DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

Rept.Bk.No. 80/127

DISPLAY OF DRILLCORE FROM OLYMPIC DAM

MINERAL EXPLORATION SECTION

by

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and

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DME No.: EL 536

CONTENTS

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ABSTRACT

Thirty trays of confidential drillcore representative of RD 16 at Olympic Dam, was provided by Western Mining Corporation Ltd and placed on public display from May to October 1979 by the South Australian Department of Mines and Energy. The opportunity to inspect the core and to obtain an insight to the lithologies and mineralisation at Olympic Dam was greatly appreciated by all geoscientists.

The mechanics of establishing this unprecedented display and conducting visits are described, the technical observations of about 350 visitors are summarised and conclusions are drawn concerning successes and shortcomings of the excercise and possible future displays.

Significant outcomes from the display were the general lack of correlation with any other known deposit (with the possible exception of Mount Painter) and the lack of consensus on the mode of origin for both the mineralisation and host rocks. Most models involve elements of contemporaneous sedimentation, volcanism, high-level plutonism and hydrothermal activity.

INTRODUCTION

It was agreed in February 1979 that Western Mining Corporation Ltd (WMC) would provide a representative selection of drillcore from the Olympic Dam deposit, to be displayed by the Department of Mines and Energy. It was considered at that time that additional public information was desirable and that this form of data release would be of great value to the exploration industry, without involving WMC in premature, necessarily interpretive description of the environment of mineralisation.

ORGANISATION

The principal concern in mounting the display was security of the core, both during and between inspections. The "Model Room" in the Geophysics Section at the Glenside Core Library was chosen because it was lockable, well lit and spacious enough to comfortably accommodate 30 trays of 0.8 x 0.5 m on benches and racks.

Drillhole RD 16 was chosen, as it was at that time the deepest (by about 500 m), it was mineralised, and it intersected the greatest diversity of rock types, including representatives of almost all major rock types and mineralisation types. Thirty trays were selected by representatives of WMC and the Department to cover major rock types, major mineralised zones, and contacts (see Appendix-graphic log).

WMC prepared the selected trays by infilling gaps in core with dowelling, and covering trays of excessively broken core with perspex (with representative specimens extracted and boxed for hand examination). WMC also documented the display by preparation of a hand-out consisting of a summary geological log, gravity and magnetic logs, descriptive comments relating to the drilling of RD 16, and core processing details (Appendix).

A declaration to be signed by all visitors and retained by the Department (Appendix) outlines the conditions of the inspection, relating to supervision by Department personnel, core handling and sampling, and technical publications referring to the core.

The display was advertised by invitation to technical staff of all exploration companies operating in South Australia, and later, in the departmental publication "Mineral Industry Quarterly" (No. 13). Viewing procedures including an appointment system and a group size limit of 5 were established and inspections commenced on 8th May 1979. Inspections were supervised by the authors, W.P. Fradd and B.W. Atterton (SADME).

The core was returned to WMC in early October 1979, after inspection by about 350 geoscientists from over 100 organisations. Many of these returned to re-examine the core in detail after an initial inspection.

INSPECTIONS

After discussion of guidelines with WMC personnel, the technical staff sharing the supervisory role (principally the authors) were guided by a stated objective that visitors were to be helped to the limit of our knowledge in evaluating the drillhole on display. Thus while detailed information was not extensively volunteered, questions relating to petrology, texture, chemistry and representativeness of samples were answered to the best of our ability. The geology of other drillholes was defined as outside the limits of discussion and questions involving 3-dimensional relationships were rejected. All types of non-destructive core testing were allowed; scintillometry, photography and UV lamp scans were used to supplement hand specimen examination. UV scanning was found to highlight the distribution (in veins) of a late-deposited barite phase which gave a strong red fluorescence. Inspection in any detail usually required 2-4 hours, while a few individuals or teams spent (or aggregated in two or more visits) up to 8 hours. Shorter inspections comprised little more than cursory confirmation of rock type and mineralisation. Many observers expressed gratitude to WMC and the Department for the opportunity presented by the display. Many also revealed a lack of knowledge of the necessary close working relationship between company and government in a developing project, in their expression of disbelief that such a release could be arranged without extreme coercion.

Not surprisingly, additional information was frequently sought to resolve interpretational ambiguities inherent in the rocks. Thin and polished section reports, or sections available for personal examination, trace-metal and whole-rock geochemical data, scintillometer and other electric hole logs, and radiometric age data were most often requested, either directly or in the course of discussion.

