



1968

THE PARLIAMENT OF THE COMMONWEALTH OF AUSTRALIA

PARLIAMENTARY STANDING COMMITTEE ON PUBLIC WORKS

REPORT
relating to the proposed construction of a
TELEVISION
TRANSMITTING STATION
at
Mount Bellenden Ker
Cairns, Queensland

BY AUTHORITY
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PARLIAMENTARY STANDING COMMITTEE ON PUBLIC WORKS

TELEVISION TRANSMITTING STATION,
MOUNT BELLENDEN KER, (CAIRNS), QUEENSLAND

R E P O R T

By resolution on 11 September 1968, the House of Representatives referred to the Parliamentary Standing Committee on Public Works for investigation and report, a proposal for the construction of a television transmitting station at Mount Bellenden Ker near Cairns, Queensland.

The Committee have the honour to report as follows:

THE COMMITTEE'S INVESTIGATION

1. The Committee received written submissions and drawings from the Postmaster-General's Department and the Department of Works. We took evidence at public hearings in Canberra and Cairns from witnesses representing these departments, the Department of Civil Aviation, the Australian Broadcasting Control Board, Far Northern Television Limited of Cairns and from the Mareeba Shire Council. Written submissions were received from the Douglas Shire Council and from the Queensland Branch of the Postal Telecommunication Technicians' Association.

2. When in Cairns we inspected the area at the foot of Mount Bellenden Ker including the site of the lower station of the proposed cableway.

THE REFERENCE

3. The proposal submitted to the Committee is for the erection of a television transmitter building on the central peak of Mount Bellenden Ker, which is some 25 miles south of Cairns and is about 5,000 ft above sea level.

4. As well, the work includes a cableway terminating at the summit near the transmitter building, an access road from the Bruce Highway to the lower cableway terminal, a power transmission line from the electricity supply source and foundations for the tower which is to support a microwave antennae.

5. The estimated cost of the work is \$1.1 million.

TELEVISION SERVICES

6. In implementing the policy of providing television as widely as possible, the capital cities were provided with services in the first two stages of development. In the third stage, services were provided to 13 of the highly developed and populated country areas and in the fourth stage, were approved for a further 20 country areas including the Cairns region.

7. Television has now been provided in all approved areas with the exception of the Cairns region, where the service is being provided from a temporary site to Cairns only, this being the largest centre in the region.

8. The Cairns Service The interim service in Cairns, which is the only one of its kind in Australia, was provided to serve a limited area because to do so was relatively simple. On the other hand, the provision of a service to the whole Cairns region, from an engineering viewpoint, is a complex and difficult project. Operation of the limited service has naturally resulted in persistent pressure for the early extension of the service to other parts of the region.

9. The present service can reach about 40,000 people and the equipment is located in space now required for expansion of radio telephone services. The programme for the national station is relayed from Brisbane on the SEACOM microwave link which terminates at Cairns, while the commercial station operates from studios it has built in the city.

10. The aim is to provide a first quality service to the 90,000 people who live in Cairns and its environs including the Atherton Tablelands and coastal areas north as far as Mossman and south to Tully. This objective can be achieved by transmitters on Mount Bellenden Ker. We noted that the possible extension of this coverage to areas such as Cooktown by the use of translators is to be studied when the new facilities are operating.

11. The nearest neighbouring stations are the national and commercial stations at Townsville, their range extending northwards about halfway to Cairns. By locating the Cairns stations on Mount Bellenden Ker their service will extend halfway to Townsville in a southerly direction, so providing a continuous television coverage in the area between Townsville and Cairns.

12. The national service does not propose to establish a studio at Cairns. It is expected that, subject to an agreement on sharing the cost of the Mount Bellenden Ker development, the commercial studios will remain in Cairns, with the programme relayed to the transmitter over the same route as the national programme.

13. Committee's Conclusion The Committee believe that the Cairns region should be provided with a permanent television service without further delay.

CHOICE OF SITE

14. Technical Considerations Television signals travel approximately in a straight line so that a near line-of-sight path from transmitting to receiving aeriels is necessary to ensure satisfactory reception. Hence the common practice in television transmission is to locate the transmitting aerial on the highest possible site in the area served.

