Port Moresby Town
Local Development Plan

Volume 2

Background Information

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1 Introduction

1.1 Framework of the Study

The Local Development Plan for the Town Area of Port Moresby is a significant undertaking. The study area contains activities and areas of great significance for not only the National Capital District (NCD), but for Papua New Guinea as a whole. The exact boundaries of the study area are shown on **Map 1** (included with other maps at the rear of this document) and illustrated in **Figure 1.1**.

Figure 1.1: Port Moresby Town, Local Development Plan Study Area

At its heart is the town centre of Port Moresby, containing the most substantial business area in the country. Adjoining the town centre is the second-largest Port in the country. At the northern edge of the study area is Konedobu, the original administrative centre for PNG, though now secondary to Waigani.

The study area is also one of great natural beauty. The main visual features are the dominating hills, which provide a "necklace" around the area, juxtaposed with the waters of Fairfax Harbour.

The Plan is to be made under the provisions of the PNG Physical Planning Act 1989. This Act provides a comprehensive mechanism for physical planning at the National/Provincial levels of Government and provides powers for the planning and regulation of physical development and land use in Papua New Guinea. Within the NCD, most of these functions are implemented by the National Capital District Physical Planning Board (NCDPPB), which is administered by the National Capital District Commission (NCDC).

Preparation of the Plan flows directly from the 1996 Urban Development and Services Study (UDSS), commissioned by the NCDC as a broad framework for the management of growth

and development in the NCD. The UDSS made many recommendations in relation to the future management of the NCD, including the creation of fourteen planning districts that would be subject to detailed Local Development Plans (LDP's). The LDP for the Town Area is the first of these. The work completed within the 1996 UDSS has been the primary reference point for this report and is drawn on extensively.

The study is being undertaken in the following sequence:

Phase 1 Context of the Plan completed in September 2001;

Phase 2 Analysis and Plan,; and

Phase 3 Implementation Strategy, undertaken between June and September 2005.

Phase 1 work has subsequently been printed as Volume 2, Background Information: and Phase 2 and 3 comprise Volume 1.

A Project Management Team has been established to oversee the progress of the study, with membership drawn from a range of government agencies, the private sector and community interests. The membership of the PMT is provided as **Appendix B** to this report.

1.2 Scope of Report

This report completes Phase 1, documenting data collected to establish a comprehensive basis and context for the study.

Information presented in this report aims to comprehensively provide the background to and key characteristics of the study area in relation to physical, social, environmental, economic, administrative and infrastructure features. Issues and characteristics have been investigated and recorded, to serve as inputs to the subsequent process of analysis and Plan development.

This information is structured around the following key sections:

- National, Provincial and Urban Context;
- Physical Environment;
- Cultural, Social and Economic Context;
- Built Environment; and
- Policy Context.

It should also be noted that this report is essentially a "work in progress" and will require further updating and review as the study progresses. More than anything else, it is a resource to ensure that Phase 2 of the study – Analysis and Plan, is properly informed.

Limitations, where they occurred, have been documented. They include such things as:

- reliability, where records have not been kept, and information is obtained by survey within project constraints;
- accuracy of previous records and reports relied upon; and
- currency of information, such as that relating to infrastructure and development approvals, where there is a backlog or inadequacy in records maintenance.

1.3 Objectives

The objectives of the study, as set out in the project brief are:

1. To assist the NCDC and NCD Physical Planning Board prepare a Local Development Plan for the study area.
2. To assist with institutional strengthening of the NCDC by providing training to counterpart staff.

The principal objective of this first phase of the study is to assemble the range of information required in subsequent stages, formulating the Local Development Plan and developing a framework for its implementation.

In doing so it must identify factors which are relevant to the process, and how they relate and interact. As such the Phase 1 study will provide the tools for planning analysis, and later planning decisions.

The study aims to understand and document any problems which exist in coordination and delivery of the multiple services and systems impacting on orderly development in the area. It should also provide a useful resource document for NCDC and departmental use in streamlining future management. It will identify the need for intra- and cross-government cooperation.

NCDC counterparts were actively involved throughout the study, both in the field and the office. Fields of participation included engineering infrastructure, physical planning, settlements, community and social services, and mapping. The involvement had significant benefits on both sides. It has contributed to institutional strengthening of planning processes within the NCDC, and will assist future implementation of the Plan.

The study maximised community participation through contact and meetings with stakeholder groups, with the aim of developing a plan for which there is a sense of ownership and commitment for its success. There was an open invitation to stakeholders to make comment at any stage of the work.

1.4 Methodology

Preliminary project planning established the total framework for data and information collection, reflecting the scope of the Terms of Reference and associated considerations.

Parallel investigations occurred over a seven-week data collection period in fields of planning, engineering infrastructure, environment, culture and socio-economic issues. Within each discipline, the best sources of information were identified, and individually programmed. More detailed information on methodology for each section of this report is presented in the relevant chapter.

The range of activities covered primary and secondary research and included:

- review of previous reports;
- review of legislation and other legal instruments;
- review of existing policies;
- data collection from various government agencies;
- site visits and inspections;
- field interviews and questionnaires; and
- use of field assistants and local informants, particularly within settlement areas.

Documentation of information has included mapping, reporting, tabulations and photos, as appropriate and presented throughout this report. This has involved the extensive use of a Geographic Information System for data management and presentation.

A difficulty in presentation of the scope of information in this report has been the inevitable compromise between stand-alone content (often in considerable detail) and attempting to provide a clear overall picture. A huge volume of material has been prepared in Phase 1 and judgements have been made in relation to the presentation of this material, in order to ensure that this document is both manageable and comprehensive. Additional material will be drawn upon as the study progresses.

2 National, Provincial & Urban Context

2.1 National Context

The location of the NCD, in which the study area is based, is depicted in relation to neighbouring provinces and to Central Province in **Figure 2.1.**

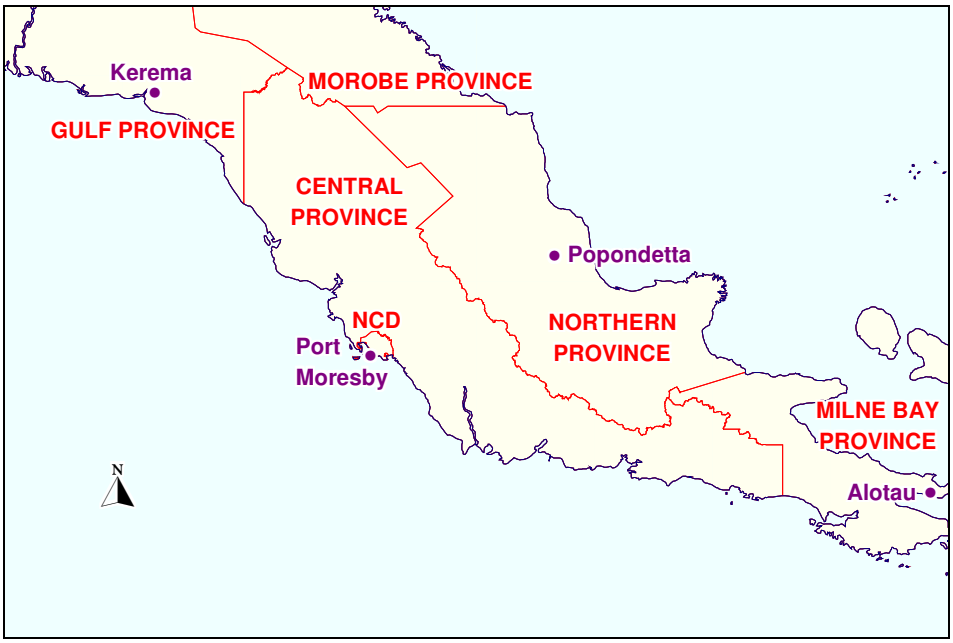


Figure 2.1: Regional Location of NCD

2.1.1 Role of the Area

a Traditional Settlement

The traditional settlers of the city of Port Moresby are known as the Motu Koitabu people. The Motu and Koitabu people originate from different and unrelated backgrounds but have – over the millennia – integrated culturally.

The Koitabu people are a land based people, who speak a Papuan Language which belongs to the Koiarian Family. The Motuans were a maritime people who appear to have arrived in the area after the Koita people. The Koitabu and Motu people are discussed more fully in **Section 4.2.2.**

b European Settlement

Port Moresby was named after the first European explorer to sail into the harbour in 1873, British sea captain, John Moresby. European population settlements and administration of selected areas were established shortly thereafter. Port Moresby was declared a British

Protectorate in 1884 and was established by the British Administration as the seat of government and sole port of entry to Papua.

The location was chosen because:

a) it was the only place where any permanent colonial settlement had occurred;

b) it enjoyed relative healthiness; and

c) its vicinity and easy access, especially for sailing vessels to Cooktown and a telegraph station.

The Port Moresby town area was the main part of this settlement, and the town centre still follows the original grid pattern prepared by W A Cuthbertson in 1886. This area of relatively flat land between Paga and Touaguba Hills was designed for the exclusive use of European settlers and sought to achieve standards of planning, building and services comparable to a typical western town of the time.

Using the Queensland regulations as a guide, he divided the land into quarter-acre allotments and established two townships, Granville east and Granville west. These are the areas of present day Konedobu and town centre respectively (Oram 1976:25-26).

Growth of the town took place in parallel with the process of colonial expansion and economic growth of the country. As the settlement grew, development expanded onto the slopes of Paga and Touaguba Hills, with the grid road pattern being replaced by a random series of tracks that followed the contours of these relatively steep slopes.

