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THE PARLIAMENT OF THE COMMONWEALTH OF AUSTRALIA

Parliamentary Standing Committee on Public Works

REPORT

relating to the proposed construction of a

BEEF CATTLE RESEARCH LABORATORY

at

Rockhampton, Queensland

(TENTH REPORT OF 1977)

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THE PARLIAMENT OF THE COMMONWEALTH OF AUSTRALIA
PARLIAMENTARY STANDING COMMITTEE ON PUBLIC WORKS

R E P O R T

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PARLIAMENTARY STANDING COMMITTEE ON PUBLIC WORKS

BEEF CATTLE RESEARCH LABORATORY
ROCKHAMPTON, QUEENSLAND

R E P O R T

On 10 August 1977 His Excellency the Governor-General in Council referred to the Parliamentary Standing Committee on Public Works for investigation and report to the Parliament the proposal to construct a beef cattle research laboratory at Rockhampton, Queensland.

The Committee has the honour to report as follows:

THE REFERENCE

1. The proposal submitted to the Committee is for the construction of a comprehensive beef cattle research laboratory complex to continue research into increasing the productivity of the beef cattle industry in Northern Australia. The complex will be operated by the C.S.I.R.O.'s Division of Animal Production.
2. The laboratory will be air conditioned and of two-storey brick construction with internal concrete columns, concrete floors and an insulated metal deck roof. The administrative section, of similar construction, will be a single storey air conditioned unit. The plant section will be a naturally ventilated single storey structure. Associated structures will include an animal building, a food preparation building a caretaker's residence and a flammable store.
3. The estimated cost of the proposal, at June 1977 prices, was \$5.44 million.

THE COMMITTEE'S INVESTIGATION

4. In addition to receiving submissions from the C.S.I.R.O. and the Department of Construction, the Committee received written submissions from:
 - the Rockhampton City Council, who support the proposal;
 - various breeders' societies within the beef industry, who, whilst having certain reservations, support the proposal in principle;

- the Cattlemen's Union of Australia and the United Grazers' Association of Queensland, who support the proposal;
- the Australian Meat Research Committee, who provided evidence in support of the C.S.I.R.O.'s submission; and
- two graziers who questioned the need for the laboratory in view of the present depressed state of the industry.

5. During the public hearing at Rockhampton on 28 and 29 September 1977 the Committee heard evidence from representatives of the above organisations and the two graziers. A representative of the Queensland Department of Primary Industries also gave evidence, supporting the establishment of the laboratory and outlined the growing importance of the Department's complementary role with C.S.I.R.O. and the beef industry, particularly over the last five years.

6. Prior to the public hearing, the Committee inspected the existing facilities of the Tropical Cattle Research Centre comprising the Rockhampton-based laboratory facilities and the national cattle breeding station, Belmont, located some 32 km north of the city. The Committee also inspected the site for the proposed laboratory, which is 5 km north of Rockhampton.

7. The Committee's proceedings will be printed as Minutes of Evidence.

BACKGROUND - THE NORTHERN BEEF CATTLE INDUSTRY

8. The beef cattle industry is one of the main economic bases of rural development in Northern Australia. Because of the unsuitability of the region north of the 26th parallel for sheep production or cropping, cattle raising currently represents the most appropriate and viable form of land use for most of that area.

9. Some recent statistics, provided by the Australian Bureau of Statistics for an 11 months period ending May 1977, give an indication of the importance of the beef cattle industry in Northern Australia.

	<u>Herd Size (1976)</u>	<u>Number of Cattle Slaughtered (Including Calves)</u>	<u>Meat Production (Tons Carcass Weight)</u>
Northern Australia	9.3m	887 135	196 164
Total Australia	29.9m	10 524 000	1 744 331
Percentage in Northern Australia	31%	8.4%	11.3%

10. These statistics show that while Northern Australia carries some 31% of Australia's beef cattle population, the percentage slaughtered in the region is only 8.4%. This is due to the fact that many of the beef cattle born in Northern Australia are moved south for fattening and slaughter. It is also partly due to the low productivity of cattle in the north as the result of low calving rates and an age at turn-off at least a year greater than in the south.