The following compilation of observations and conclusions illustrates the diversity of geological interpretation possible when a large group of independent professionals bring their various expertise and experience, preconception and possibly prejudice to bear on a single problem.

ORIGIN OF THE MAIN ROCK TYPES

Pebble conglomerate

In evaluating this unit the following features were most frequently noted as significant in deducing its origin:

- rounded, apparently locally derived clasts of mostly resistant rock fragments.
- limited size ranges and lithological diversity of clasts.
- extremely sharp ?unconformable contacts at top and base.
- "hydrothermal" barite-fluorite-chalcopyrite matrix.

It was generally agreed that the matrix had been deposited in the intergranular spaces of a residual blanket or outwash type of sediment, probably prior to deposition of the overlying Tregolana Shale. The absence of placer concentration of resistate uranium minerals surprised many observers.

There were variations in estimates of the timing of deposition and matrix emplacement. The deposition of the conglomerate was considered:

- as the final episode of the immediately underlying volcanic and hematitic sedimentary sequence.
- as surface lag accumulated during a period of exposure.
- as basal to the Tregolana Shale.

On the basis of similarity between the red-green alteration in the Tregolana Shale and the volcanic and hematitic sedimentary sequence, the matrix emplacement, alteration and mineralisation could be interpreted as syn- or post-Tregolana in age. One observer concluded that the deposit was a pebble dyke.

There was also disagreement about the source of fluids from which the matrix was deposited. Theories ranged from hydrothermal emanations relating to the main mineralising event, to hydrothermal remobilisation of adjacent mineralised phases, or groundwater charged by leaching of mineralisation. It was suggested that fluid-inclusion temperature studies on the fluorite may clarify these uncertainties.

One experienced observer noted that sediment of this style (ignoring matrix) was widespread on the pre-Adelaidean unconformity surface throughout the Stuart Shelf.

Volcanics

The importance of the volcanics in indicating the general environment of accumulation of this unusual suite of rocks, and as a basis for correlation, was widely recognised either expressly or implicitly. However, the obscurity of this unit, due to lack of texture, fine grainsize, and advanced, diverse alteration precludes clear analysis.

Several observers (a significant minority) questioned the distinction between fine-grained sediment and volcanic, and did not find the "?amygdules" convincing, while another significant proportion favoured an intermediate to basic original composition for persuasive textural reasons (but it is suspected that at least some of these may have been influenced by preconceived or over-extended correlation concepts). The evidence includes:

- distribution of identified feldspar laths.
- iron oxides released on alteration.
- non-porphyritic character compared with all South Australian Precambrian acid to intermediate volcanics.
- presence of amygdules, and
- analogy with examples in Bumbarlow No. 1 Stratigraphic well (Benagerie Ridge, Frome Embayment).

However, analysis of the available petrological and analytical data convinced most that original composition should fall in the acid to intermediate range. A few visitors saw a distinct similarity in composition, and hence a very close genetic link, between the sericitised hematised volcanics and the more-granitoid-like granitic breccia.

While the volcanics were mostly thought to be subaerial, the nature of the hematitic sedimentary interbeds was thought by some to indicate a subaqueous environment, compared with the coarse clastic interbeds typically found in the subaerial Gawler Range Volcanic sequence. This raised the possibility that these may be subaqueous lateral equivalents of the Gawler Range Volcanics.

The possible presence of primary or introduced sulphide as indicated by bleached zones with limonite cores, particularly in fractures, was noted as significant by some.

Correlations were stated, or suggested, to most Precambrian volcanics known in South Australia including Beda, Roopena and Gawler Range Volcanics, volcanics in the Musgrave Block, below the Cooper Basin, and in a similar Proterozoic environment in Arnhem land, and even as part of a package laterally equivalent to the Pandurra Formation. The geochemical "finger-printing" approach illustrated by Chris Giles (Quarterly Geological Notes of the Geological Survey of S. Aust. No. 71, July '79) is recommended as a test of the affinities of these volcanics.

Hematitic Sediments

These units were also closely examined for environmental indications, potential correlatives and contained mineralisation. Features of greatest interest were:

- detail and attitude of fine bedding.
- concordant and discordant internal brecciation.
- white crystals in selected beds.
- barite fracture fillings.
- sulphide distribution, and
- green sulphide-bearing ?tuffaceous interbeds.

Occasional bedding plane sedimentary structures and cross-bedding were used to confirm upright facing.

