

1969

THE PARLIAMENT OF THE COMMONWEALTH OF AUSTRALIA

PARLIAMENTARY STANDING COMMITTEE ON PUBLIC WORKS

## REPORT

relating to the proposed

# AUGMENTATION OF SEWERAGE SERVICES

Darwin, Northern Territory

(Third Report of 1969)

COMMONWEALTH GOVERNMENT PRINTING OFFICE  
CANBERRA: 1969

## C O N T E N T S

|                                     | <u>Paragraph</u> |
|-------------------------------------|------------------|
| The Committee's Investigation       | 1                |
| The Reference                       | 3                |
| Existing Services                   |                  |
| Initial Development                 | 5                |
| Subsequent Development              | 7                |
| Growth of Darwin                    | 9                |
| The Need                            | 13               |
| Previous Committee's Investigations | 14               |
| Current Position                    | 16               |
| Conclusions                         | 19               |
| Proposed Services                   |                  |
| Planning Outline                    | 20               |
| The Northern Zone                   | 23               |
| The Central Zone                    | 32               |
| General                             | 42               |
| Programme                           | 46               |
| Estimate of Cost                    | 49               |
| The Committee's Observations        | 50               |
| Doctor's Gully                      | 54               |
| Seabreeze Outfall                   | 57               |
| Planning and Investigation          | 59               |
| Recommendations and Conclusions     | 63               |

PARLIAMENTARY STANDING COMMITTEE ON PUBLIC WORKS

AUGMENTATION OF SEWERAGE SERVICES, DARWIN,  
NORTHERN TERRITORY

R E P O R T

By resolution on 6 March 1969, the House of Representatives referred to the Parliamentary Standing Committee on Public Works for investigation and report, the proposal to augment sewerage services in the northern and central sewerage zones at Darwin in the Northern Territory.

The Committee have the honour to report as follows:

THE COMMITTEE'S INVESTIGATION

1. The Committee received written submissions and drawings from the Northern Territory Administration and from the Department of Works. Evidence was taken at public hearings in Canberra and Darwin from representatives of these bodies, the Department of Health, the Northern Territory Port Authority, the Corporation of the City of Darwin and from one private witness.
2. During our visit to Darwin we carried out an aerial inspection of the Leanyer Swamp area, and the Seabreeze and Doctor's Gully outfalls. On the ground we examined sewage treatment facilities draining into Ludmilla Creek, the pumping station at Rapid Creek, the Seabreeze outfall and the comminutor station and outfall at Doctor's Gully.

THE REFERENCE

3. The works which make up this reference are -

- (a) in the northern sewerage zone, a main trunk sewer, a pumping station and rising main and treatment lagoons at Leanyer Swamp; and
- (b) in the central zone, a main trunk sewer, interceptor sewers and a pumping and a comminutor station and a deep water marine outfall off East Point.

4. The proposed facilities are designed to relieve overloading of the existing sewerage services in areas generally north of the city and to meet future development in these areas. The estimated cost of the work is \$4.55 million.

EXISTING SERVICES

5. Initial Development The first communal facilities in Darwin for the treatment and disposal of sewage were built in 1950. Because the population was then domiciled in widely dispersed areas, a number of localised installations were built, it being thought uneconomic at that stage of development to collect sewage for disposal through a central system.

6. The facilities took the form of independent collection and disposal systems serving

- the Parap and Fannie Bay areas;
- the R.A.A.F. Station;
- the northern district of Nightcliff; and
- the City and Stuart Park areas.

Treatment facilities at Ludmilla and the Narrows respectively serviced the first two mentioned areas, the Nightcliff system terminated in a marine outfall at Seabreeze Point at Nightcliff and the City and Stuart Park areas were dealt with as a number of small units from which sewage was discharged into the sea after the solid components were broken down.

7. Subsequent Development Since then the increasing volume of sewage created by Darwin's growing population has been dealt with by more intensive use of the facilities provided initially and by progressively extending them. For example, the outfall at Seabreeze Point which originally served only part of the Nightcliff area now discharges sewage from the suburbs of Nightcliff, Rapid Creek and Millner, west of Rapid Creek, and Alawa and Jingili to the east. The same system will also be capable of taking sewage from part of the new suburb of Moil. At that point, it will have reached its capacity.

