DECISION AND REASONS FOR DECISION [1999] AATA 468

ADMINISTRATIVE APPEALS TRIBUNAL)
) No N97/1217
GENERAL ADMINISTRATIVE DIVISION)

Re THE APPLICANT

Appl
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And INDUSTRY RESEARCH AND DEVELOPMENT BOARD

Res
pondent

DECISION

Tribunal Mr BJ McMahon (Deputy President)

Date 28 June 1999
Place Sydney
Decision The decision under review is set aside and the matter is remitted to the respondent with a direction that a favourable certificate under section 39L of the *Industry Research and Development Act* 1986 be issued to the applicant.

(Sgd) BJ McMahon
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Deputy President

CATCHWORDS

INDUSTRY RESEARCH AND DEVELOPMENT – expenditure on construction of cut off wall and levee bank – de-watering – blasting - whether systematic investigative or experimental activities – whether innovation – whether carried on for purpose of acquiring new knowledge or creating new or improved materials, products, devices, processes or services – alternatively whether carried on for a purpose directly related to carrying on of systematic investigative or experimental activities – activities carried out in accordance with a plan or organised method – evidence of innovation and technical risks - dual purpose to acquire new knowledge and to create a new or improved process or method – finding that de-watering and blasting carried out for purpose of carrying on construction of wall and levee – expert evidence impressive

STATUTORY INTERPRETATION – section 73B Income Tax Assessment Act 1936 – meaning – beneficial provision – broad approach to construction
WORDS AND PHRASES – systematic – investigative – experimental – innovation – technical risk – new knowledge – new or improved materials products devices processes or services – purposes directly related to the carrying on of activities – ordinary meanings – innovation not to be read down – broad construction to promote objects of Industry Research and Development Act 1936
Industry Research and Development Act 1986 s 39T(4)
Income Tax Assessment Act 1936 s 73B
Taxation Laws Amendment Act (No. 4) 1994
Re Charles IFE Pty Ltd and Industry Research and Development Board 95 ATC 2149
Re Philip Morris Ltd and Industry Research and Development Board 98 ATC 2001
Industry Research and Development Board v Unisys Information Services Australia Pty Ltd 97 ATC 4848
Re Mobil Oil Australia Ltd and Industry Research and Development Board 95 ATC 2042
Re Confidential and Industry Research and Development Board (decision number 11668, 6 March 1997)
Re Confidential and Industry Research and Development Board (decision number 401/1999, 10 June 1999)
Tesco Supermarkets Ltd v Nattrass [1972] AC 153
Hamilton v Whitehead (1988) 166 CLR 121

REASONS FOR DECISION

28 June 1999 Mr BJ McMahon (Deputy President)

1. This is an application brought pursuant to section 39T of the *Industry Research and Development Act* 1986 ("the Act") to review a decision made under section 39L which was confirmed on review pursuant to subsection 39S(4). Subsection 39T(4) provides that the hearing of a proceeding before this Tribunal relating to a reviewable decision must take place in private. These reasons are therefore cast in such a way as to preserve the confidential identity of the applicant. It is, however, necessary in order to explain the decision, to give some facts relating to the applicant's business and activities.
2. It carries out coal mining operations in the Hunter Valley. Its mining area included alluvial lands which contained many millions of tonnes of coal reserves. This alluvial area consisted of land below the one in one hundred year flood level and was composed of unconsolidated alluvial materials which were extremely permeable. These alluviums had direct contact with the Hunter River. Unless preventative measures were taken, it would have been impossible to mine the alluvial area because of the large inflows of water into the mining operation which might otherwise be expected.
3. The evidence was that coal mining on alluvial lands had been previously unknown in Australia. They had not been mined not only because of the technical difficulties associated with mining these areas, but also because of the possible environmental consequences that might follow unsuitable mining activities. Although

there had been some mining of alluvial valley floors in the United States of America, the evidence was that none of those mines had been subject to a large hydraulic head from flooding which was a feature of the present site.

4. In order to mine the alluvial lands and exploit the available coal reserves, the applicant decided to construct a cut-off wall and levee bank to prevent an ingress of sub-surface waters and surface flood waters into the mining area. Extensive investigations were carried out leading to the design of the cut-off wall which was eventually accepted. These investigations focussed on the physical characteristics of the alluviums, the geotechnical conditions within the alluviums along the length of the cut-off wall, the maximum forces encountered in flooding and other sources of wall instability.

5. Soil-bentonite technology was chosen as a means of preventing ground water flowing into the mining area. Put simply, soil-bentonite technology involves the design and construction of a wall composed of bentonite and suitable soil and placing that wall in such a position as to block off the flow of unwanted waters. The evidence was that this technology had not previously been used in the coal mining industry, nor had it been used in the geological conditions that existed in the alluvial area, namely in the presence of dense soils, solid rock and coal. In particular, it had not been used in situations where there was a potential for large hydraulic heads from flooding as was the case in this proposed mine.