There was no consensus as to whether the depositional environment was distinctly volcanic, evaporitic or detrital, but it was agreed that the hematite was primary and syngenetic. Although the core on display was too severely skeletonised for a complete impression, variable bedding attitudes, brecciation and rare convoluted laminae in zones less than 2 mm thick were generally attributed to soft ("wet") sediment deformation.

One observer noted the uniformity of clasts and matrix, and the low clast/matrix ratio of breccias, which he interpreted as brecciation of semiconsolidated material rather than tectonic brecciation of indurated rock. White crystals were variously interpreted as salt casts (in redbed mudstones), volcanic phenocrysts in sediments of rather direct volcanic derivation (either detrital or chemically deposited), or porphyroblasts as a result of syn- or post-depositional diagenesis.

In one case the mineralised basal hematitic unit was considered to be significantly different (a chemical precipitate) from those above (detrital). Another observer postulated the derivation of hematitic sediments by erosion of underlying mineralisation and redeposition in an appropriate environment. Yet another interpreted the opposite, that bedded zones within the underlying hematitic breccia were clasts reworked from the hematitic sediments.

The sediments were variously equated to the Sturtian Holowilena/Braemar Iron Formations of the Adelaide Geosyncline, Carpentarian Tarcoola Beds, and to Moonta and other metamorphic basements containing iron formations throughout the State. A quite striking visual similarity was demonstrated between relatively iron-poor indurated hematitic sediment, and an iron-rich example of northern Yorke Peninsula basement (Wandearah Metasiltstone).

It was also observed that these are unconvincing as genuine "Banded Iron Formations" (implying chemical iron/silica oxide precipitation) and may be better interpreted as sediments derived from a basement rich in true iron formation, or as volcanic rocks.

Agglomerate

In this narrow interval within the interbedded sedimentary and volcanic sequence, the striking presence of a diversity of coarse, highly rounded clasts of general acid volcanic affinity (some hematitic sediment) in a highly altered matrix of volcanic appearance was of unknown significance to most observers.

The exotic clast assemblage relative to the containing sequence, and in particular the absence of granitic clasts, was noted.

Sedimentary, glacial and volcanic (including pebble dyke) origins were proposed, and the presence or absence of mineralisation was frequently questioned.

Hematitic Breccia

The most remarked upon feature of this formation was the abundance of hematite. Its relationship to the gravity anomaly was widely appreciated.

Rare fine and coarse depositional banding in this unit was usually convincing evidence of its detrital origin. However, it was occasionally described as directly intrusive material in the cap-zone of a high-level granite intrusion. This conclusion was based on the texture of the coarser material from the top of the unit (520 m) which would conceivably have been derived by intense hematisation of a phase of the granitic breccia displayed (815 m). As mentioned earlier, a few observers interpreted the depositional banding as clasts reworked from the overlying hematitic sediments.

The majority in assessing it as a clastic accumulation, were divided on three aspects of its origin. It was interpreted as either:

- sedimentary or volcanic.
- containing syngenetic or hydrothermally introduced hematite, and
- containing syngenetic or hydrothermally introduced copper and uranium mineralisation.

Resolution of these alternatives was based on the perceived nature and significance of:

- clast assemblage and character.
- phases and textures of hematite present.
- relationship between mineralised and barren portions, and
- evidence of pre-existing rock type.

However, most evidence was equivocal. For example, one observer thought atoll-textured and embayed quartz clasts were indicative of volcanic origin, while another attributed the same feature to the corrosive effects of fluoritic hydrothermal fluids.

An intense history of repeated brecciation and hydrothermal activity was commonly invoked to account for clasts of breccia and the numerous phases of hematite.

While the mineralisation was closely studied, it did not provoke much significant comment beyond admiration of locally developed high grades. The dark-coloured sulphidic assemblage in a matrix of hematite, and general fine grainsize restricted the effectiveness of hand specimen examination and the significance of observable features was often unclear. The zoning of sulphide mineralogy (reversed mineralogical order compared to the expectation of some observers) and overlap of mineralisation across the sharp lower contact into the altered granitic breccia are examples of this.

No correlatives of this unit were proposed.

Granitic Breccia

In spite of the foregoing, this rock and its contained mineralisation provoked the greatest dispute, uncertainty and conflict in interpretation. Comments ranged from "That is an arkose", and "Its texture is not plutonic" to "It must be a granite", and "granitised sediment/volcanic". Many geologists considered that the lithology displayed only limited brecciation and were surprised that the terminology had been adopted.

The fine-grained feldspathic lithology at about 1016 m was subject to a similar range of interpretations including most commonly: aplite, syenite and sandstone.

