ASSESSMENT REPORT - NUMBER 5

CHANNEL ISLAND POWER STATION. ENVIRONMENTAL ASSESSMENT REPORT.

SEPTEMBER 1983

CONSERVATION COMMISSION OF THE NORTHERN TERRITORY
DARWIN N.T.

CHANNEL ISLAND POWER STATION

ENVIRONMENTAL ASSESSMENT REPORT

Environment Unit
Conservation Commission of the Northern Territory

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CONTENTS

1.0 INTRODUCTION

1.1 Background

The need for a second power station in Darwin has become increasingly urgent since the late seventies. At that time the spiralling price of oil and the limited remaining work-life of the current Stokes Hill facility dictated that a new station, probably coal-fired, be ready to generate as the current oil-fired units began to phase out in 1987.

Various energy sources for the new station were considered, although the plan for a conventional coal-fired turbine plant has not been seriously disputed. Then, as now, technological and financial criteria ruled out a solar, wind, tide or nuclear powered station, and the price of oil was considered prohibitively expensive. Natural gas was thought at one stage to be a realistic alternative; however, delays in the Joseph Bonaparte field proving and the expense of infrastructure requirements reduced the viability of this alternative.

By July, 1981, site selection had been reduced from fourteen possible locations up to 100 km by road from central Darwin down to two, following a report on site suitability by an independent consultant. Final site recommendation - for Channel Island - was achieved in the same month and received Cabinet approval on 12 August.

The proponent, the Northern Territory Electricity Commission (NTEC) engaged Caldwell Connell Engineers Pty Ltd (CCE) as environmental consultants in January 1982. Draft copies of the resultant Environmental Impact Statement (EIS) were available for public and Governmental comment from 30 March to 11 May 1983, although some previous drafts had been assessed and commented on by the Conservation Commission (CCNT) prior to this period.

Following the public review period, NTEC took cognisance of the various comments received where appropriate (under the requirements of the *Environmental Assessment Act, 1982*) and released the first copies of the final EIS on 18 August 1983.

1.2 This Report

This report provides a detailed assessment of the power station proposal as described in the final EIS, and considers matters raised as a result of the public review process, as well as additional information arising from ongoing liaison between NTEC and CCNT.

The detailed assessment comprises three chapters which focus on the three main aspects of the EIS:

1. The Proposal - This chapter discusses Sections 1 and 2 of the EIS which include background information and site selection investigations which led to the proposal for the Channel Island Power Station.

2. Environmental Aspects - this chapter discusses Section 3 of the EIS which describes the existing conditions and identified environmental impacts; and

3. Safeguards and Monitoring - This chapter discusses Section 4 of the EIS which reviews the safeguards designed to mitigate the environmental impacts.

2.0 THE PROPOSAL

NTEC proposes to construct a 300 MW power station on Channel Island in Middle Arm (see Map 1) incorporating six 50 MW units to be progressively installed with completion scheduled for 1995.

Projected demand figures and the retirement schedule for currently operational units dictate that if additional generating capacity is not provided, power shortages can be expected in Darwin by 1988, when the two oldest oil-fired Stokes Hill units will have reached the end of their service life.

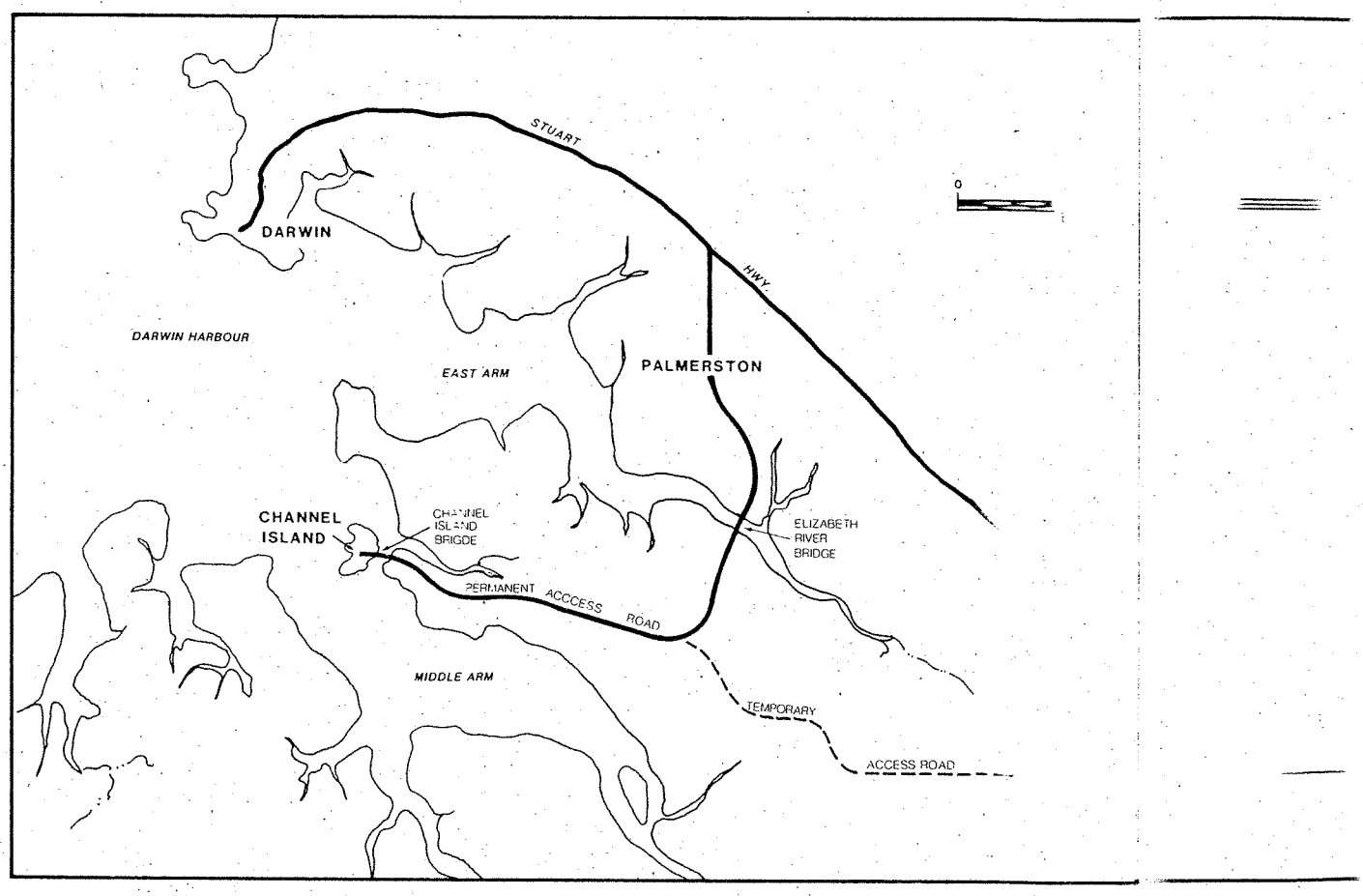
The debate over fuel sources, site selection etc., has resulted in NTEC facing a tight schedule if blackouts are to be avoided in the late 1980's. Despite this, NTEC has undertaken a full EIS on the final site.

In the EIS, chapters on the background of the proposal and historic and projected electricity demand and supply, clearly annotate the early phases of the project development. Notes on average and peak demand trends illustrate the inevitability of a new power generation facility for Darwin.

The section on power generation options (Chapter 3) leans heavily on a study by Merz & McLellan and Partners (MMP) which NTEC commissioned to aid the site selection process.

