PROGRAMME

and

ABSTRACTS

for the

THIRTEENTH SYMPOSIUM

on

"ADVANCES IN THE STUDY OF THE SYDNEY BASIN"

DEPARTMENT OF GEOLOGY
THE UNIVERSITY OF NEWCASTLE
N.S.W. 2308

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Department of Geology

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"ADVANCES IN THE STUDY OF THE SYDNEY BASIN"

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4 to 6 May, 1979

Convener:

Professor C.F.K. Diessel
Department of Geology
The University of Newcastle

559.4405

Advances in the study of the Sydney Basin; abstracts of the symposia: (annual) 1st symposium 1966 to 4th symposium 1969. Newcastle, University of Newcastle, Department of Geology. Published as one volume with individual title pages. From 5th symposium 1970 title changed to Advances in the study of the Sydney Basin; programme and abstracts, which see also.

Geology - N.S.W. - Congresses

University of Newcastle - Department of Geology

Symposium on Advances in the study of the Sydney Basin, University of Newcastle (s)

559.4405

Advances in the study of the Sydney Basin; programme and abstracts of the symposia; (annual) 5th symposium 1970 to date. Newcastle, University of Newcastle, Department of Geology. Previously known as Advances in the study of the Sydney Basin; abstracts of the symposia, which see also.

Geology - N.S.W. - Congresses

University of Newcastle - Department of Geology

Symposium on Advances in the study of the Sydney Basin, University of Newcastle (s)

FOREWORD

Who would have thought when these Symposia began in 1966 that enough interest would have been generated in the Sydney Basin for them to continue to the end of the 1970's? In fact, the interest is as strong, if not stronger, than ever.

This year, emphasis will be placed on the application of coal petrology and engineering geology, two most appropriate aspects as coal takes on great importance in our efforts to grapple with the energy crisis.

To all I say "Welcome" and express the hope that you will join us again in 1980 as we set our course for that decade.

BERYL NASHAR

Head of Department

PREFACE

The programme and abstract volume of the TENTH NEWCASTLE SYMPOSIUM contains an author and locality index for the first ten symposia.

This year, the format for the symposium has been altered slightly in order to accomodate an extensive discussion time during the Saturday afternoon sessions on environmental and engineering geology and current problems in applied coal petrology. In the remaining sessions, a keynote address, and thirteen papers dealing with a wide variety of topics, will be given.

R. OFFLER

C.F.K. DIESSEL

PROGRAMME

FRIDAY, 4th MAY 1979

	HOURS
REGISTRATION in the Foyer of the Geology Building The University of Newcastle	9.00 a.m. - 5.00 p.m.
MEETING of the Working Group for Coal Petrology of the Standard Association of Australia in Room G04, Geology Building.	10.00 a.m. - 12.30 p.m.
EXCURSION: Inspection of the geology and mining operations at the Costain Ravensworth No. 2 Open Cut Coal Mine. Transport to and from the mine will be by bus. Leader: Associate Professor K.H.R. Moelle	1.00 p.m. - 6.00 p.m.
INFORMAL GATHERING at Stan's Bar in the University Union Building.	After 8.00 p.m.

SATURDAY, 5th MAY 1979

REGISTRATION in the Foyer of the Geology Building The University of Newcastle	8.30 a.m. - 9.00 a.m.

MORNING TECHNICAL SESSION

Geology/Physics Lecture Theatre E01
(beside the Geology Department)

Chairman: Associate Professor D. Branagan

OPENING of the 13th Newcastle Symposium	9.00 a.m. - 9.05 a.m.