11. There is scope for improving the turn-off from beef herds in Northern Australia by pasture improvement which is a major objective of the C.S.I.R.O. Division of Tropical Crops and Pastures. However, the development of cattle better adapted for production in a tropical environment can be achieved with relatively minor financial inputs on properties and it is directed more to reducing costs of production than to increasing gross level of production.

12. At the February 1977 National Agricultural Outlook Conference, the Bureau of Agriculture Economics (BAE) released its report, The Australian Farm Situation - 1976-77. In part the report stated -

" The market situation for Australian beef exports continues to be dominated by demand and supply development overseas and by associated arrangements for access to the major markets in North America, Japan and Western Europe.

... Overall, there are signs of some strengthening in demand and a downturn in world beef production and cattle numbers, but the resulting improvement in market opportunities and export prices at least in the first half of 1977 may only be gradual. "

13. In its submission to the Outlook Conference, the Australian Meat Board concluded that the chances of recovery in the world beef market were stronger now than at any time since world prices commenced to turn down in 1973.

BEEF CATTLE RESEARCH AT ROCKHAMPTON

14. The National Cattle Breeding Station, Belmont, is a 3600 hectare property owned by the Australian Meat and Livestock Corporation. It was purchased by the then Australian Meat Board in 1952 to provide facilities for studies on the breeding of beef cattle adapted to the tropical and sub-tropical environments of Northern Australia. The property, which is managed on behalf of the Corporation by the C.S.I.R.O. Division of Animal Production, currently runs some 2500 head of cattle. Improvements to the property have been made over the years, largely from the revenue obtained from cattle sales.

15. Breeding Research Program The breeding research program at Belmont is of necessity long term in nature. The first matings of experimental cattle were made in 1954 and the beginnings of the laboratory were established in the same year. The research program has concentrated on crosses between two breeds of British cattle - Herefords and Shorthorns and crosses of this cross with the zebu types, American Brahman and the Africander. The objectives of this research have been initially:

- to determine the genetic potential of different breeds and lines for the important characters;
- to develop techniques to enable the selection for these characters in breeding programs;
- to combine the important characters from different breeds into new strains and improve them by selection;
- to identify and analyse those characters such as tick and worm resistance, heat tolerance and feed utilisation that are likely to be important for the adaptation and productivity of beef cattle in northern environments;
- to measure these characters and assess their relative importance under the various environmental conditions of the north.

16. Cattle Breeds and the Northern Australian Environment The two main British breeds in Northern Australia, the Shorthorn and the Hereford and mixtures of the two, will breed well when in reasonable physical condition, but they are susceptible to stresses imposed by high temperatures, tick infestation and internal worm parasites. For these reasons, British breeds do not generally grow as well in the tropics as they do in the temperate climates to which they are adapted. Nor do they grow as well in the tropics as the *Bos indicus* breeds - the humped cattle of Asia and Africa known collectively as zebu. This has led to the importation of zebu cattle, mainly American Brahmans and breeds derived from them. About half of the cattle in Northern Australia now have some zebu ancestry. The *Bos indicus* that have been introduced into Australia are a very restricted sample of the total population of breeds of animals around the world.

17. The Committee is concerned that the considerable delay in the construction of the Off Shore High Security Quarantine Station at West Island Cocos (Keeling) Islands (5th Report of 1973) and the Animal Health Laboratory in Geelong (6th Report of 1974) is hampering research into cattle problems in Northern Australia. The Committee was informed that even after the

establishment of both these facilities it will be some time before cattle would be imported from high risk areas. The mechanisms of the Quarantine Station and the Animal Health Laboratory will be tested with animals from safer areas first and this would defer the introduction of animals from the high risk areas.

18. Owing to the interest of breeders in rate of gain in weight, it is likely that some of the larger European breeds such as the Charolais and the Chianina will be given a trial. Large mature size contributes a great deal to rate of gain in weight. Other European breeds have been used in the north but so far the Shorthorn and Hereford predominate.