In the MMP study, potential energy sources were analysed as to their availability, technological feasibility and economic viability. These sources included black coal, natural gas, oil, nuclear energy, hydro power and solar, tidal, wave, wind, geothermal and biomass energy. Of these sources, black coal was regarded as having the best potential, although it is noted in the EIS that it will be possible to convert the installed units from coal to gas firing if economically feasible gas supplies are developed in the future.

Having concluded that a coal-fired power station represented the best approach for the new facility, the various technological options within



MAP 1. CHANNEL ISLAND AND ENVIRONS.

this decision were outlined. The adoption of a direct seawater cooling system was preferred providing that its environmental consequences could be contained.

Chapter 4 of the EIS summarises the site selection process contained in the MMP report. The amount of detail in this section, presented impartially by the sub-consultants, is very informative and made selection of the final site clear and inevitable; however, the method used to predict potential savings from joint use of the developed infrastructure appears less than fully objective and seems to assume an unwarranted amount of joint-user capability for the Channel Island site. If this sub-section is ignored, then the Quarantine Island site becomes marginally more attractive economically; however, when balanced against the qualitative variables - which included the real possibility of considerable airborne pollution over Darwin and Palmerston if the Quarantine Island site were selected - the suitability of the Channel Island site could not be disputed. A geotechnical study in late 1981 confirmed this suitability.

Chapter 5 contains a detailed description of the proposed facility, including infrastructure.

Basic design incorporates a one in ten thousand year safety factor that will require the relocation of some 960,000 m^3 of material on site; the effects of this activity are dealt with later in this report.

Understanding of the basic process of converting coal into electricity is enhanced by a schematic presentation (Figure 7of the EIS). The process first involves coal being unloaded from ships (via a constructed wharf facility) via conveyors to a 60,000 to 70,000 tonne covered, live coal storage bunker. This coal will be drawn off by enclosed conveyors to the boiler house bunker - which will have a capacity equivalent to approximately 24 hours at full load - from where it will be drawn through pulverisers as required. The pulverised coal will be combusted with heated, forced-draught air in the boilers at a rate of 500 tonnes/day at full load for each 50 MW unit. The heat from this combustion creates steam from the boiler feed water which is to be raised to a temperature approaching 510° C before being introduced to the turbines. The turbines will

drive generators to produce electrical energy and the steam will be recondensed back to water to be recycled.

Hot exhaust gas from the boiler combustion chamber will be used to preheat boiler feed water and the forced-draught air will then pass through electrostatic precipitators, to remove fly ash, before being voided to the atmosphere through a one-hundred metre high exhaust stack. There will be three stacks, each having a flue from two 50 MW units.

Ash from the boiler combustion chamber (furnace ash) will be mixed with water to form a slurry which will be passed to an ash settling pond. Fly ash from the electrostatic precipitators will form a further portion of the slurry and the facility is expected to produce about 300 tonnes of ash per day, comprising 15% furnace ash and 85% fly ash. The slurry will be pumped to a settling pond or 'ashdam' on the southern side of the island where the ash will settle out forming a relatively pure sediment which could be sold as an ingredient for light-weight cement or brick manufacture, or as a filler for hot mix and asbestos sheet formation.

Supernatant water will be recycled through the slurry system.

Hot exhaust gas (flue gas) contains, among other things, quantities of nitrogen oxides (NO_x) and sulphur dioxide (SO_2) which will be emitted to the atmosphere. The selection of appropriate coals can greatly reduce the amount of gaseous emissions - particularly SO_2 - and NTEC states that coal with a sulphur content averaging 0.5% will be used.

The condensers for the turbine steam will require constant cooling. Two types of system commonly used in the past are an enclosed water system involving a cooling tower which acts as a heat exchanger with the atmosphere, and a continuous flow system which uses an outside water source. The former system is the more desirable environmentally, but depends on relatively low ambient temperatures to be effective; the latter system requires a large source of water located proximally to the facility so that inlet and outlet canals can be prepared without high construction expense. Incoming water is chlorinated to prevent marine fouling organisms such as barnacles, etc. blocking the cooling system. The two environmental

difficulties with the canal system - the option chosen by NTEC - were damage to the local aquatic environment caused by the rise in ambient water temperature, and pollution of that environment by free chlorine. The impacts of the cooling system and the flue gasses have been dealt with in Section 4 of this report.

Freshwater for the power station, used mainly for boiler make-up water, will amount to approximately 1,100 m^3/day and will be supplied by either the Darwin River or Manton Dam mains.

Various liquid wastes are developed during the operation of the facility and their disposal has been considered in the EIS as follows:

(i) contaminated washdown water, arising from boiler blowdown and plant cleaning and hygiene operation, will contain oils, grease and water treatment chemicals and are to be entrained into the ashdam system;

(ii) dead coal stockpile runoff will contain some soluble organic and inorganic compounds from the coal, but should be minimal once the stockpile surface had been sealed. Runoff and leachate from this area are to be entrained to the ashdams;

(iii) a water treatment plant, containing purification resins requiring periodic regeneration is considered necessary to prevent sealing of heated surfaces (i.e. within the boilers) by contaminated water. Effluent composed of high TDS water and some resin regeneration chemicals will be directed to the ashdams; and

(iv) sewage arising from the operational workforce is to receive secondary treatment on site with the resulting effluent proceeding to the ashdam.

Stormwater from 'clean' areas of the site is to be directed to an outflow adjacent to the jetty abutment.

The berthing facility for unloading the 45,000 dwt bulk coal c... described as a 900 m long jetty and associated infrastructu... bathymetric topography was found to be such that no additiona... would be required. Details on unloading facilities have not bee... in the EIS pending detailed information on the type of on-ship ... that existed; however, all conveyors transporting the coal fro... to coal storage areas will be covered.

Planned road access is described as having three facets:

(i) a temporary access road;

(ii) bridging facilities at a site on the Elizabeth River ... Channel Island from the mainland adjacent; and

(iii) a permanent access road.

The location of these constructions has been drawn on Map 1. ... mentally relevant aspects of these constructions, plus those ... provision of the transmission lines and telephone services are no... in the EIS.

The proposal is stated to require 2,000 man-years of construct... is expected to employ about 250 workers on site at any given ti... workers are expected to commute from existing quarters.

Material excavated during benching operations (approximately 96... to be used for some reclamation of low-lying south-western area... creation. Impermeable bankment fills and gravels suitable for ... will have to be imported to the island.

3.0 EXISTING CONDITIONS AND ENVIRONMENTAL EFFECTS

3.1 Introduction

Section 3 of the EIS, incorporating Chapters 6-12, discusses the impacts on the land, water, air, visual, acoustic, historical, archaeological, regional planning and socio-economic environments in some detail.

As is pointed out in Chapter 6.2, a development of the magnitude of the proposed power station has major local impacts. These impacts form three main categories - impacts on the land, through vegetational clearance, levelling, etc., on the air, by air-borne emissions; and on the water through the condenser heat-exchange process - and a major function of the EIS process is the structuring of strategies to negate or reduce these and other, mainly sociological, impacts. To this end specific impacts are identified in each subsection of Section 3 of the EIS.

3.2 Land

In Chapter 6.1 the existing land environment is described in terms of topography, geology, soils, climate, flora and fauna.

According to the EIS, the island as a habitat has clearly been considerably modified by human activities, mostly since the advent of white settlement. Much of the southern part of the island is dominated by exotic species which have opportunistically spread from abandoned gardens into disturbed areas and clearings. The mammal fauna is dominated by the common rat, *Rattus rattus* which is probably the only mammal left on the island. The insect community is reported as diverse with distinct zoning; however, as the EIS correctly states, there is no reason to believe this assemblage is in any way unique.