	HOURS
CHAR PETROLOGY IN RELATION TO THE AGGLOMERATION PROBLEM IN COAL LIQUEFACTION. L.H. Hamilton CSIRO Fuel Geoscience Unit	9.05 a.m. - 9.35 a.m.
APPLICATION OF COAL MICROSCOPY IN RELATION TO COAL HYDROGENATION EXPERIMENTS. M. Shibaoka CSIRO Fuel Geoscience Unit	9.35 a.m. - 10.05 a.m.
THE PETROGRAPHY OF INSOLUBLE RESIDUES DERIVED FROM THE HYDROGENATION OF COALS OF VARYING RANKS. C.F.K. Diessel The University of Newcastle	10.05 a.m. - 10.35 a.m.
Morning Tea in Geology Department	10.35 a.m. - 11.05 a.m.
TRACE ELEMENTS IN COAL AND THE GEOCHEMICAL CYCLE. D.J. Swaine CSIRO Fuel Geoscience Unit	11.05 a.m. - 11.35 a.m.
KEYNOTE ADDRESS Professor A.V. Bradshaw CSIRO Process Technology "The present state of the art of coal liquefaction."	11.35 a.m. - 12.25 p.m.
SUMMARY AND VOTE OF THANKS BY CHAIRMAN	12.25 p.m. - 12.30 p.m.
Lunch at the Special Functions Room of the University	12.30 p.m. - 2.00 p.m.

AFTERNOON TECHNICAL SESSION I

Geology/Physics Lecture Theatre E01
(beside the Geology Department)

Chairman: Associate Professor C.F.K. Diessel

DISCUSSION OF THE RESULTS OF THE I.C.C.P. EXERCISE 1978 (RING ANALYSIS 1 AND 2). R.E. Guyot ACIRL	2.00 p.m. - 2.30 p.m.

DISCUSSION OF THE RESULTS OF THE RING ANALYSIS ORGANISED BY THE STANDING COMMITTEE ON COALFIELD GEOLOGY OF N.S.W.	2.30 p.m. - 3.00 p.m.

M. Smyth
CSIRO Fuel Geoscience Unit

Afternoon Tea in the Geology Department	3.00 p.m. - 3.30 p.m.
GENERAL DISCUSSION on current problems in applied coal petrology.	3.30 p.m. - 5.30 p.m.

Leader: C.F.K. Diessel

Suggested topics:

1. In view of the substantial differences in the results of the international and national ring analyses photomicrographs will be shown in order to identify and clarify areas of discrepancy.

2. Why do laboratories differ in their reflectance measurements?

3. A comparison of methods of coke stability calculations.

AFTERNOON TECHNICAL SESSION II

Physics Lecture Theatre DG12

Chairman: Associate Professor K.H.R. Moelle

GEOLOGICAL ASPECTS OF TRACK MAINTENANCE IN RAILWAY TUNNELS NEAR LITHGOW.	2.00 p.m. - 2.30 p.m.

P. Hilleard
Public Transport Commission of N.S.W.

ON THE NEED FOR A BUILDING ORDINANCE AND CODE FOR THE NEWCASTLE AREA.	2.30 p.m. - 3.00 p.m.

K.H.R. Moelle
The University of Newcastle

Afternoon Tea in the Geology Department	3.00 p.m. - 3.30 p.m.

GENERAL DISCUSSION on environmental and engineering geology in the Sydney Basin. 3.30 p.m. - 5.30 p.m.

Leader: K.H.R. Moelle

Suggested topics:

Engineering and environmental geological problems in city and country areas with regard to the construction of roads and railways, buildings, mines and beachfronts.

For example:

1. Is there a need for engineering geological maps for city areas?

2. To what extent does the "urban sprawl" interfere with the development of mines and sterilize mineral resources?

3. What is resource management? Some case histories from the Sydney Basin.

Buses leave University grounds for SYMPOSIUM DINNER at the Rothbury Estate, Hunter Valley 6.30 p.m.

First bus returns to Newcastle, followed at thirty minute intervals by remaining buses 10.30 p.m.

SUNDAY, 6th MAY 1979

Geology/Physics Lecture Theatre E01
(beside the Geology Department)

Chairman: Professor B. Nashar

PETROLOGICAL AND PETROCHEMICAL STUDIES OF ALKALINE BASIC INTRUSIVES IN THE Mt. ARTHUR AND GUNNEDAH REGIONS. 9.30 a.m. - 10.00 a.m.

D.H. French, J.A. Gamble, B. Nashar
The University of Newcastle

INTRUSIVE BRECCIAS IN NEW SOUTH WALES COAL SEAMS 10.00 a.m. - 10.30 a.m.