19. The Brahman is a zebu breed developed in southern U.S.A. from cattle of Indian origin. Imported American Brahmans have been used in crosses to form the Droughtmaster, the Braford and other breeds. The Santa Gertrudis, which was imported from the United States, is an American Brahman cross in origin. Brahmans are tolerant of heat, resistant to worms and ticks and will maintain weight on pastures where British breeds are losing weight. Cross breeds derived by crossing Brahmans with British breeds grow well by comparison with British breeds and, indeed, also by comparison with pure Brahmans. They combine complementary merits from both parental breeds. However, the fertility of cattle derived from Brahmans is variable and is affected by stress.

20. It is possible that a large number of breeds will come to inhabit the north and that a system of rotational cross breeding will be introduced for some purposes. It is not the purpose of the Division of Animal Production to test the performance of every breed or every cross between breeds. Its purpose is to firstly identify those characters that an animal must have if it is to be profitably exploited in the north and secondly to work out easy ways of measuring their desirable traits.

21. The characters necessary for adaptation to the tropics together with other factors important to productivity such as fertility, survival, growth rate, carcass quality and temperament are not yet to be found combined in any breed - either British or zebu. The desirable combination of attributes can only be achieved by scientific cross-breeding and selection.

22. The primary and continuing aim of the research program is an accurate description of the qualities required in beef animals for production in the tropics and improvement of appropriate selection criteria; this can only be achieved by learning more about the physiological and biochemical mechanisms which make one animal more productive than another in the Northern Australian environment.

23. Belmont Red During the course of the public hearing, a certain amount of criticism was expressed by stud breeders that the Belmont Red was in competition with their own breeds and that the Belmont Station had set out with the specific idea of developing this breed.

24. The Committee was advised by C.S.I.R.O. that the Belmont Red, which is an Africander cross breed, was very much a by-product of their research. Since 1968 a number of selected breeding animals have been released each year. It is perhaps unfortunate that the animal had been given the name "Belmont Red" and C.S.I.R.O. did not believe an unfair advantage had been gained over the industry because of its introduction. Their role is to do research and to create a model for experimentation. As stated elsewhere, C.S.I.R.O. primarily concerns itself with genetic research for the improvement of livestock in Northern Australia.

THE NEED

25. Organisation and Role of C.S.I.R.O. at Rockhampton To complement the work at Belmont, C.S.I.R.O. established laboratory facilities at Rockhampton with a staff of specialised scientists to investigate the physiological and biochemical basis for the genetic differences between the various breeds of cattle used at Belmont. The C.S.I.R.O. organisation to meet this task is described below.

26. Division of Animal Production This Division is primarily concerned with animal breeding and conducts a selection program whose main aim is to define the make-up of an animal that will produce beef most efficiently.

27. Division of Entomology Its primary role is concerned with carrying out research into the cattle tick, an external blood feeding parasite which causes tick fever. Ecological studies on the tick commenced in 1969. There is a Tick Research Station on about 100 hectares of Belmont which includes some cattle handling facilities and a small field laboratory. It also studies the buffalo fly, another blood feeding parasite of cattle in tropical areas and the Division's Dung Beetle Section is working towards the introduction of more species of beetles for the tropics in an attempt to secure improved dung burial and so reduce the numbers of buffalo fly.

28. Division of Animal Health This Division investigates resistance to internal and external parasites, tick fever, immunology and reproductive diseases.

29. Other Divisions Also located at the Tropical Cattle Research Centre is the Division of Computing Research with an officer in charge and a computer operator who undertake data analysis services. Located independently at Rockhampton and Belmont are staff from the Division of Entomology consisting of two Research Scientists, two Experimental Officers, two Technical Officers and three Technical Assistants.

30. In addition, the Division of Tropical Crops and Pastures which investigates pasture improvement, the utilisation of pasture and the nutritive value of new species, has some experimental plots of sown pasture at Belmont, but no laboratory facilities as yet.

31. Existing Laboratory Accommodation at Rockhampton The present accommodation to house C.S.I.R.O. staff and equipment is spread over several locations and comprises:

- one very small wooden building for laboratory purposes in Hunter Street, 1 km from the Airport;
- one two-storey brick building for laboratory and office purposes; originally used as a livery stable, 418m² in area, in Quay Lane;
- portion of a building rented from Dalgety's - 60m² in area and located two doors from the two-storey brick building, used for office and laboratory purposes;
- various field laboratories at Belmont.