8. Other disposal services comprise

- comminutor plants at Stuart Park discharging macerated sewage into Frances Bay North and servicing Stuart Park, Farap and Darwin High School;
- Imhoff primary settling and sludge tanks at Ludmilla discharging into Ludmilla Creek and servicing Fannie Bay, the Flats complex, Racecourse and Hudson Fysh;
- a stabilisation pond near Ludmilla for the biological treatment of sewage before discharge into the headwaters of Ludmilla Creek, servicing Ludmilla, Bagot, the Narrows and R.A.A.F. housing;

- an Imhoff tank south of the Stuart Highway near the R.A.A.F. gates discharging into the headwaters of Sadgrove Creek and thence to Frances Bay;
- septic tanks in the Winnellie industrial area processing trade wastes and sewage before discharge into Sadgrove Creek;
- individual septic tanks in the Bishop Street industrial area;
- an Imhoff tank and trickling filter discharging into the headwaters of Reichardt Creek and thence Frances Bay, servicing the Coonawarra naval area and housing complex.

#### GROWTH OF DARWIN

9. Recorded population figures for Greater Darwin between 1947 and 1966 are:

|      |   |        |      |   |        |
|------|---|--------|------|---|--------|
| 1947 | - | 5,208  | 1964 | - | 17,781 |
| 1954 | - | 8,081  | 1965 | - | 19,628 |
| 1961 | - | 14,753 | 1966 | - | 20,767 |

10. The population increment during this period represents an annual rate of increase of about 7%. This rate, which shows every sign of being maintained in the future, will if projected, result in a population approaching 28,000 in 1970, 32,000 in 1972 and 39,000 in 1975.

11. These predictions are broadly supported by the Regional Planning Officer whose estimates are marginally higher. His more optimistic figures tend to be confirmed by the population estimates for 1967 and 1968 which suggest that the increment in those years was, in fact, closer to 9%.

12. The Committee believe that all the facts point to the Darwin population continuing to grow at a steady rate of more than 7% annually for some time. We consider that this assumption can, quite reasonably, be used as a basis for planning future development proposals including essential services.

#### THE NEED

13. The Committee were told that when the existing sewerage services were being planned, it was acknowledged that it was expedient, initially, to provide services only where the population was then concentrated rather than an integrated system capable of progressive expansion. We were also informed that it was considered that a single system would be uneconomic at that stage, that the minor systems proposed would be satisfactory for a limited time only and that as the main zones of population became more clearly defined and developed, it would be necessary to replan the scheme within a framework leading ultimately to an integrated system.

14. Previous Committees' Investigations At this point, it is worth reflecting that in the submissions made to the Public Works Committee in 1965 on the residential sub-division of Alawa in the Casuarina district and again in 1967 on the adjoining Jingili sub-division, the Committee were told that the permanent service for the disposal of sewage from the Casuarina district was to be through a pumping station at Rapid Creek and thence to the outfall at Seabreeze Point. We were then informed in 1968 in relation to the nearby Moil sub-division that it had been discovered that this means of disposal was no longer satisfactory. We noted, at that time, that long term plans were being developed to build facilities at Leanyer Swamp for the treatment and disposal of sewage from all settlement east of Rapid Creek, including Alawa, Jingili and Moil.

15. In the report to Parliament on the Moil reference tabled on 27 August 1968, the Committee commented

" Initially, sewage from Moil will be discharged through the Rapid Creek pumping station and the outfall at Seabreeze Point .....

It has been evident for some time that major additional sewage disposal facilities would be required in Darwin. We were told that a proposal is to be referred to the Committee soon for the construction of a major treatment works in the Loanyer Swamp area and that when the initial part of this system is operating, sewage from Moil will be reticulated to it .....

There was some conflict in the evidence given to the Committee about the time when the new system will need to be operating. It was apparent, however, that plans for residential sub-divisions are ahead of those for sewage disposal and that the occupation of neighbourhood units after Moil can only proceed if the trunk sewer and the facility at Loanyer Swamp are available. It is therefore imperative that the Government come to an early decision about the provision of additional sewage disposal facilities in Darwin in order that there is no consequent delay in the provision of housing. "

16. Current Position Although it has been possible, so far, to dispose of the sewage from new areas as they have been settled by using existing services, it is obvious that they are rapidly becoming overloaded. The treatment installations which are close to housing are being used beyond design capacity and the Committee were told, are the cause of complaints due to obnoxious odours. We also noted that there are serious suggestions of the pollution of creeks and foreshores by untreated sewage. The latter is giving rise to apprehension about the risks to the health of those who swim in these areas.

