LEGISLATIVE MEASURES CONCERNING SUBSIDENCE ASSOCIATED WITH COAL MINING IN N.S.W.

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ABSTRACT

There exist several legislative provisions in N.S.W. which work together to control surface subsidence due to extraction of coal by underground methods. The important ones are the Coal Mining Act, Coal Mines Regulation Act, Mine Subsidence Compensation Act and Dams Safety Act. In addition, there are guidelines laid down by the Chief Inspector of Coal Mines for mining under and in the vicinity of tidal waters and the ocean. There are also conditions of coal mining leases and conditions of approvals given to undertake various methods of mining which stipulate further controls.

The legislative provisions and relative controls are designed to minimise surface damage, ensure safety of major public utilities, control surface land use and compensate damage caused by subsidence as a result of coal mining operations. They aim at balanced and responsible development of our valuable coal resources consistent with adequate safeguards to surface improvements and natural features. The paper discusses in detail these legislative provisions and the mechanics of their operation with a view to emphasising the fact that underground coal mining operations are undertaken responsibly and in a planned and rational manner for the overall benefit of the community. Further, the paper aims to demonstrate the need for legislative measures and conditioning of mining operations to keep abreast of developments in the knowledge and skills of mining and subsidence engineers and continuing improvements in mining technologies.

Likewise there is a need on the part of engineers and those associated with introduction of new technologies to appreciate the requirements and existence of legislative and other measures having a direct or indirect association with surface subsidence as a result of coal mining operation.

INTRODUCTION

Coal is one of the most valuable resources in N.S.W. It is a valuable export earner and much in demand for use in steel, electricity generation and cement industries. Directly and indirectly it provides employment for a considerable number of people. Being a diminishing, non-renewable resource, its exploitation and utilisation should be optimised to the maximum benefit of the community.

It is paradoxical that the extraction of coal which provides many benefits also causes subsidence problems. Subsidence due to underground mining operations can create deleterious effects to the surface of land and therefore has always given cause for concern to surface land owners and the general public. Increasing community desires for protection of the environment and concern about subsidence in coal mining areas appear to conflict with increasing demands for coal to sustain the industrialised society. The conflict can however be resolved by providing a balance between the development of coal resources and protection of environment by sound subsidence management. The regulatory measures administered by the State is one means to achieve this goal. The development of statutory provisions and regulations for subsidence management has come a long way in N.S.W. This paper presents an overview of statutory provisions and controls which exist to protect the environment and community from subsidence related problems. Rights under the common law are also briefly covered.

COMMON LAW

Under common law a miner is responsible for damage caused to the surface of land by his activities unless he has the benefit of a right to lot down the surface of the land.

Such a right may be express (eg. an instrument in writing authorising the action) or implied. An example of an implied right is

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where a miner conducts his operations pursuant to a lease granted by the owner of the surface (e.g. the Crown) and there is no condition in the lease protecting the surface.

LEGISLATION EMBODYING SUBLIENCE CONTROLS

Legislation has been enacted to address disruption which may be caused by subsidence as a result of coal mining operations. The legislation embodying specific subsidence provisions and associated matters includes:


2. Coal Mines Regulation Act, 1982 (N.S.W. Government, 1982), which makes provision for the safety of operations in coal mines and the appointment of various officials in the coal mining industry.

3. Mine Subsidence Compensation Act, 1961 (N.S.W. Government 1983) which provides a scheme for control of surface development and the payment of compensation where improvements on the surface are damaged by subsidence following the extraction of coal.


COAL MINING ACT, 1973

The Coal Mining Act, 1973 (N.S.W. Government, 1984), amongst other things, sets out the procedure for the granting of titles to prospect and mine for coal; restrictions on grant of these titles and the rights and duties of registered holders. The objective of the Act from the point of view of environmental protection in relation to underground mining is the regulation of coal mining in such a way that mining operations are conducted so as to cause minimal surface damage. The Act empowers the Minister for Mineral Resources to impose a variety of conditions on coal mining titles, i.e., coal leases, and to require action designed to prevent or mitigate damage.