6. Detailed investigations were undertaken into the siting and height of a levee. The design proposed that the cut-off wall be keyed into and be an integral part of the levee. Considerable emphasis was placed on designing the levee and cut-off wall interface after laboratory studies into the settlement behaviour of a range of soil-bentonite backfill mixes had been conducted. The combined levee and cut-off wall structure were intended to act as a barrier to floods and ground water flows.

7. The applicant then undertook a program of monitoring the integrity of the wall and levee. The program is still ongoing and will continue during the life of the mine, estimated at 10 years. The monitoring and testing followed the de-watering of the alluvial aquifer, that is to say the removal of water from the proposed work site. The evidence was that the development of a cut-off wall and levee bank to allow alluvial lands to be mined had not been done on a significant scale, either in Australia or in any other part of the world.

8. A soil-bentonite cut-off wall involves the excavation of a relatively narrow trench which is continually topped up with a bentonite slurry. Bentonite is a form of clay. This slurry has properties including high swell, high water absorption and low permeability which prevent the trench from collapsing. Bentonite forms a weak structure when placed in solution, has self-healing properties when broken and has the ability to form a filter cake.

9. De-watering involved the sinking of bores on the river side of the mine. These were spaced on a grid pattern with intervals depending on local permeability. As with catch drains, the evidence was that there were difficulties with constructing a bore field that could cope with high river level conditions. There were also significant costs involved both in the construction and maintenance of the bore field, as well as high energy costs required to run the bore field pumps.

10. The applicant's principal area of expenditure, for present purposes, was laid out

in the construction of the cut-off wall and levee bank. The slurry cut-off wall trench was excavated using bentonite slurry trenching methods and was then back-filled with a mixture of soil and bentonite to provide an impervious wall. Its maximum depth below the natural surface was approximately 30 metres.

11. Difficulties were encountered in the excavation because of the presence of a coal seam over a 1,150 metre length. This excavation was expected to be difficult because of the variety of hardness bands running through the seam. As it turned out, the contractor did experience considerable problems in this part of the work.

12. Eventually the construction was completed through the use of a combination of four hitherto uncombined, but nevertheless common engineering techniques. The machines and methods used were hydro-fraises, long stick excavators with specially modified buckets which allow ripping of hard material at depth, large diameter drilling through the slurry and the use of blasting under the bentonite slurry.

13. In late 1994, the applicant applied to the respondent for an advance ruling on the whole project involving the mining of alluvial lands. At its meeting on 1 March 1995, the tax concession committee ("TCC") (a delegate of the respondent Board) gave an unfavourable opinion on the whole of the project on the grounds that the claimed activities did not comply with the definition of research and development activities as set out in section 73B of the *Income Tax Assessment Act* 1936.

14. At part of the relevant time, the section defined "research and development activities" as follows:

> *"(a) systematic, investigative or experimental activities that –*
> *(i) are carried on in Australia or in an external Territory;*
> *(ii) involve innovation or technical risk; and*
> *(iii) are carried on for the purpose –*
> *(A) of acquiring new knowledge (whether or not that knowledge will have a specific practical application); or*
> *(B) creating new or improved materials, products, devices, processes or services; or*
> *(b) other activities that –*
> *(i) are carried on in Australia or in an external Territory; and*
> *(ii) are carried on for a purpose directly related to the carrying on of activities of the kind referred to in paragraph (a)."*

15. That definition was amended by the *Taxation Laws Amendment Act (No. 4)* 1994, which applied to deductions claimed for the 1994/95 year of income and which then read:

> *(a) systematic, investigative or experimental activities that involve innovation or technical risk and are carried on for the purpose of:*
> *(i) acquiring new knowledge (whether or not that knowledge will have a specific practical application); or*
> *(ii) creating new or improved materials, products, devices, processes or services; or*
> *(b) other activities that are carried on for a purpose directly related to the carrying on of activities of the kind referred to in paragraph (a)."*

16. The claims of the applicant relate to expenditure spread over two periods covered by the two definitions. However, as all the activities in question were carried on

in Australia, there is no real difference in the application of the definition according to either text.

17. A second application was lodged on behalf of the applicant for the 1994 calendar year. This project was considered to be the same project as outlined in the advance ruling which had been rejected in March 1995.

18. A third application for registration for the 1995 calendar year was received by the respondent Board on 1 July 1996. This application related to the same project, but by this time the respondent Board was prepared to take a different view. The claimed activities considered by the TCC were:

(1) Investigation and design of a suitable ground and flood water protection system that comprised:
    - (a) Overseas investigation of alluvial valley floor mining in USA.
    - (b) Assessment of various options that led to the choice of pursuing a Cut-off Wall type to control ground water and minimise seepage.
    - (c) Research and design of a soil-bentonite cut-off wall.
    - (d) Investigations leading to a choice of levee bank design.
    - (e) Research and design of the levee bank and the interface join between the cut-off wall and levee bank.

(2) Construction of the cut-off wall and levee bank which includes instrumentation to measure performance of the wall and bank.

(3) Dewatering the alluvial mine site area to allow mining to commence.

(4) Blasting and mining a technically determined section (about 1000 metres) of the alluvial area adjacent to the cut-off wall and levee bank.