32. The Division of Animal Production staff are located at Belmont and in the two laboratory buildings in Quay Lane. The Division of Entomology has five officers located in the small building in Hunter Street and other staff at a field laboratory at Belmont.

33. The main building in Quay Lane has been the subject of several safety and fire reports and is totally unsuited to its purpose. It has been described by the C.S.I.R.O. Safety Officer as the least safe laboratory building in the whole of the organisation. Moreover, the whole environment is highly detrimental to staff morale. Although the outside walls are brick, all internal partitions, floors and stairs are timber. Fume cupboards do not comply with safety standards and there is no safe laboratory for handling radioactive materials. There are no cold rooms and no controlled-temperature rooms. Fittings and finishes generally have deteriorated beyond repair. The smaller rented building, which is of a slightly better standard, comprises two offices, the library and a small laboratory. The Quay Lane

laboratories house 12 professional staff (including one officer from the Division of Animal Health and one from the Division of Computing Research) and 19 supporting staff.

34. The Quay Lane laboratories are totally unsuitable for research involving experiments on live cattle. The building cannot be used for experiments with small laboratory animals. As a result, many of the physiological aspects of the research which involve close observation of animals under carefully regulated conditions have had to be conducted at Belmont where the facilities are limited in number and scope. In addition, the remoteness of these experimental facilities from the laboratory has imposed a heavy travel burden for many of the staff and ineffective use of this manpower.

35. Experimental Facilities at Belmont The Belmont Station has residences for the Station Manager and Overseer and for the stockman in charge of the experimental yards. There are bachelors' quarters for station hands and a caretaker's cottage has been built at an entrance leading to the homestead. General animal handling facilities are good and the station is excellent for running experimental herds of cattle.

36. In addition to the facilities used by the management of the Belmont herd there are some experimental facilities comprising three somewhat inadequate cattle yards and about 60 stalls, which can accommodate approximately 80 cattle. In the new complex C.S.I.R.D. will maintain a balance between the proportion of cattle in stalls for single feeding and those in yards, group fed. The experimental facilities also comprise a climate room, metabolism cages, tick breeding pens, respiration chambers and a research abattoir. While some of the facilities in the experimental complex are adequate for present purposes, others have reached a stage where they need substantial upgrading to be effective.

37. There are no facilities at Belmont for more detailed intensive studies on fertility, immunology and parasite resistance. The facilities for the measurement of metabolic rate in animals i.e. the respiration chambers, are totally inadequate and need to be upgraded.

38. After the new laboratory is completed, some of the facilities at Belmont will be fully utilised for complementary work with the selection and management of the experimental herd.

39. Committee's Conclusion The existing facilities of the Tropical Cattle Research Centre are dispersed, overcrowded and inadequate for research work.

40. In spite of difficult working conditions, the research work has contributed significantly to increasing the profitability of the beef cattle industry in Northern Australia.

41. There is a need for a comprehensive beef cattle research laboratory at Rockhampton to replace existing unsatisfactory facilities.

THE PROPOSAL

42. Proposed Facilities The proposal includes the following buildings:

- laboratory, administration and central plant building;
- animal building;
- feed preparation building and silos;
- flammable store;
- animal waste treatment plant;
- pathological incinerator building;
- caretaker's residence.

43. Laboratory, Administration and Central Plant Building C.S.I.R.O. requires the laboratory facilities, administration and central plant facilities to be accommodated within the one building but to be designed so that certain areas within each section can be isolated at evenings and weekends, i.e. seminar rooms and canteen, thereby allowing for their use outside normal working hours.

44. The laboratory unit is a two-storey structure and the administration section is a single-storey structure. Both will be air conditioned. A sketch of these buildings is at the end of this report.

45. The central plant area is a naturally ventilated single-storey unit.

46. Animal Building This naturally ventilated single-storey building comprises:

- covered animal accommodation;
- covered drafting, weighing and bleeding yards;
- covered metabolism and climate rooms.