Land impacts (6.2) are correctly identified as occurring in two phases, constructional and operational. Construction impacts include

the impacts of clearing and benching, access roads and transmission line and water pipeline placement as well as those of the construction crew. Heavy earthmoving machinery has been implicated in the spread of the die-back fungus *Phytophthora* and construction crews may bring in pets, litter and exotic plants to the detriment of the ambient environment. Effective operational impact mitigation will involve the control of litter, pest species, soil erosion and recreational pursuits on the island. These mitigation procedures are dealt with in depth in Section 4 of the EIS, and Section 4 of this review.

3.3 Water

The existing estuarine environment has been extensively studied. There is a unique coral reef assemblage in the channel between the island and the mainland, and damage to this reef resulting from heated water discharge has been seen as a possible development constraint. Studies done in the area for this EIS include fish and zooplankton sampling and extensive dye-release tests in the vicinity of the proposed discharge point. An attempt was also made to establish the ambient estuarine condition around Channel Island; however, the conditions proved to be so variable that few concrete statements could be adduced.

The dye studies showed a tendency for water in the vicinity of the proposed outlet to become entrained in water passing down the seaward side of the island except for a brief period during peak flood when some entrainment into the channel may eventuate. The creation of a bund wall for the proposed ash settling pond could affect these entrainment characteristics; the implications of this are discussed later in the section on monitoring (Section 4).

An additional result of the dye studies was some clarification of the possible entrainment of heated effluent into the cooling water intake. If this became a feature of the cooling system, it would be less effective and would result in effluent water reaching much higher temperatures than those predicted using non-entrainment assumption.

In this case it appears there may be some entrainment just after high water which will disappear as the ebb quickens due to an eddy formation along the western side of the island.

The conclusion reached from the dye studies, and from the results of a predictive heat dispersion model done on the proposal by the University of NSW, was that the average temperature excess in Middle Arm adjacent to Channel Island would be 0.16° C for the 300 MW station operating at 70 per cent load. The effects of the heated effluent were therefore considered to be extremely localised. The threat to the unique reef assemblage or the ambient Middle Arm condition is virtually non-existent. This conclusion is further discussed in the section on monitoring.

Further examination of the estuarine condition considered mangrove communities, intertidal communities, the benthos and fish and zooplankton assemblages.

With regard to the mangroves, which are described in detail, it is shown that the community structure is similar to other areas of the Darwin region. Locally the north-western mangal on the island is considered more diverse and of higher habitat value than the south-eastern mangal. Data is presented to support this.

Mud flats, sand flats and rocky intertidal substrata were examined and their infauna described. The faunal assemblages are considered representative of the Darwin region and were not considered to be a development constraint. The invertebrate community associated with the mangroves was found to be diverse, and richer than that of adjacent mud flats, illustrating the value of mangroves as a protective habitat.

Unfortunately, the southern mangrove community will be largely sacrificed for the project when the ash dam bund is constructed; however, identical habitat is common in the adjacent embayments of Darwin harbour and the planned destruction should only represent a minimal reduction in the availability of this habitat.

The channel reef, and the local fish and zooplankton commun... examined. The reef assemblage is described in detail and s... to preserve its integrity will be discussed later. The ... zooplankton communities were examined mainly to determine ... tinguishing features that may enhance their conservatio... While a new species of copepod was found, this record - ... interesting features of the zooplankton catches - is consi... an indication of a general lack of taxonomic information ... locally than a feature unique to the Channel Island area.

While the tidal patterns and water movements of the area ... that any zooplankton and most fish species would be on... visitors to the Channel Island region it is indicative of t... taking approach taken by the authors of the EIS that these co... have been described in detail. The result of this approac... not only has the conservation status of the assemblages beer... established, but the information available on Darwin region ... taxa has been enlarged.

In summary, the main effect of the project on the local ... environment is that of the heated effluent discharge. Th... will be localised over an area of mud flat - within 200 ... outfall - that cannot be considered to be unique or to ha... ticularly high conservation value. The Conservation Commiss... with this conclusion and considers the information in the E... existing environment and perceived effects to be satisfac... regard to the effect of the proposal in the vicinity ... Island.

Unfortunately, the effect of the proposal - at least on pa... extends beyond the immediate environs of Channel Isla... temporary and permanent access roads have not received imp... ment and have already shown some impacts where mangrove ... have been penetrated. Some of these impacts could have be... if they had been properly assessed and this omission is ... major shortcoming in the EIS.

3.4 Air

The emission of large quantities of gaseous and particulate wastes from the combustion of coal can cause air pollution if adequate control measures are not implemented. The prevailing air quality of a region is extremely variable and the management of air quality is difficult.

The Northern Territory does not have an air quality management strategy but would probably model a strategy upon the existing Victorian strategy. This defines three facets of control: emission controls, local control via the estimation of ground level concentrations (GLC's), and regional control. In the absence of legislated emission limits it appears that the local control concept will be sufficient to allow an assessment of the potential environmental impact of the project.

NTEC indicates, however, that the power station will be designed to comply with recommended NH and MRC Emission Standards for particulate matter, sulphur dioxide, nitrous oxides and opacity. These are the only significant emission products and these recommended limits may be embodied in future NT legislation on air quality.

Meteorological data and stack performance specifications were used in computer simulations of maximum predicted GLC's for the most critical pollutant, sulphur dioxide. The specifications included two stack heights and the use of 0.5% sulphur content coal. The analysis was performed for sulphur dioxide because design GLC's for NO_2 will be met easily when the chimney height is adequate to comply with the SO_2 design GLC's.

The simulated GLC's were compared with the GLC's proposed as objectives in the Victoria Air Policy, which is 34 pphm for SO_2. This was exceeded only once for a 100 metre stack under some extremely unlikely meteorological conditions and at a site 16 km downwind from the power station.

The simulation represents a 'worst case' situation and the results may be interpreted to indicate that there is little potential to exceed the limits under normal operating conditions. However, the relevance of the limits to the impact of the emissions upon the ambient air quality was not discussed with regard to the occupational health or environmental implications.

In this regard the investigations of the impact of the power station upon the ambient air quality are deficient. It is indicated that continuing investigations are being performed as the parameters are refined, particularly the coal type and the meteorological data. The final design of the plant will incorporate this data and will ensure compliance with the relevant air quality standards.

3.5 Visual and Acoustic Factors

A development the size of the proposed power station has an unavoidable visual impact; however, in this case the relative remoteness of the site - compared with the current facility for example - is an asset. Figure 24 of the EIS gives an impression of the power station's impingement on the skyline as seen from Darwin city and, provided visible emissions are kept to a minimum (unlike the present oil-fired facility), the impact of the silhouette will be minimal.

Locally, the appearance of Channel Island will clearly be drastically altered, mainly when approached from the south. As is stated in the EIS: 'apart from the selection of suitable materials, colours, articulation of the building and retention of as much vegetation as possible, there is little else that can be done'. Landward impacts of the power station and the transmission line will be negligible due to the screening effect of natural contours.

The acoustic impact of the power station is described in detail in Chapter 10 of the EIS. There is currently no source of man-made noise on the island, and noise levels of around 30 dBA are encountered; this compares with 33-40 dBA in typical residential areas and 35 dBA

in the central Darwin area and at Palmerston. The attenuation of power station sound levels was modelled for the region and the conclusion reached that noise originating from the facility will be unnoticeable at either of the major population centres. Levels on the island itself are predicted to exceed 60 dBA which will require NTEC to adopt sound proofing and worker protection procedures as required, and will also impinge to some extent on the quality of any recreational pursuits conducted in the vicinity of the power station.