The use to which surface lands are put and the need to conserve and protect the flora, fauna, fish and fisheries and scenic attractions, and features of architectural, archaeological, historical or geological interest in or around the land over which a coal lease is sought are important considerations which will be taken into account before the granting of a coal lease and the setting of appropriate conditions.

The provisions of the Coal Mining Act require due consideration to be given to surface improvements and features. This empowers the Minister to include in coal leases conditions to minimise damage to any such surface improvements and features as he considers appropriate. The types of conditions could be barriers around, or protective pillars beneath, substantial surface improvements or restrictions on pillar extraction or longwall mining.

The Minister has considerable flexibility in the determination of conditions and may allow mining to continue notwithstanding some minor damage to surface, if he considers that the public interest would be best served. The New South Wales Department of Mineral Resources has adopted policies and plans which have enabled the continued development of coal resources in a manner acceptable to the community.

COAL MINES REGULATION ACT, 1982

The Coal Mines Regulation Act, 1982 (N.S.W. Government, 1982) amongst other things, stipulates methods or systems of working in mines. When a coal lease is granted to a mining company, the company is entitled to no method of mining other than the bord and pillar system except with the approval of the Minister for Industrial Relations on the recommendation of the Chief Inspector of Coal Mines.

When the bord and pillar system of mining is used, the Coal Mines Regulation Act stipulates minimum size of pillars and roadways. The width of pillars shall be no less than one-tenth the depth of cover to the surface or 10 m which ever is the greater. The maximum roadway width allowable except under exemption is 5.5 m.

There are two provisions in the Act by which surface features are protected from direct and indirect effects of subsidence caused by underground mining. The Minister for Industrial Relations on the recommendation of the Chief Inspector of Coal Mines, may direct a mine operator to

1. leave a barrier of sufficient width against the mean high water mark of tidal waters; and

2. leave a protective pillar or pillars of such dimensions as are specified in the direction against surface improvements or features whether natural or artificial.

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The provision in (1) above protects surface developments in foreshore areas where mining-induced subsidence if uncontrolled could result in inundation of the land surface. The extent of subsidence control depends upon the slope of the land surface and the extent of development.

The provision of protection in (2) may be used to protect surface features such as water mains, gas pipelines, railways and other structures which are not designed to withstand subsidence-induced stresses. Such structures in many cases exist at the time of granting a coal lease. Generally when consideration is given to undermining a surface development, the authority owning it is asked to investigate that development’s structural integrity because of additional stresses associated with subsidence. If the structure cannot accommodate ground movements and the potential damage could cause significant cost - both social and economic - to the community, then pillars may be required to be left under it. Alternatively, a suitable partial extraction system may be adopted to control subsidence.

As previously indicated the Minister for Mineral Resources, if he considers it appropriate, may also include similar conditions in coal leases.

The Act in general enables sufficient provisions to be applied to control mining activity under and in the vicinity of tidal waters and under important surface features. The extent of coal pillar support required to be left depends upon the ability of such features to withstand subsidence movements without exhibiting distress.

**MINE SUBSIDENCE COMPENSATION ACT, 1961**

**FUNCTIONS AND COMPOSITION**

The Mine Subsidence Compensation Act, 1961 (N.S.W. Government 1983) has two main functions.

1. It provides, in general, for payment of compensation by the Board for damage to land and/or improvements situated anywhere in the State which is caused by mine subsidence following the extraction of coal or oil shale; and

2. It enables the Mine Subsidence Board to regulate surface development within proclaimed mine subsidence districts, in that all land subdivisions and proposals to erect or alter improvements in those districts are subject to the Board’s approval. The Board may refuse any application for these purposes or it may grant approval conditionally or unconditionally.