15. It is also important that although it is possible to provide the same television coverage with a number of stations of lower power at lower elevations, economical use must be made of the limited number of available operating frequency channels. A single elevated transmitter therefore has the decided advantage of obviating interference to and by more distant stations and channels for the possible future expansion of the television service in the area are conserved.

16. Mount Bellenden Ker The proposed site of the transmitter building is on a relatively flat area near the summit of Mount Bellenden Ker which rises from near sea level to just over 5,000 ft in a National Park and State Forest Reserve, 31 miles by road south from Cairns.

17. The slopes of the mountain are covered in a dense tropical rain forest. On the mountain, the annual rainfall increases with elevation reaching a maximum of about 200 in. at 3,000 ft. The mountain is covered by cloud up to 50% of the time between December and July and up to 30% of the time during the remainder of the year.

18. Following a detailed survey of alternative locations, an assessment of costs favoured the development of the transmitter facilities on Mount Bellenden Ker. The Australian Broadcasting Control Board, which is

concerned with the determination of sites, favours this site for technical reasons. The Queensland National Parks Trust, which controls development in this area, has endorsed the use of Mount Bellenden Ker providing the cableway does not require the cutting of a swathe on the eastern slopes of the mountain.

19. The Committee were told that from a technical viewpoint the summit of Mount Bellenden Ker offers an ideal site for coverage of the tablelands and coastal plains and a clear transmission path into the populous area of Cairns.

20. Alternative Sites Initial planning for the Cairns television service was directed towards exploiting the height advantages of Mount Bellenden Ker. But the very high cost of an access road over the steep jungle covered slopes, or the prohibitive cost of a heavy load cableway as an alternative, promoted a study of alternative schemes which would involve less capital outlay without a significant loss of coverage. In consequence, Mount Bartle Frere, although 10 miles further south of Cairns, was chosen as it appeared by a photogrametric survey to offer a more feasible means of access by road at a lower cost. Cableway costs to this location would have been much the same as for Mount Bellenden Ker.

21. However, from a transmission viewpoint, Mount Bartle Frere was inferior because of an obstructed radio path into Cairns which would produce a higher ratio of reflected signals causing "ghost" images on receivers. A detailed survey of Mount Bartle Frere then showed that the terrain was more rugged than at first thought and that some 28 deep gorges would need to be bridged or filled. The estimated cost of the roadworks thus rose from

\$500,000 to \$800,000. Annual maintenance charges on the road would have been extremely high.

22. The Committee were informed that by this time development towards remote control of television stations had reached the stage where it had been established that the permanent station could be controlled from Cairns, so requiring less use of access facilities. Concurrently, a re-examination of the methods of transporting construction materials and equipment to the site showed that loads could be reduced to units of about one ton.

23. Attention was then directed towards the use of cableways of lower capacity than previously considered. The opportunity was thus provided for a further study of Mount Bellenden Ker as the transmitter site, particularly as it would be 35 road miles closer to Cairns.

24. The study which included consideration of cableway systems, power access and a route survey, established that the capital cost of road and cableway access to the alternative sites was about equal at \$1.1 million. Maintenance and operating costs over a 15-year period were assessed at \$300,000 for Mount Bartle Frere and at \$150,000 for Mount Bellenden Ker.

25. Briefly, the Mount Bartle Frere proposal involved 6.8 miles of new access road, 2.6 miles of cableway and 9.4 miles of power transmission line. Comparable figures for Mount Bellenden Ker were 1.5 miles of road, 3.3 miles of cableway and 4.6 miles of power line.

26. Alternative Schemes During the analysis of the alternative sites, a study was made of other single and multiple transmitter station schemes including the use of translators and a single station on a lower elevation with a compensating higher tower. All of these schemes would have resulted

in either a restricted coverage or increased costs. None proved satisfactory in all respects - some which involved less capital cost were unacceptable due to high annual charges or insufficient overall coverage. In any case, necessity to provide multiple stations in all cases would require an almost complete use of the available television channels leaving insufficient reserve for future requirements. This situation would have been unacceptable.

27. Committee's Conclusion In the light of all the factors involved, we believe that Mount Bellenden Ker is the most appropriate site for the Cairns television transmitter building.