Features of the granitic breccia to attract most attention were:

- granular texture; which was variously interpreted as not plutonic, locally igneous, cataclastic, mylonitic, altered igneous, and igneous clasts but detrital matrix. The absence of any foliation, or other evidence of metamorphic recrystallisation, was widely agreed.

- textural uniformity over the total intersection; this was used to support an igneous origin. However, localised textural variability at possible clast boundaries was often taken as indicative of sedimentary origin.

- chloritic, sericitic and hematitic alteration, and K-feldspathisation. The green sericitic alteration was often misidentified as epidote. Localisation of chloritic alteration near mineralisation was often noted. The extremely pervasive and uniform impregnation of hydrothermal alteration products and absence of widespread veining (especially quartz veining) were considered remarkable, indicating to some a high degree of permeability in the rock mass at the time of alteration. Others noted the similarity of the alteration suite to that classically associated with porphyry systems and were swayed towards an igneous history.

- chemical composition; this was acknowledged to be unusually acidic and potassic but the rock was once authoritatively described as mineralogically and chemically very typical of the Hiltaba type (post-Kimban orogeny, age about 1480 m.y.).

- subtle, subhorizontal layering and detrital aspects were recognised throughout the interval by some observers who were persuaded that the unit was a sediment. No observations were unequivocal.

- disseminated and vein sulphide developments scattered throughout the unit were of interest but not diagnostic. The possibility of derivation of some or all of the hematite in the sequence from pyrite was suggested.

- a possible clast of apparently porphyritic texture similar to the dominant clast type in the agglomerate, was observed at about 1245 m. As an exotic clast in granitic sediment it lends weight to a sedimentary origin, but due to the possibility that it may be xenolithic and the isolation of the occurrence, it could not be considered diagnostic.

Interpretation of this accumulation of ambiguous evidence was usually attempted in conjunction with that of the equally ambiguous inferences from the contained hematitic mineralisation. The combination introduces only a few constraints to the range of possibilities.

Hematitic and sulphidic breccia

The predominance of yellow sulphides (pyrite and chalcopyrite) allowed much closer examination of this mineralisation than that overlying the granitic breccia. Frequently noted significant features, some of which were said to have conflicting genetic implications, include the following:

- clast types; including iron oxide phases, sulphides and rock species. The clasts are fine grained and not particularly diverse in the intervals on display, being mainly altered granitic breccia. A few exotic species were detected, and the absence of quartz (abundant in the hematitic breccia mineralisation) was distinctive. Ragged coarser clasts of chloritised granitic breccia concentrated near the margins of the mineralisation appear to be of different origin to other clasts.

- clast morphology; including angularity and size variations, the morphological similarity of many hematite, rock and sulphide clasts, and evidence of multiple brecciation.

- rock textures; particularly layering defined by grain-size variations and graded bedding, indicating probable sedimentary/volcanic character (but explained in other models by hydrothermal "settling", mylonitisation, magma movement etc.).

- contrasting contact relationships; ranging from gradational and feldspathised, to sharp, and flow-like in appearance (explained in sedimentary/volcanic models by wet sediment mobility or hydrothermal remobilisation) and accompanied by variable but intense feldspathic, chloritic or hematitic alteration of adjacent granitic breccia.

- mineralogical zoning of chalcopyrite/pyrite and hematite/magnetite with depth.

- comparison with hematitic breccia mineralisation, which was mostly thought to be not significantly different in origin, although possibly differently emplaced.

Interpretation of this mineralisation as a sedimentary/volcanic/volcanoclastic accumulation complements a sedimentary environment of deposition for the granitic breccia. Conversely, reconstructions based on brecciated intrusive granite require that the hematitic and sulphidic breccia forms an epigenetic style of mineralisation. Between these extremes lies a variety of compromises (and outside of them are a few less plausible alternatives) which will be indicated in the following section.

INFERRED GEOLOGICAL SEQUENCES OF EVENTS

The comments and interpretations of numerous observers are here synthesised into coherent genetic sequences. Amongst the numerous models proposed, the following were the most commonly suggested:

Volcanogenic-syngenetic model (sedimentary and volcanoclastic accumulation of all lithologies on display in RD 16). The sequence of events is:

- high-level granite intrusion into unknown basement.
- exposure of granite by stripping of cover, or faulting.
- basin development (caldera, graben or rift) adjacent to granite, associated with the onset of volcanism.
- rapid accumulation of locally derived talus breccia of coarse granitic sediment interrupted by quiescent intervals when hematitic mineralised sediment or volcanic debris was deposited in a sedimentary breccia including abundant exotic clasts.
- volcanic deposition of hematitic breccia and associated mineralisation (volcanism accompanied by pervasive hydrothermal alteration of acidic rocks).
- sedimentary/volcanic deposition of fine-grained hematitic sediments and associated volcanics.
- weathering and erosion producing pebble conglomerate, and
- final phase hydrothermal activity producing open space deposition of barite, fluorite and sulphide in fractures and conglomerate matrix.