3.6 Historic and Archaeological Factors

Channel Island has an integral association with the historic development of Darwin and detailed investigations of European and Aboriginal habitations have been commissioned by NTEC. The results of these studies have clarified and documented the historic role of the island and have helped NTEC to control the impact of the new facility.

The majority of Chapter 11 of the EIS is devoted to a detailed account of the European settlement and is interesting and informative. Although most of the 30 or so major buildings can now be located on the basis of their remnant foundations alone, the historical value of these remnants is in no doubt, and NTEC have demonstrated suitable concern over their preservation. Priority conservation areas (EIS Figure 28) are identified and suitable protection strategies have been outlined by CCE.

No sites of Aboriginal mythological or ceremonial importance were considered to be located on Channel Island, although evidence of previous Aboriginal occupation is provided by the presence of four middens. Although three of the middens have been partially excavated by previous occupants to provide road-fill materials, the archaeological importance of these mounds is now appreciated and it will not be necessary for the development of the power station to interfere with these sites.

The occurrence of graves on the island has presented NTE issue of some sensitivity, and strategies are curren developed in association with the Aboriginal Sacred Sites Au deal appropriately with any graves that may be disturbed du struction (many are not clearly marked) and with the main bu

3.7 Regional Planning and Socio-economic Factors

With the establishment of Palmerston and the probable future ment of the Southport area, it has been perceived that station proposal would be the first step in an integrated pro local port and industrial development. While this may event time in the future, the EIS identifies some constraints scenario.

The current and committed expansion of the present Port D created a climate of under-utilisation of available facilit that a new terminal remains unlikely - with the possible exc a bulk cargo facility.

Industrial development along the East Arm peninsula woul stricted by the narrowness of the available land corrido susceptibility of the area to storm surge, and by the he infestation levels of mosquito vectors and biting midges.

The conclusion is correctly drawn in the EIS that on the bas above limitations, the power station proposal would have lit on regional industrial development. It is noted, however developers could tap into the fresh water supply to the powe

Fishing is a popular recreational pastime in the relatively waters of Darwin Harbour, although access and suitable facilities have remained a problem. The new access Palmerston will result in considerable time saving for fishermen wishing to fish the upper reaches of the harbour able site for a new ramp has been identified by NTEC in th of Oyster Rock.

It is expected that some 60% of the power station construction work-force would be drawn from outside of the Northern Territory; this increase of 700-800 people - if families of workers are included - is not expected to place any undue strain on existing local infra-structural or community services; however, some shortage of housing and caravan park accommodation may be experienced for the two years of construction.

Staffing of the power station will lead to a nett increase in NTEC personnel of some 75 people. This increase will be spread over a period of 5 to 6 years and is not expected to significantly affect Darwin's community structure.

4.0 SAFEGUARDS AND MONITORING

4.1 Introduction

This is perhaps the most crucial aspect of an EIS and on the basis of the contents of this section, the effectiveness and astuteness of the investigating consultants is judged by the assessing authorities.

Section 4 (Environmental safeguards) of the final EIS contains all the perceived impacts that have come to the attention of the consultants during the course of their investigations, and provides strategies for their mitigation. It is Conservation Commission policy, in its role as an advisory body to the Minister for Conservation, to advise that environmental approval for a proposal be granted if appropriate, subject to the proponent undertaking to adopt the identified mitigating strategies. This section of the assessment report will, therefore, enumerate those strategies along with the specific impacts they attend.

4.2 Land-based Impacts

Three impacts have been identified:

(i) soil erosion;

(ii) the introduction of litter, pests and exotic species; and

(iii) excessive removal of vegetation along the service corridors.

Mitigating strategies:

(i) Development of appropriate guidelines in conjunction with the Land Conservation Unit of the Conservation Commission to specify the following:

- Zones which must not be disturbed by earth moving equipment or construction activities.

- Permissible batters for side slopes of excavated areas.
- Location and design of culverts and stormwater drains to prevent water erosion.
- Restoration works aimed at establishing vegetation on disturbed areas, and controlling wind and water erosion until adequate ground cover is established. Wherever possible, major earthworks should be timed to permit revegetation works to be completed towards the end of the dry season, when moisture is available to assist germination and seedling establishment.
- Routine inspections of disturbed zones and areas still under restoration to provide early warning of potential erosion problems.

(ii) Control of litter, pests and exotic species will depend on the following:

- Minimising favourable habitats for the reproduction of mosquitos and biting midges (sandflies), particularly during construction of bunded areas such as the south ash lagoon - removal of vegetation from these areas, coupled with careful grading to avoid isolated pockets of water, should assist in this regard.
- Provision of adequate rubbish collection points on the island, at construction depots and at locations used by the public for recreation.
- Animal pests such as rats, feral cats and dogs, and kites are best controlled by preventing the accumulation of litter.
- Any earthmoving equipment from areas known to be infested with problem weed species or the root fungus *Phytophthora* should be washed down before being transported to the power station site.
- Routine inspections, combined with those described above, should be made to check for any weed species which may colonise disturbed zones and invade adjoining areas.

(iii) Excessive removal of vegetation will be subject to conditions applied to ameliorate soil erosion [see (i

4.3 Estuarine Impacts

These impacts may be divided into constructional and [illegible] Potential construction impacts that have been ide[illegible] associated with the construction of bund walls, bridges, t[illegible] cooling water system and the possibility of spills or othe[illegible] Strategies to combat these impacts include:

- Consultation with the Fisheries Division prior to un[illegible] underwater blasting with a view to minimising the zone [illegible] of the resultant pressure waves.
- Implementation of good construction and restoration pra[illegible] minimise sediment discharges from disturbed areas. (P[illegible] attention should be given to controlling sediment ru[illegible] mangrove zones).
- Strict limitations on the areas of mangroves which are [illegible] to be removed, covered or otherwise disturbed.
- Development of emergency procedures, in consultation [illegible] Darwin Oil Spill Committee, for use in any incidents [illegible] spills of oil or other pollutants.

Operational impacts will revolve around the cooling wa[illegible] Identified safeguards include:

- Development of a design for the intake structure and [illegible] minimise mortality of fish and the larger inver[illegible] resulting from their impingement on the screens.
- Installation and operation of an effective control [illegible] regulate chlorine dose rate to the minimum level nec[illegible] prevent marine fouling of the cooling water system.
- Investigation of the permeability of the base of the [illegible] to identify any need for an impervious base for the [illegible] minimise movement of leachate into the marine environm[illegible]

The EIS identifies the need for an estuarine monitoring programme that would firstly establish the ambient condition for reef and soft bottom areas in the vicinity of the power station, establish suitable control sites, develop baseline data for heavy metal accumulation studies and monitor mangrove communities, and secondly, would monitor change in the above. The programme would be implemented in two phases: Phase I during construction and Phase II during operation.

The programme has been developed after detailed consultation between CCE, NTEC and the Conservation Commission and initial site selection and data collection surveys have been conducted. The strategies of the programme are reproduced entirely in the EIS (pp. 133-134).

By using the prescribed monitoring system, NTEC will be able to check the accuracy of the impact prediction models developed in the EIS, and in this context point 7 - the study of the plume dispersal under various operational conditions - is seen as the primary Phase II strategy designed to not only judge the accuracy of the heat dispersal model described in Section 7.2 of the text, but also to determine the need for any supplementary strategies or design improvements.