L.H. Hamilton
CSIRO Fuel Geoscience Unit

SYDNEY BASIN DIATREMES AND MAAR VOLCANOES. C. Herbert and E. Crawford Geological Survey of N.S.W.	10.30 a.m. - 11.00 a.m.
Morning Tea in the Geology Department	11.00 a.m. - 11.30 a.m.
UNDERGROUND LIQUID WASTE DISPOSAL AND ITS FEASIBILITY WITHIN THE SYDNEY REGION. R. Corkery Geological Survey of N.S.W.	11.30 a.m. - 12 noon
GEOLOGY OF HISTORIC BUILDINGS. G.S. Gibbons and J.L. Gordon N.S.W. Institute of Technology	12 noon - 12.30 p.m.
SUMMARY AND VOTE OF THANKS BY CHAIRMAN	12.30 p.m. - 12.35 p.m.
Lunch at the Special Functions Room of the University	12.35 p.m. - 2.00 p.m.

CHAR PETROLOGY IN RELATION TO THE

AGGLOMERATION PROBLEM IN COAL LIQUEFACTION

L.H. Hamilton
CSIRO Fuel Geoscience Unit

A major problem in the liquefaction of coal by flash pyrolysis is agglomeration of char particles within reactors. The growth of agglomerates frequently leads to stoppages through complete obstruction of reactors working in either the fluidized bed or entrainment modes of operation. Although the cause of agglomeration is not completely understood it clearly is related to coal properties such as plasticity, swelling and adhesion, and to reactor design and operation involving reactor shape, particle size and velocity, duration of heating, particle suspension density, etc.

To some extent the process of char formation can be elucidated with the petrological and scanning electron microscopes using char properties such as reflectivity, anisotropy, morphology and internal structure. Some remnant macerals and minerals can be identified, and the extent to which particle individuality has been lost can be assessed.

Growth of agglomerate in an entrainment reactor appears to be initiated by adhesion of char to the reactor wall. This is followed by further adhesion of char grains to those already deposited. In contrast agglomeration in fluidized beds generally appears to form as the char makes multiple contacts with the fluidized bed sand grains. In one exam an entrainment char agglomerate had a foam-like structure in polished section but under the scanning electron microscope its morphology indicated that char cenospheres had not entirely lost their individualit This suggests that the agglomerate formed largely as the coal particles were near or at their maximum plasticity. On another occasion, when a fluidized bed reactor was running efficiently, char was examined to gain information on the resolution of the agglomeration problem in this particular case. The sand was evenly coated in char with relatively small vesicles. This, together with some concentric structure and detailed filling of sand surface irregularities, indicates the char was very plastic when it impinged on the sand grains. Char blown out of the fluidized bed, however, contained some cenospheres and appears to have formed from the fragmentation of cenospheres (and related structures) and from lesser spalling of char from the sand grains.

Study of captive vitrinite particles pyrolysed in an electrically heated steel mesh indicate that the agglomeration process is markedly affected by particle size, heating rate and coal rank.

APPLICATION OF COAL MICROSCOPY IN RELATION TO COAL HYDROGENATION EXPERIMENTS

M. Shibaoka

CSIRO Fuel Geoscience Unit

The combination of various microscopic and chemical techniques improves our understanding of some problems related to coal hydrogenation.

The behaviour of coal macerals during hydrogenation with or without a vehicle solvent can be traced if the coal samples, hydrogenated to various extent, are examined under the microscope. Changes in morphology and optical properties of the macerals can be correlated to their chemical composition and physical properties and also those of liquid and gaseous products. The microscopic approach would be more useful for understanding the process of coal hydrogenation rather than the prediction of yields of various products from particular coals.

The behaviour of some catalysts during coal hydrogenation can also be microscopically investigated. This approach is particularly powerfu: in the investigation of tin and zinc chlorides which travel through the solid coal and react directly with some macerals.

In coal hydrogenation practice, the formation of mesophase and other coke-like deposits causes serious technical problems. Methods to avoid the formation of such materials and even removal of them from a coal hydrogenation plant can be microscopically investigated.