47. This building is connected to the laboratory, administration and central plant building by a covered way. The animal accommodation area has been designed to accommodate 90 adult cattle and 20 calves and provision has been made to expand this accommodation to accommodate 150 cattle and 50 calves. These experimental facilities, which will enable physiological studies to be undertaken, will replace those facilities at Belmont that need upgrading and will complement the remainder.

48. To provide the special natural ventilation requirements to the metabolism building, the external walls have adjustable ventilators from floor level to one metre and similar ventilators have been provided in the monitor roof and the top of the walls. The Committee suggests that as animals will be housed in the metabolism building, the compressed asbestos cement external walls be protected by suitable meshing or railing.
49. The covered animal accommodation and weighing area, drafting and bleeding yards will have roof covering only, with open walls formed of horizontal pipe rails.
50. Feed Preparation Building This building is designed as a naturally ventilated two-storey structure of similar design to the metabolism and climate rooms of the metabolism building. The three adjacent silos will be sheathed with galvanised iron.
51. Flammable Store This single-storey building is to the standard design of the Department of Construction.
52. Pathological Incinerator Building This single-storey structure is designed as a roofed area to protect the pathological incinerator from rain. The incinerator will be used to dispose of animal carcasses.
53. Carstaker's Residence A house will be designed to conform with the normal Commonwealth standards.
54. Integration of C.S.I.R.O. Divisions As provision is made to house the Divisions of Entomology, Animal Health, Tropical Crops and Pastures and Computing Research within the new complex, it highlights the multi-disciplinary nature of the program and the importance of collaboration at Rockhampton.
55. Committee's Conclusion The new complex will integrate existing C.S.I.R.O. staff and enhance the research effort.
56. The Site The proposed site of 32 hectares is situated some 5 km north of Rockhampton on the Bruce Highway opposite the Capricornia Institute of Advanced Education. Consideration was given by the C.S.I.R.O. to establishing the laboratory facilities at Belmont before the proposed site was finally selected. The relative isolation of Belmont would require the staff to commute daily from Rockhampton and would also impede the very important scientific contact which is developing between C.S.I.R.O., the Queensland Department of Primary Industries and the Capricornia Institute of Advanced Education.
57. Committee's Conclusion The site selected is suitable.

CONSTRUCTION

58. Structure The laboratory, administration and central plant building and the flammable store will have external walls of load bearing brickwork.
59. The animal building, feed preparation building and pathological incinerator building will have galvanised steel portal frames.
60. Floors will be reinforced concrete and will drain to the animal waste drainage system as appropriate.
61. Roofing generally will be metal decking supported by steel roof framing and purlins.
62. All buildings will be designed to withstand the wind forces set down in A.S. Code 1170 Part 2 for cyclone areas.
63. External Finishes The laboratory, administration and central plant building and the residence will have external walls of clinker bricks and natural grey finished exposed concrete floor beams and sunhoods.
64. Window frames will be anodised aluminium with anodised aluminium cyclone screens or laminated glass. Roofs will be metal deck with coloured compressed asbestos cement fascia panels.
65. The external walls of the metabolism building and feed preparation building will be insulated infilled panels of compressed asbestos cement. Louvres will be metal and the roofing material will be insulated metal deck and translucent plastic. The silos will be sheathed with painted galvanised iron.
66. The external walls of the flammable store will be clinker brick with a metal deck roof. The pathological incinerator building will have chainwire mesh walls and gates.
67. Internal Finishes Generally, the internal partitions will be of concrete blockwork, paint finish and lined with ceramic tiles to toilets. Floors in library and main offices and seminar room will be carpeted, welded sheet vinyl to laboratories, canteen, general offices and circulation areas, ceramic tiles to toilets and granolithic to plant room and workshops.

68. Ceiling linings generally will be acoustic tiles, painted hard plaster, plasterboard or painted concrete. Ceiling linings will not be provided in the central plant building and roof space plant rooms.

69. Civil By arrangement with the local authority a short length of the Bruce Highway service road, adjacent to the site will be sealed. Internal roads will be sealed with kerbs and channels. Car parking will be provided for 62 vehicles. The perimeter of the site will be fenced and some internal fencing will be provided to break up the site into paddocks. Cattle grids and lockable gates will be provided at various locations.