Volcanogenic-polygenetic model, where the sequence of events is:

- high-level granite intrusion into unknown basement, possibly auto-brecciated and pervasively altered.
- exposure of granite by stripping of cover sequence.
- volcanism and associated invasion of granite mass yielding the mineralised volcano-sedimentary cover sequence, mineralised bodies within the granite and possibly hydrothermal alteration of the granite, and

- post-volcanic events as in the previous sequence.

"Porphyry" (sensu lato) model:

- deposition of hematitic sedimentary/volcanic sequence on unknown basement.
- erosion, and deposition of pebble conglomerate.
- intrusion of auto-brecciated, high-level granite into sedimentary sequence. Hematitic residual magmatic fluids carry mineralisation, and effect hydrothermal alteration, remobilisation, and mineralisation of granite and intruded sequence. Mineralisation thus emplaced in a variety of forms. Hematitic influence in both volcanic and intrusive phases suggests common magmatic source.

Evidence may be interpreted from the core to support or refute each of these reconstructions, and those observers who expressed interpretations were approximately equally divided between the three basic concepts. However, it is noticeable that while interpretational details of accumulation/emplacement of mineralisation conflict, there is considerable overlap in the general concept of a tectonically active environment with elements of semi-contemporaneous intrusive/extrusive magmatic, hydrothermal and faulting activity. This allows a wide range of compromise proposals, incorporating selected aspects of the three basic concepts described, and variations on these themes. Graben, rift and caldera environments were commonly cited in the context of many of these interpretations.

In addition to the above consensus interpretations, a variety of alternative mechanisms were suggested but not widely supported. Contentious aspects of these genetic schemes are noted below:

Regolith concepts

(a) mineralisation developed "par descensum" in a mylonite zone in granite, and subsequently buried by volcanics.

(b) exposed granite brecciated by mechanical or leaching weathering processes and mineralisation introduced by hydrothermal activity during subsequent volcanic phase.

Granitisation concepts

(a) diagenetic recrystallisation of interlayered fine-grained mineralised ferruginous and barren muddy to sandy sediments.

(b) passive, relatively low temperature metasomatic recrystallisation of an accumulation of fine-grained acid volcanics or volcanoclastics. Hematitic, mineralised material either "sweated out", introduced by the hydrothermal activity, or as interbeds chemically unaffected by the hydrothermal activity.

Remobilisation concepts

Mineralised, hematitic sedimentary and volcanic sequence intruded by high-level granite and constituents redistributed by associated hydrothermal activity.

Infaulted concepts

(a) syngenetic, sedimentary/volcanic mineralisation repeated within a granite by reverse faulting.

(b) a single layer of hydrothermal/metasomatic mineralisation within a granite which has been brecciated and repeated vertically by extensive thrust faulting.

GENERAL COMMENTS

It is significant that none of about 350 observers could cite a deposit (apart from Mount Painter) considered analogous to this representation of Olympic Dam. Numerous suggestions were made describing examples in which some aspects of this mineralisation and environment are repeated, but none was comparable overall.

The association of hematite (containing iron in its most oxidised state), with a variety of copper and uranium minerals at less than maximum oxidation state was widely noted as 'inexplicable'. Other examples were sited from various types of deposits, including Tennant Creek (NT), Cadia (NSW) and the

Superior Mine in the south-western United States. At the Superior Mine a cupriferous intrusive invades a pyritic carbonate sequence; in this sulphur-deficient system, chalcocite and bornite form at the expense of pyrite, which is converted to hematite, due to copper having stronger chalcophile affiliations than iron.

Alternatively, the Olympic Dam hematite-sulphide association was attributed to specialised pH/Eh conditions, deposition under surface or near-surface conditions, or conversion of original magnetite or pyrite to hematite.

Features to attract attention by their absence were:

- the complete absence of quartz veins. This was often used to argue against a direct igneous origin for the granitic breccia.

- the general lack of porphyries except as clasts.