OTHER SERVICES

28. The Committee noted that in planning the development on Mount Bellenden Ker consideration was given to the extent to which other Commonwealth departments and State and local government bodies might use the facilities for communication purposes, without detriment to television transmission. The basis of the study was that part of the development and operating costs would be offset by a contribution by those concerned.

29. The site is particularly well located for the Post Office to establish a major radio telephone trunk system between Cairns and Atherton and a number of smaller radio systems to other centres requiring trunk relief.

30. The Department of Civil Aviation also wishes to share the facilities on Mount Bellenden Ker to establish a more efficient air-ground-air radio communications system than presently exists on the much lower Saddle Mountain just north of Cairns. The establishment of a V.H.F. repeater on Mount Bellenden Ker would improve the coverage at an altitude of 10,000 ft by about 60,000 square miles.

31. The proposals submitted to the Committee have been planned to meet these two requirements. We noted that arrangements can be made in the future to accommodate, by agreement, other radio services such as police, ambulance etc.

THE CABLEWAY

32. The cableway is to consist of a steel wire track cable suspended on eight steel towers above the eastern slopes of Mount Bellenden Ker. It will be approximately 3.3 miles long and will climb 5,000 ft between its bottom and top stations. On this cable will run a passenger cabin which will be hauled between the two stations by an endless steel rope driven by an electric motor located at the bottom station. The cabin will carry six to eight persons and will be detachable from its wheel bogie so that one ton unit loads can be carried if required. The cabin which will be fitted with necessary safety devices will travel at about ten miles per hour.

33. The cableway will be suitable for day or night operation in all weather except when winds exceed 50 miles per hour. The supporting towers and stations will be designed to withstand winds of 140 miles per hour without damage.

34. The track cable will have a diameter of about $1\frac{1}{4}$ in. and weight some 29 tons. It will be divided into two sections both of which will be anchored at Tower 4, approximately 10,000 ft from the bottom station. The hauling cable which will have a diameter of $\frac{7}{8}$ in. and weigh 14 tons will be driven from the bottom station.

35. The steel towers which will range in height from 15 ft to about 80 ft will carry the cableway above the tree tops.

36. Stations having a steel framework and suitably clad will be provided at the top and bottom of the cableway to accommodate platforms, machinery and controls. The bottom station will also contain wash room and toilet facilities, a garage and store. The top station will be attached to the transmitter building and be suitably isolated for fire protection against damage to the operating machinery.

37. The driving machinery will consist basically of a drive motor of about 80 horse power. The endless hauling cable will run on 6 ft diameter sheaves or "bull wheels", located at both stations. Provision will also be made for the hauling cable to be driven from the bottom station by a small petrol engine should the power supply fail.

38. The braking system will be of three separate parts, viz. an electromechanical brake, an emergency brake hydraulically released and spring applied and a hand operated mechanical brake.

39. The cableway will be provided with push button controls at three points, viz. the top station, the passenger cabin and the bottom station. Manual controls will also be provided at the bottom station.

40. We noted that during construction, clearing of foliage on the slopes of the mountain is to be kept to a minimum to meet the requirements of the Queensland Forestry Department. Permanent clearing will only be necessary over small areas at the feet of cableway towers and transmission poles.

41. Communication and Safety Provisions Radio communication is to be provided between the cabin and the two stations. Indicators will be provided at both stations to show the location of the cabin at all times.

The cabin will be automatically slowed when approaching either of the two stations and when passing across Tower 4 where the two sections of the track cable are anchored. The car will be automatically stopped at the stations.

42. Other safety devices will include over travel limit switches, an over speed switch to stop the car if its speed exceeds a predetermined limit and a switch to lock the cabin wheel bogie on the track cable.

43. Also provided will be an anemometer to indicate wind speed and a pendulum operated mercury switch to warn of dangerous swinging of the cabin and to automatically reduce speed under these conditions. Battery powered lights will be supplied in the cabin.

44. The cabin will also be provided with a trapdoor and a boatswain's chair with sufficient rope to reach the ground from the highest point, and an automatic lowering device. Since in some positions on the cableway the cabin will be up to 700 ft above the ground, an auxiliary emergency car is to be provided. It is to be capable of travelling on the track under its own power to evacuate timid or injured persons and would also be a means of inspecting the facility.