By definition in the Act, “Improvement” includes any building or work erected or constructed on land; any formed road, street, path, walk or driveway; any pipeline, water, sewer, telephone, gas or other service main, whether above or below the surface of the land.

Under the provisions of the Act, a Board was constituted to administer the Act. The Board, called the Mine Subsidence Board, consists of six members including the Secretary, Department of Mineral Resources and the Chief Inspector of Coal Mines both of whom are statutorily appointed under the Act. The other four members are appointed by the Governor for terms of three years.

**COMPENSATION SCHEME**

The compensation fund established under the Act is primarily financed by contributions paid annually by the proprietors of colliery holdings. These contributions are rated on the land value of the colliery holdings and amounts that vary from 0.004 cents to 3.59 cents in the dollar. The average rate in 1984-85 was 0.92 cents and income from the levy during the period totalled around $578,000 (Mine Subsidence Board, 1985). Other income is derived from interest on investments and fees for certificates issued under the legislation.

Compensation by the Board for subsidence damage may be in one of three ways.

1. Payment of monetary compensation for damage.

2. Purchase by the Board of a damaged improvement and/or land.

3. Carrying out repairs as may be necessary to restore land and/or improvement to as near as practicable the equivalent position before damage occurred. Repairs are mostly carried out under Board’s supervision.

Where damage has occurred and further subsidence is likely, the Board may effect temporary repairs to improvements and defer payments for damage claims or permanent repairs until it is satisfied that subsidence has finished or is unlikely to recur within a reasonable time.

Within proclaimed mine subsidence districts, for a claim to be entertained certain criteria need to be met, e.g. in respect of dwellings erected after proclamation of a
district. Such dwellings must have been erected in accordance with the requirements of the Board.

The Board accepted 167 claims in respect of land or/and improvements during 1984-85 of which 133 were within proclaimed subsidence districts. Most of the claims came from the

Newcastle Mine Subsidence District (101) followed by Swansea – North Entrance (12), Lithgow (1) and Westlake (2). (Mine Subsidence Board, 1985). The Board paid around $539,000 in subsidence compensation.

The Board's decision as to whether damage has been caused by mine subsidence is final. However, should the owner of an improvement be dissatisfied with the amount of compensation deemed payable, he may appeal against the Board to the Land and Environment Court.

CONTROL OF SURFACE DEVELOPMENT

Surface development in extensive coal mining areas is controlled by proclaiming such areas as mine subsidence districts. Within these districts, all new surface developments are to be submitted to the Board for approval. Twenty areas of the State covering areas of extensive mining activities, have been proclaimed as mine subsidence districts so far by the Board. Due to administrative difficulties which would arise if all coal bearing lands were proclaimed as districts, the Board's policy has been to recommend proclamation of only those coal bearing areas which have potential for subsidence damage and where such areas are likely to experience substantial surface development.

If the Board approves the design of a structure and the structure is then constructed according to this approved design, the owner is indemnified against damage that is caused by mining subsidence. The Board has established general design guidelines for domestic structures, which vary from district to district. These guidelines generally relate to the size of foundation slab or foundation footing and the height and type of structure.

The role of the Board of regulating surface development in areas of extensive current or future coal mining activities enables optimal coal recovery and leads to minimum coal sterilisation. Without such controls, mining would cause substantial social and economic costs to the community within urban areas.

DAMS SAFETY ACT, 1978

FUNCTIONS AND COMPOSITION

The N.S.W. Dams Safety Committee was constituted in January, 1979 under the Dams Safety Act, 1978 (N.S.W. Government, 1979). It has statutory functions under this Act and under the Coal Mining Act.

Under the Dams Safety Act, the Committee reports to the Minister for Public Works, and its functions are to maintain a surveillance of dams prescribed under the Act, to ensure the safety of the dams; and to examine and investigate the location, design, construction, reconstruction, extension, modification, operation and maintenance of dams, including the environs around dams. Under the Coal Mining Act, the Committee makes recommendations to the Minister for Mineral Resources in respect of the granting and renewal of coal leases and mining applications under and in the vicinity of prescribed dams and their storages. The Committee's role is to ensure the safety of the dams and storages in relation to coal mining operations carried out in the vicinity of the dams and their storages.