Substantial expansion of the city did not occur until after the end of WWII in 1945 and until this time, the majority of development was within the study area. From a population of 5,000 in 1946, the greater city of Port Moresby expanded rapidly across the flatter valley areas to the north-east and had reached a population of 77,000 by 1971. The recently released preliminary census figures for the year 2000 show a population of 252,469 for the whole of the National Capital District (NCD) area.

c *Recent History*

The town area of Port Moresby has continued to grow and remains the business hub of PNG. Since the 1970s, the National Government has had in place a policy to develop Waigani as the administrative centre for the nation and move functions from the town centre and Konedobu.

The national seat of Government moved from the town centre to Waigani in the early 1980s with the opening of the new Parliament House. Administrative functions continue to move slowly out of Konedobu, although government-owned corporations (such as the PNGBC) remain in the town centre, reinforcing its central role in business activity.

The role of the study area in the life of PNG has been prominent since colonisation, and the combination of historical development, natural attributes and business activity indicate that this prominence will not diminish in the near future.

2.2 Provincial Context

As illustrated by **Figure 2.1**, the NCD and study area are located centrally along the coast of Central Province. The NCD was annexed from Central Province after independence and has operated relatively independently since that time.

Administrative functions of the Central Province Government have remained in the study area though the Provincial Government intends to move its administrative headquarters to Central City in the Bautama area, close to the boundary with the NCD.

Ties between the study area, NCD generally and Central Province are close and will remain so, with Port Moresby acting as a major magnet for economic and social activity.

2.3 NCD Context

The study area is a small but significant area in the National Capital District, and is shown in **Figure 2.2**. Having a total land-based area of only 570ha, the study area comprises 2.2% of the total land area of the NCD (approximately 25,500ha). In terms of population, the study area houses 15,138 people, out of 252,469 across the NCD, or approximately 6% of the total population.

The study area, however, contributes "well above its weight" in terms of its contribution to the NCD. The area is probably the greatest single contributor to the perceived character of Port Moresby, with rugged summits rising above the Harbour and a beautiful beach, in close proximity to traditional villages.

The town area is also a major contributor to employment in the city, with substantial activity in the town centre, Port and Newtown areas. It contains most of the remnant historic buildings and WWII sites in the city and is a hub for social and recreational activity with the Sir Hubert Murray Stadium, Ela Beach and Royal Papuan Yacht Club.

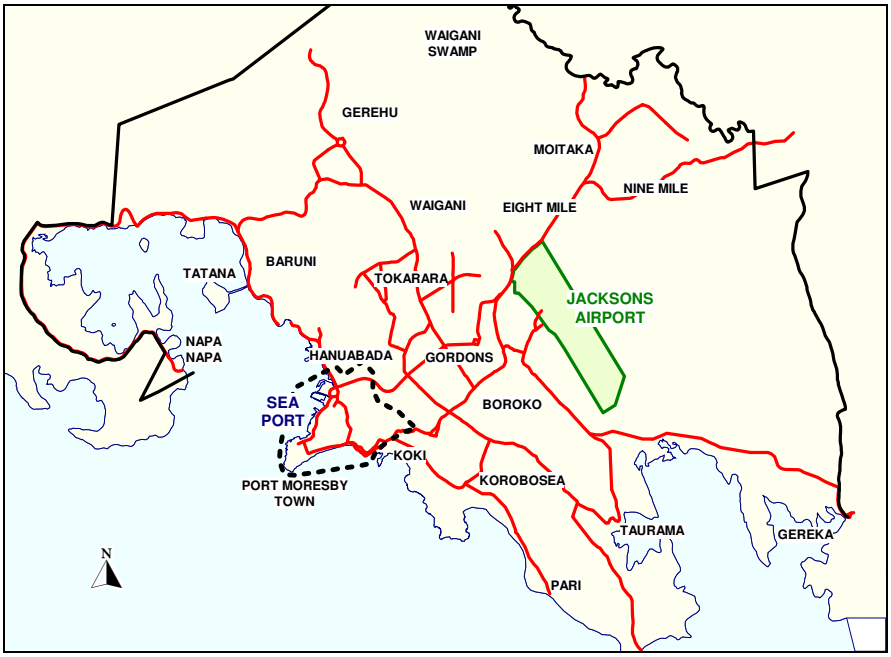


Figure 2.2: Location of the Study Area in the National Capital District

3 Physical Environment

This section provides an overview of the physical environment of the study area, including identification of key environmental limitations and constraints to future development.

In relation to the matters covered in this section, the following maps are of relevance:

- **Map 1** provides a visual illustration of the location of soils and other features present in the study area.
- **Map 2** shows contours, peaks and topography.
- **Map 3** illustrates slopes.
- **Map 4** shows vegetation, natural springs and sensitive environmental areas.

3.1 Geology & Soils

3.1.1 Soils

The dominant soils of Port Moresby, according to Bleeker (1983), can be identified under a group of soils called Ustropepts. These soils have a very local distribution and are more commonly known as Brown Clay soils.

Ustropepts are relatively shallow soils rich in bases and are typical of low rainfall areas with a pronounced dry season and a vegetation of eucalypt savannah. Since this type of climate is rare in Papua New Guinea, these soils cover only small areas and are mainly confined to a narrow coastal strip in the Central Province.

These soils are derived from fine textured sedimentary rocks rich in calcium and magnesium. They are only slightly leached and commonly contain fairly high amounts of exchangeable sodium in the subsoil.

Soils in the study area are divided into three zones. The Hill slope, Foot slopes and the valley floor. The most fertile are the hill slopes and the foot slopes due to the soils being well drained. Also all the topsoil from the top of the hill is washed down to the bottom of the slopes or are deposited in the hill slopes. Gardening activity on the hills has also speeded up the soil erosion from the top to the bottom clogging up drains etc (refer to discussion under Erosion and sedimentation below).

The pH of these soils are all within 6.0 – 7.0, indicating that the soil is not acidic and that all the basic nutrients required by plants are available. Soils on the valley floor are slightly acidic due to heavy leaching of the bases and soils becoming water logged during the rainy season.

a Hill slopes

The soils on the hill slopes are mostly grey brown to orange brown on steep slopes and dark grey to black on gently sloping hills. These soils contain in various percentages angular to blocky gravel of 2-6mm, sand and silt in the top profile. Further down the profile either the soil is clay or contains residuals from weathering of parent rock materials which were mainly limestone dolomite and gypsum with brown chert.

Soil tests conducted on the soil shows that calcium is predominant due to the nature of the parent material, followed by magnesium, sodium and potassium.

b Foot slopes

Foots slope deposits have been developed from slope wash and soil creep under the influence of gravity and water. These soils are mainly alluvial or colluvial by nature and they range from dark grey to black and grey brown to orange brown. The soil consists of angular gravels of varying sizes but mostly of silt, fine sand and clay. The pH of the area is slightly acidic to neutral.

c Valley Floor

Soil deposit here is mainly alluvial. These soils are mainly Vertisols, which shrink when dry and swell and become very sticky when wet. The clay mineral montmorillonite dominates. These soils are often acidic to neutral. Particle size analysis done on the soil shows 4% gravel, 18% sand, 14% silt and 64% clay. The colour of the soil range from grey to black (Poiya 1999).

3.1.2 Foundation Conditions

The foundation conditions for the various geological features are shown in **Map 1** and detailed below.

a Port Moresby/Paga Beds

Mudstone has a high bearing capacity (Qu range 20 – 200MPa) and low compressibility. Heavy foundations loads can be carried on shallow foundations.

b Hillslope Deposits

The clayey and sandy gravels of these deposits are generally less than 2m thick and are underlain by relatively stable weathered mudstone. Foundations are commonly founded on the underlying mudstone bedrock.

c *Footslope Deposits*

Typically, these deposits contain clay with varying amounts of sand and gravel with medium to low compressibility. The clay content can be classified as inorganic clay with high plasticity (CH – Unified Soil Classification System).

Light, flexible structures can be safely constructed on shallow strip or pad foundations. Taller and heavier buildings will probably require piled foundations[1].

d *Valley Floor Deposits*

Deposits consist of sandy, silty clay material with a top layer of slightly organic clay and have a high shrinkage capacity. Whilst light and flexible structures are not prone to vertical movement during seasonal changes in soil-moisture content, heavier and rigid structures need to be founded on deeper and more stable material or pier and beam construction.

e *Beach Sand*

Light foundations can be safely founded on shallow footings but large building should be carried on piles.

f *Reclaimed Land*

Numerous sites have been reclaimed throughout the project area, notably the Royal Papua New Guinea Yacht Club and Harbour City sites. Both of these sites were reclaimed using material from the Poreporena Highway.

The subsurface conditions below seabed level generally comprise loose coralline sand and silt overlying soft silty clay at a depth between 4-6m. Dredging of reclaimed areas is generally not required.[2]

The reclaimed land and the underlying material require adequate compaction and consolidation. Raft, pier, strip and piled foundations need to be assessed, depending on the building loads.

3.1.3 Slope Stability

Port Moresby/Paga Beds (Mudstone) are massive and generally stable. However, as described in the Urban Development and Services Study extensive residential development on Paga Hill and Touaguba Hill are 'vulnerable to failure from even minor seismic activity'[3]. On steep slopes major cuts are required into the hill with excavated material used to fill large areas. As such, the fill areas on these steep slopes are susceptible to instability and the

[1] Page 23, Port Moresby Urban Geology (Memior 1), Geological Survey of Papua New Guinea, undated
[2] Appendix A, Port Moresby Port, Foreshore and Road Prefeasibility Study, Maunsell Consultants, 1986
[3] Section 4.4, Chapter 9, Urban Development and Servies Study, Wilbur Smith, 1996

cut faces, when exposed to the weather, may fracture and erode. This problem is further compounded by the ingress of water by leaking water mains, sewers and poor drainage. It is therefore considered prudent for sites to be considered case-by-case.

Hill-slope deposits however, could be susceptible to slope instability. This is particularly the case at the fault between Paga Hill and the hill-slope deposits in the saddle between Paga Hill and bedrock of Touaguba Hill. Of concern is the generation of pore water pressure within the soil, thus weakening the soil and increasing the possibility of slope failure. According to Geological Survey Section (Department of Mineral Resources), these pressures can be readily generated during localised movements along the fault.