17. In relation to the development occurring in the Casuarina district, it is clear that there can be no occupation of new residential areas after Moil until additional disposal facilities are provided.

18. In short, the point in time has now been reached when the Darwin sewerage services require major reconstruction. This need, which it was recognised in 1950 would inevitably occur, has been created largely by the need to service residential development after Moil but also by the inability of the existing facilities to satisfactorily cope with increasing loads.

19. Conclusions Because of the serious situation which is developing, the Committee believe that it has been established that there is a need to

- (a) replan Darwin's sewerage services; and
- (b) provide improved treatment and disposal facilities as a matter of urgency, particularly serving the Casuarina district.

#### PROPOSED SERVICES

20. Planning Outline Based on the town plan then emerging which suggested that major domestic and industrial expansion would occur in the Casuarina/Rapid Creek and Ludmilla/Winnellie areas respectively, significant investigations were commenced about five years' ago with a view to planning Darwin's future sewage treatment and disposal services. It seems that only at that stage were expansion proposals sufficiently authoritative for the probable future sewerage needs of Darwin to be seen and for long term planning to start.

21. We noted that a number of alternative schemes were proposed for study and evaluation culminating in the acceptance of a concept to divide the Darwin sewerage area into three major zones, viz.

- the city zone, which embraces the main commercial area, Larrakeyah and Kahlin being bounded on three sides by the harbour and on the north by Palmerston and Stuart Parks;
- the central zone, which includes Fannie Bay, Parap, Ludmilla, Stuart Park, Bagot, Coconut Grove, the western part of Millner, the R.A.A.F. area, the Winnollie industrial area and adjoining areas east to the Coonawarra naval station and housing complex; and
- the northern zone, covering the Nightcliff district suburbs of Nightcliff, Rapid Creek and the eastern section of Millner and new residential development east of Rapid Creek, including the Casuarina, Dripstone and Sanderson districts.

22. Services in the city zone have been progressively improved in recent years to keep pace with more intensive development of the area. The culmination of this programme was the construction of a deepwater marine outfall off Doctor's Gully at Larrakeyah, discharging comminuted sewage two-thirds of a mile off shore. This installation has just come into operation.

23. The Northern Zone The northern zone augmentation, initially, covers the Casuarina suburbs of Alawa, Jingili, Moil and Wagaman and other future sub-divisions east of Rapid Creek in Dripstone and Sanderson.

The urgency of the need for sewerage services for Wagaman and subsequent development has already been mentioned.

24. For the part of the zone west of Rapid Creek, it is proposed at this stage, to retain the existing system terminating in the Seabreeze outfall. The latter was recently extended to about two-thirds of a mile.

25. The new work proposed commences with a gravity trunk sewer in Moil proceeding through Wagaman and the eastern part of the Dripstone district, discharging into treatment lagoons in Leanyer Swamp, over a mile from the nearest housing.

26. Sewage is to be collected by gravity from areas above the level of the trunk sewer. From areas below the sewer, it will first flow by gravity to a pumping station east of Rapid Creek and then be pumped through a rising main to the trunk sewer. A further pumping station, not part of this reference, will be required later for sewage from the northern and western parts of Dripstone.

27. The Committee were told that concrete pipe is proposed for the trunk sewer and cast iron or mild steel for the rising main. As the sewage will tend to be corrosive by the time it reaches the trunk sewer, the concrete pipes will be protected by a plastic lining.

28. The treatment lagoons are to be developed in stages. The first stage, which is part of this reference, will be for a population of 15,000 to 20,000. Subsequent stages can be added as required, servicing a population of 60,000 or more. There will therefore be capacity at Leanyer to treat the sewage from the Casuarina, Dripstone and Sanderson districts which together are expected to house up to 37,500 people. It will also be possible, when required,

to absorb the sewage from areas west of Rapid Creek when the Seabreeze outfall is phased out of operation.

29. The lagoons will be located and built so as to use a minimum amount of earthworks, with the banks of suitable material mainly excavated from the lagoon bottom. The banks will be either lined at water level with concrete or stone pitched to minimise erosion and weed growth.

30. We noted that in the circumstances and as ample isolated land is available which is of limited use for other purposes, treatment lagoons are considered to be the best method of treatment. Departmental witnesses confidently assured the Committee that being isolated, lagoons will create no nuisance.