4.4 Air Environment

Emissions to air will consist of stack emissions, coal dust and construction dust. The control of stack emissions is by coal selection, fly ash removal equipment and stack height. Preliminary plume dispersion modelling indicates that concentrations of the three significant emission components, particulates, sulphur dioxide and oxides of nitrogen, will be within recommended air quality limits. The design of the equipment and stack will be finalised during the detailed design phase when coal types have been identified and more meteorological data are available.

Control of coal dust emissions will be achieved by the use of covered conveyors, roofed storage bunkers and sealing of dead coal stockpiles. The proposed control measures are part of standard safety procedures.

Dust emissions from construction activities will be minimised by soil erosion control techniques. Disturbed areas and the ash lagoons will be revegetated progressively.

The control measures proposed by NTEC to safeguard the air quality of the region are not comprehensively described but are adequate if the concepts outlined in the EIS are followed. At this stage the details of some of the control techniques cannot be finalised but NTEC indicate that they will select the optimum techniques at the appropriate time.

There is no discussion of any occupational hygiene monitoring for airborne pollutants as part of an environmental monitoring programme. NTEC has indicated that they will perform this monitoring as required; however, a more definite commitment should be made and the preliminary design of a programme should be drafted.

4.5 Visual Environment

Mitigating strategies - designed to screen the visual impact of the project - include the following:

- Maintenance of the existing vegetation screen provided by mangroves and dry-land vegetation where possible;
- Siting all structures to the south of the main ridge on the island;
- Use of non-reflective materials, preferably in khaki or green/grey colours to merge with prevailing colours of the landscape;
- Placing architectural emphasis of the buildings on the horizontal dimension where possible; and
- Revegetation of disturbed areas not required for power station operations.

It is also suggested by CCE that NTEC's route for the transmission lines should be carefully selected to minimise their visual impact.

In this regard, vegetation should be retained between the road and the power lines where possible.

4.6 Acoustic Environment

Although noise level predictions rule out adverse noise levels in existing or proposed urban areas, detailed consideration should be given at the design stage to reducing noise levels at the power station, to protect the work place environment and minimise noise intrusion in potential conservation and recreational zones on Channel Island (Figure 28 of the EIS). Monitoring of noise levels in and around the power station should be carried out as each new unit is commissioned.

4.7 Historic and Archaeological Environment

Impacts to these factors may be divided into historic sites within or outside the primary impact zone and to the sensitive question of grave sites.

Within Primary Impact Zone. Historic elements which will be disturbed by the project should be recorded before construction commences; in some cases, specific items may be removed under supervision of qualified historians for later display.

Outside Primary Impact Zone. It has been decided that the best strategy to protect relics in the undeveloped segment of the island would be the elevation of the land to historic reserve status, and discussions on the expediency of this strategy are currently taking place.

Failing the gazettal of an historic reserve, the consultants have identified the strategy appropriate for NTEC to follow. This is quoted below:

'The aim should be to retain much of the structures [illegible] present state and provide suitably identified walking tr[illegible] background information. This would enable a proper appr[illegible] to be gained by visitors since the trail could link the [illegible] stone jetty, the remnants of the early Quarantine [illegible] buildings and the later buildings associated with the pr[illegible] ive development of the Leprosarium...

It will be important to retain as much of the existi[illegible] tation as possible. To maximise the potential separa[illegible] least in visual terms, between the proposed historic z[illegible] the power station development, it is recommended that a[illegible] systems providing access to the historic zone run para[illegible] the main mass of the power station buildings. The den[illegible] the vegetation is such that line of sight is obscured w[illegible] matter of metres from the road edge. Keeping the roa[illegible] narrow a corridor as possible will help to minimise [illegible] contact between the historic zone and the power station.

4.8 Planning and Socio-economic Considerations

The new facility is not expected to have any socio-ec[illegible] planning impacts apart from opening up access to the [illegible] peninsula.

With regard to recreational impacts, consideration is curre[illegible] given to the establishment of a recreational and scientif[illegible] the mainland adjacent to Channel Island. A management pla[illegible] developed by a multi-disciplinary group to provide an appropriate balance between active recreational facilities and pass[illegible] natural vegetation associations and habitats, and the [illegible] elements which remain on the island. Discussions on this [illegible] proceeding between CCNT and NTEC.

The Conservation Commission has produced a summary of the [illegible] which should apply as part of the conditions of approval [illegible] station proposal. This is included as Appendix A.

5.0 EFFECTIVE PUBLIC REVIEW

The Channel Island EIS was released to the public in draft form for a six week review period. During this time, members of the public and N.T. and Commonwealth Government Departments were invited to assess the draft and submit comments and any suggestions for improvement, areas of inadequacy, etc. that would need to be taken into account by NTEC prior to publication and formal assessment of the final EIS.

Nineteen formal submissions were passed on to the Conservation Commission by NTEC which, with the inclusion of the Commission's own comments, consisted of submissions from 5 independent statutory authorities, and 10 N.T. Government and 4 Commonwealth Government Departments.

Details of these submissions and the appropriateness, or otherwise, of NTEC's response are discussed below.

5.1 Independent Statutory Authorities

5.1.1 National Trust of Australia: The Trust's Executive and Project Committees both considered the draft EIS and requested the implementation of the recommendations contained therein.

5.1.2 Historical Society of the N.T. (Darwin Branch): The Society, while accepting that some loss of historic material was inevitable in a project of this magnitude, strongly recommended the adoption of strategies suggested in the draft sections on impact mitigation for historic and archaeological sites and planning and socio-economic considerations (13.6 and 13.7 of the EIS). The Society offered a further strong recommendation that more detailed historical and archaeological studies be undertaken as soon as possible, particularly with regard to those sites seen to be in direct threat.

NTEC's response here has been to confirm their policy of the creation of a Management Committee, with appropriate representation, to control impacts to areas outside the primary

impact zone. Discussions are continuing on this strategy, which should certainly result in the determination of the most appropriate land-use formula for the areas under consideration. There remains though, an area of concern with regard to the primary impact zone itself and it is considered a shortcoming in the EIS that, while the sensitive question of graves has received sympathetic treatment, NTEC has allowed a non-commital approach to the issue of disturbed archaeological and historical sites to pass from the draft to the final EIS, despite the expressed concern of interested parties. While this may reflect a misinterpretation of their policy as reflected within the final EIS, it has been up to NTEC to clearly state their proposed strategy for disturbed site treatment where areas of N.T. historical significance are at stake.

A suitable response to the expressed concern found in the submissions would have been the insertion in the final EIS of a statement that a historian/archaeologist would be continually available during the construction phase to not only fully document known historical sites before they were disturbed, but also to take full advantage of the discovery of any previously unknown sites.

5.1.3 Aboriginal Sacred Sites Authority (ASSA)/Landsearch Consultants: The Authority was generally appreciative of the draft EIS, considering it a 'rigorously prepared document'. Their comments revolved around a suggested rearrangement of the content, with some additions, to increase its clarity.

NTEC has adopted the approach suggested by the ASSA in the final EIS.

5.1.4 Bureau of the Northern Land Council (NLC): The NLC expressed concern over the treatment of human remains that may be disturbed; however, NTEC has satisfied this Commission that suitable research and liaison, to which NTEC are committed, will ensure that every possible precaution will be taken and that possible offence to surviving family or clan members will be generally eliminated.

5.1.5 N.T. Emergency Service: The service expressed concern that the full effect of tropical cyclones and their storm surges have not been considered.