Footslopes and Valley floor deposits are generally of grades less than 15% and do not pose a slope stability problem.

3.2 Topography and Geomorphology

3.2.1 Topography

Within the confines of the project boundary, a central spine rises from the shoreline to a height of 170m. There are five principal hill features including Touagaba and Paga Hills. The terrain is steeply undulating, posing engineering geology problems: steep grades and slopes exceeding 50%. The undulating and steep, hilly terrain ensure water supply, roads and drainage are expensive to construct and maintain. The topography of the study area is shown on **Map 2.**

The harbour is a natural deep-water port that provides good protection under all weather. The port has a maximum usable depth of 11 metres.

3.2.2 Slopes

Map 3 shows the slopes within different ranges. The commercial and industrial precincts are mainly constructed in areas of slopes less than 15% (8.5°). High and low cost residences are constructed in areas with slopes mainly between 15-50% (8.5°-26.6°). There are only very small patches of slopes between 50-100% (26.6°-45°) and these are restricted to cut slopes. No slopes are above 100% (>45°).

3.2.3 Erosion and Sedimentation

a Sediment Wash-off and build-up

Currently about 2,000m^3 of material is removed from the drainage courses each year. Approximately half of this amount is sediment and the other half rubbish and debris. Sedimentation is accelerated by the growth of water hyoscine in the drainage canals.

The source of sediment build up is primarily land disturbance from new construction and erosion from hillside burning off and farming practices[4]. The Burns Peak and Port Moresby/Paga Beds (mainly calcareous and siliceous mudstone) is highly erodable after the slope face is disturbed through excavation. The first 300mm of the mudstone weathers and fractures quickly, contributing to the sediment load. It is anticipated, through weighting coefficients of proportions of disturbed and developed land, that the rate of erosion will accelerate as development and farming increases.

Sedimentation and rubbish commonly block pipes, culverts and other structures and is a ubiquitous problem for the stormwater system. After long, dry periods, localised nuisance flooding routinely occurs at numerous sites within the area.

3.2.4 Geomorphology

Port Moresby is part of the al region known as the Southern Plains and Lowlands. In general, the Port Moresby area consists of low hills and ridges formed on moderately to steeply dipping, highly deformed early Tertiary sedimentary rocks including, chert, sandstones and siltstones. There is generally a clear alignment of ridges and intervening low-lying areas within the rocks. The development of cliffs is restricted to the Paga Point where the foothill reaches the sea.

The area has a rather distinct geomorphic character because the low seasonal rainfall results in a savannah-type morphogenetic regime similar to that of northern Australia but quite unlike the humid tropical regime dominating most of Papua New Guinea. This is also the reason for a degree of landform stability with landforms, surface deposits and weathering profiles inherited from an older landscape cycle not to be found anywhere else in Papua New Guinea. A well-developed actively growing fringing reef complex surrounds the Port Moresby Harbour. Within the bay itself, reef growth and development has ceased due primarily to human activities including the construction of the wharf facilities, Harbour City and the Royal Papuan Yacht Club.

As stated above, the low seasonal rainfall is partly responsible for the landscape stability of the Port Moresby area. Field observations indicate that erosional features like landslides and slips and gullies are rare, apart from excavation features created by man. Coupled with the low rainfall, the slopes are usually covered with a dense growth of grasses, which impedes sheet and gully erosion. The activities of earthworms and termites are important in that they work through the soil shifting soil particles from the lower soils horizons to the surface. While earthworms may require a considerable amount of moisture, termites are more important in the area they tend to occur predominantly in dry or seasonally dry areas. The contribution of termites to slope and soil formation has not been studied in Papua New Guinea but investigations from northern Australia indicate that termites are capable of moving large amounts of soil.

[4] Section 7.2.3, Port Moresby Urban Stormwater Management Study, SMEC 1995

3.3 Climate

3.3.1 Overview of Climate

In terms of climate, Port Moresby is one of the driest regions of the country with a mean annual rainfall of between 1000mm and 1500mm. Broadly speaking, there are two distinct seasons: a 'southeast' or generally dry season and a "northwest' (mainly wet) season. The southeast season from May to October is the time of the south-easterly trade winds. As indicated by Table 3.1and Figure 3.3, the monthly rainfall for this period is low. By the beginning of December equatorial winds from the west have moved south to flow over the area, and remain prominent until March. During the northwest season, rainfall can be twice as much as in the southeast season.

Rainfall records indicate that over the last few years the weather conditions in Port Moresby have been wetter than normal. The wet season has persisted longer from the November-December period to about April with the relatively shorter dry season occurring between June and October. Any number of explanations, including variations in the microclimate, can be responsible for this development. One possibility is the warmer surface temperatures over the Bismarck Archipelago, caused by geothermal heating, which has the potential of affecting the general circulation of surface winds and ocean currents around the PNG mainland and associated islands.

Table 3.1: Average Annual and Monthly Rainfall Records – Port Moresby, 1990-2000

Month	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Mean	187.0	191.1	224.4	147.8	112.3	22.6	16.2	29.1	16.7	31.7	48.5	88.2	1115.6
Max	420.4	303.0	366.2	325.6	403.6	174.2	90.2	72.8	62.2	109.2	201.4	162.0	1534.2
Min	80.6	73.4	49.8	48.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	648.0

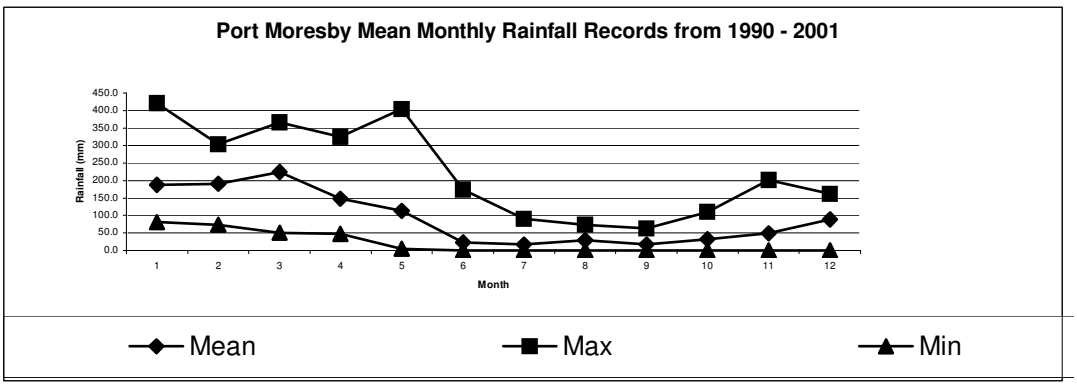


Figure 3.3: Average Annual and Monthly Rainfall Records – Port Moresby, 1990-2000

3.3.2 Climate Change

Climate change is a phenomenon that in time may have significant effect on the study area, through global warming, changes in rainfall patterns and sea level rises.

A recent study in the Western Province (JICA and Unisearch, 2001) has indicated that in some places sea levels have in fact changed. For example the village of Tureture has moved inland by as much as 500m. Similarly, on the Aroma Coast (Central Province), local informants have indicated that the sea is encroaching upon villages like Domara, Tutubu and Kepari and the villages have either moved inland or houses are being built on stilts. Such changes in sea level may not be directly related to global warming, however, its potential impacts cannot be disregarded.

The South Pacific Regional Environmental Programme (1989) postulated that a 2 degree celcius increase in average temperature would lead to a 4m rise in sea level. Such a scenario would have a significant adverse effects on the study area, particularly on low-lying shorelines and reclaimed areas. With a rise in sea level, beach sand will tend to wash offshore. As a result the shoreline will not be as steady and will retreat in many places. Beaches that rely on obtaining sand and sediment from further alongshore will receive less – another factor increasing erosion and shoreline retreat. Coastal erosion would be even worse for Port Moresby because when rainfall is reduced, sediment from the land is likely to drop.

Some scientists believe global warming may raise average temperatures by 4 degrees Celsius as a result of a fourfold increase in global carbon dioxide (CO_2 – twice the present calculated increase (SPRE, 1989). This could be devastating for much of the South Pacific. If the present Southern Hemisphere patterns were intensified, many areas now short of water in the dry season would become markedly drier with desertification a possibility. With a 4 degree warming, most of Papua New Guinea would get 15mm less rain per day on average compared with a reduction of 1mm associated with CO_2 doubling. This would be catastrophic for centres such as Port Moresby, which already suffers water restrictions in June – August and depends on the December – March rain.

At present, Port Moresby is little affected by tropical cyclones. With a global 4 degree warming and possible northward displacement of the equatorial weather trough in the southern summer, this zone could extend north to the sea between PNG mainland and the Solomon Islands, the zone of tropical cyclone formation. The result: more cyclones would hit Milne Bay, D'Entrecasteaux and Louisiade archipelagos. The storms could make the same track as cyclone Hannah, which caused considerable damage in the Tufi – Milne Bay area in 1972. Tropical cyclones could push further south than now because of increased sea surface temperatures.

These predictions, based on the movement of the 'meteorological' equator, all assume that the circulation in the Southern Hemisphere will be much stronger, with a 4 degree warming, and that present atmospheric circulation conditions will not change in the sub tropics. In other words, this represents a worst-case scenario.

3.4 Vegetation

A number of vegetation types occur within the study area and are shown on **Map 4**. The common and extensive type is the savannah grassland. Others include remnants of deciduous forest, beach forest and mangrove forest. This section briefly describes the vegetation types of the Port Moresby Bay and the surrounding hills.