Some aspects which were consistently discussed included:

- the influence of pervasive alteration, multiple hydrothermal pulses and repeated brecciation in rendering ambiguous most features of the rocks which may have provided evidence of the geological history.

- geological correlations with other parts of the State.

- proximity of lineaments.

- exploration significance of recorded geophysical information, and

- elements of analogy with Mount Painter mineralisation.

While the gravity anomaly is readily explained by the dense hematitic rocks in the section, the source of the regional magnetic feature remains unresolved. Possibilities include:

- sediments (including banded iron formations) in older metamorphic basement below or intruded by the rocks drilled.

- magnetite masses forming a deeper part of zoned mineralisation, and

- igneous intrusives, which may be part of the metamorphic basement or younger and genetically related to the environment and processes of mineralisation.

Using the regional magnetic data, several visitors had made depth to source estimates in the vicinity of 2 km.

It was generally agreed that the duplication at Mount Painter of much of the unusual geochemical and lithological association present at Olympic Dam indicates a similarity of origin and thus possibly of age. The detailed distribution of mineralisation is dependent on conditions of emplacement and subsequent history, which are clearly dissimilar. In particular, it was suggested that argillic alteration at Mount Painter is indicative in porphyry terms of the peripheries of mineralisation, while that at Olympic Dam (potassic, sericitic and hematitic) is more typical of the core. This may imply a central concealed target or erosion of a pre-existing central deposit at Mount Painter.

CONCLUSIONS

The display of drillcore was an innovative and practical solution to the problem of progressive release of confidential information on a significant geological environment previously unknown in this State. In preparation and operation it was successful, effective and not excessively demanding of either organisation, although some improvements are suggested below.

Core disruption was minimal and losses negligible as a result of clearly defined requirements (supervision, small groups and declarations) and the highly responsible attitude shown by visitors. The five month display period was at least 20% longer than necessary to achieve the desired exposure. Apart from a "last minute" rush, the frequency of inspections in the last 2 months indicated that all major interest had been satisfied.

The conduct of the display clearly had benefits for all concerned. The most important are summarised below.

For WMC, the pressure for release of further information (correctly regarded as premature at this stage) has been eased, considerable goodwill generated, and a certain amount of constructive feedback and informed discussion promoted.

For the Department, the level of interest shown, and the establishment of a valuable precedent have justified the input of effort. The exercise can also be considered to have made a significant contribution to effective exploration for further deposits of this type within South Australia.

For the exploration companies, the information has allowed an assessment of the environment of mineralisation, expanding the area of search beyond the limits of the Stuart Shelf and placing all exploration for similar mineralisation on a firmer conceptual basis.

For all who inspected the core, the satisfaction of professional interest provides the background for more informed discussion and a better understanding of any future written information.

Difficulties experienced were mainly in the area of supervision, and sample selection. It was felt that professional supervision was desirable to allow visitors to obtain maximum benefit from their inspection. This involved about 400 man hours over the duration of the display. However, much of the beneficial feedback was obtained during discussions while inspections were in progress. Selection of an appropriately representative sample and description of the degree to which that sample was representative presented difficulties within the guidelines limiting discussion to the particular drillhole.

For WMC, the weakening of a privileged exploration position, the isolation and potential disruption of core which may be required at any time, represent the costs of undertaking the display.

Observers naturally requested additional information, but more significantly, were required to spend too much of the available inspection time making identifications and measurements, and documenting their observations.

Improvements to the efficiency of any future display would be based on increased effort by the Department in preparatory stages to facilitate:

- the conduct of inspections (by reducing the supervision requirement), and
- the study of the core (by upgrading documentation of factual data).

The use of perspex tray covers throughout (with selected specimens extracted and boxed for hand inspection) would eliminate the need for supervision apart from the beginning and end of inspections, without severely restricting observers. The technical level of supervision provided should depend on the degree of feedback sought, particularly if more refined documentation were to be provided.

Upgraded documentation might include a gamma log or radiometric core scan, photographic record, tray by tray description of petrological, textural and special features, and saw-splitting of representative specimens. The availability of microscopy is of debatable net value with benefits including the possibility of resolving interpretational ambiguities, and more detailed appraisal, and logistic disadvantages such as the prolonged time taken for inspection and increased potential for core disruption. It could be available in the form of a binocular instrument, selected thin and polished sections and appropriate microscopes, display of photomicrographs, or a series of petrographic descriptions available with hand-out material. In future displays, more detailed hand-outs could be made available prior to inspection, at cost if necessary.