THE PETROGRAPHY OF INSOLUBLE RESIDUES DERIVED FROM THE HYDROGENATION OF COALS OF VARYING RANKS

C.F.K. Diessel

The University of Newcastle

Hydrogenation experiments carried out on different coals in a batch autoclave under constant conditions, have demonstrated that the liquid yield is dependent on both composition and rank of the coal charge. Likewise, the amount and composition of the solid residue is closely related to the original coal properties. Three groups of petrographic entities can be distinguished in the insoluble residue. These are:

1. Undissolved material, comprising components which appear to have remained "inert" during the reaction such as minerals and some members of the maceral group inertinite;
2. Solvent affected material, i.e. either partially dissolved coal or polymerised and re-solidified coal-liquids;
3. Heat affected material, including mesophase, semicoke and graphite.

This paper emphasises the role of the maceral group inertinite and establishes a relationship between coal rank and the degree of "inertnes of inertinite. Most inertinite below a reflectivity level of 1.40% (in oil) is reactive which, in a low rank coal, may comprise more than 50% of all inertinite. With increasing coal rank its reactive portion decreases.

TRACE ELEMENTS IN COAL AND THE GEOCHEMICAL CYCLE

D.J. Swaine

CSIRO FUEL GEOSCIENCE UNIT

Trace elements in coal can be seen in proper perspective if they are considered as part of the geochemical cycle. This means that they are part of a dynamic system with inputs from natural sources (volcanoes, sea spray) and anthropogenic sources (bush fires, combustion). The consideration of trace element results in isolation may lead to wrong conclusions.

Selenium will be dealt with in detail to illustrate the basic concept of a geochemical cycle, stress being given to selenium in coal and fly-ash. The relevance of the natural background will be shown by results for rocks, soils and related materials. Minerals in coal and trace elements associated with them, the relevance of pyrite, changes during combustion and the likely fate of involatile and volatile elements will be discussed.

The geochemical approach is important at all stages of coal winning and utilization. Good data and correct interpretation are essential if one is to avoid the pitfalls inherent in dealing with trace substances.

REPORT ON THE RESULTS OF THE I.C.C.P. EXERCISE 1978

(RING ANALYSIS I and II)

R.E. Guyot

ACIRL

Australian Coal Industry Research Laboratories Ltd. agreed to organise an I.C.C.P. Exercise for 1978/79 consisting of two parts. Ring Analysis I was associated with the comparative petrography of an Australian high inertinite coking blend and its predicted coke strength. Ring Analysis II was concerned with the comparative petrography of both Australian high vitrinite and inertinite coals and their respective derived hydrogenation insoluble char residues.

The objective of Ring Analysis I was an inter-laboratory comparison of the maceral, microlithotype, vitrinite reflectance and inertinite reflectance results in addition to the prediction of coke strengths. The primary objectives of the Ring Analysis II Exercise were the identification of petrographic entities in insoluble chars, measurement of their reflectance, and comparison with maceral group reflectance values in the respective feed coals, with the resultant estimation of the maceral group's hydrogenation history.

For Ring Analysis I samples of a coking blend ground to minus 1 mm were supplied to interested participants, whereas for Ring Analysis II samples of both high and low vitrinite coal at both minus 1 mm and minus 75 µm were made available, together with insoluble chars ground to minus 75 µm.

Data assessed from Ring Analysis I indicates a wide variation in results of the maceral, microlithotype and reflectance measurements as well as the prediction of coke strength. Data assessed from Ring Analysis II also shows a wide variation in results reported for maceral, microlithotype and reflectance determinations for both coals. Also petrographic examination of the insoluble char residues indicates that three groups of entities can be identified - undissolved coal and minerals; partially dissolved coal; and heat affected liquefaction products. Comparative reflectance measurements conducted on these entities on a "whole char mineral free basis" suggests that for the high vitrinite coal all of the exinite and inertinite were converted leaving about 10% of partially dissolved vitrinite, whereas in the case of the high inertinite coal about half of the inertinite reacted leaving about 12% partially dissolved vitrinite and 5% exinite in the insoluble char.

Due to the variability of results obtained for both these exercises it appears that some work on the part of the I.C.C.P. is necessary in order to establish some internationally acceptable procedure, especially as concerns nomenclature and classification of the insoluble coal char residues.