3.4.1 Beach forest

The original luxuriant beach forest occurred around Ela Beach some years ago but has since been replaced or degraded as a result of development on the waterfront. Remnant plant species of the original forest exist but scattered throughout the bay. Representative plant species include *Hibiscus tiliaceus, Calophyllum inophyllum,* and *Casuarina equisetifolia* are still persistent within the bay especially around Ela Beach, Paga Point, and Badili. The current flora now is a mixture of native and exotic plant species with the latter being more abundant.

3.4.2 Mangrove forest

Evidence indicates that mangrove forest once occupied some sections of the area from Koki to Hanuabada but was over exploited to extinction by coastal dwellers and land refills. Currently no mangrove species are found within the Port Moresby Bay except outside the study area towards Baruni and the Bootless Inlet.

3.4.3 Savannah grassland

This is by far the most common vegetation type around the Port Moresby Bay including the surrounding hills (Paga Hill, Burn Peak) and areas included in the study. The proportion however, is greatly reduced. Within established settlements, savannah grassland intermingles with exotic plant species. Common grass species include *Themeda australis, Panicus micranthum, P. viale, Ophiuros tongalingii* and in some instances the kunai grass - *Imperata cylindrica*. Shrub and trees are scattered and comprise *Antidesma gaeshembila*, several species of eucalypts (*Eucalyptus alba, E. confertiflora, E. tereticornis*) and the gymnosperm, *Cycas circinalis*.

3.4.4 Deciduous forest

The only remnants of this forest type can be observed near the foot of Burns Peak and on well-drained areas. Plants usually present in this forest type include *Garuga floribunda, Cochlospermum sp., Jossinia desmantha,* and *Canthium sub-orbiculare*.

3.4.5 Introduced flora

There is no proper account of the number of exotic plants introduced into the Port Moresby area. However, common plants observed in the area include the *Samanea saman* (rain tree) *Peltophorum sp., Sesbania sp., Sanseviera sp., Cassia grandis, Delonix raggia, Hibiscus*

roseus, Adenanthe sp., Azadarachta indica and *Bauhinia spp.* Most are highly adaptive to the dry condition of Port Moresby and have become naturalised. They are also highly competitive against the native floras. *Sansevieria sp.*, for instance, escaped and is establishing well outside the Port Moresby. *Azadarachta indic*, a native tree of India and introduced some years ago by the National Capital District, is well established with new propagules cropping up in settled and disturbed areas.

3.4.6 Impact of development on vegetation

The expansion of the city combined with over exploitation by the human population has seen much of the original vegetation types being diminished. A large proportion of the landscape has been reshaped and reorganised to cater for new infrastructure, while increased population has completely wiped out the remaining trees for building and fuel purposes.

3.5 The Marine Environment

This report provides an overview of the marine environment within the Port Moresby Bay based on visual observations and recent ecological surveys (Maniwavie et al 1998) of the area. The marine environment of the Port Moresby embayment is part of the western sector of the Papuan coastal lagoon. It includes marine habitats enclosed from Gemo Island to the Pyramid Point, and past Pari Village. The embayment includes several smaller bays such as the Fairfax (Port Moresby) Harbour, Walter and Joyce Bays. The embayment is separated from the open sea by a discontinuous coral line barrier reef that occurs at the edge of a narrow continental shelf approximately 3 km offshore (Moore 1981a). There are two major inlets; the Fairfax Harbour and the Bootless Inlet.

The Port Moresby Bay has been known to support subsistence and small-scale artisanal fisheries. In the communities throughout the Bay, fishery related activities are important components of the local economy. Additionally, the bay provides recreational benefits and is regularly used for diving, boating, recreational fishing, and swimming. The Bay also supports a high concentration of urban settlement as compared to other Papua New Guinean cities/towns (Opu et al 1998).

3.5.1 Marine habitats

Distinct habitat types occur within the Port Moresby Bay, all of which provide important shelter, foraging and nursery sites to marine organisms. These include the shoreline, the intertidal zone, the seagrass beds, the shallow submerged reef, the reef slope, and the basin floor.

Shoreline - the shoreline generally separates terrestrial from marine environment. The substrates are made up of one or combination of rocks, rocky cliff, boulders, sand, and coral rubbles. Within the Port Moresby Harbour the shoreline is rocky except for Ela Beach.

Intertidal Zone - the intertidal zone is a portion of the beach that is submerged during high tide and exposed during low tide. The width of the zone ranges from 1 to 3 metres. The substrate is predominantly sandy/silty but in some areas coral rubbles exist. The seagrass species *Syringodium isoetifolium* and *Thalassia hemprichii* dominate the sandy/silty substrates while assemblages of different algae occur on coral rubbles. This zone is highly degraded due to prolonged exposure, over-harvesting and activities resulting from landfill.

Photo 1: Shoreline and Intertidal Zone at Ela Beach

Seagrass Beds - seagrass beds extend beyond the intertidal zone. The substratum is generally sandy with patches of coral rubbles and boulders. A number of seagrass species co-occur here including *isoetifolium*, and *Halodule uninervis*. Where coral rubbles and bounders exist the brown algae *Padina minuor*, *Sargassum* sp., *Turbinaria* sp., and *Hamelida* become dominant.

Seagrass beds serve as an important foraging site for juvenile fishes. Maniwavie et al (1998) observed abundant juvenile fishes foraging in this zone. In a recent study on nearby Motupore Island, Kawanamo (1997) reported 47 species of coral reef associated fishes in the seagrass beds.

Submerged Reef Flat - the depth of the submerged reef flat does not exceed 4 metres. Mixtures of substrates, ranging from sand to boulders exist in this zone. A wide range of organisms inhabits this area, including snails (gastropods), sea urchin (echinoids), sea cucumbers (holothurians) and *Choriaster granulatus*. The sea urchin *Diadema setosum* occur in large aggregations and seem to graze on rubble and boulders.

Reef Slope - the inclination of the reef slopes within the Port Moresby Harbour and the surrounding areas varies from shallow (0-20°) to moderate (21-45°). The edge of the reef slope is broken and undefined. Areas of rubble sand, algal assemblages, and live corals made up the slope. Coral growth occurs down to less than 10 metres.

Basin Floor - the basin floor has a depth of more than 10 metres. The substratum is composed of sand and silt that support an array of polychaetes (sea worms), crustaceans (crabs), and holothurians (sea cucumbers), the latter being the most abundant.

3.5.2 The Marine Community

The Port Moresby Bay supports a large array of marine life. The distribution of the marine life appears to be influenced by the availability of habitat types, the hydrological cycles, and other environmental parameters such as precipitation, temperature and wind. Currently, there is inadequate information on the number of organisms dwelling in this marine environment. However, an indirect indication can be sorted from the distributions of corals, seagrass and mangrove ecosystems since these systems are highly correlated with biological diversity.

The corals in the Port Moresby Bay are distributed in a patchy manner. In sheltered bays, luxuriant growth can be found. Maniwavie et al, (1998) sighted 7 families of corals between Paga Point and Pyramid Point. The common coral families throughout the Bay are the branching and tabulate corals (Acroporidae), branching corals (Pocilloporidae and Milliporidae), brain or massive corals (Poritidae), and soft corals (Alcyoniidae). Similar corals are expected in the Fairfax Harbour.

Table 3.2 provides an overview of coral types found in the area (Modified from Maniwavie et al. 1998).

Table 3.2: Common coral families and other benthic life forms recorded from Paga Point to Pyramid Point

Site	Most Common Coral Families	Other Common Benthics
Paga Short Overflow	Alcyoniidae, (Sinularia sp.), Acroporidae (tabulate)	Algae (*Sargassum sp., Padina minor*), Sea grass (*Syringodium isoetifolium*
Arakuti reef Ela Beach	Acroporidae, Pocilloporidae	Cone shell (Conidae), Algae (*Padina minor, Sargassum sp.*) Sea grass (*Halophila ovalis*)
Badili out fall	None	Sea Urchin (*Diadema setosum*), sea grass (*Enhalus acoroides*)
Duagena Island	Pocilloporidae, Acroporidae, Milleporidae	Algae (*Padina minor*) *Gymnospora*, Sea cucumber- Holothurians (*Holothuria fuscogila* & *Theoenota anax*)
Joyce Bay out fall	None	Sea grass (*Enhalus acoroides*)
Manubada Island	Milleporidae, Acroporidae	Coraline Algae
Joyce Bay Vabukori village	Milleporidae, Poritidae	Sea cucumber –Holothurian (*Holothuria fuscogila*)
Joyce Bay site 2	Milleporidae, Poritidae	Coraline algae
Joyce Bay Site 3 Pari village	Acroporidae, Faviidae, Fungiidae, Dendrophyllidae, Pocilloporidae	Algae (*Halimida*)

Joyce bay (Pyramid point)	Acroporidae, Faviidae,Fungiidae, Pocilloporidae	Algae (*Halimida*)

Similarly, seagrass beds occur in patches in the Port Moresby Bay. Based on herbarium records, literatures and virtual observations of seagrasses, approximately ten species in two families (Hydrocharitaceae and Potomagetonaceae) occur in the bay. These include *Enhalus acoroides*, *Thalassia hemprichii*, *Halophila ovalis*, *Halophila ovata*, *Halophila decipiens*, *Halophila spinulosa*, *Halodule uninervis*, *Halodule pinifolia*, *Cymodocea rotundata*, *Cymodocea serrulata*, and *Syringodium isoetifolium*. Of these, *Thalassia hemprichii* appear to be the most abundant and are usually exposed during low tides.

Macro algae (sea weed) are a common feature of the marine environment. In the bay they are represented by species of *Sargassum*, *Padina*, and *Turbinaria*.. Coraline algae are present that include several species of the genus *Hamelida*., associated with sandy substrata.

There is limited information on the total diversity of fishes in the area. However, 43 commercially fished species are found within the bay and adjacent areas, and are listed **in Table 3.3** (Federizon and Anas, 1997).

Other obvious life forms found in the Bay include several species of sea cucumber, sea urchin, star fish, crustaceans, and gastropods.