As in this case, any future display should be justified mainly on the grounds of benefit to exploration efficiency in South Australia. Displays from other areas of the state should be sought when the justification is apparent.

TJI:DJF/GU

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APPENDIX

HAND-OUT MATERIAL

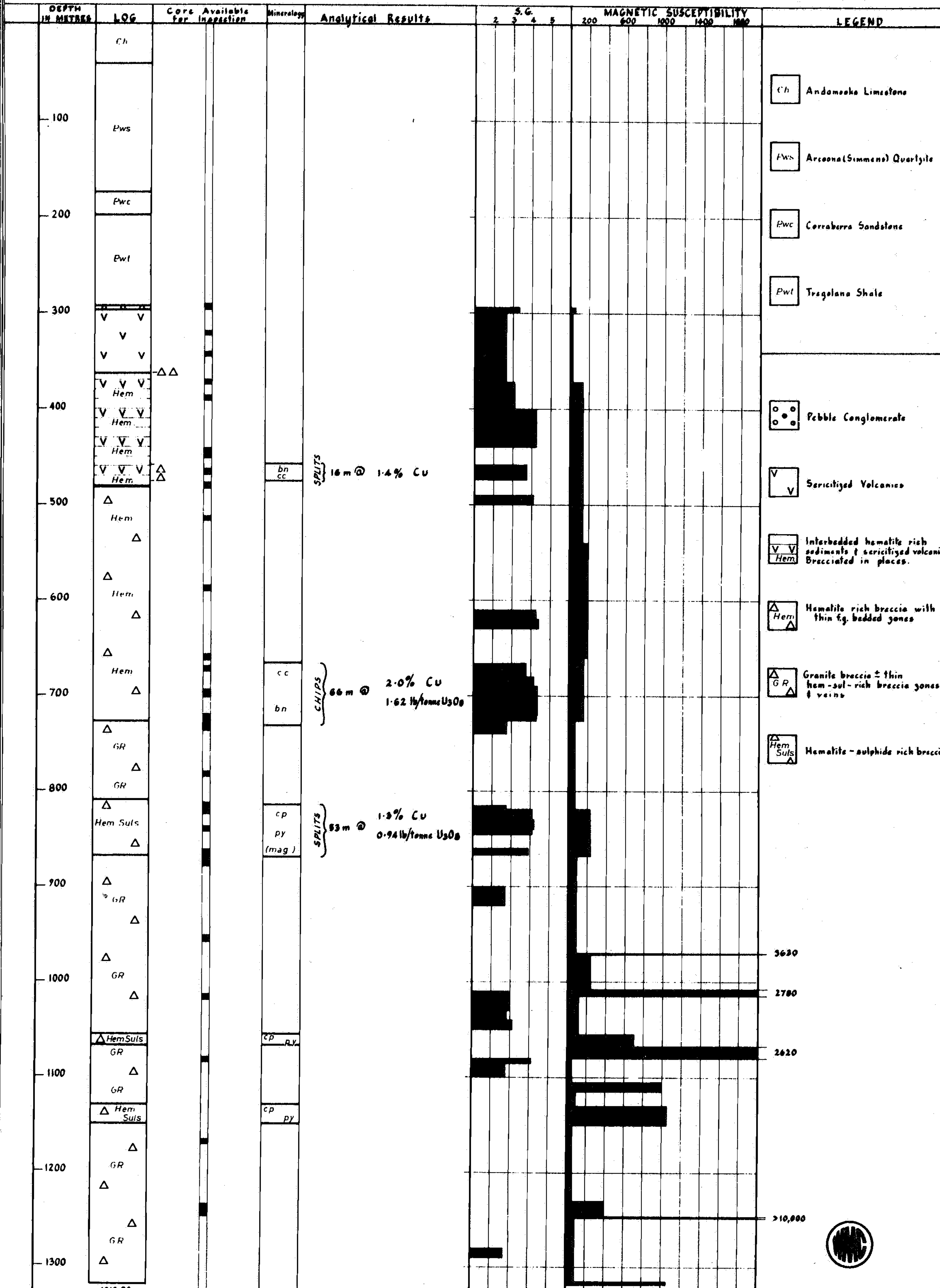
Log of geology, specific gravity and magnetic susceptibility.

Descriptive notes.

Declaration.