While this is not strictly a question on the impact of the power station on the environment, NTEC has responded with information that its engineers will incorporate considerations of storm surge levels into the design of all facilities. It is the Conservation Commission's view that NTEC will complete all necessary design requirements to further the life-span of the facility without prompting. Design benching levels indicated in the EIS appear to take account of recorded storm surge levels.

5.2 Commonwealth Government Departments

5.2.1 Department of Science and Technology, Bureau of Meteorology: The Bureau's main concern was over the adequacy of the data used for GLC predictions for atmospheric emissions. In the Bureau's opinion, better, longer-term data were available for the Pasquill models than was used, although this data related to Darwin Airport rather than Channel Island itself.

NTEC considered that this comment was arguable and undertook to liaise directly with the Bureau to clarify the situation.

5.2.2 Department of Aboriginal Affairs: Concern was expressed by the Department over 'the apparent inconsequential weight given to the matters relating to the historical use of the island as a leprosarium and the essential importance of the island to Aboriginals throughout the Northern Territory because of the numerous burials that took place at Channel Island'.

On this issue, the Department is liaising closely with the ASSA with whom NTEC is co-ordinating its impact mitigation strategies.

The Conservation Commission considers that any areas [illegible] in this context can be handled properly between t[illegible] NTEC given the Electricity Commission's stated conc[illegible] correct treatment of human remains.

5.2.3 Department of Home Affairs and Environment: The [illegible] limited its comments to a clarification of their ro[illegible] development; NTEC incorporated an appropriate respo[illegible] final EIS.

5.2.4 Department of Aviation: Aviation indicated that it m[illegible] a red strobe marker light to be placed on top of [illegible] after assessment of the completed structures by i[illegible] Operations Branch. NTEC have indicated that they [illegible] allowance for this facility in final structure desig[illegible]

5.3 N.T. Government Departments

5.3.1 N.T. Port Authority: The Authority provided comm[illegible] erroneous supposition on the joint-user flexibility [illegible] NTEC will need to assist coal unloading operations [illegible] existing and future handling capacity of the Port o[illegible]

NTEC undertook to incorporate the Authority's comm[illegible] final EIS and has done so to some extent. Ther[illegible] however, the question of the joint-user flexibi[illegible] tugs. The Port Authority queried NTEC's assum[illegible] potential saving on tug-boat running costs by [illegible] leasing to suitable alternative users - the poin[illegible] the type would be over-sized for most requirement[illegible] used the potential savings from a variety of area[illegible] tugs - as an economic argument to determine site s[illegible] is the Conservation Commission's view that such a [illegible] doubtful for two reasons: (i) the figures are ve[illegible] to verify, and (ii) they may be used to artificia[illegible] a preconceived hypothesis, and that if NTEC is [illegible] importance on such figures, they should be full[illegible] and fully accurate.

NTEC has not altered the figures for potential savings by the joint use of tugs in the final EIS.

5.3.2 Department of Community Development: The Department expressed an interest in an involvement in the development of a management strategy 'for those parts of the island which have heritage value'. NTEC, in response to this comment and those of the Historical Society of the N.T. and in accord with its own policy, will attempt to form a management committee to resolve this question. Dialogue has been established between the interested parties.

5.3.3 Department of Health: Health's senior medical entomologist expressed concern at NTEC's lack of apparent consideration of the mosquito and biting midge problem at Channel Island. A large amount of information was provided by Health to NTEC that explained the irritant and disease spreading potential of these pests, accompanied by data sheets from a field survey conducted in the area.

The field survey showed an extremely high prevalence of biting midges - which prompted Health to comment 'such a population of midges is absolutely intolerable to an unprotected person' - and a number of disease vector mosquito species. These results suggested that the level of irritation liable to be suffered by workers would already be very high and all steps should be taken to minimise the creation of further breeding habitat. Strategies for this were suggested to NTEC.

The Electricity Commission's response has been the inclusion in the final EIS of a proposed mitigation strategy in accordance with the guidelines supplied by Health. The Conservation Commission has indicated that adoption of this strategy is one of the conditions on which environmental clearance should depend and Health has advised their satisfaction with this development.

5.3.4 Department of the Treasury: This Department drew NTEC's attention to the availability of more recent (than 1981) costing data and suggested their incorporation into the final EIS. NTEC has not responded to this suggestion.

5.3.5 Department of Mines and Energy: This Department's main concern was the limited nature of the monitoring proposals in the draft EIS, particularly in respect of the marine systems. This was also a major concern of the Conservation Commission and has been dealt with through extensive discussions and field programmes since the draft EIS was produced.

The final EIS contains details of the strategy behind the programme and the Conservation Commission has been satisfied that this will be implemented by NTEC.

5.3.6 Department of Transport and Works: Roads Division drew attention to the lack of environmental safeguards applicable to road and bridge work contracts; however, this is an area beyond the consultant brief and has been covered separately through liaison between NTEC and Roads Division.

Water Division commented on the general lack of data presented by the consultants when reaching conclusions on estuarine impacts. Discussion with the consultants has revealed that this is mostly due to structural considerations within the EIS rather than through a lack of data; however, the consultants, in their own interests, should have clarified this point. Certainly additional dye studies will be carried out on commencement of generation to check plume predictions, and the consultants would have created a more favourable impression by including this fact in the draft document. This has been included in the final EIS.

3.3.7 Department of Lands: In their general comments Lands has queried the apparent dichotomy in the draft that arises out of the fact that although the EIS refers to a 300 MW facility, the ulitmate capacity of the site will be 1,000 MW. This

latter estimate by NTEC is a response to perceived power requirements after the year 2000, though NTEC has limited its planning and construction to cover needs over the next fifteen years. This would seem the correct procedure given that (i) the construction of any additional power generation capacity over 300 MW will be the subject of a further EIS, and (ii) the prospect of improved technologies, alternative energy sources and radical departures from projected energy requirements would render planning beyond the current level futile.

The Lands Department's concern over the possibility of an ash lagoon on the northern section of the island is unwarranted in terms of the current proposal, if NTEC follows its preferred options. Any plan to interfere with northern Channel Island will be subject to detailed environmental assessment.

In its specific comments, Lands raise a number of issues that have been covered by comments to other submissions; however, a question on the adequacy of the southern ash lagoon as a receptacle for all stockpile runoff, treated sewage effluent, etc., in addition to the ash slurries, requires attention.

NTEC responded to this criticism of the draft by undertaking to include runoff/storage/evaporation calculations in the final EIS - although the point is made that uncontaminated site runoff will be discharged into the estuary adjacent to the jetty abutment. NTEC has not included this data in the final EIS and this area remains unresolved.

Two further issues raised by Lands have been subject to rather indifferent response from NTEC.

Firstly, Lands queried the lack of 'worst case' data in the heated effluent plume predictions. This is a fair criticism, and NTEC's response (communicated informally to CCNT) - that the effect of the plume under average conditions would be insignificant, so there is no necessity to extrapolate this to a 'worst case' condition - cannot be considered satisfactory. The 'worst case' situation, however, will be covered as far as possible when the modelling predictions are checked by additional hydrological studies when generation commences.

Secondly, Lands pointed out that possible synergis... of the power station and other industrial operat... vicinity were not considered in the EIS. NTEC's v... they are not responsible for any synergistic ef... that their operation will have an estimated negligi...