19. At its meeting on 2 October 1996, the TCC decided that some activities (referred to as core activities) were covered by paragraph (a) of section 73B(1) and some (described as supporting activities) were covered by paragraph (b). Activities described above in paragraphs (1)(a), (b), (c), (d) and (e) involving the investigation and design of a water protection system were accepted as complying with the definition. The activities described above in paragraphs (2), (3) and (4), namely the construction, de-watering and blasting stages of the project, were rejected. Activities 1(c), (d) and (e) were accepted as eligible core activities as they were systematic, investigative or experimental activities which involved innovation or technical risk and were carried on for the purpose of acquiring new knowledge or creating new or improved materials, products, devices, processes or services. The TCC determined that activities (1)(a) and (b) were not core activities but accepted that they did directly relate to the core activities and were therefore supporting activities.

20. The activities mentioned in paragraphs (2), (3) and (4) are those that are the subject of the present proceedings. They were rejected by the TCC as the respondent's delegate for the reason that the primary technical problems associated with the cut-off wall would be solved by the design, development and testing activities [1(c), (d) and (e)], that these activities would lead to the specifications for the construction of the wall and that construction would not involve any systematic, investigative or experimental activities but rather the application of known bentonite techniques. The TCC further determined that the construction of the wall and levee, de-watering of the aquifer and blasting would not be carried on for the dominant purpose of acquiring new knowledge

or creating new or improved materials, products, devices, processes or services. Rather, it said, they were carried on for purposes associated with mining and so could not be considered to be core activities as they would not involve acquiring new knowledge or creating new or improved materials, products, devices, processes or services. The TCC also determined that they were not supporting activities.

21. The respondent was asked to reconsider its decision in relation to the three outstanding activities. On 11 August 1997, the TCC made the reviewable decision under section 39S of the Act.

22. Omitting formal parts, the terms of that decision were as follows:

"1. That the TCC confirms its decision of 2 October 1996, in that the stated R&D activities described as "Construction of the cut-off wall and levee bank etc" does not constitute R&D as defined in part (a) of [the] definition of research and development activities in section 73B of the Income Tax Assessment Act 1936.

The activities were considered not to have been undertaken in a systematic, investigative or experimental manner and did not involve either innovation or technical risk.

2. That the TCC confirms its decision of 2 October 1996, in that that stated R&D activities described as "Construction of the cut-off wall and levee bank etc" does not constitute R&D as defined in part (b) of [the] definition of research and development activities in section 73B of the Income Tax Assessment Act 1936.

The activities were not carried on for a purpose directly related to the carrying on of a core R&D activity.

3. That the TCC confirms its decision of 2 October 1996, in that the stated R&D activities described as "dewatering the alluvial mine site area to allow mining to commence" does not constitute R&D as defined in part (a) of [the] definition of research and development activities in section 73B of the Income Tax Assessment Act 1936.

The activities were considered not to have been undertaken in a systematic, investigative or experimental manner and did not involve either innovation or technical risk.

4. That the TCC confirms its decision of 2 October 1996, in that the stated R&D activities described as "dewatering the alluvial mine site area to allow mining to commence" does not constitute R&D as defined in part (b) of [the] definition of research and development activities in section 73B of the Income Tax Assessment Act (1936).

The activities were not carried on for a purpose directly related to the carrying on of a core R&D activity.

5. That the TCC confirms its decision of 2 October 1996, in that the stated R&D activities of blasting, mining and liquefaction study, described as "Blasting and mining a technically determined section (about 1000 metres) of the alluvial area adjacent to the cut-off wall and levee bank", does not constitute R&D as defined in part (a) of [the] definition of research and development activities in section 73B of the Income Tax Assessment Act 1936.

The activities were considered not to have been undertaken in a systematic, investigative or experimental manner and did not involve either innovation or technical risk.

6. That the TCC confirms its decision of 2 October 1996, in that the stated R&D activities of blasting and mining, described as "Blasting and mining a

technically determined section (about 1000 metres) of the alluvial area adjacent to the cut-off wall and levee bank", does not constitute R&D as defined in part (b) of [the] definition of research and development activities in section 73B of the Income Tax Assessment Act 1936.

The activities were not carried on for a purpose directly related to the carrying on of a core R&D activity.

7. That the TCC revokes its decision of 2 October 1996, in that the stated R&D activity of liquefaction study, described as "Blasting and mining a technically determined section (about 1000 metres) of the alluvial area adjacent to the cut-off wall and levee bank, does constitute R&D as defined in part (b) of [the] definition of research and development activities in section 73B of the Income Tax Assessment Act 1936."

23. To qualify as *"core activities"* the *"activities"* (and they are defined with reference to the plurality of the applicant's endeavours) must be systematic, investigative or experimental, and must involve innovation or technical risk. If the activities are systematic and investigative, there is no requirement that they be experimental. Similarly, if the activities involve innovation, there is no requirement that they involve technical risk. In either event, the activities must be carried on for the purpose of acquiring new knowledge or creating new or improved materials, products, devices, processes or services.