31. Other forms of disposal considered for this zone were

- disposal into the sea at Seabreeze Point by the enlargement of the present outfall; and
- treatment at Leanyer Swamp by an activated sludge process or by sedimentation and trickling filters.

The alternatives were rejected because each was more costly than the system proposed and neither offered any practical or operational advantage.

32. The Central Zone The scheme for the central zone envisages collection and disposal of sewage after comminution through a deepwater marine outfall at East Point.

33. The outfall is to be designed to prevent bacterially harmful or visible material finding its way back to the shore after discharge. However, the proposal is flexible to the extent that, as a safeguard, an area of land

is being reserved near the comminutor site to permit further treatment should it be found necessary. It was made clear to the Committee that comprehensive testing of the receiving waters will be conducted after the outfall is completed to ensure that it is operating satisfactorily.

34. Sewage will be collected from the sub-areas within the zone and delivered to the main trunk sewer either by gravity flow or pumping. Where possible existing pumping stations will be eliminated but new stations are proposed at Winnellie, Stuart Park and Coconut Grove.

35. Processing of the sewage by comminution before outfall through a diffuser outlet is considered desirable to facilitate the breakdown, dilution and oxidation of its solids content.

36. The deepwater marine outfall proposed will differ significantly from the shallow water outfall at Seabreeze Point. Generally, it involves the transport of sewage by pipeline well out to sea to such a depth that pollution does not find its way back to the shore. The usual result is dilution and settlement of waste materials accompanied by oxidation and die-off of bacteria, although in some instances local conditions cause the sewage to remain at depth.

37. This compares with the disposal of sewage in shallow water. This is generally acceptable only where its volume is small compared with the body of water into which it is discharged and where either public access to the outlet area is limited or where the movement of tides sweeps the area clean, often enough to prevent harmful aggregations of pollution.

38. The effectiveness of an outfall such as that proposed depends largely on the relative quantities of salt water and sewage and on the tidal currents. Darwin is generally favourably placed in both of these respects, having a relatively small population and a large volume of sea water surrounding it, subject to wide ranges of tide.

39. The outfall at East Point is to have a capacity for 45,000 people, although initially the population served by the installation is potentially only 19,000. Studies in 1964 suggested that East Point would provide a satisfactory deepwater marine outfall disposal point for a population in excess of 60,000 and possibly as high as 300,000. Studies are now in progress to evaluate this assessment.

40. Other methods of disposal considered were

- treatment lagoons;
- activated sludge, using either the oxidation ditch method or the coarse bubble aeration method; and
- sedimentation and trickling filters.

Lagoon treatment would have been the most economical but had the undesirable feature that large water areas at Luadmilla could have become feeding and resting places for birds. As the lagoons would need to be near one of the flight funnels of Darwin Airport and the bird-strike hazard would be thereby increased, the proposal was abandoned. The possibility of odour near built-up areas was a further factor against lagoons. This objection also applied to the other forms of treatment considered.

41. Both activated sludge treatment and sedimentation and trickling filter treatment were rejected because they were more costly than the deepwater marine outfall and they had no compensating benefits. The marine outfall proposal also had the clear advantage that it required less land than the other alternatives.

42. General The Committee were told the routes of the proposed mains and the location of pumping or comminutor installations are not expected to present any problems in respect of easements or the acquisition of the required land.

43. In the northern zone, the trunk sewer as it leaves Dripstone will enter an R.A.A.F. reserve but arrangements will be made for this to occur without disruption to either party. Although the final stages of the treatment ponds at Leanyer Swamp will be in an area now used by the R.A.A.F. as a firing range, negotiations are proceeding for the range to be relocated.

44. When the work in this reference is completed, the Seabreeze outfall will still be servicing Nightcliff, Rapid Creek and the eastern part of Millner. However, the design of the northern zone installation allows for the eventual phasing out of the outfall and for sewage from the area, except for that from a small part of Nightcliff adjoining Coconut Grove, to be treated at Leanyer.

45. Sewage from the latter portion of Nightcliff will be discharged through East Point when the Seabreeze Point outfall is phased out.

PROGRAMME

46. The Committee noted that it is proposed to design and construct the northern zone and central zone works as separate projects.

47. Subject to an early approval to proceed being given, tenders for the northern zone work are expected to be called in July 1969, a contract let in September 1969 and the contract completed about December 1970. The facilities will thus be available in good time for connection to the first housing in the Waganan sub-division for which the other basic services have not yet been commenced.