70. Hydraulic Services The laboratory complex will be connected to the adjacent Council water main. All sewage will be pumped into the Council reticulation system. Acid waste will pass through neutralising chambers before discharging into the sewer. A separate waste drain will be provided from the radioactive laboratory connected to a baffled retention tank which is then connected to the sewer.

71. All washdown water from the animal pens will be piped to the animal wastes treatment plant. Using an extended aeration process, this effluent will be treated to a standard suitable for disposal by irrigation. The treated effluent will be stored and used to irrigate pastures. It is envisaged that all effluent will be chlorinated then utilised in this manner. Stormwater run off from land and buildings will be excluded from the storage.

72. Electrical Mains power will be reticulated at 415/240v. Emergency power will not be provided in the complex. Lighting throughout the buildings will be in accordance with ASA Code C.A.30 recommendations and general purpose outlets will be provided as necessary

73. Lifts A single oil hydraulic lift will service the ground and first floors of the main building.

74. Fire Protection Automatic sprinklers, small bore hoses and hand extinguishers will be provided within the laboratory, administration and central plant building and feed preparation building.

75. Thermal alarms, small bore hoses and hand extinguishers will be provided in the animal building.

76. External fire hydrants will be provided throughout the complex.

77. Mechanical The laboratory and administration areas and the electronic workshop, will be air conditioned. The air conditioning system will be of conventional type using a central chilled water plant, a central air handling unit for treating fresh air for the laboratories and numerous small air handling units; a unit will be provided for each laboratory suite. Mechanical exhaust systems will be provided in other areas as appropriate.

78. Landscaping A co-ordinated landscaping scheme is proposed for areas adjacent to the buildings.

79. Consultations with other Authorities The project had been discussed with the Rockhampton City Council, the Queensland Department of Primary Industries, the Capricornia Institute of Advanced Education, the Capricornia Conservation Council, the Department of Environment, Housing and Community Development, the Queensland Main Roads Department, the Queensland Water Quality Control Council, Telecom and the Capricornia Regional Electricity Board and there were no objections to the proposal.

80. Environmental Impact Public comment on the environmental impact statement prepared for this proposal was invited in December 1974. Neither C.S.I.R.O. nor the then Department of Environment and Conservation received any adverse comments on the proposal as a result of the advertisements or of the many reports in the Rockhampton press. On 21 January 1975, the then Department of Environment and Conservation advised C.S.I.R.O. that the Environmental Impact Statement had not revealed any significant environmental problems and the complex could, with care, be designed and operated in harmony with the local environment.

81. Committee's Conclusion The Committee recommends the construction of the work in this reference.

FUTURE DEVELOPMENT

82. Provision has been made to accommodate on the site the following possible future development:

- new laboratory building;
- extensions to laboratory, administration and central plant building;
- extensions to animal building;
- small animals building;
- glass house.

ESTIMATE OF COST

83. The estimated cost of the work when referred to the Committee was \$5.44 million made up as follows:

	\$
Building works	3 638 000
Mechanical services	705 000
Electrical services	331 000
Civil works	331 000
Hydraulic services	397 000
Fire protection	38 000
	<hr/>
	5 440 000

PROGRAM

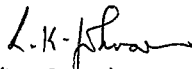
84. The estimated time for the preparation of contract documents, calling and analysing tenders is 12 months. Following acceptance of a contract, construction will take 78 weeks.

RECOMMENDATIONS AND CONCLUSIONS

85. The summary of recommendations and conclusions of the Committee is set out below. Alongside each is shown the paragraph in the report to which it refers.