24. The terms or phrases *"systematic"*, *"investigative"*, *"experimental"*, *"innovation"*, *"technical risk"*, *"new knowledge"*, *"new or improved materials, products, devices, processes or services"*, and *"purposes directly related to the carrying on of activities"* are not defined for the purposes of the Act. The ordinary meaning of key words and the definitions assigned to them in the Macquarie Dictionary are as follows:

"Systematic means "arranged or conducted according to a system, plan or organised method"
Investigative means "characterised by or inclined to investigation"
Experimental means "based on, or derived from, or making use of experiment"
Experiment means "an action or procedure undertaken to make a discovery, test a hypothesis or demonstrate a known fact"."

25. The terms have also been considered in various decisions of this Tribunal and in a judgment of a Full Court of the Federal Court. Those decisions are as follows:

- *Re Charles IFE Pty Ltd and Industry Research and Development Board* 95 ATC 2149.
- *Re Philip Morris Ltd and Industry Research and Development Board* 98 ATC 2001
- *Industry Research and Development Board v Unisys Information Services Australia Pty Ltd* 97 ATC 4848
- *Re Mobil Oil Australia Ltd and Industry Research and Development Board* 95 ATC 2042
- *Re Confidential and Industry Research and Development Board* (decision number 11668, 6 March 1997) which was the subject of the appeal referred to above in *Unisys*.

26. From these definitions and decisions, several general statements of principle may be discerned as follows:

(a) The words are to be given their ordinary meanings and dictionary

definitions are relevant (*Unisys*).

(b) Provided the condition of innovation or technical risk is not de minimis, the conditions are satisfied by the presence of innovation or technical risk of whatever degree and not necessarily of any particular degree (*Unisys*).

(c) There is no requirement that the innovation or technical risk must be substantial (*Unisys*).

(d) The Macquarie Dictionary definition of innovation is *"something new or different introduced"* and *"the act of innovating, introducing of new things or methods"*. Accordingly, an activity may be innovative because it is the first example of the large scale use of certain processes.

(e) The meaning of *"risk"* is *"uncertainty as to outcome"* and the word *"technical"* qualifies *"risk"* adjectivally and means *"belonging or pertaining to an art, science or the like"*. An activity may, therefore, be innovative because the implementation had to pioneer new territory and may involve technical risk because, while there was little risk in the technology itself, there was induced risk in the attempt to apply it (*Mobil Oil Australia*).

(f) Technical risks may be involved because there is uncertainty as to practical outcome and whether the end product could be processed and sold commercially. It can also arise where there is a significant number of variables and it is difficult to ascertain the effect of the interaction of those variables (*Unisys*).

(g) So far as supporting activities are involved, these include activities which were in some way inputs to or of assistance to accepted core activities (*Charles IFE*). That decision is also authority for the proposition that a project may be eligible even though it is a mixture of activities some of which do and some of which do not meet the legislative requirements. That approach appropriately recognises that the legislation expressly focuses on the concept of research and development <u>activities</u>.

(h) In considering a claim for the development of a particular technology it is necessary to have regard to the whole project which involved activities prior to and subsequent to the relevant year (*Philip Morris*). Accordingly, it follows that segmenting the overall project or activities in question is contrary to the general proposition that eligibility applies to activities as a whole or, in commercial terms, to a project.

(i) The statement that it is the process not the product that must meet the criteria is not correct. There is nothing in the legislation requiring that the definition be read down to refer only to processes rather than products (*Unisys* at first instance not dissented from by the Full Court).

27. In its written submissions, the respondent opposed the claims for eligibility for construction, dewatering and blasting in these terms:

(a) "any activities of a systematic investigative or experimental nature involving innovation or technical risk were carried out during the design phase of the project and were concluded prior to the commencement of construction;

(b) there were no activities involving innovation or relevant

technical risk during the construction phase of the project;

(c) *in any event the activities which were carried out during the construction phase were no more than quality control measures and therefore not to be regarded as systematic, investigative or experimental activities (s 73B(2)(b));*

(d) *the applicant has not in any event established to the requisite degree that it had a relevant purpose in undertaking work in connexion with the project;*

(e) *the dewatering and blasting activities carried out at the conclusion of construction involved neither innovation nor technical risk and furthermore, were not activities carried out for the purpose of "carrying on" the construction."*

28. Evidence was given by five witnesses on behalf of the applicant and by one witness on behalf of the respondent. Mr C, a mining engineer, was an executive employee of the applicant. His evidence was especially useful for demonstrating the presence of the requisite purpose. In the context of this section, purpose clearly does not mean sole purpose. Such a reading would be inconsistent with the object of the Act, which is to promote research and development activities. It would also be inconsistent with the co-existing words of exclusion, to which I referred in *Re Confidential and Industry Research and Development Board* (decision number 401/1999, 10 June 1999). In that decision, I drew attention to the fact that distinctions are made within s 73 between various degrees of purpose. For example, there are references to *"exclusively for the purposes of"* in subs. (4), (5), (7), (15), (21), (23), (24), (28) and (31). In paragraph (7)(b) there is a reference to *"for that purpose and not … for any other purpose"*. In that decision I drew the inference that an unadorned use of the word *"purpose"* in paragraph 73B(2)(g) indicated that the word was left unqualified and that the inference properly to be drawn was that no qualification relating to sole, dominant or main was to be imputed. Those observations, however, related to the use of the word in the paragraph to which I have referred. The normal rule of construction probably applies to subs. (1). In the context of that subsection, *"purpose"* probably means *"the dominant purpose"*.