Table 3.3: List of commercially fished species recorded in the Port Moresby Bay and adjacent areas

Family	Genus	Species	Common Name
Balistidae	*Abalistes*	*stellatus*	triggerfish
Acanthuridae	*Acanthurus*	*nigricauda*	surgeonfish
Scaridae	*Bolbometopon*	*muricatum*	parrotfish
Carangidae	*Carangoides*	*ferdau*	jacks
Carangidae	*Carangoides*	*fulvoguttatus*	jacks
Carangidae	*Caranx*	*lugubris*	jacks
Carangidae	*Caranx*	*melampygus*	jacks
Carangidae	*Caranx*	*tille*	jacks
Carcharhinidae	*Carcharinus*	*sp.*	shark
Serranidae	*Cephalopholis*	*sonnerati*	sea bass
Labridae	*Cheilinus*	*chlorourus*	wrass
Chirocentridae	*Chirocentrus*	*dorab*	wolf herring
Serranidae	*Epinephelus*	*corallicola*	sea bass
Scombridae	*Euthynnus*	*affinis*	tuna
Scombridae	*Katsuwonus*	*pelamis*	tuna
Leiognathidae	*Leiognathus*	*equula*	slipmouth
Lethrinidae	*Lethrinus*	*erythropterus*	bream
Lethrinidae	*Lethrinus*	*olivaceus*	bream
Lutjanidae	*Lutjanus*	*gibbus*	snapper
Lutjanidae	*Lutjanus*	*kasmira*	snapper
Lutjanidae	*Lutjanus*	*rivulatus*	snapper
Lutjanidae	*Lutjanus*	*semicinctus*	snapper
Lutjanidae	*Lutjanus argenti-*	*maculatus*	snapper
Megalopidae	*Megalops*	*cyprinoides*	tarpon
Holocentridae	*Myripristis*	*violacea*	squirrelfish
Acanthuridae	*Naso*	*unicornis*	surgeonfish
Mullidae	*Parupeneus*	*indicus*	goatfish
Polynemidae	*Polydactylus*	*plebius*	threadfin
Priacanthidae	*Priacanthus*	*hamrur*	bigeye
Scombridae	*Rastrelliger*	*kanagurta*	mackerel
Holocentridae	*Sargocentron*	*spiniferum*	squirrelfish
Scaridae	*Scarus*	*forsteni*	parrotfish
Scaridae	*Scarus*	*rivulatus*	parrotfish
Scombridae	*Scomberomorus*	*commerson*	spanish mackerel
Siganidae	*Siganus*	*argenteus*	rabbitfish
Siganidae	*Siganus*	*doliatus*	rabbitfish
Sphyraenidae	*Sphyraena*	*qenie*	barracuda
Sphyrnidae	*Sphyrna*	*lewini*	shark
Scomberidae	*Thunnus*	*albacares*	tuna
Scomberidae	*Thunnus*	*albacares*	tuna
Hemigaleidae	*Triaenodon*	*obesus*	shark
Belonidae	*Tylosurus*	*crocodilus*	needlefish
Mugilidae	*Valamugil*	*seheli*	mullet

3.5.3 Hydrology and Pollution

a Water circulation

Sound knowledge of the general water circulation in the bay provides a good understanding of the movement of suspended solids/effluents. Moore (1981, 1982a, 1982b) undertook detailed studies of the hydrology of the area and reported the following:

- water movement is predominantly tide-driven;
- the tides of the region (western sector of the Papuan coastal lagoons) are of mixed amplitude and predominantly semi-diurnal. The tidal range is about 3.0 metres with a mean spring tidal range of 1.7 metres. When tidal range is wide particularly during spring tides, the lagoon is completely flushed;
- the theoretical flushing time for the harbour is 5-14 days, in accordance with the prevailing tidal range – shorter flushing time during spring tides compare to neap tides;
- mass water movement in the Harbour is considered to be in gyre, moving in an anti-clock wise flow. A single circulation pattern appears to exist throughout the annual cycle, regardless of the prevailing wind direction;
- the surface current has a mean depth of 1.5 metres. At Paga Point it was recorded at 10-15 metres depth (Maniwavie *et al* 1998); and
- during the dry season the waters develop a vertical homohalinity and become vertically stratified during the wet season. These changes are also influenced by tides entering the lagoon.

b Shoreline Development

Shoreline developments along the seafront impact not only on the marine ecosystem but depending on the location and scale of development, also affect the hydrology of the marine area. This often results in sediment build up along the shoreline, less water movement creating stagnant water bodies, and overall alteration of water current transportation systems which are necessary in flushing out discharges and debris.

Various issues have risen due to shoreline development along the Port Moresby waterfront. Modern coastal development includes wharves, jetties, seawalls, land reclamation, housing schemes and sewage facilities.

While most wharves and jetties are on stilts and posts which pose fewer problems to water movements, land reclamation poses considerable problems. Observations of litter flow and accumulation against the seapark jetty of Ela Beach indicates that the localised inshore current running from Koki to Paga Point may have been affected (Genolagani 1981). The reclaimed landform creates a barrier, affecting the current flow, which results in debris

accumulating on the western sector of the beach. Similarly land reclamation activity near Konedobu and towards the Yacht Club affects water movement into the Fairfax Harbour. This is expected ultimately to lead to a change in the abiotic parameters of the water such as salinity conditions, and the flushing period. This in turn will affect the marine life and mangrove vegetation common to this area.

c *Sewage outfalls*

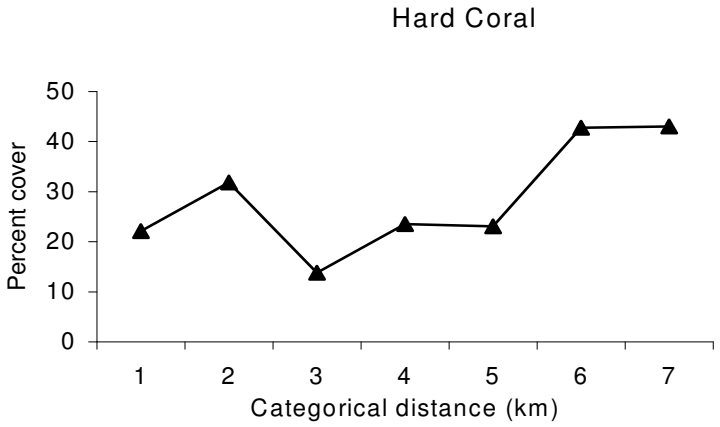
There are eight outfalls that discharge untreated sewage into the Port Moresby Bay, of which one (Paga outfall) is in the study area (refer to more detailed discussion under Sewerage Infrastructure Section). Non-point sewage discharges are associated with villages situated on the waterfront and runoff from unsewered settlements.

3.5.4 The Health Status of the Marine Environment

Given the activities along the waterfront, there is a general consensus that the marine ecosystem of the Port Moresby bay is progressively deteriorating. This is indicated by the health status, and percent cover of corals. Corals are very sensitive to natural and anthropogenic disturbances and can be used as an indicator of stressed coastal marine ecosystem (Opu *et al* 1998). They are part and parcel of the whole marine food web. They also perform other essential functions such as providing refuge and breeding sites for most coral reef organisms. A decline in cover will certainly lead to decline in other associated organisms.

The percentage cover of corals tend to progressively increase with distance from the city (**Figure 3.1**). The area from Paga Point to Koki Point recorded on average 20% coral cover compared to Pyramid Point with over 40% cover. Dead corals were uncommon, indicating some degree of resilience in corals.

Figure 3.1: Relationship between coral cover and distance from town centre



Other observations included a general decline in some organisms. For instance fish life is quite rare within a 50m radius of the Paga Point sewage outfall. At the Koki outfall live corals were absent within a 100m radius of the diffusion area, and only a few fish were sighted.

The inter-tidal zone from Paga Point to Koki Point generally appears to be very highly degraded and polluted as a consequence of land reclamation and rubbish pollution from the main Koki Market and nearby villages. Around Koki the water body is slightly warmer (Maniwavie et al 1998) and seems to remain turbid most of the time. Fish life is very low with occasional individuals of the family *Balistidae*.

It would appear that there is currently little consideration of marine environment impacts arising from development in the study area, and no attempt to restore degraded areas and habitats. This is a matter that warrants further examination.

3.6 Natural Hazards

Although major natural disasters such as volcanic eruptions and catastrophic flooding are relatively unheard of in the area, there is potential for a number of hazardous natural phenomena.

3.6.1 Earthquakes/Tsunamis

The main island of PNG and associated smaller islands are situated between and are part of two major crustal elements, the relatively stable continental landmass of Australia to the south and the deep oceanic basin of the Pacific to the north. According to the plate tectonics concepts, the New Guinea area has lain in the zone of interaction between the northward-moving Australian Continental Plate and westward-moving Pacific Plate since Cretaceous times.

As the Australian plate is moving north and the Pacific plate is moving west the area is subjected to complex structural movements. This is characterised by young folded and faulted mountains, contemporary volcanic and seismic activity and curved chains of islands and ocean rises known as islands arcs.

Calculations have suggested an average return period of about 200 years for an event of intensity MM7[5] (Modified Mercalli Scale). This intensity is likely to cause extensive damage and possibly slope failures. Buildings on flatter areas, founded on alluvium will be most susceptible to damage. This estimation has not been updated since publishing of the Port Moresby Urban Geology (unfortunately this reference is undated, although it would appear to be mid-1970s). An earthquake of intensity of MM7 within the Port Moresby region would justify a higher classification than the current Seismic Zone 4 (or lowest impact).

[5] *Page 13, Port Moresby Urban Geology (Memior 1), Geological Survey of Papua New Guinea, undated*

According to the Principal Seismologist of the Department of Mineral Resources, there is a general concern about application of seismic loads to building design, as Port Moresby has not been exposed to a seismic event greater than MM4. Complacency by designers and developers is already evident. Some buildings have been damaged as a result of minor seismic activity (less than MM4), and the possibility of an event greater than MM4 and the impacts need to be assessed.