The adequacy of this response (again communicated ... is definitely arguable. Firstly, NTEC's gaseou... ticulate emissions, whilst they will probably ... current NH & MRC standards, cannot be considered ne... any means, and secondly, if Darwin ambient air quali... be lowered to the extent that existing standar... ceeded, major contributors to this situation woul... have a responsibility to the community to react app...

5.3.8 Department of Education: This Department asked ... informed on the influx and distribution of workforc... and expressed concern over the ability of Darwin ... primary schools to cope with any sudden influx ... NTEC has undertaken to liaise with Education direct...

5.3.9 Department of Primary Production: DPP indicated ... no comment to make on the draft EIS, althoug... Division was not formally consulted.

5.3.10 Conservation Commission of the N.T.: This Commis... ments on the draft EIS are reproduced entirely in ... In general, NTEC's response to the Commission's ... been adequate although time constraints on fina... duction have meant that some areas appear to req... attention even though they have received complete ... discussions between NTEC and CCNT. This schedu... has been dealt with further below [see (iii)].

Three areas may be considered inadequately treate... the assessment process.

(i) NTEC dismissed the CCNT proposal for an enlarged intake pumping capacity on the grounds of economics and lack of necessity [the comments of sub-section 13.2 on p. (iii), Appendix B refer]. It is the view of CCNT that this strategy requires closer attention as it contains considerable advantages for the proponent.

Firstly, the mixing of condenser cooling water with untreated water would reduce the temperature and free chlorine loads in the effluent before it impinges onto the outlet region. This would be an added safety factor in the event of chlorine dose meter or intake pump failure and would provide a ready-made solution if effluent temperature modelling is shown to be inaccurate.

Secondly, in the long term, NTEC will have to install greater pumping ability if the power generation capacity is increased beyond 300 MW, and long-term cost saving could be achieved by the installation of this increased pumping capacity now rather than later.

(ii) Air emissions have been the subject of some debate between CCNT and NTEC as a result of a basic difference in strategy. NTEC have contended that gaseous emissions will be controlled at source by the selection of appropriate coals for combustion and that NH & MRC emission limits will not be exceeded.

While this philosophy appears sound, it is CCNT opinion that such a strategy lacks the flexible approach that circumstances may demand. A supplementary monitoring system would be considered the minimum requirement for SO_x and NO_x emissions, with NTEC prepared to take appropriate steps should its quality control criteria fail or in the event of the unavailability of suitable coals. Time constraints have meant that this area remains unresolved at time of writing.

(iii) An additional manifestation of the accelerated assessment process is the unfinished appearance of the final

EIS. The draft frequently contained statements preceeded by the word 'should', i.e. NTEC should....., which is the consultants' way of notifying the proponent of safeguards, strategies or techniques they have identified as suitable. The next step should be detailed discussion between the consultants, the proponent and the relevant supervising authority as to the appropriateness or otherwise of these ideas to the extent that the final EIS contains a series of definitive statements and undertakings. The Channel Island EIS did not reach this stage, and as a result contains very little in the way of a commitment to the environment by NTEC. This has meant that the assessment process has in fact been prolonged as CCNT has had to require NTEC's commitment to all indefinite statements in the final EIS and has had to construct an exhaustive list of safeguards as conditions for environment clearance. It must be said, however, that NTEC's response to environmental conditions has generally been one of responsibility and integrity.

6.0 SUMMARY

Overall, the Conservation Commission considers that the consultants, Caldwell Connell Engineers, have produced a detailed and thoroughly researched document given that:

(i) the ambit of the EIS was improperly framed by NTEC so that the potential impacts of access road and bridge construction were not assessed, and

(ii) the length of time between production of the draft and the final EIS was inordinately compressed by NTEC development pressures to the detriment of the final document.

The impact of the new power station will be overwhelmingly beneficial in that future power supplies for domestic and commercial users in the Darwin region will be assured. Detrimental impacts will be largely controlled by appropriate designing and will be continually monitored.

Shortcomings in the final EIS - which include the lack of data on jetty, sea-wall, bridge and access road construction, a general lack of stated impact mitigation commitment by NTEC and a lack of predictive data on the ash pond water budget - are mostly manifestations of the previously mentioned compression of the draft - final EIS time span.

NTEC has a dedicated environmental staff. Their efforts, and the climate of continual open liaison between officers of NTEC and CCNT, has greatly facilitated assessment of the proposal.

APPENDIX A

CHANNEL ISLAND POWER STATION

RECOMMENDED ENVIRONMENTAL SAFEGUARDS

CHANNEL ISLAND POWER STATION - RECOMMENDED ENVIRONMENTAL SAFEGUARDS

To minimise the potential environmental impact of the project, it is recommended that the following safeguards be implemented during the design, construction and operational phases. These safeguards should be included under the conditions of approval applied to the project.

General Safeguards

1. NTEC to develop and operate the Channel Island Power Station project in general conformity with the concepts and controls described in the EIS. Any conceptual changes will require further assessment by the appropriate authorities. The development and refinement of the control techniques during the successive design phases should involve consultation with the appropriate authorities.

2. NTEC to be responsible for operating the power station in an environmentally acceptable manner. This involves taking appropriate action to mitigate those impacts identified in the EIS and also to react in a responsible manner to any presently unrecognised effects of the operation.

Land-Based Safeguards

3. The development, in conjunction with the Land Conservation Unit of the Conservation Commission, of erosion control procedures which will specify the following:

   (a) areas of no permissible disturbance;

   (b) permissible side slope batters for excavated and filled areas;

   (c) location and design of culverts and stormwater drains; and

   (d) restoration works aimed at re-establishing vegetation on disturbed areas (note that the timing of earthworks should be considered in terms of their potential erosion hazard).

4. The control of litter, pests and exotic species by:

(a) generally minimising favourable habitats for mosquito and biting midge breeding areas by maximum reduction of free standing water as in puddles, temporary ponding, etc. and specifically during construction of bunded areas such as the south ash lagoon by removal of standing vegetation and subsequent grading to eliminate water pocketing. This operation (south ash pond reclamation) to be conducted in close liaison with the Medical Entomologist, N.T. Department of Health;

(b) the provision of litter collection points on the island at construction depots and any areas (under NTEC control) used for public recreation;

(c) the spraying of all earthmoving equipment entering the N.T. for the purposes of this proposal, to eliminate the possibility of the introduction of the root-rot fungus *Phytophthera*; and

(d) inspection every two months of Channel Island for invading introduced weed species to be conducted by the NTEC environmental officer.

Estuarine Safeguards

5. To minimise impacts during the construction phase, the following measures should be undertaken:

(a) Fisheries Division to be consulted on the most appropriate timing for underwater blasting programmes; and

(b) mangrove destruction be limited to that necessary for the construction of the wharf and bridge abutments, cooling water inlet and outlet points, the south ash pond and the western seawall.

6. Operational impacts to be reduced by adoption of the following:

(a) cooling water intake structure and screens to be designed to reduce fouling by fish and larger inveterbrates;

(b) installation and operation of an effective chlorine dose rate control system with influent and effluent concentration levels to be recorded continually; and

(c) investigation of the ash lagoon base permeability to determine the need for an impervious lining.

7. Overall impact monitoring to be conducted by NTEC following the method outlined by Caldwell Connell Engineers in their document M375A, communicated to NTEC on 1 July 1983, and using the sites identified by Caldwell Connell biological staff during the dive series conducted on 1-5 August 1983. Copies of reports generated by this monitoring programme are to be provided by NTEC to the Conservation Commission.