The Committee consists of eight part-time members, seven of whom are nominated on the basis of their experience in dam engineering and one in relation to coal mining. One member each is nominated by the four State Government Authorities which own and operate large dams (Electricity Commission of N.S.W., Metropolitan Water, Sewage and Drainage Board, Water Resources Commission, Hunter District Water Board), one by the Minister administering the Public Works Act, one by the Minister administering the Mining Act and two by the Federal Council of the Institution of Engineers, Australia.

RESTRICTIONS ON MINING

Under the Coal Mining Act, 1973 the Committee may declare a notification area for any prescribed dam. All coal mining lease proposals and all applications for renewal of coal leases for lands within the notification area are required to be referred to the Committee. The Committee may then recommend conditions it considers appropriate to the Minister for Mineral Resources for inclusion in the lease or renewal. A prescribed dam, under the Dams Safety Act, 1978 is one listed in Schedule 1 of the Act. The Schedule can be amended from time to time on the recommendation of the Committee. A prescribed dam is normally

- 15 metres or more in height; or
- 10 to 15 metres in height and

The AusIMM Illawarra Branch, Ground Movement and Control related to Coal Mining Symposium August 1986
storage capacity of more than 250 megalitres; or
- 5 to 10 metres in height and storage capacity of more than 500 megalitres.

In some cases, dams having less height and storage capacity than the above may be prescribed, if it is considered that significant consequences may ensue downstream on failure or mis-operation of the dam. The Committee has to date, prescribed 217 dams out of which 98 are State owned, 56 are owned by Local Government (Municipal and Shire Councils), 29 are owned by mining companies and 24 are privately owned. Dams located in N.S.W. but owned by Federal Authorities are not subject to the Act.

A notification area is a polygon drawn to enclose the two restricted zones - the storage restricted zone and the structure restricted zone. Fig. 1 defines the restricted zone for storage. The zone includes the area of the reservoir, the marginal zone (0.7D wide) around the reservoir and a further zone (0.5D wide) around the marginal zone. The storage restricted zone thus normally extends 1.2D beyond the reservoir. The structure restricted zone is shown in Fig. 2. The extension of the zone depends upon the type of structure to be protected. For the seven south coast Water Board Dams, the structure restricted zone is defined as all the land under and within a nominated distance of the dam foundation.

For Avon, Cataract, Cordeaux and Nepean Dams, the distance is 1 km.

For Woronora Dam, the distance is 1.5 km.

For Upper Cordeaux 1 and 2 dams, the distance is 350 metres.

GRANT OR RENEWAL OF LEASES

As indicated all applications for the granting or renewal of coal leases located wholly or partly within notification areas are referred to the Department of Mineral Resources for the Dams Safety Committee. If there is no current mining within the restricted zone, the Committee generally recommends to the Minister that granting or renewal of the lease be conditional upon the mining company giving twelve (12) months notice to the Minister of details of proposed mining within the restricted zone. If there is current mining within the restricted zone, the Committee may recommend to the Minister the renewal of lease subject to the mining company providing within 30 days details of current and proposed mining within the restricted zone. The notice gives sufficient time for the Committee to properly assess mining applications and make appropriate recommendations to regulate mining under and in the vicinity of dams and reservoirs to ensure that practices appropriate to maintain the integrity of the storage and the safety of the dam are adopted.

The Committee classifies dam storages into major storages where failure of the dam or reservoir could cause loss of life and significant economic loss, and minor storages where failure would not cause loss of life or significant economic loss.

For mining within the restricted zones of major storages, the Committee adopts a conservative approach in determining sizes of pillars and the extent of coal extraction and will normally recommend extensive monitoring. Some general guidelines include the following.