3.6.2 Flooding

Papua New Guinea is located well within the Inter-Tropical Convergence Zone (ITCZ) and as a result experiences rainfall rates ranging from "over 1,500mm/yr in the driest coastal regions to over 6,000mm/yr in the wetter upland regions" (McAlpine et. al.1983). Although Port Moresby constitutes one of the driest regions of the country, there is potential for heavy rainfall and the city has had major problems of flooded roads and drains in the recent past.

There are two other factors that facilitate potential flooding in Port Moresby. These are the slow permeability and high water holding capacity of the soils, together with the dominance of smectites in the clay fraction which impede rapid infiltration. During the wet season when rainfall exceeds infiltration, surface runoff will be high and during periods of prolonged rain the surface runoff can become a cause for concern. Secondly, most of the area is built-up and the ground surface is mostly sealed or cemented. This means that there is little infiltration in the built-up areas. Where the capacity of urban storm drains are exceeded, excess water has the potential to cause flooding.

Surface water management and areas of flooding and inundation are shown in **Map 18**.

In addition to the low level of permeability, the following causes of flooding are noted:

- blocked culverts and pipes resulting in localised flooding;
- drainage structures of inadequate size or poorly located, again causing localised flooding;
- high tides submerging drainage outlets and surcharging the drainage system; and
- areas of natural retention causing inundation.

The main areas of localised flooding are briefly discussed below.

a Lawes Road/Champion Parade, Hubert Murray Stadium and Sports Field.

These areas are part of the largest catchment in the study area. The drainage structures are inadequate for most flows and overgrown and the road surface is too low, resulting in the inundation of the intersection. However, this is a naturally low area and serves as a retention basin, further discussed under stormwater drainage.

b Stanley Esplanade

Flooding of this road is a result of inadequate roadside drainage and runoff from Port Road.

c Ela Beach Road

The road commonly floods because of poor roadside drainage and surcharging of the drainage system at high tide.

d Hunter Street / Champion Parade

Localised flooding results during periods of low intensity rainfall because inlet pits on Champion Parade are poorly placed and rubbish and debris commonly block the pits.

3.6.3 Tidal Surges

Tsunamis (or tidal surges) are recorded for all of PNG, however no detailed analysis is apparent for Port Moresby. Fairfax Harbour and the study area are 'protected' by a barrier coral reef parallel with the coastline and approximately 5km and it is understood that there is a relatively low risk of tidal surge.

3.7 Water Resources and Quality

Two aspects of water quality in the study area have been reviewed:

a) the water quality of natural springs; and

b) water quality standards, with particular reference to the discharge of effluent into Fairfax Harbour.

3.7.1 Natural Springs

Water samples have been collected from three underground springs to test for major heavy metal constituents including lead, mercury, and chromium. These samples were collected from spring water at Gorobe Settlement, wellwater at Gorobe Settlement and Ranuguri Spring. The location of the natural spring sites is shown on Map 4. At the time of writing the results of water quality sampling are yet to be received, however, a general overview of issues is provided.

a Gorobe Spring

This is a natural ground water spring, which slowly seeps out of a slope of about 30° inclination. This spring flows continuously throughout the year, including dry season. People do not normally drink from this water source but it is sometimes used for washing and doing

laundry during dry weather. The spring has the tendency to form a pool and when this happens it becomes stagnated and may be a breeding place for mosquitoes.

b Gorobe Well

This is a shallow well associated with superstitious beliefs. Legend has it that young men using this water will get swollen lips. The belief goes that two young women live in the well with their father and come out at night to kiss young men who wash in the well.

c Ranuguri Spring

This natural spring flows year-round and is used solely by occupants of Mailakoum settlement for drinking (when boiled), washing, cooking, laundry and other domestic purposes. Prior to the construction of the Poreporena Highway it was also used by Ranuguri settlers.

Traditionally, it provided water for the old Koitabu village located in this area (Norwood, 1984: 53).

3.7.2 Water Quality Standards

As also noted in the wastewater section of this report, the new PNG Water Quality Standards have been drafted in 2000 adopting World Health Organisation Water Quality Standard 1997-98. Most importantly the new standards include biological criteria (that are currently excluded from existing permits). These standards also require a classification of the marine bodies in the project area to their *protected environmental value (PEV)*. The new standards, when adopted, will require a review of the current and future effluent discharge quality at Paga Point and the overflow pipes at the pumping stations. Water Permits currently issued to Eda Ranu for wastewater discharge will remain under the current system until the permits expire. At this time the new Water Quality Standards will apply.

At present, a water use permit (licence) is required from the Office of Environment for water abstraction or discharge to watercourses for commercial operations. A key issue will be ensuring that these water quality standards are enforced by the appropriate regulatory authority.

Photo 2: Discharge of raw sewage into Fairfax Harbour from the Stanley Esplanade Overflow

With regard to the stormwater drainage system in the area, about 2,000m^3 of sediment is removed from drainage canals and structures each year. This sediment runs off from both garden areas and urban development sites and has the potential to increase turbidity in surrounding waterways.

There are currently no gross pollutant traps in operation to collect sediment and treat general waste prior to its discharge to surrounding waterways.

These are matters that warrant further review as part of Phase 2 of the project.

3.8 Waste Disposal And Management

Surveys on solid waste production and management were carried out as part of the NCDC Urban Services Study, 1996. From this survey the adjusted daily weights of solid waste by origin for the study area are shown in **Table 3.4**.

Table 3.4: Daily Waste Generated in the Study Area (tonnes)

	Dom.	Streets/ Markets	Comm	Indust.	Instit'l	Constr	Lawn & Agric.	Total
Downtown	2.3	0.5	7.1	0.3	0.1	2.0	0.2	12.5
Koki	0.6	1.3	1.4	0.0	0.0	0.1	0.0	3.4
Konedobu	1.0	0.6	6.2	0.7	0.0	2.1	0.1	10.7
Paga Hill	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Touaguba	0.2	0.0	0.0	0.0	0.0	0.0	0.2	0.4
Total	4.1	2.4	14.7	1.0	0.1	4.2	0.5	18.0

There are a few aspects that can be drawn from the above table. It can be noted that:

a) The data for Paga Hill may be misrepresented because at the very least there is bound to be some waste from domestic or lawn and agricultural activities. One reason for the absence of waste from Paga Hill may be that waste may not have been collected from this area.

b) The large amounts of waste from Town and Konedobu (12.5 and 10.7 tonnes per day respectively) can be expected, as these are the major areas of commercial and construction activities, which are the largest waste generating sectors. Large facilities such as the Post Courier, and factories producing dairy products, milled flour, rice products and packaged chicken as well as the construction of Harbour City and the Yacht Club would be responsible a major proportion of this solid waste.

It is also noted that all waste generated within the study area is removed to landfill elsewhere in the NCD.

3.9 Noise Considerations

There are presently no major point-source noise generators in the study area, with a reasonable level of separation between the industrial/port areas and residential zones and between major roads and residential areas.

Noise sources will need to be considered as part of the review of zones, to ensure that there is appropriate separation between incompatible land use.

3.10 Environmentally Important Areas

This assessment of the physical environment has raised a series of issues relating to the environmental quality of the area. The study area is heavily developed and there are limited areas of natural significance remaining.

Of greatest significance and most sensitive to urban development pressures is the marine environment. Fairfax Harbour has a significant range of coral life and fish species and is an

important asset to the city for many reasons. Recent development and reclamation activity appears to be having negative near-shore impacts on both marine life, water quality and tidal flushing cycles. Areas of marine-land interaction are therefore identified as environmentally important areas, which warrant close consideration in Phase 2 of this study.

These areas include Ela Beach, the Paga Point foreshore and offshore reef areas. Natural springs also provide a traditional source of water and are probably an indicator of the environmental health of the area.

Most natural vegetation in the area has been cleared, however, large areas of savannah grass remain and their retention warrants further consideration.

These environmentally important areas are shown on **Map 4**.

4 Cultural Social and Economic Context

4.1 Population & Housing

4.1.1 Population Change - NCD

At the time of writing, preliminary population and housing figures from the Year 2000 Census were available, but no other information. For example, total dwelling numbers are available, but no breakdown in the type of dwellings. It is anticipated that additional information will be become available during the course of the project.

These preliminary 2000 Census figures show a marked slow-down in population growth for the National Capital District as a whole, with a total population of 252,469 and low growth rate of 29% in the 10 year inter-census period. **Table 4.1** shows the change in NCD population from 1971 – 2000.

Table 4.1: NCD Population Change 1971 - 2000

Period	Start date population	End date population	10 –year change (persons)	10-year change (%)
1971-1980	76,507	123,624	47,117	61%
1980-1990	123,624	195,570	71,946	58%
1990-2000	195,570	252,469	56,899	29%

In contrast with the preliminary 2000 population figure of 252,469, the 1996 Urban Services Study predicted a "low-growth scenario" population of 316,055 for 2000 and a high growth scenario of 329,416.

4.1.2 Population & Housing Change - Study Area

The Study Area comprises 40 individual Census Collector Units (CCUs). Change in the number of households and population of each of these CCUs between the 1990 and 2000 Census' is shown in **Table 4.2**.

There are many noteworthy features within this Table. Overall population for the study area has grown from 14,179 persons in 1990, to 15,138 in 2000, representing 7% growth over 10 years, a significantly lower rate of growth than the 29% for the whole of the NCD.

The total number of households has grown from 3 258 to 3 670, being a 13% growth 1990-2000.

Average dwelling occupancy in the study area has fallen from 4.35 persons in 1990 to 4.12 persons in 2000. This is significantly lower than the NCD as a whole, which has an average dwelling occupancy of 5.9 persons based on preliminary 2000 figures.