OLYMPIC DAM PROJECT

RD16



DIAMOND DRILL CORE DISPLAY - OLYMPIC DAM PROSPECT

The Olympic Dam Copper-Uranium Prospect is located about 25 kilometres west of Andamooka on Roxby Downs Station. Exploration commenced in the area in 1975 after a detailed study of copper environments in South Australia indicated potential in the Stuart Shelf Area. The discovery hole RD1 was sited in July 1975, and intersected 38 m @ 1.05% Cu and minor uranium. To date a further 19 diamond drill holes have been completed.

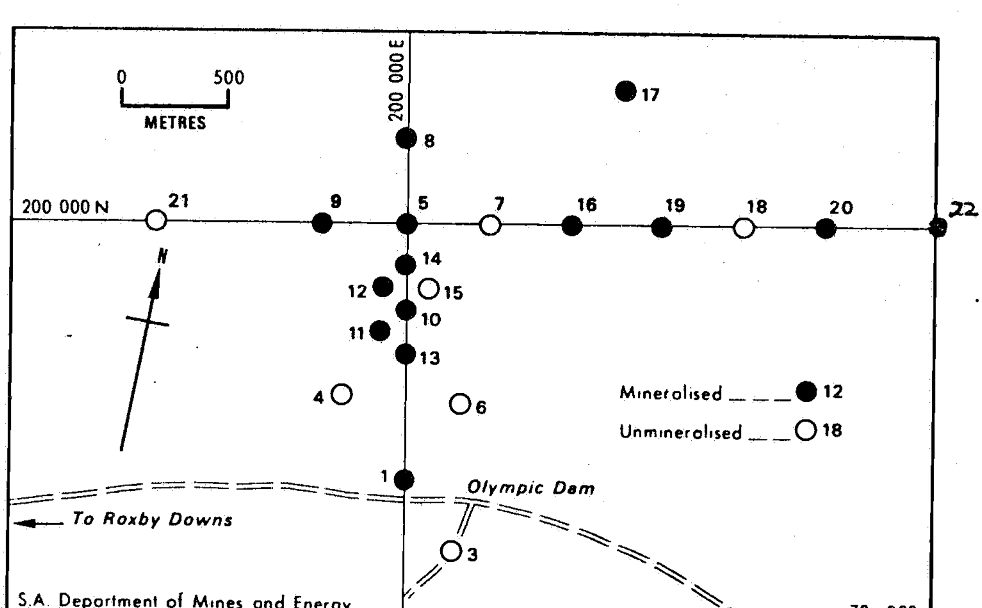
Diamond drill hole RD16 was selected for display because it shows greater lithological variation than other holes at Olympic Dam, and is the deepest hole drilled to date. The trays of drill core on display were carefully selected as being representative of Rd16 by SADME and W.M.C. geologists.

RD16 was percussion precollared to 166 m and drilled BQ to 419.7 m in August 1977 without intersecting significant mineralization. It was later decided to deepen the hole and it was finally completed at 1318.9 m late in 1978. Bad ground conditions necessitated the completion of the hole below 480 m with AQ rods after an attempted wedge had failed. Drilling to 419.7 m was carried out using a Longyear '38', and drilling below this was completed by a Mindrill 'F150'. Both drilling rigs are owned and operated by Western Mining Corporation Limited, Exploration Division.

The assay results presented are taken from published company reports and are derived from assays of 1 m split core samples and 2 m bulked chip samples. Analysis was carried out in Western Mining Corporation Limited laboratories by A.A.S. and fluorimetric techniques.

The specific gravity data presented are derived from averages of results from 6 m spot samples to a depth of 419 m, below this continuous core over 1 m intervals was measured in selected zones as indicated.

Magnetic susceptibility measurements were made using a Bison Instruments Magnetic Susceptibility Meter Model 3101A. Spot samples of full core were measured at 6 m intervals, average results with spot highs are presented in c.g.s. units x 10^{-6}.



Drill locality plan, Olympic Dam prospect, Roxby Downs

NAME:

ORGANISATION:

I,   , the undersigned, seek approval to inspect diamond drill-core from RD16 at Olympic Dam on   .

It is understood that this core is the property of Western Mining Corporation Limited and agree that the following conditions shall apply to any inspection:

(1) A representative of the Department of Minerals and Energy is to be present at all times during inspection.

(2) No sampling of the core is permitted.

(3) Any proposed publication referring to the core is to be discussed with Western Mining Corporation prior to preparation. Any resulting publication is subject to written approval from Western Mining Corporation Limited prior to submission for publication.

(4) In accordance with standard practice every effort is to be made to minimise damage to the core and to ensure replacement of the core in its original position and orientation.

Signed ______________________

Date ______________________