29. It was Mr C's evidence which established to my satisfaction that this purpose of the applicant company in carrying out the relevant activities was to acquire new knowledge by way of ascertaining whether the construction of a soil-bentonite cut-off wall with a connected overlapping levee bank in the context of a maximum hydraulic gradient exceeding 30 was a cost-effective way of isolating underground and ground waters to enable open-cut mining of alluvial coal to take place. The company also had the purpose of creating a new or improved process or method for isolating underground and ground water to enable open open-cut mining of alluvial coal to take place, bearing in mind that a soil-bentonite cut-off wall had not previously been constructed for that purpose or in those conditions.

30. There was no evidence of a formal nature from the Board of Directors of the applicant company. Nevertheless, as the officer who had charge of the project and who worked closely with the designer, constructor, contractors and others engaged in the formulation and execution of the project, Mr C's purpose was that of the company (*Tesco Supermarkets Ltd v Nattrass* [1972] AC 153, at 170-171 and *Hamilton v*

Whitehead (1988) 166 CLR 121, at 127).

31. Evidence was given by Mr Fitzhardinge for the respondent. He had practised continuously in the field of geotechnical engineering for almost 35 years. His expert qualifications and his entitlement to give opinion evidence were not questioned. There are, however, reasons why his evidence should not be preferred. In making this observation I should make it clear that I do not intend any reflection on Mr Fitzhardinge's high standing in his profession, nor upon the professionalism which he brought to the preparation and delivery of his evidence. The reasons for preferring the expert evidence put forward on behalf of the applicant are partly due to comparative experience of the witnesses, partly due to the fact that the evidence of one of the applicant's witnesses was not questioned and partly due to the fact that the totality of the evidence weighs heavily in favour of the applicant.

32. Mr Fitzhardinge's relevant experience is in dam construction. His evidence concentrated on comparisons between the applicant's project and work on three dams with which he was concerned, namely the Grahamstown Dam in the Hunter Valley, and two dams in Thailand. In each case, construction involved a soil bentonite cut-off wall. The two Thai walls passed through alluvial sands and gravel. The Hunter Valley wall passed through alluvial sands which included a small zone of peat and other lignitic material and hard bands of indurated soils with rock strength. Although there are some chemical resemblances between peat and coal, particularly in their chemical reactions with bentonite, Mr Fitzhardinge's experience did not extend to the direct excavation of coal for the purpose of constructing a soil-bentonite cut-off wall.

33. Secondly and more importantly, however, Mr Fitzhardinge was briefed with copies of the evidence of Mr C and three of the applicant's expert witnesses. For some reason which was not made clear at the hearing, he was not given any of the material provided by the fourth expert witness, Dr Truscott. Even by the time he gave his evidence to the Tribunal he had not seen that material. Dr Truscott was the principal designer of the project and gave evidence which was fundamental to the applicant's case on the questions of innovation and technical risk. This evidence remains, therefore, uncontroverted. There is no reason to reject any part of it.

34. Dr Truscott, at the relevant time, was a Senior Manager (Geotechnical and Dams) with Gutteridge Haskins and Davey Pty Ltd, Consulting Engineers. In that capacity, he supervised all the work that led to the design and to the management of the construction and implementation of the design.

35. Because of the importance and novelty of this work, a design audit was carried out by another expert geotechnical engineer, Mr Davidson. He was a Senior Principal and Vice President at Woodward-Clyde, an international consulting engineering firm of 6,000 employees. He had extensive experience in the design and construction of slurry walls and other seepage control measures, all of which served as useful precedents to the applicant's project without detracting from the uniqueness of that undertaking.

36. Two outside experts based in the US were qualified by the applicant, provided reports and travelled to Australia for cross examination on those reports. Each of them enjoys world eminence in the very fields with which this application is concerned. Mr Cavalli of New York, had over 25 years of experience in civil engineering and construction and had been responsible as a construction executive for projects throughout the United States, Canada, the Carribean and the Middle East.

37. Professor Filz of Virginia Polytechnic Institute and State University, had a background as a professional engineer until he obtained a doctorate in civil engineering in 1992. He has been an associate professor since 1997. His expertise is in civil engineering with specialisation in geotechnical engineering. Within the field of geotechnical engineering, his particular areas are soil structure interaction and environmental geotechnics. Within environmental geotechnics he has focussed on the soil-bentonite cut-off walls. At the time he gave his evidence, he was currently working on a research project supported by the US National Science Foundation to investigate soil-bentonite back-fill stresses and deformations of ground adjacent to soil-bentonite cut-off walls.

38. The expert evidence put forward by the applicant was impressive in its scope, depth and standard. The quality of the witnesses was of the highest. Their accumulated experience far exceeded that of Mr Fitzhardinge. The technical propositions which I will state in these reasons emerge after a consideration of the evidence put forward by the applicant. There was a large volume of evidence put forward by both parties. It would be quite impractical, if these reasons are to be kept within manageable limits, to examine every statement and proposition in detail. I have endeavoured to abstract what I regard as the most important aspects of the evidence. In doing so, I have endeavoured, in general terms, to balance assertions by the applicant with criticisms by the respondent.