45. Maintenance and Operating Costs Based on a 15-year cycle and 8 hours per week operation, the average annual maintenance cost for the cableway is expected to be \$4,500. This figure allows for renewing the track cable every 20 years and the hauling cable every 10 years, and general inspections and maintenance.

46. The annual cost of operating the cableway for 8 hours a week, allowing for power and a trained operator in attendance when the cableway is in use, is estimated at \$2,500.

OTHER ENGINEERING SERVICES

47. Access Road The access road will connect the Bruce Highway with the bottom station of the cableway. It is to be $1\frac{1}{2}$ miles long and will have a 12 ft wide sealed gravel pavement with gravel shoulders. A small parking area will be provided at the bottom station.

48. Transmission Line and Power Supply Power is to be supplied by the Cairns Regional Electricity Board at 22,000 volts to a point near the bottom station to which the transmission line will be connected.

49. For safety reasons, the line will be taken to the transmitter site on separate poles running generally parallel to and on a line about 120 ft north of the cableway. The line will comprise three conductors supported on separate poles to give a conductor spacing of 15 to 20 ft which will ensure proper separation over the long spans involved. The poles will be located generally adjacent to the towers of the cableway and they will vary in height up to 60 ft to keep the conductors over the tree tops. Longer poles will be of prefabricated metal sections and the shorter ones of treated timber.

TRANSMITTER BUILDING

50. Planning Considerations Accommodation needed for the transmitters and other equipment for the Postmaster-General's Department and the Department of Civil Aviation has governed the planning of the building. Account was also had of the need to provide amenities for staff working in the building and living accommodation for staff required to remain there for longer periods.

51. The building is a two-storey structure similar to other buildings erected by the Commonwealth for television transmission purposes. It will be linked to the top station of the cableway and will be sited close to the tower supporting the microwave antennas. Future extension of the building will be possible.

52. The design of the building and the selection of materials have been influenced by climatic conditions and the limitation on weight and size of components imposed by the capacity of the cableway. Externally, the building will have a simple functional appearance.

53. Construction The building will be of steel frame construction on concrete footings. Walls will be steel clad prefabricated insulated units with a sheet metal lining. The roof will be of coated corrugated steel bolted to steel roof framing. Steel decking welded to beams and topped with concrete screed will form the floors, which will be covered with vinyl tiles. Windows will be provided to living quarters but will be kept to a minimum in equipment areas. The structure and cladding will be designed to withstand winds of high velocity and to require little maintenance.

54. Engineering Services Electric power will be reticulated from the substation at the upper termination of the transmission line to the main switchboard, with subcircuits to power outlets and fluorescent lighting throughout the building. Emergency power will be provided by an automatic start diesel generator on the lower floor.

55. Mechanical ventilation and heating will be provided in equipment areas. Heat from the transmitters will be exhausted or reticulated as required to save heating costs.

56. Rain water will be stored in three 2,000 gallon steel tanks under the building. An automatic electric pump will raise water to a head tank for domestic use and to provide water under pressure to external hose cocks.

57. Fire protection will be provided internally by hand operated chemical extinguishers and from $\frac{3}{4}$ in. hose cocks externally. A fire break wall and a fire door will be provided between the transmitter building and the upper cable car station.

58. A smaller septic tank will be provided for sewage treatment.

59. Committee's Recommendation We consider that the proposed works accord with the requirements for the establishment of a transmitter building on Mount Bellenden Ker. The Committee therefore recommend the construction of the works in this reference.

DESIGN AND CONSTRUCTION PROGRAMME

60. It is expected that a minimum period of 30 months will be required to complete the design and construction of the works in this reference. This period does not include the time required for the installation of transmitting equipment. We noted that because of the urgency of the project, the Government gave approval in September 1968 for design and documentation to proceed on the basis of the proposals submitted to the Committee.

61. Due to the problems of climate and terrain and because weather conditions are unpredictable, it is difficult to assess the delays that might occur during construction for these reasons. It is expected, however, that given favourable conditions the works will be completed in April 1971. If this target is achieved, transmission from the new facilities could commence at about the end of that year.