Table 4.2: Population & Housing Change – Study Area, 1990-2000

Census Collector Unit Name	Households			Persons		
	1990	2000	% Ch.	1990	2000	% Ch.
Gorobe Street.	146	109	(25)	938	584	(38)
Autubu Street	69	45	(35)	177	222	25
Gorobe Settlement	72	136	89	649	1,069	65
Talai Settlement	262	443	69	1,771	2,429	37
Salvation Army (Koki)	74	81	9	323	340	5
Tohu Street.	65	69	6	234	291	24
Koki Street.	102	68	(33)	386	299	(23)
Ogoa Street.	119	96	(19)	260	285	10
Ela Makana	92	103	12	290	248	(14)
Ela Makana	100	190	90	228	387	70
Vanama	77	94	22	627	476	(24)
Elanese Road	95	74	(22)	572	254	(56)
Airvos Ave.	41	51	24	216	207	(4)
Toaguba Hill	86	119	38	288	326	13
Davara Road	75	113	51	295	244	(17)
Chesterfield Street.	58	96	66	126	261	107
Ela Beach	47	25	(47)	320	215	(33)
Douglas Street.	103	115	12	192	217	13
Champion Parade	44	47	7	258	112	(57)
Port Road	88	32	(64)	241	224	(7)
Portlock Street.	77	105	36	202	270	34
Brampton Street.	101	105	4	261	219	(16)
Daugo Dr.	104	103	(1)	223	316	42
Davetari Dr.	86	83	(3)	223	212	(5)
DPI Compound	75	68	(9)	388	339	(13)
D'Albertis Street.	48	61	27	242	276	14
Ranuguri Settlement	111	174	57	703	1,392	98
Aviat Club	53	60	13	269	274	2
Airvos Ave.	39	46	18	182	156	(14)
LeHunt Road	88	39	(56)	256	101	(61)
Kamadec Street.	76	46	(39)	246	191	(22)
Paga Hill Settlement	51	73	43	283	390	38
Paga Hill	130	168	29	377	385	2
Vanama Cres.	37	32	(14)	192	195	2
Pandora Street.	77	87	13	254	239	(6)
Ginigini Street.	49	42	(14)	406	277	(32)
DCA Compound	53	35	(34)	356	280	(21)
Elanese-Lawes Road	87	114	31	344	534	55
Sir Hubert Murray Stadium	37	55	49	197	191	(3)
Bevan Street.	64	68	6	184	211	15
Total	**3,258**	**3,670**	**13**	**14,179**	**15,138**	**7**

Age breakdown figures not yet available. These would be useful in the evaluation of recreation and community facilities, though it is unclear whether they will be available during the study.

There is no year 2000 information at this stage on the breakdown of housing types. The breakdown from 1990 is presented in **Table 4.3**.

Table 4.3: Housing Type – Study Area, 1990

House Type	1990	
	(No)	(%)
High Covenant Housing	521	15.64
Flats	917	27.53
Duplex	300	9.01
Domestic Worker Quarters	231	6.93
SDS	35	1.05
High Covenant Self Help	109	3.37
Low Cost	177	5.31
Make Shift	443	13.30
Traditional	1	0.03
Low Cost Self Help	109	3.27
Not Surveyed	488	14.65
Total	3,331	100

The figures in Table 4.3 have been sourced from the 1996 Urban Services Study and show a slight discrepancy in the total number of dwellings compared to National Statistical Office figures in Table 4.2, for unknown reasons.

4.1.3 Population Change – Census Collector Units

Population change in each Census Collector Unit between 1990 and 2000 has been assessed and illustrated on **Map 5**.

As this map clearly illustrates, the highest rates of population change over the 10 year period were experienced in areas of new development such as Chesterfield Street (107% growth) and Ela Makana (70%) and in settlement areas, such as Ranaguri (98%), Gorobe (65%). Population increase in these areas may additionally have been due to an increase in the number of squatters in the area.

The greatest decline in population over the 10 year period occurred in LeHunt Rd (61%), Champion Parade (57%) and Elanese Rd (56%).

It is noted that the CCU areas are generally quite small in area and potentially subject to large fluctuations in population with the construction or demolition of a relatively small number of dwellings.

4.1.4 Population Density

The density of population across the study area in 2000 has also been calculated and is shown in persons per hectare (ppha) in **Table 4.4** and **Map 6**.

Table 4.4: Population Density by CCU (2000)

CCU No.	CCU Name	ppha
3	Gorobe Settlement	99.52
44	Kermedec Street.	97.25
35	Aviat Club	60.49
4	Talai Settlement	58.78
5	Salvation Army (Koki)	56.31
1	Gorobe Street.	50.52
47	Vanama Cres.	50.50
15	Davara Road	46.17
51	Elanese-Lawes Road	42.68
21	Portlock Street.	41.72
16	Chesterfield Street.	35.52
13	Airvos Ave.	35.32
24	Davetari Dr.	33.90
30	Ranuguri Settlement	32.63
2	Autubu Street	32.49
23	Daugo Dr.	31.27
7	Koki Street.	31.17
20	Port Road	27.38
25	DPI Compound	26.94
18	Douglas Street.	26.78
9	Ela Makana	26.44
46	Paga Hill	26.22
6	Tohu Street.	24.04
48	Pandora Street.	23.97
50	DCA Compound	23.75
11	Vanama	20.95
8	Ogoa Street.	20.95
45	Paga Hill Settlement	19.71
22	Brampton Street.	16.49
10	Ela Makana	16.15
54	Bevan Street.	15.45
42	Airvos Ave.	15.11
14	Touaguba Hill	15.05
49	Ginigini Street.	14.59
26	D'Albertis Street.	13.66
17	Ela Beach	10.88
12	Elanese Road	10.46
43	Le'Hunte Road	8.08
52	Sir Hubert Murray Stadium	7.84
19	Champion Parade	6.44
Plan Area Density		**26.56**

The highest densities occur in the Gorobe Settlement area (99.52 ppha) and in Kermedec Street (97.25 ppha). It is noted that the density of population evident in some areas can appear unrealistically low due to the size of the CCUs and existence of other non-residential activities. There are, however, significant existing residential areas on Touaguba and Ela

Makana Hills, which show low population densities in the range of 20-40 ppha and the average density across the whole study area is 26.56 ppha.

To determine the maximum possible dwellings and population that could be achieved in the study area, based on the permitted densities, **Table 4.5** calculates the land area allocated in each category against the maximum permitted population and dwellings. Clearly this could never be achieved due to the fact that land development is a continuous cycle affected by many factors and all sites will never be simultaneously developed to their full potential. It is useful, however, as a benchmark against which future density provisions can be compared and as an indication of the extent to which the area has achieved its development potential.

Table 4.5: – Development Potential Under 1984 Plan

Residential Density Area	Total area (hectares)	Maximum Persons	Maximum Dwellings
R1	34.82	2,611	522
R2	86.41	12,962	2,592
R3	26.97	6,743	1,348
R4	16.05	8,026	1,605
TOTAL	164.26	30,342	6,067

These figures exclude the 'Special Policy' area for residential development in the town centre, where a floorspace 'bonus' of 2:1 is provided for residential development, but which has been rarely taken up.

The existing total population for the study area is 15,138 (including settlement areas). The total number of dwellings is 3,670. A great deal of this population and dwellings are outside the existing residential areas in settlements and on other non-residential land. The maximum development potential of the residential areas is 30,342 persons and 6,067 dwellings.

Notwithstanding potential infrastructure deficiencies, this would indicate that the study area is currently developed at less than 50% of its potential in relation to population and numbers of dwellings anticipated under the 1984 Plan. Potential reasons for this are:

- a lack of adequate infrastructure;
- a lack of available land for development, possibly caused by long-term land holders unwilling/unable to sell or develop;
- small allotments and fragmentation in land ownership;
- a poor economic environment for property investment;

- unrealistically high density targets which are not achievable given the difficult topography; and

- the normal development cycle, whereby all properties will never be developed to their potential simultaneously.

This is a matter that warrants closer examination in Phase 2 of the study.

4.1.5 Underlying issues for the 2000 Census figures

Clearly, the preliminary figures for the 2000 census raise a significant issue in that while the previous 10-yearly census (1970-1980 and 1980-1990) show a significant population growth of around 60%, population growth rate is seen to have halved since then, with a population growth of only 29% for the period 1990 - 2000.

Previous decades' figures are understood to comprise a combination of natural growth and inward migration. The current figures would suggest that, given that natural growth rate is estimated at approximately 3% per annum (national average), the population growth recorded for the study area reflects either zero in migration or even low out-migration.

The National Statistics Office, which has responsibility for conducting the census, has cited the following reasons for the apparently low population growth recorded for the 1990-2000 period:

- inward migration was especially high from the mid 1970s, following the gaining of independence, through to the mid 1980s, and in-migration has since slowed dramatically;

- there may be a level of out-migration reflecting the current economic downturn affecting Port Moresby;

- economic migrants to the area may be working in town but living outside the study area (ie. commuting), so offsetting residential population growth in the study area;

- there may be an issue that seasonal work is affecting the census figure – a number of workers (estimated to be between 5-10,000) may work outside the NCD for part of the year and so have been excluded at the time of census;

- while the national average for natural population growth is approximately 3%, natural population growth in Port Moresby is understood to be lower due to lower birth rates. This is understood to be due to better education and better access to health facilities and contraception.

While the current figures are only preliminary, it is understood that they are unlikely to be significantly modified in the process of preparing final figures.

The above reasons may provide some explanation for the apparent dramatic slowdown in the population growth. However, the possibility that an element of under-counting has occurred cannot be dismissed, and this possibility will need to be taken into consideration when considering future growth scenarios for the study area.