39. The first question to ask is whether the applicant's project involved systematic and investigative activities. There was no real dispute that all three activities in question were carried out in accordance with a plan or organised method. They were certainly not haphazard. The pre-arranged plan envisaged the various stages of construction prior to de-watering and blasting. The six main parts of the construction program involved (1) the construction of a platform, (2) the trenching, (3) the mixing and placing, (4) the connection with the levee, (5) testing and (6) instrumentation. Not only was this project systematic, it involved investigative activities. As will be seen later in these reasons, there were unknown areas at the commencement of the activities which had to be explored and investigated in a systematic manner.

40. The next question to be asked is whether the project involved innovation. It was the respondent's case that any innovative activities took place during the design phase and were concluded prior to the commencement of construction. I prefer the evidence of the applicant for reasons which I have given. Design was not concluded when construction began. Necessarily there were a number of matters that were to be addressed by the contractor and project team during the construction phase. The existence of these matters could not be addressed during the design phase. These included:

(a) The existence of cobble or open gravel zones in the alluvial materials and how these zones would affect the trench and the wall.

(b) The existence of tree trunks and boulders in the excavation area and how these would affect the cut-off wall.

(c) The type and nature of the coal layers likely to be encountered and how the cut-off wall would interact with the coal.

(d) The nature of geological faults in the excavation area and how these would impact on the cut-off wall.

(e) The depth of the alluvium and coal seams ie. just how far down

excavation would need to be in order to find an impermeable base.

41. It was part of the respondent's case that no innovation was present because existing engineering methods were used to address the above subjects. The four methods of construction referred to all involved the use of machinery which was commonly used in civil engineering works. I accept the applicant's submission and the evidence of its witnesses that innovation consisted of using the combination of these engines to effect the applicant's purpose. In the *Unisys* decision at first instance, this Tribunal refused to read the statutory criteria as referring only to processes rather than products. In my view, the same observations have relevance in the present case. It is not a correct way to approach a claim by analysing individual segments and individual tools used in separate sections of the project. Innovation should not be given a narrow meaning. It should be given a broad construction in order to promote the objects of the Act. The Full Court in *Unisys* approved of this approach to interpretation. Innovation, in the context of this section, cannot mean only activities involving the use of new processes. By way of analogy, it could hardly be said that the discovery of penicillin was not the result of research and development because the task of isolating and breeding the substance was carried out with the aid of microscopes, a scientific instrument invented in the 16th century. In the present case, the evidence showed that this was the first occasion upon which the four methods, to which I have referred, were used in combination. Even though they may have had individual or other combined uses in other projects, the bringing together of these technologies constitutes innovation.

42. The principal reason why the project may be regarded as innovative is because there was no precedent for the construction of such a wall through coal and the applicant was intent upon ascertaining whether the activities would succeed and provide a general model for further similar activities to be carried out in respect of other alluvial coal mines owned by the applicant. This evidence was given by Mr C. Professor Filz, who said that *"this whole thing is a big experiment"*, indicated that the lessons he learned from the project would be used in his own research.

43. The fact that the *"whole thing"* was generally regarded as innovative is attested to by the fact that it was the subject of various papers of a learned kind at important conferences. Examples are the papers (exhibit 1) part authored by Dr Truscott delivered at the international conference on Dam Engineering in Kuala Lumpur in August 1995 and another paper (exhibit 2) which he part authored, delivered at the Australian National Engineering Conference in Darwin in April 1996.

44. Features of the project which were innovative and which were of interest were the fact that the difficulties of constructing the first soil-bentonite cut-off wall through coal in the world were explored, explained and in practice resolved. The wall was also the first soil-bentonite cut-off wall with a connecting overlapping levee bank.

45. As Mr Cavalli put it, the project represented the first installation of a slurry trench and soil-bentonite cut-off wall through coal in Australia, as well as the rest of the world, resulting in a novel method of construction and data providing knowledge regarding the durability of soil-bentonite when permeated by lignin and tested in the ground water. Innovation did not stop with a determination to use this method of construction. The construction itself, contrary to the assertions of the respondent, was a continuation of the innovative design process through implementation and experiment.

46. It was asserted by Mr Fitzhardinge that the project was an appropriate application of relatively uncommon but well-established construction techniques in conditions well within the range of previous experience in relation to slurry trench excavation, soil-bentonite cut-off wall technology and water barrier performance. He also did not consider that the project involved technical risk as the uncertainties were those which are ordinary for such a project and were appropriately managed in the design and construction using standard engineering approaches.

47. In my view, the weight of the evidence is contrary to this opinion. The construction aspect contributed a number of *"indisputable firsts"* as Mr Davidson put it. This was the first soil-bentonite slurry wall excavated with a long reach excavator in Australia. It was the first soil-bentonite slurry wall cut off for coal mine de-watering control in the world. It was the first soil-bentonite slurry wall through coal in the world. To be first is, as I have indicated above, to be innovative.