	<u>Paragraph</u>
1. THE EXISTING FACILITIES OF THE TROPICAL CATTLE RESEARCH CENTRE ARE DISPERSED, OVERCROWDED AND INADEQUATE FOR RESEARCH WORK.	39
2. IN SPITE OF DIFFICULT WORKING CONDITIONS, THE RESEARCH WORK HAS CONTRIBUTED SIGNIFICANTLY TO INCREASING THE PROFITABILITY OF THE BEEF CATTLE INDUSTRY IN NORTHERN AUSTRALIA.	40
3. THERE IS A NEED FOR A COMPREHENSIVE BEEF CATTLE RESEARCH LABORATORY AT ROCKHAMPTON TO REPLACE EXISTING UNSATISFACTORY FACILITIES.	41
4. THE NEW COMPLEX WILL INTEGRATE EXISTING C.S.I.R.O. STAFF AND ENHANCE THE RESEARCH EFFORT.	55

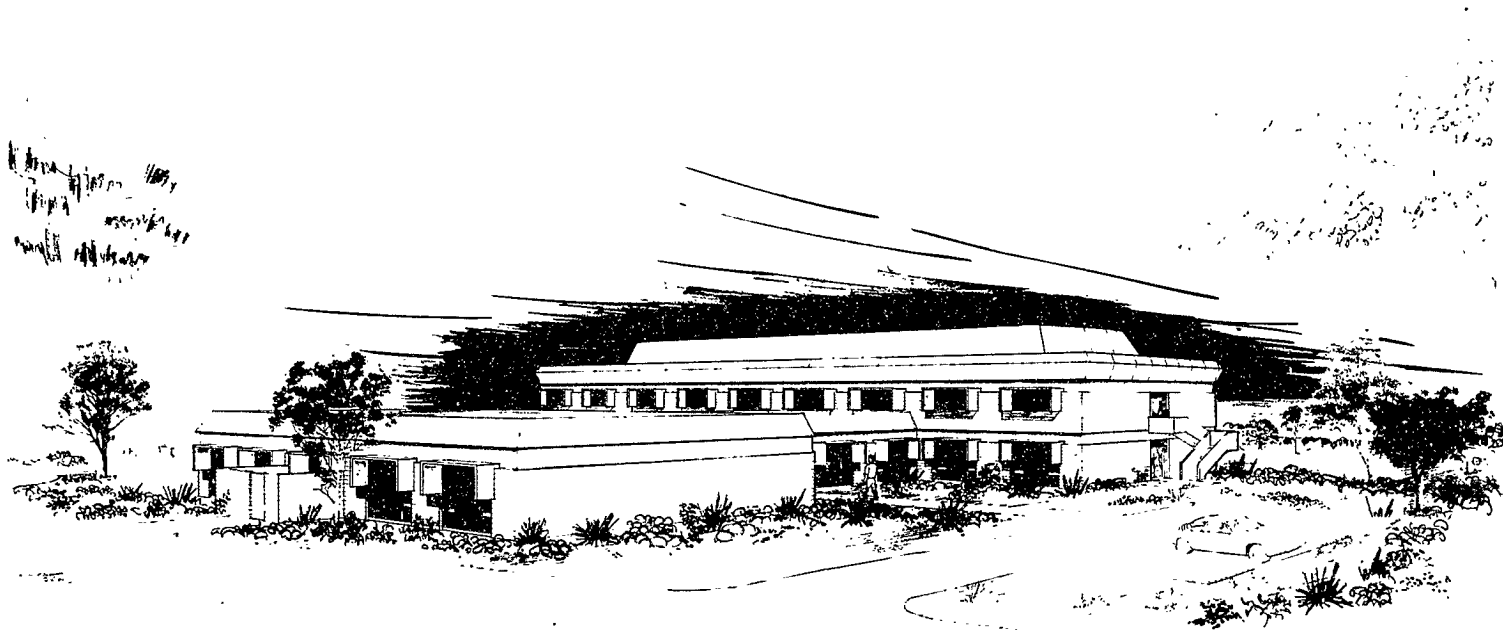
	<u>Paragraph</u>
5. THE SITE SELECTED IS SUITABLE.	57
6. THE COMMITTEE RECOMMENDS THE CONSTRUCTION OF THE WORK IN THIS REFERENCE.	81
7. THE ESTIMATED COST OF THE PROPOSED WORK WHEN REFERRED TO THE COMMITTEE WAS \$5.44 MILLION AT JUNE 1977 PRICES.	83



(L.K. Johnson)
Vice-Chairman

Parliamentary Standing Committee on Public Works,
Parliament House,
CANBERRA, A.C.T.

27 October 1977.



ROCKHAMPTON : BEEF CATTLE RESEARCH LABORATORY.