1. Mining is not allowed under dam structures and their restricted zones.

2. Mining under the storage and within the storage marginal zone is limited.
to bord and pillar first workings. Outside the storage marginal zone total extraction would normally be permitted.

3. Bord and pillar mining is required to have maximum bord width of 5.5 m and minimum pillar width of either fifteen times the thickness of extraction or one-tenth of the cover depth over the pillar which ever is the greater.

4. In some instances panel and pillar mining has been permitted under the storage and within the storage marginal zone. In such cases panel width is restricted to one third of the cover depth and pillar width is not less than one fifth the cover depth over the pillar or fifteen times the thickness of extraction whichever is the greater.

5. Pillars are not extracted within the 35 degree angle of draw of major faults.

For minor storages, the Committee has relaxed the guidelines applicable to major storages and generally allows mining within the structure restricted zone.

In almost all cases the Committee requires the mining company to forward records of geological and geotechnical features encountered during working including location and amount of water inflows and seepages and to monitor on a regular basis surface subsidence movement. As mining progresses, the Committee reviews the monitored data to ascertain that no unexpected geological conditions are encountered and to check whether predictions are following predictions. Any untoward report is investigated.

OTHER LEGISLATIVE CONTROLS

There are probably two other pieces of legislation which are of particular interest in the context of this paper.

PUBLIC WORKS ACT, 1912

The Public Works Act, 1912 (N.S.W. Government, 1980) contains the following provisions in Section 142.

*142(1) If the owner, lessor or occupier of any mine or minerals lying under any authorized work or any work connected therewith, or within 40 metres from the boundary thereof, is destitute of working the same, such owner, lessee, or occupier shall give to the Constructing Authority notice in writing of his intention so to do, thirty days before the commencement of working.

(2) Upon the receipt of such notice, the Constructing Authority may cause such mines to be inspected by any person appointed by him for the purpose.

(3) If it appears to the Constructing Authority that the working of such mines or minerals is likely to damage the authorized work, and if the Constructing Authority is willing to make compensation for such mines or any part thereof to the owner, lessee, or occupier, then such owner, lessee, or occupier shall not work or get such minerals.

(4) If the Constructing Authority and such owner, lessee, or occupier do not agree as to the amount of such compensation, the same shall be settled as in other cases of disputed compensation as provided in Division 2 of Part VII hereof.

In general terms "authorised work" means any work (of the nature of public buildings and constructions) which has been authorised by a Minister of the Crown. The term "Constructing Authority" covers these Ministers and also the Commissioner for Water Resources and the Government railways. Ministers in such circumstances are deemed to be 'corporate agents' for the purpose of acquisition and disposal of lands for such projects.

COAL ACQUISITION ACT, 1981

The Coal Acquisition Act, 1981 (N.S.W. Government, 1981) enabled the Government of N.S.W. to vest all coal, not vested in the Crown as at 1st January, 1982, in the Crown on and from that date. In essence because of the history of colonisation of N.S.W. and the granting of land from the Crown to the people, there was up until 1st January, 1982 a mixture of both Crown and privately owned coal throughout New South Wales. Ownership of the mineral (coal) depended upon the date of grant of the land and the ruling legislation at that time of grant.

On and from 1st January, 1982 privately owned coal has ceased to exist and all coal

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mining operations must now be by way of coal lease granted or deemed to have been granted under the provisions of the Coal Mining Act. Previously there had been many situations where coal mining companies operated by virtue of their own private ownership of the coal or by arrangements made with the owner of private coal.

This legislation has had the effect therefore of unifying all mining operations under the provisions of the Coal Mining Act and the Coal Mines Regulation Act (both discussed elsewhere in this paper) although the principal aim for the introduction of the Coal Mines Act was to ensure that royalties on all coal won in N.S.W. were paid to the Crown.