48. Tenders for the central zone portion of the work are scheduled to be called in July 1970, a contract let in September 1970 and the work completed in June 1972.

ESTIMATE OF COST

49. The estimated cost of the work when referred to the Committee was \$4.55 million as follows:

Northern Zone

\$

|                                                                                            |           |
|--------------------------------------------------------------------------------------------|-----------|
| - trunk sewer, pumping station,<br>rising main and first stage of<br>the treatment lagoons | 1,800,000 |
|--------------------------------------------------------------------------------------------|-----------|

Central Zone

|                                                                                                      |             |
|------------------------------------------------------------------------------------------------------|-------------|
| - trunk sewer, interceptor sewer,<br>pumping and comminutor stations<br>and deepwater marine outfall | 2,750,000   |
|                                                                                                      | <hr/>       |
|                                                                                                      | \$4,550,000 |
|                                                                                                      | <hr/>       |

THE COMMITTEE'S OBSERVATIONS

50. Subject to the other recommendations and conclusions in this report, the Committee recommend the construction of the works in this reference. In considering the alternative methods of treatment and disposal, it is necessary to strike a balance in which due regard is given to the aesthetic, health, engineering and economic factors. We think that this has been achieved and that the facilities now proposed will provide a satisfactory basis for the disposal of Darwin's sewage in both the short and long term.

51. It is quite clear that the installations proposed for the northern zone will provide a first class sewage disposal service for that area.

52. From the evidence taken, the Committee firmly believe that the deepwater marine outfall at East Point will be able to satisfactorily dispose of the sewage from the central zone without nuisance or hazard to the public. It is acknowledged that this view may not necessarily be shared by all and that there will be some people who, being mindful of the shortcomings of the present facilities, will be apprehensive about the possible pollution of the waters and foreshores of Darwin harbour and the resulting health risks.

53. The fact that the flow of sewage through the shallow water outfall at Seabreeze Point will be considerably reduced when the northern zone system is operating and that the small overloaded units discharging into Darwin harbour at various points will no longer be used, can, in our opinion, only mean a large improvement in the present situation. There is, furthermore, the safeguard being designed into the system to provide biological treatment facilities in the remote event that the installation does not perform as expected. There can thus be little basis for comparing the existing conditions with those which will prevail when the work is completed.

54. Doctor's Gully Although the works in the city zone, terminating at the comminutor station and deepwater outfall at Doctor's Gully were not part of this reference, they are related to it because they are an important and integral part of Darwin's sewerage service. The installation was brought into operation a few days before the Committee's visit to Darwin.

55. We took evidence from a witness whose residence adjoins, on one side, the comminutor station, and on the other, a vent connected to the head of the rising main before it enters the station. The witness told the Committee of the distress caused to her family, and in the area generally, by the obnoxious odours coming from the vent.

56. After a site inspection, we concluded that better judgment might have been used in locating and constructing this particular vent. However, we noted the evidence of departmental witnesses about the measures being taken to alleviate the cause of what we consider to be a serious and justifiable complaint and were reassured that the problem is being actively tackled in order to restore the amenity of the area.

57. Seabreeze Outfall When the proposed works are operating, the Seabreeze outfall will continue to be used, serving Nightcliff, Rapid Creek and the eastern part of Millner. When the outfall has reached the end of its economic life, its use is to be discontinued and sewage from the area will be diverted partly into the northern system and partly into the central system.

58. We looked closely at the timing of the closure of the Seabreeze outfall and see no reason to suggest a change unless it is proved that the outfall is contributing to the pollution of Darwin harbour or its foreshores.

We recommend that the efficiency of the outfall be kept under close review during the period after the current works are completed with a view to accelerating the work if testing shows this action is warranted.

59. Planning and Investigation The plan adopted for the treatment and disposal of Darwin's sewage divides the area involved into three zones. It will have been noted that the present reference deals only with the northern and central zones and that work on the city zone has been proceeding for some time with a most important part, the comminutor station and marine outfall, having just been completed. Presumably, the latter work was not referred to the Committee because it was estimated to cost less than \$500,000.

60. It is difficult to know whether, in other circumstances, the conclusions we reached on the present reference would have been any different, but in the replanning and reconstruction of a major basic service such as the Darwin sewerage system, we think that there would have been considerable merit in referring the work in all three zones to the Committee for investigation and report. For example, it is felt that it would have been competent for consideration to have been given to a completely integrated system involving all three zones, using common treatment and disposal facilities.