48. Construction involved a good deal of instrumentation. This led to the allegation by the respondent of mere quality control. In my view, the weight of the evidence is again contrary to this submission. Several kinds of instrumentation not ordinarily applied to soil-bentonite cut-off walls were used for this part of the project. These included settlement plates, extensometers, inclinometers, settlement profile gaugers, survey monuments and piezometers. The operations of obtaining the instruments, installing them, reading the instruments, reducing the data and interpreting the data were all part of a systematic effort to gain new knowledge about the performance of the cut-off wall, according to Professor Filz. His evidence was that such instrumentation was far in excess of what one would normally expect in mere quality control. Data from the instrumentation was used by the cut-off wall designers to improve understanding of the consolidated stress state in the soil-bentonite back fill. It was the evidence of Professor Filz that this had important implications for hydraulic conductivity and resistance to hydraulic fracture of the soil-bentonite. He added that the topic was one of the most important components of a research investigation he was currently performing under financial sponsorship provided by the US National Science Foundation.

49. In addition to the innovative nature of the construction, there were also identifiable technical risks as that term has been understood in the authorities to which I referred. Mr Davidson, the independent auditor of the original design, identified eight technical risks in his affidavit (exhibit K). The first dealt with the problem of excessive settlement and the way in which this risk was addressed during the process of construction. The settlement monitoring program was much more comprehensive than ever done before and, according to Mr Davidson, provided effective guidance for adjustment of the design. The wealth of settlement data generated also provided invaluable data to other ongoing research programs. It assisted in resolving the settlement problem for a Raytheon Plant Project in California and on other sites identified by Mr Davidson.

50. A second technical risk was the possibility of any undisclosed defects within the wall. These defects have been observed in the past when contaminated slurry becomes entrapped with the backfill. For the first time, this project adopted the novel device of a down-hole, bore hole camera for use in the slurry trench to inspect visually the quality of the backfill and the contact with the foundation. This innovative approach provided the first direct observation of the in situ condition of soil-bentonite backfill and built a level of

confidence that the backfill was relatively uniform and formed an integral contact with the foundation. This new technique has now been added to the armoury of civil engineers.

51. A third technical risk was overcome by ensuring that the soil-bentonite backfill was designed to provide a very low permeability seepage barrier. There was a high risk that the backfill would be too coarse or gap graded, producing an unacceptably high permeability. To address this risk, fines had to be imported for some segments of the alignment and then be added to the mix to obtain the needed gradation. This required an unusually high level of systematic monitoring and testing of the backfill and custom blending of fines into the backfill to produce a suitable grading. In Mr Davidson's opinion, this also provided an innovative technical precedent for other projects with problematic trench spoil gradations.

52. A fourth technical risk involved the matching of the backfilled gradation to filter compatible with the surrounding soil mass. Normally, the soil-bentonite gradation is compatible because it has been borrowed from the same soils but where there is variation with depth there can be filter incompatibility. Formation of a filter cake reduces this potential but the controlled backfill grading provides a second line of defence. Mr Davidson gave evidence that he has since adopted the approach used for the construction of the subject wall on a number of subsequent projects.

53. A fifth technical risk involved the uncertainty surrounding the excavatability of the sedimentary cap rock above the coal. It was exposed in outcrop as a hard zone that could have significantly impeded excavation process with backhoe or clamshell. As it turned out, this apprehended problem did not arise. The fact that a risk is happily resolved does not, of course, remove the uncertainty involved in an identified technical risk at the commencement of the project.

54. A sixth technical risk involved the excavation of coal. This was the first slurry wall ever constructed through coal. It was originally anticipated that once through the cap rock, the trench would be readily excavated by clam shell with chisels being required to break up harder zones. This turned out to be completely wrong. The coal was too hard to be excavated with the backhoe or clam shell and the chisel simply bounced off the compressible coal. The unexpected difficulties in design which had to be eventually resolved through the use of a combination of excavating equipment resulted in a substantial claim by the contractor, which was ultimately resolved when the technical problems were solved. The problems with coal excavation were unprecedented and the experience of the applicant now provides valuable information for future projects. Mr Davidson gave as an example the Yallown Energy Project in Victoria, where a soil-bentonite slurry wall cut-off is contemplated for ground water control in a brown coal deposit. The experience of excavating through coal for the construction of the wall illustrates both the innovation and the technical risks involved in the applicant's activities.

55. A seventh technical risk lay in the possible slurry loss to the alluvium. A loss of this kind could cause trench collapses and a large consumption of bentonite. The long-term performance of the bentonite exposed to coal contamination was also an unknown. There was no way in which this risk could be assessed except during construction by observation. Any problems were then attacked by adjusting the bentonite content, using additives, changing bentonite and implementing a contingency

plan. As it turned out, there was no significant slurry loss. Once again, however, the fact that an uncertainty as to outcome attached to an aspect of the construction is sufficient to justify a finding of technical risk.