ESTIMATE OF COST

62. The estimated cost of the works when referred to the Committee was \$1.1 million as follows:

	\$
- Cableway, including towers, cables, mechanical equipment, terminal buildings	600,000
- Access road and power supply	210,000
- Site clearing and earthworks	90,000
- Transmitter building and services	200,000
	\$1,100,000

SHARING OF COSTS WITH COMMERCIAL OPERATOR

63. The Committee took evidence from the Chairman of Directors of Far Northern Television Limited, the commercial television station operator at Cairns, about sharing the capital cost of establishing the transmitter building and facilities on Mount Bellenden Ker and annual operating charges. We noted that it is usual where the commercial operator uses facilities in common with the national service, for there to be a sharing of capital and operating costs according to a more or less standard formula.

64. In this particular instance, we noted that Far Northern Television Limited had not been consulted by the Government about the proposed development and that it had also been unable to ascertain the extent of its future financial obligations in the event of it sharing common facilities on Mount Bellenden Ker. Thus, not only was the company having difficulty in planning its future operations but it was also unable to comment objectively

on the proposals submitted to the Committee from the point of view of the commercial operator.

65. On the other hand, departmental witnesses informed the Committee that the Government was unable to negotiate a sharing agreement with Far Northern Television Limited until the cost of the proposed facilities was known and an approval for the work had been obtained from Parliament following the Committee's investigation.

66. We could understand each of these points of view and appreciate that the establishment of the permanent television facilities at Cairns has been beset by delays and difficulties not experienced elsewhere. The Committee can appreciate also the reluctance of the Government to discuss the ambit of a sharing agreement with the commercial operator until an approval has been obtained to proceed with the provision of permanent transmitting and other facilities. We do feel, however, that in the light of its fundamental interest in the proposals now being examined, there was some scope for preliminary discussions and perhaps an interim agreement on the sharing arrangements with the commercial operator, subject to the proposals being approved by Parliament.

67. We would hope in the further extension of television services, that the Government is not faced with the engineering and other problems it has met at Cairns. However, should a similar situation arise again, we strongly recommend that the Government commence negotiations on the sharing arrangements with the commercial operator on a tentative basis, if necessary, considerably earlier than in the case of the Cairns proposal. Furthermore, we believe that investigations should be carried out with a view to establishing a formula for the sharing of costs by commercial television operators based on estimated population coverage.

RECOMMENDATIONS AND CONCLUSIONS

68. 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.

Paragraph

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|----|--|----|
| 1. | THE CAIRNS REGION SHOULD BE PROVIDED WITH A PERMANENT TELEVISION SERVICE WITHOUT FURTHER DELAY. | 13 |
| 2. | MOUNT BELLENDEN KER IS THE MOST APPROPRIATE SITE FOR THE CAIRNS TELEVISION TRANSMITTER BUILDING. | 27 |
| 3. | THE COMMITTEE RECOMMEND THE CONSTRUCTION OF THE WORKS IN THIS REFERENCE. | 59 |
| 4. | THE ESTIMATED COST OF THE WORKS WHEN REFERRED TO THE COMMITTEE WAS \$1.1 MILLION. | 62 |
| 5. | THERE WAS SOME SCOPE FOR PRELIMINARY DISCUSSIONS AND PERHAPS AN INTERIM AGREEMENT ON THE SHARING ARRANGEMENTS WITH THE COMMERCIAL STATION SUBJECT TO THE PROPOSALS BEING APPROVED BY PARLIAMENT. | 66 |
| 6. | SHOULD A SIMILAR SITUATION ARISE AGAIN, WE STRONGLY RECOMMEND THAT THE GOVERNMENT COMMENCE NEGOTIATIONS ON THE SHARING ARRANGEMENTS WITH THE COMMERCIAL OPERATOR ON A TENTATIVE BASIS, IF NECESSARY, CONSIDERABLY EARLIER THAN IN THIS CASE. | 67 |
| 7. | INVESTIGATIONS SHOULD BE CARRIED OUT WITH A VIEW TO ESTABLISHING A FORMULA FOR THE SHARING OF COSTS BY COMMERCIAL TELEVISION OPERATORS BASED ON ESTIMATED POPULATION COVERAGE. | 67 |