REPORT ON THE RESULTS OF THE RING ANALYSIS ORGANISED BY THE STANDING COMMITTEE ON COALFIELD GEOLOGY OF N.S.W.

M. Smyth

CSIRO Fuel Geoscience Unit

A sample of a New South Wales Permian coal has been sent to a number of laboratories, both private and institutional, which are actively engaged in petrographic analyses. Each laboratory was asked to carry out a maceral, microlithotype and reflectivity measurement on the coal, following the recommendations of the International Committee for Coal Petrology.

Good agreement exists among the petrologists for both macerals and microlithotypes, when only broad groupings are considered. However, there is wide disparity in the proportions of the macerals and microlithotypes when these groups are subdivided. As would be expected, disagreement is greater amongst different laboratories, than within a laboratory. Values of the reflectivity measurements are in better agreement.

Exchange of ideas on interpretation of terms, plus examination of photographs and/or samples is recommended to resolve the existing differences in petrographic analyses.

GEOLOGICAL ASPECTS OF TRACK MAINTENANCE IN RAILWAY TUNNELS NEAR LITHGOW

P.R. Hilleard

N.S.W. Public Transport Commission

Over the years, N.S.W. railway engineers have experienced considerable difficulties maintaining the track formation in the ten tunnels near Lithgow, due primarily to an undefined foundation rock degradation problem.

It was originally considered by a consultant group that the degradation was caused by abrasion between the ballast layer and the underlying sandstones and claystones, producing fine grained materials which then contaminated the ballast layer.

In 1977, it was decided that excavation of the existing track and replacement with a continuous paved concrete track would eliminate the problem. During excavation in early 1978, engineering geological mapping revealed that the principal source of fine grained contaminating materials was a pumping action on open bedding separations in the upper 1.5 m of bedrock below the track. Water which had seeped into the fissures from the saturated surroundings was violently ejected as the fissures closed, carrying with it grains of rock crushed or abraded from the faces.

Many of the bedding separations had developed into flat lense-shaped cavities in the foundation, and had collapsed under the weight of a train, causing minor subsidence of the track. In several areas the above contamination, combined with the hydrostatic pressure of springs in the foundation rock, resulted in lateral instability of the track.

Since a continuous paved concrete track was to be constructed for the full 5 km route distance of the project, with an alignment accuracy of a couple of millimetres, the future development of further cavities, and the continued growth of cavities which remained below the 0.75 m deep rock excavation, was of considerable concern. In an attempt to terminate their growth, some of the larger cavities were pressure grouted after the track slab was completed.

ON THE NEED FOR A BUILDING ORDINANCE AND CODE FOR THE NEWCASTLE AREA

K.H.R. Moelle

The University of Newcastle

The nature and configuration of the Permian Newcastle Coal Measure sequences poses considerable difficulties for the civil engineer and builder. There is a definite need for a detailed engineering geology map of the Newcastle area. Considerable damage to public and private constructions could easily be avoided if the relevant geological parameters were better known and understood.

The Newcastle Harbour deepening project has resulted in unnecessary controversy, confusion and damage.

A significant portion of the Newcastle City Council and Lake Macquarie Shire areas has adverse geological features which call for special foundations and building/construction requirements.

The geological parameters of the Newcastle district and their influence on the safety and stability of buildings call for a specific Newcastle building code.

PETROLOGICAL AND PETROCHEMICAL STUDIES OF ALKALINE BASIC INTRUSIVES IN THE MOUNT ARTHUR AND AND GUNNEDAH REGIONS

D.H. French, J.A. Gamble and B. Nashar

The University of Newcastle

Basic intrusions, mostly sills, of probable Tertiary age, are widespread in the Sydney and Gunnedah Basins. This paper reports preliminary petrological and petrochemical results of a study of drill-core material from sills in the Mount Arthur and Mount Ogilvie areas near Muswellbrook and the Gunnedah Colliery Holdings, west of Gunnedah, in New South Wales.

In both areas the rocks in the intrusions are teschenitic with a mineralogy of clinopyroxene, plagioclase, olivine, Fe-Ti oxide and analcime. Specimens from chilled margins are invariably highly altered but the relic phenocryst mineralogy indicates plagioclase and olivine to be liquidus phases on intrusion. Biotite and barkevikitic amphibole are common in rocks from the sills at Mount Arthur and Mount Ogilvie but rare in those of the Gunnedah intrusions. This may indicate higher water contents in the case of the Mount Arthur and Mount Ogilvie magmas.