56. The final technical risk identified by Mr Davidson was the possibility of trench instability which could have been caused by a number of factors, including a slurry loss, bentonite contamination, excessive excavation time, ground water migration and bentonite dilution, among others. Again, as it turned out the bentonite was not degraded by the coal or diluted by infiltration and it maintained a stable trench even during long periods of open trench while the coal was pre-drilled and excavated. This fortunate result could not have been foreseen, except by taking the technical risk and working through it.

57. The de-watering and blasting activities, the second and third segments of the project to which objection was taken by the respondent, were, in my view, activities carried out for the purpose of carrying on the construction. The definition of *"supporting activities"* in section 73B is wider than the definition of *"core activities"* in that the use of *"a"* instead of *"the"* probably indicates a subsidiary, collateral or subordinate purpose, rather than an actuating purpose. Accordingly, if among other purposes, the applicant had a purpose in carrying out the de-watering and blasting which was directly related to the carrying on of the construction activities then the de-watering and blasting can properly be regarded as falling within the terms of the second half of the definition.

58. The de-watering was to determine the integrity and performance of the cut-off wall and is, therefore, directly related to the design aspects, both on paper and in the additional design experienced in the construction. It involved applying a hydraulic gradient to the wall by de-watering the contained area and measuring the pumping rates and the water pressures in the ground on both sides of the wall. Records were kept of the ground water extraction rates and of the ground water levels on either side of the wall. Analyses were then performed to interpret the data and to draw conclusions about the integrity and performance of the cut-off wall.

59. Although the primary purpose of de-watering the area was to facilitate coal extraction, a subsidiary purpose which, in my view, falls within the terms of the definition, was to determine whether the soil-bentonite cut-off wall technology could be used to reduce seepage and facilitate coal extraction elsewhere and to assist directly in the supplementary design work embodied in the construction.

60. The construction of the levee was an integral part of the construction of the cut-off wall. The latter was, in fact, anchored to the former. The whole formed part of the one design and such construction work that was carried out on one may also be regarded as a working out of the design of the other.

61. Testing of either the wall or the levee to their full potential has not been possible. This will occur only when a one in 100 year flood occurs. No doubt the applicant hopes this will not happen during the life of the mine. The risk, however, is continuing. It has, to some extent, been addressed through the de-watering program. The soil-bentonite wall is buried up to 30 metres below the ground surface and it is not possible to inspect the wall or the alluvium or coal adjacent to the wall in detail. All that can be done is to establish design principles, construction procedures and construction monitoring that will reduce the technical risk of problems developing to a low level. De-watering of the alluvium established the required head drop relatively easily, thus indicating that in

general the wall was functioning correctly and the volume of any seepage or leaks through the wall was less than the capacity of the de-watering pumps.

62. The third aspect of the project to which the respondent took objection, namely the blasting, is also, in my view, an activity carried on for a purpose directly related to the carrying on of the core activity of construction of the wall and levee.

63. Blasting was carried out in the mine adjacent to the 1,000 metre length and associated measurements and studies were made to determine its effect on the soil-bentonite mix. There were two basic concerns. Firstly, it was thought that the peak ground acceleration due to blasting could cause liquefaction of the saturated low density soil-bentonite mix. This occurs when a potentially unstable mix is shaken by a blast or an earthquake. When this occurs, the particles separate and the soil-bentonite becomes a heavy liquid. This could cause excess water to drain out into the adjacent alluvium, resulting in settlement of the soil-bentonite and the possibility of a phenomenon referred to as arching. The second concern was that during blasting, the various sub-horizontal sedimentary layers are lifted and gas flows through these layers until the gas and energy are dissipated. There was concern that lifting layers or sub-horizontal cracks opening adjacent to the cut-off wall would cause cracking of the wall.

64. Accordingly, various special blasting and heavy drop-weight trials were carried out by the applicant, in association with a specialist consultant company, to determine the attenuation of peak ground acceleration at a given distance from the blast and to determine the possible effect on attenuation of a pre-split face.

65. The results from these studies were variable. Assessment of the data indicated that there was a high likelihood that blasting would cause liquefaction of the soil-bentonite and that it was not practical to reduce the blasting to a level that would ensure the soil-bentonite would not liquefy. The blasting, in my view, was also used to develop an understanding of the effect of future mining on the soil-bentonite. That being so, the blasting was a supporting activity carried on for a purpose directly related to the carrying-on of the core activity of construction of the wall.

66. On the evidence put before me, I find that activity 2, identified in paragraph 20 of these reasons, was a core activity and that activities 3 and 4 were supporting activities as defined. Accordingly, the decision under review is set aside and the matter is remitted to the respondent with a direction that a favourable certificate under section 39L of the *Industry Research and Development Act* 1986 be issued to the applicant.

I certify that the 66 preceding paragraphs are a true copy of the reasons for the decision herein of Mr BJ McMahon (Deputy President)

Signed:

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Associate

Dates of Hearing	7, 8, 9, 10, 11 June 1999
Date of Decision	28 June 1999
Counsel for the Applicant	Dr J Griffiths
Solicitor for the Applicant	Gilbert & Tobin

Counsel for the Respondent	Mr M Rudge SC Dr A Gelbart
Solicitor for the Respondent	Australian Government Solicitor