Any deviations of the actual data from the predictive modelling data particularly for plume temperature and dispersal patterns, are to be the subject of discussion between the two bodies and suitable treatment by NTEC on the advice of the Conservation Commission. Monitoring will be carried out initially at 6 monthly intervals but may be adjusted, after agreement between NTEC and the Conservation Commission.

Air Pollution Safeguards

8. Dust created during construction to be minimised by regular watering of unpaved roads and cleared areas during the dry season.

9. Operational fugitive dust to be controlled as follows:

(a) the use of covered conveyors throughout the site;

(b) 'live' coal storage to be in a roofed slot bunker; and

(c) 'dead' coal stockpiles to be sealed.

10. For stack emission control NTEC to be responsible for:

(a) designing and operating the power station to meet the NH&MRC National Emission Standards specified in the EIS;

(b) undertaking appropriate monitoring to ensure that these standards are being achieved;

(c) developing the necessary monitoring systems and operational controls using the following guidelines -

Particulates - a continuous monitoring system based on opacity recording.

Sulphur Oxides - stipulation of the maximum sulphur content of the coal to be used and routine analysis of the sulphur content. Analytical records are to be kept and made accessible for inspection by relevant Government authorities.

Nitrogen Oxides - monitoring on an appropriate frequency to be determined following an assessment of initial surveys performed during the commissioning phase.

Trace Elements - analysis as required of the coal for the trace constituents of interest.

11. NTEC to be responsible for undertaking appropriate occupational health monitoring to the satisfaction of the Department of Health.

Visual Intrusion Safeguards

12. The visible impact of the power station to be minimised as far as possible by adoption of the following strategies:

(a) retention of existing vegetation is to be maximal, and all disturbed areas not required after the completion of construction are to be revegetated;

(b) all structures are to be located south of the main ridge spine of the island;

(c) external surfaces are to be painted/clad in non-reflective camouflage colours - khaki or green/grey;

(d) architectural emphasis is to be on the horizontal rather than the vertical plane as far as possible; and

(e) wherever possible, transmission lines will be routed to avoid visual intrusion. The maintenance of vegetation between the access road and the lines will assist in this regard.

Acoustic Safeguards

13. (a) A vegetational screen to be maintained or implanted surrounding the main power house area to improve noise attenuation.

(b) Noise levels are to be monitored in accordance with the undertaking specified in the EIS and appropriate action taken by NTEC should the monitoring results indicate excessive levels.

Historical and Archaeological Safeguards

14. (a) Within the Primary Impact Zone: All features to be destroyed or disturbed are to be investigated and documented to the satisfaction of the relevant authorities.

(b) Outside the Primary Impact Zone: Subject to the settlement of appropriate land tenure over the balance of Channel Island north of the live coal bunker (i.e. in excess of NTEC operational requirements), an appropriate plan of management be developed for the control of public access/information/recreation by a management committee of appropriate authorities.

(c) NTEC to revegetate disturbed areas immediately north of the final construction with appropriate taller native species to act as both a visual and acoustic barrier. The Conservation Commission to provide advice on this aspect.

(d) NTEC to continue liaison with ASSA on all aspects related to disturbance of graves on the island.

Recreational Safeguards

15. Strict control is to be exercised by NTEC over the use of Channel Island for recreational pursuits by the construction workforce, particularly in respect of the designated priority conservation areas in Figure 28 of the final EIS and any other priority conservation areas on the adjacent mainland.

Construction Safeguards

16. Based on the above safeguards, and after consultation with the Conservation Commission, NTEC to develop detailed guidelines for environmental protection for inclusion in contract conditions.

APPENDIX B

CONSERVATION COMMISSION COMMENTS ON THE DRAFT EIS

CONSERVATION COMMISSION COMMENTS ON THE DRAFT EIS

The Draft EIS for the Channel Island Power Station identifies all the expected and potential environmental problems. Each is discussed to some extent ranging from a superficial statement to a comprehensive report detailing the investigations performed to define the problem. Proposed measures to mitigate the problems have been outlined in Chapter 13, Environmental Safeguards, although it is indicated that the details of these measures and related monitoring programmes cannot be established until the design study is well advanced.

However, some requirements of the monitoring programme influence the design of certain facilities of the plant. Therefore, it is recommended that the monitoring programme be further defined. Specific comments with regard to this aspect are discussed below and if NTEC would like some assistance with the definition of the programme they may contact the Environment Unit who have some expertise in this field.

13.1 Land Environment - The statement suggests consultation with the Land Conservation Unit of the Conservation Commission to ameliorate soil erosion, a liaison that should already be well advanced. It is essential that Land Conservation Unit be approached by NTEC before site clearance gets under way.

13.2 Estuarine Evironment - The draft statement contains no estuarine monitoring system. It is requested that NTEC produce a system for this Unit's appraisal before publication of the final EIS; the proposed monitoring system should contain the following:

1. Details of the chlorine injection system and a continuous monitoring device for outlet canal chlorine concentrations.
2. A plan of monitoring sites in the vicinity of Channel Island, including a control site away from the power station influence.
3. Provision for measuring appropriate environmental variables (e.g. temperature, turbidity, salinity, silicate ion, etc.) at the monitoring sites.

4. A system for monitoring the effects on mangrove mangals in the vicinity and the unique coral reef between Channel Island and the mainland.

5. A monitoring system for the ash pond free water quality.

In an effort to further reduce the effects of the cooling water plume, the following strategy is suggested: instead of passing the total volume of the inlet water through the condenser cooling system, an inlet pumping system twice the capacity of that currently envisaged should be installed with half of the entrained water bypassing the condensers to remix with the heated effluent before re-entering the estuary. This would dilute both the temperature and chlorine load before the effluent impinges onto the ambient system.

The final EIS should include a schedule for the above monitoring system to include pre-generation figures, and contain details of NTEC investigations into the permeability of the ash lagoon base strata.

13.3 Air Environment - Monitoring of stack emissions will be required throughout the life of the project. Provision for sampling the stack either by automatic or manual equipment should be incorporated in the design of the stack. Analysis for total particulates, sulphur dioxide, nitrous oxides and carbon dioxide should be performed on a regular basis. This will also serve as a check on the efficiency of the precipitator.

It is recommended that ambient air quality monitoring be performed for both occupational health reasons and to monitor environmental effects.

The control of dust emissions from most possible sources appears to be adequately described except for the pulverising circuit. Is this a totally enclosed circuit or if not is there a need for a wet scrubber?

13.4 Visual Environment - The visual impact of the overhead transmission lines to the future residents of Palmerston may be of sufficient importance to warrant further consideration.

13.5 Acoustic Environment - A survey of noise levels should be performed shortly after commissioning to confirm the levels predicted in the EIS. In conjunction with this survey, the noise levels around the plant should be measured for occupational health purposes.

13.6 Historic and Archaeological Factors - This should contain a categorical undertaking from NTEC to advise any contractors or other authorities working on the power station project of the existence of archaeological sites in the vicinity and of the fact that they are protected by N.T. legislation. Periodic onsite liaison with a representative of the Museum is indicated. Further protection strategies, adopting the ICOMOS guidelines and the other suggestions incorporated in this section, need to be generated and reviewed before the commencement of construction operations on the Island. The final EIS should contain NTEC's recognition of this aspect.

13.7 Recreation - As no detailed discussion has been held on the proposed establishment of a reserve for scientific or recreation purposes on the mainland adjacent to Channel Island, the statements in this section could be misleading. While we do not disagree with the need to cater for the recreational and other requirements along the lines suggested, no decisions have been taken at this stage, although this could be implied from the style of presentation of the information in this section. It is suggested that the section be revised and the Environment Unit could assist in this regard.