Internal contacts between intrusive phases and breaks in mineralogy point to a multiple intrusion of magmas. *Insitu* differentiation of these magmas has produced mafic-rich zones with a complementary development of syenitic pegmatites and veins.

INTRUSIVE BRECCIAS IN N.S.W. COAL SEAMS

L.H. Hamilton

CSIRO Fuel Geoscience Unit

Intrusive breccias of a type not previously recognised have been found in coal seams at Gunnedah, Kandos No. 2, and Berrima Collieries. They are a variety of alloclastic breccias apparently formed through delithification caused by magmatic intrusion. They may be relatively common but would be difficult to recognise unless they were fresh and were associated with coal.

The Gunnedah and Kandos breccias can be traced into massive altered teschenite and range from a mixed sediment type to an igneous type. Apophyses are common at the contact with the massive teschenite but the teschenite contains relatively few xenoliths. Contacts with intruded rocks are generally sharp and distinct. The breccias consist of unsorted, angular to sub-rounded fragments of sedimentary rocks (including some coal) and igneous fragments (epiphyses) in a matrix of disaggregated rock fragments, clay and carbonate minerals. The Berrima breccia was not traced into magmatic rock but it is associated with teschenite dykes and has mildly cindered the coal.

Mild cindering of the coal, their association with magmatic dykes, and their structures indicate that the breccias are intrusive rather than extrusive, and were not formed as sedimentary dykes. A lack of appropriate deformation in the country rocks further indicates that they are not fault gauge bodies. Cindering of the coal indicates it was of about bituminous rank at the time of intrusion; consequently the intruded rocks were lithified. The disaggregation of the sedimentary rocks to form a hot, intrusive mud therefore requires that the sedimentary rocks, other than coal, were at least partially delithified. Some attenuated fragments can be found where the process of disaggregation has been arrested. The coarser-grained sedimentary rocks have been more readily delithified than those of finer grain size.

The breccias can be described as delithification breccias of proximal-magmatic to telemagmatic origin. The process of delithification also most probably contributed to the formation of the Mesozoic volcanoes of the Sydney region and to the formation of St. Michael's Cave dyke at Avalon.

SYDNEY BASIN DIATREMES AND MAAR VOLCANOES

C. Herbert and E. Crawford

Geological Survey of N.S.W.

Diatremes in the Sydney Basin (popularly known as volcanic necks) have been interpreted as layered intrusive bodies which did not penetrate to the ground surface (Wilshire 1961). However, it is suggested that the diatremes are the eroded roots of short lived, explosive volcanoes called maars (Crawford et al. in press). A maar is a volcanic crater (100 m to 2 km diameter) cut into country rock below general ground level (10 m to more than 200 m deep) and possessing a surrounding low rim of pyroclastic debris (up to 100 m high). A diatreme, considered to be the subsurface extension of a maar volcano, is a pipe-like volcanic conduit filled with pyroclastic debris and blocks of wall rock.

Maar volcanoes are thought to erupt as a continuous succession of explosions. Layered air-fall and base-surge deposits are formed as a tuff ring around a central vent (Lorenz 1973). Collapse into the eruption chamber, which is usually located at a depth of about 2 km, causes a ring fault to develop. During eruption, continual subsidence carries the layered pyroclastic and country rock debris down, within the ring fault, at virtually the same rate as new eruptive layers form at the surface. In this way, layered diatremes form as carrot-shaped bodies which taper downwards into a feeder dyke (Lorenz, 1975).

Bedded pyroclastic and country rock fragments, deposited in the subsiding crater and surrounding rim, commonly display crossbedding, ripples, antidunes, and scour-and-fill structures. These sedimentary structures are formed during dispersal of debris by radial base surges. Crude graded bedding may form as a result of direct air-fall deposition between base-surge blasts. Volcanic bombs ejected during eruption may also deform and penetrate underlying bedding. These layered deposits can be transported several hundreds of metres below their original depositional site at the surface, via subsidence within the ring fault, to form the diatreme.