CONDITIONS OF LEASES AND APPROVALS

LEASE STAGE

It is a requirement of the Coal Mining Act, 1973 that the Minister for Mineral Resources, prior to the grant of any coal lease, ensure consultation with any other Government Department or Statutory Authority which may have a material interest in the lands being considered for a coal lease. For example, the surface may be traversed by a main road, or railway or by pipelines or have other improvements upon it.

Thus in drawing up the conditions upon which the coal lease could be issued, it can be that another Department or Authority will request a condition protecting its interest in improvements on the surface. In some cases these conditions do no more than require the Department or Authority to be notified prior to mining being carried out so that the body can be aware of the timing of mining operations and make arrangements for surveillance by its officers. In other cases, as mentioned elsewhere in this paper, there is a complete embargo on mining, for example, under the principal structure of the day walls of the large Metropolitan Water Severance and Drainage Board's water supply dams in the Southern Coalfield.

All these arrangements fit within the charter of the Department of Mineral Resources which is to ensure responsible development of the mineral resources of N.S.W.

Conditions inserted in coal leases are administered by the Department of Mineral Resources and any approvals required or directions given by virtue of such conditions usually involve either the Minister, the Secretary of the Department or the Chief Mining Engineer (Coal) depending upon the nature of the particular matter and the wording of the condition.

In view of the importance of underground coal mining operations to the economy of N.S.W. and Australia and the importance of surface improvements over much of the State's coal reserves, there is ongoing dialogue between representatives of the Department of Mineral Resources and other Government Authorities on issues concerning the amount and method of extraction of underground coal deposits.

The continual process of building up local knowledge of subsidence after the extraction of coal seams, based upon local geological and mining conditions is a vital part of the management of the State's coal resources in keeping with other surface land usage.

PILLAR EXTRACTION STAGE

Conjointly with the introduction of the Coal Mines Regulation Act 1982 (which replaced the Coal Mines Regulation Act 1912), the Miscellaneous Acts (Coal Mines Regulation) Repeal and Amendment Act, 1982 (N.S.W. Government, 1982) was enacted. This Act in Schedule 4, contains the following clauses.

"(7) Any approval or consent given by the Minister pursuant to any condition or term contained in a coal lease granted under the Coal Mining Act, 1973, to the effect that the registered holder of the coal lease may use a method of working other than the bord and pillar system shall be deemed to be a consent given for the purposes of section 135 (1) of the Principal Act subject to the same conditions.

(8) Any approval or consent given by the Minister pursuant to any condition or term contained in a coal lease granted under the Coal Mining Act, 1973, to the effect that the registered holder of the coal lease can remove pillars (where he is using the bord and pillar system of workings) shall be deemed to be an approval given for the purposes of section 135 (2) (e) of the Principal Act subject to the same conditions.

(9) Any term or condition contained in a coal lease granted under the Coal Mining Act, 1973, to the extent that it authorises the giving of an approval or consent of a kind referred to in subclause (7) or (8) shall be deemed to be revoked with effect on and from the appointed day."
Thus, whilst the Coal Mines Regulation Act, 1912 was in existence, the conditions of coal leases issued under the Coal Mining Act were paramount. These leases included conditions defining the dimensions of pillars and tunnels in underground workings as well as providing that workings other than bord and pillar workings ("first workings") required the specific approval of the Minister for Mineral Resources. These conditions were effectively "removed" from coal leases by the Miscellaneous Acts (Coal Mines Regulation) Repeal and Amendment Act, 1982.

Now matters relating to methods of workings, size and dimensions of pillars, approvals for pillar extraction or use of longwall mining methods are all dealt with under the provisions of the Coal Mines Regulation Act 1982. This Act is administered by the Minister for Industrial Relations through the Chief Inspector of Coal Mines of the Coalfields Division of the Department of Industrial Relations.