61. As it was, with the city zone works already completed, the foundations of the system were already established and the basis for the remaining elements was so far committed as to make pointless a closer investigation of the other alternatives.

62. The Committee were also critical of the evidence of some technical witnesses, it being based on an assumption that the schemes presented were the only ones feasible and of the lack of details of the cost of alternative

schemes. This criticism is not meant to imply that there was inadequate investigation before reference of the work to the Committee but that there could have been more details of the other methods examined.

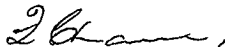
#### RECOMMENDATIONS AND CONCLUSIONS

63. 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

- |    |                                                                                                                                                     |    |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 1. | ALL THE FACTS POINT TO THE DARWIN POPULATION<br>CONTINUING TO GROW AT A STEADY RATE OF MORE THAN<br>7% ANNUALLY FOR SOME TIME.                      | 12 |
| 2. | THIS ASSUMPTION CAN BE USED AS A BASIS FOR PLANNING<br>FUTURE DEVELOPMENT PROPOSALS INCLUDING ESSENTIAL<br>SERVICES.                                | 12 |
| 3. | THERE IS A NEED TO REPLAN DARWIN'S SEWERAGE SERVICES.                                                                                               | 19 |
| 4. | THERE IS A NEED TO PROVIDE IMPROVED TREATMENT AND<br>DISPOSAL FACILITIES, AS A MATTER OF URGENCY,<br>PARTICULARLY SERVING THE CASUARINA DISTRICT.   | 19 |
| 5. | THE ESTIMATED COST OF THE WORK WHEN REFERRED TO THE<br>COMMITTEE WAS \$4.55 MILLION.                                                                | 49 |
| 6. | SUBJECT TO THE OTHER RECOMMENDATIONS AND CONCLUSIONS<br>IN THIS REPORT, THE COMMITTEE RECOMMEND THE<br>CONSTRUCTION OF THE WORKS IN THIS REFERENCE. | 50 |

7. BETTER JUDGMENT MIGHT HAVE BEEN USED IN LOCATING  
AND CONSTRUCTING THE VENT AT THE HEAD OF THE RISING  
MAIN NEAR DOCTOR'S GULLY. 56
8. THE EFFICIENCY OF THE SEABREEZE OUTFALL SHOULD BE  
KEPT UNDER CLOSE REVIEW DURING THE PERIOD AFTER THE  
CURRENT WORKS ARE COMPLETED WITH A VIEW TO  
ACCELERATING THE PHASING OUT OF THE OPERATION OF  
THE OUTFALL IF THIS ACTION IS WARRANTED. 58
9. THERE WOULD HAVE BEEN CONSIDERABLE MERIT IN  
REFERRING THE WORK IN ALL THREE SEWERAGE ZONES TO  
THE COMMITTEE FOR INVESTIGATION AND REPORT. 60



(F.C. Chaney)  
Chairman

Parliamentary Standing Committee on Public Works,  
Parliament House,  
CANBERRA.

13 May, 1969.

FOR SENATOR PROWSE

I present the report of the Parliamentary Standing Committee on Public Works relating to the following proposed work,

AUGMENTATION OF SEWERAGE SERVICES, DARWIN,  
NORTHERN TERRITORY.

I ask for leave to make a short statement.

(WHEN LEAVE GRANTED)

The summary of recommendations and conclusions of the Committee is as follows:

1. All the facts point to the Darwin population continuing to grow at a steady rate of more than 7% annually for some time.
2. This assumption can be used as a basis for planning future development proposals including essential services.
3. There is a need to replan Darwin's sewerage services.
4. There is a need to provide improved treatment and disposal facilities, as a matter of urgency, particularly serving the Casuarina district.
5. The estimated cost of the work when referred to the Committee was \$4.55 million.
6. Subject to the other recommendations and conclusions in this report, the Committee recommend the construction of the works in this reference.
7. Better judgment might have been used in locating and constructing the vent at the head of the rising main near Doctor's Gully.
8. The efficiency of the Seabreeze outfall should be kept under close review during the period after the current works are completed with a view to accelerating the phasing out of the operation of the outfall if this action is warranted.

9. There would have been considerable merit in referring the work in all three sewerage zones to the Committee for investigation and report.

14 May, 1969.