Diatremes in the Sydney Basin show many of the features discussed above and in addition contain an Early Jurassic microfloral assemblage within the matrix of the volcanic breccia. This indicates that Early Jurassic sediments overlay the Sydney Basin and together with other evidence suggests that the diatremes are Jurassic rather than Tertiary as previously thought.

References: Crawford, E., Herbert, C., Taylor, G., Helby, R., Morgan, R., and Ferguson, J., (in press). Diatremes of the Sydney Basin in A Guide to the Sydney Basin. C. Herbert and R. Helby (eds.). Bull. Geol. Surv. N.S.W. 26.

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References continued: Wilshire, H.G., 1961. Layered diatremes near Sydney, N.S.W. J. Geol. Soc. Aust., 69, 473-48

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UNDERGROUND LIQUID WASTE DISPOSAL AND ITS FEASIBILITY WITHIN THE SYDNEY REGION

R. Corkery

Geological Survey of N.S.W.

Injection of liquid wastes through deep wells is the most commonly used method of underground liquid waste disposal in the U.S.A. and Canada. Large volumes of industrial and municipal liquid wastes have been successfully and safely isolated in deep permeable geological strata. Other methods used include disposal within deep abandoned mines and the injection of waste mixed with cement (as a grout) into hydraulically produced fractures in shale.

Injection facilities for the disposal of liquid wastes are usually complex in design, construction and operation, as numerous factors influence such projects. A comprehensive analysis of the hydrogeological environment is essential in the assessment of any potential underground liquid waste disposal site.

A detailed examination of the suitability of the Sydney region for the use of underground liquid waste disposal is warranted at present because the Metropolitan Waste Disposal Authority is currently investigatir long term solutions for the disposal of hazardous liquid wastes in the region.

The disposal of liquid wastes within deep underground coal mines is considered undesirable in the Sydney region as large reserves of coal are present. Liquid waste disposal should not jeopardise the possible future mining of coal.

The disposal of liquid wastes through deep wells is not possible in the Sydney region as the rocks in suitable areas lack sufficient porosity and permeability. Enhancement of porosity and permeability is not considered feasible.

The use of hydraulic fracturing and grout injection within shale may be possible in the Bald Hill Claystone. An area in the vicinity of Liverpool and Camden appears to be the most suitable area for the use of this method. Further detailed investigations would be necessary to accurately assess the potential of this area.

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GEOLOGY OF HISTORIC BUILDINGS

G.S. Gibbons and J.L. Gordon

New South Wales Institute of Technology

The geology of historic buildings involves examination of the natural materials of which they are constructed and the way they have withstood the weathering effects of their environment.

Most existing historic buildings in New South Wales dating from the first half of the 19th century are either country homes built of local materials, or houses along the coast (especially at Sydney and Maitland - Newcastle district) for which coastal transport allowed slightly greater interchange of materials.

Various natural materials have been used from wattle and daub, bricks to natural stone for basic construction, mortars, plasters, paints and pigments for bonding and protective coatings.

The weathered Wianamatta Group was soon recognised as an ideal brick-making material and brick pits were opened on Brickfield Hill, Sydney.

The earliest stone was cut from the Triassic boulders around Sydney Cove in the area known as "The Rocks". In the Newcastle area building stone of Permian age was quarried at Waratah and Ravensfield.

Slate from Goulburn, marbles from the Sydney Basin margins and trachyte from Bowral were used in many of our state's historic buildings.

Early mortars were made with shell burnt lime until some rock lime was mined at places such as Limeburner's Creek (Port Stephens) and the limestone areas west of the Blue Mountains. The sand used with the mortar was sandstone loam and/or crushed stone in the early days in Sydney and Parramatta. It has not yet been established when sea-sand first became generally used.

Natural material for plaster (lime) and whitewash (pipe clay) were found in great quantities around the Sydney Basin. Ochres were worked at Wingello and Barber's Creek. Portland cement, used in Europe since 1827, does not appear to have been made in Australia until 1889, when a flour-mill at Cullen Bullen (on the edge of the Sydney Basin) was pressed into service.