So that the Department of Mineral Resources' responsibilities to ensure the responsible development of the State's mineral resources can be part of the consideration of matters addressed by the Coalfields Division of the Department of Industrial Relations, administrative arrangements have been established with the Chief Inspector of Coal Mines. Under these arrangements the Chief Inspector, upon receipt of an application relating to methods of workings, requests the Department of Mineral Resources to confirm that requisite titles to mine the coal are held and in good standing. He also inquires whether the Department's records show any special requirements with respect to the area. The Chief Inspector also asks whether there are any requirements regarding mineral resource recovery and any surface features or improvements which the Department of Mineral Resources considers require protection and to what extent. As previously indicated the Minister for Mineral Resources, if he considers it appropriate, may also include conditions in coal leases considered necessary by him to protect particular surface improvements and features.

One important condition which is generally incorporated in approval for longwall methods of mining or extraction of pillar coal is the requirement for a surface survey to be undertaken to measure the subsidence effect related to the underground extraction. The data collected from such surveys is a valuable source of information for developing subsidence prediction models.

**CONTROLS OVER MINING UNDER LAKE FORESHORES**

**STATEMENT OF THE ISSUE**

The level of water in the tidal lakes is largely controlled by the level of the sea to which they are connected. The water level of the lake is therefore not affected by land subsidence induced by underground mining. It follows that, if subsidence does take place, the water will encroach upon the subsided land area. The extent of such encroachment depends upon two factors - extent of vertical settlement and the gradient of land surface away from the peripheral high water level. In places where the land surface rises quite sharply away from the high water mark around the lake edges, even if substantial subsidence were to occur, the encroachment by water would be slight or may even be negligible. In other cases however, the land surface around the lake edges is flat and even small amounts of subsidence could cause significant flooding. The avoidance of encroachment by the tidal waters is therefore an important consideration in designing mining systems in the vicinity of tidal lakes.

**MINING RESTRICTIONS**

The High Water Mark Subsidence Barrier Zone is established by extending to the seam a 35 degree angle of draw from the High Water Mark and the 5.4m contour (Fig. 3). The extent of mining within this zone depends upon the allowable subsidence which is in three categories - no subsidence, up to 150mm subsidence and up to 600mm subsidence. The allowable subsidence in a particular situation is decided by the Chief Inspector of Coal Mines. The following guidelines generally apply.

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The AusIMM Illawarra Branch, Ground Movement and Control related to Coal Mining Symposium August 1986
1. Where no subsidence can be tolerated, only limited heading drivage is allowed.

2. Where the second category of subsidence is allowed, mining can be by bord and pillar first working only with stable pillars.

3. Where subsidence in excess of 150mm but less than 600mm can be tolerated, mining can be by bord and pillar mining or panel and pillar mining with certain restrictions placed on panel and pillar widths.

In the Munnorah-Vales Point area, on the Central Coast of N.S.W., panel and pillar mining has been successfully carried out under and adjacent to the lake edge to limit surface subsidence and reduce permeability changes in the intervening strata. It once again emphasises the fact that with judicious mine planning and controlled surface subsidence a balance between coal recovery and surface protection can be achieved.

**SUMMARY**

The current legislation in N.S.W. embodying subsidence controls has been evolved over a number of years and reflects the practical circumstances which, in N.S.W., face in the mining of coal by underground means in a region where there are a diversity of land uses practised on the surface lands overlying our valuable coal seams.

Surprisingly perhaps the language of the legislation itself meshes together well and this combined with the administrative arrangements which have been set up between the Government Departments and Authorities involved has led to a good workable arrangement.

There needs however, from our experience, to be continual good ongoing relationships between the personnel of the various agencies to ensure that the importance of coal mining retains its rightful position in debates on land use. Too frequently, it would seem, others would be quick to dispense with coal mining as an unwanted activity within their area of concern when, in many instances, it is the presence of coal and the workforce it attracts that triggers the very need for such development activities.

Given our greater developing knowledge as it applies to our own conditions rather than using "borrowed information" from overseas experiences, the science of subsidence engineering is becoming increasingly important in the overall development, both mining and land use wise, that we are experiencing in New South Wales.

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