4.2 Land Tenure & Traditional Settlement

4.2.1 Land Tenure

Land tenure across the study area has been identified with the assistance of the Physical Planning Division, Department of Lands and Physical Planning and is shown **on Map 7. Table 4.6** shows the amount of land under each form of tenure.

Table 4.6: Area of Land Tenure Types

Type of tenure	Area (ha)	% of total
Customary land	89.14	15.59
Leasehold land	345.79	60.47
Freehold land	2.66	0.47
Reserve	38.49	6.73
Road reserve	91.90	16.07
Tenure not identified	3.81	0.67
TOTAL	571.80	100

With the exception of customary land, all other categories are generally referred to locally as 'alienated land', meaning that it has been transferred from traditional land ownership into other forms of tenure. The issue of land alienation continues to be a contentious issue between the Government and traditional landowners.

Leasehold land occupies the vast majority of the study area (55.1%), followed by customary land (15.6%) and land occupied by roads (15.5%). Open space reserves make up only approximately 6% of the study area and the majority of this is found on steep and relatively inaccessible eastern slopes of Touaguba Hill. Some informal open space areas and ovals do exist in the Gorobe and Talai settlement areas and these are discussed further in **Section 4.7**.

4.2.2 The Traditional Landowners

The traditional landowners of the city of Port Moresby are known as the Motu Koitabu people. The Motu and Koitabu people originate from different and unrelated backgrounds but have – over the millennia – integrated culturally.

a The Koitabu People

The Koitabu people are a land based people who appear to have migrated into the area from the highlands in what is now Goilala country. They speak a Papuan Language which belongs to the Koiarian Family. The Koitabu people lived inland on the ridges.

Seingmann (1910:111) makes mention of an abandoned Koita village on a hill to the north-west of the Port Moresby Harbour. The hill, called Huhunamo, raises at the north-west end of Port Moresby Harbour (1400 feet) and historically had a Koita village on its submit. The remnants of its people are now settled at the Motu village of Borebada, where they form the Huhunamo Iduhu.

This indicates that there were once Koita settlements on the ridges in the Port Moresby area. The old Koita village of Kira Kira was located on the hill between the present day Horse Camp settlement and Vabukori up until the war when they were evacuated by the colonial administration.

b The Motu People

There is substantial literature showing that the Motuans were a maritime people who appear to have arrived in the area after the Koita people. They are a seaside dwelling people who lived off the resources of the sea more than that of the land. They speak the Motu language which is an Austronesian language.

4.2.3 Cultural Integration

On the eve of colonism, the study area was home to the Motu and Koitabu people. Apart from the village within what is now Hanuabada, there is mention of other Koitabu settlements, one on Burns Peak and a smaller settlement at Ranuguri. According to oral history, there was an older village near Gorobe. This is verified by the archaeological midden discovery discussed as part of this study and detailed below.

The level of cultural integration between these two groups, was more or less complete. There were Koitabu Iduhu with the Motuan villages and vice versa.

4.2.4 History of Land Acquisition

To understand the history of how the land was acquired in the first place, it is important to appreciate the current situation, particularly with regard to disputes over ownership claims as well as claims for compensation by the traditional landowners.

The first legislation in relation to land was put in place by the British. This was the Land Regulations Ordinance of 1888. Upon the declaration of the Protectorate, all matters of land acquisition were to be made through the office of the Special Commissioner. The administration set out to buy land which the local people did not need and were willing to sell, as provided by the Land Regulation Ordinance (Oram 1989:60).

In the case of land ownership, it is the Land Ordinance No.6 of 1963 that is important. Of the nine regulations in this Ordinance, the last one clearly stipulated the conditions for the sale of traditional land.

> *…a native has no power to sell, lease, or dispose of native land otherwise than to natives in accordance to native custom.*

The Land Ordinance (1963) recognises that native land can be transferred or leased out between natives in accordance with native customs. Accordingly, the right-holders in Port Moresby have traditionally allowed those who are not related to use their land and this can be treated as custom. According to Oram (1976:33), those who occupy the land at the invitation of the landowners are legal right-holders until the permission is withdrawn.

A further issue is the illegal burials on settlement land, for example settlers burying their dead on land under Motu Koita landowners. Such burials strengthen the settlers' claims on land and so create problems for future relocation of such settlers or the planning and development of the land. The NCDC seeks to discourage illegal burials in favour of encouraging settlers other than landowners to be buried at public cemeteries designated by the NCDC.

Over 84% of the land within the study area is alienated land (refer to **Map 7**). Land still in the hands of traditional right-holders is confined to the hills and southern slopes along the northern border of the study area, beginning from Gorobe into Vanama and Ranuguri. It must be noted that it is on traditionally held lands that parts of the settlement of Gorobe, Talai and Ranuguri and all of Vanama are located.

The question of ownership of land upon which settlements are located is a thorny issue. The traditional right-holder as well as the State make a blanketing statement that the land is theirs.

4.3 Villages

There are no villages within the study area. However the traditional village of Hanuabada is located to the north; and the urban settlement of Koki (or Koke) lies south east, both just outside of the study boundary. The terms of reference for the study require that the impact of the Local Development Plan on these villages be considered. It is also acknowledged that, conversely, the presence of these settlements may have an impact on development choices within the study area.

4.3.1 Impact of Development on Koki and Hanuabada

The possible impact of urban development on Hanuabada and Koki is discussed below. While the former is a traditional settlement of the Motu Koita people, Koki is one of the early settlements that is now regarded by many as a traditional village. Indeed, it is a settlement of people whose ancestors came from the Wanigela area of the Central Province.

4.3.2 Koki

Koki is an urban settlement but with a difference. It home to the Wanigela people who are originally from the Wanigela area – some 50 miles from Port Moresby. In the early 1960s these people regularly brought canoe loads of fish and vegetables to sell at Koki market.

"In 1962 one man started beaching his canoe and living on it on shore for varying periods. Others followed and by 1965 there were 15 canoes in use as land-based houses. The number has increased rapidly since then… Few of the canoes ever go to sea and most of the adults are now in full-time employment"

(Surmon A.V. and R.G.Ward 1970:22).

According to the survey conducted by Muke and Nuka (1999) Koki had a population of 3,705. By ethnic composition, the population are predominantly people of Wanigela origin, supposedly descendants of the initial canoe settlers.

Koki currently experiences poor health and environmental conditions with the majority of household rubbish and sewage being disposed directly into the sea. There is local concern about the impact of current land reclamation works (Healy Parade) on the tidal flushing of waters adjacent to and under Koki settlement, and the potential for a further deterioration in health and environmental conditions through creation of a 'backwater'. This may also have some impact on the study area.

Socially, the settlement is very insular both in terms of its geographical location and its residents. The majority of the people in Koki are Seventh Day Adventists (SDA's), who live by very strict rules and regulations. These rules are believed to help prevent some of the social disorder evidenced in other settlements.

Photo 3: Koki Village

4.3.3 Hanuabada

There is a vast array of literature on Hanuabada. It is the largest Motuan village within the city and its inhabitants have felt the impact of outsiders since 1873 when John Moresby sailed into Fairfax Harbour. Moresby recorded in his journal records that there were perhaps

800 'well-fed, contended-looking people'. Once a proud people who were a dominating force in the area, the village and its people have not fared well in modern times.

Following the establishment of Port Moresby as the capital city of the country, the village was evacuated and the homes burnt down during the war. Upon their return, the village was rebuilt by the army using corrugated iron roofing. Other homes were set on land along the shore. This was be beginning of the modern Hanuabada.

Owing to the fact that the village was situated on traditional land, this was considered out of bounds of the city planners. The village was left alone and untouched. Hanuabada was not considered part of the Port Moresby urban grid in terms of the provisioning of basic services like water, sewerage and garbage collection for a very long time. These services have only recently been put in place in the village. Even today the village retains its independent character from that of Port Moresby.

Physical separation from Port Moresby has been reinforced by construction of the Poreporena Highway to the east and the bypass from the Highway to Badihagwa to the north.

There is further concern within the village that land reclamation, beginning with the development of the marina for the Royal Papuan Yacht Club and culminating with the Harbour City development has resulted in the creation of a "backwater environment", with poor tidal flushing.

The nature of future development at Harbour City should be considered in light of its impact on traditional life in Hanuabada.

4.4 Settlements

The issue of settlements has created much debate since the beginning of Port Moresby. It is not within the scope of this study to go into the details here, however, a brief synopsis of the emergence of settlements is presented in order to highlight some of the intertwining factors that make planning for the future of settlements such a difficult issue.

Settlements in the study area have been identified using the old settlement maps and fieldwork to identify new settlements and update the boundaries of older settlements. A brief appraisal of each settlement in terms of physical characteristics and ethnic composition is also presented. To assist this task, field assistants were employed from the youth population within each settlement after consultation with the leaders within the respective communities.

The discussion is restricted to presenting a brief description of the settlements within the study area, their history and composition. There are eight formally recognised settlements within the study area. These are: (a) Paga Point, (b) Gorobe, (c) Talai, (d) Newtown (Vanama 1 and Vanama 2), (e) Bomai Block of Newtown , (f) DCA Compound in Newtown, (g) Ranuguri, and (h) Mailakoum. Also within the study area are three emerging settlements,

that is, settlements in the making. These are: (a) Kermedec, (b) Koki, and (c) the Lepas settlement near the Shell Service Station in Konedobu.

For the purposes of this study, 'emerging settlements' have been identified as those with a minimum of five dwellings and which demonstrate some permanence by way of pit latrines.

All settlement locations are shown on **Map 8** (Important Cultural and Social Features) and **Maps 9-11** (Land Use).

Table 4.7 provides a summary of the area of settlements in the study area.

Table 4.7: Settlement Areas (ha)

Settlement Name	Area (ha)
Paga Point	3.26
Kerema Block	1.05
Talai	26.41
Ranuguri	9.62
Mailakoum	2.01
Vanama	8.82
Bomai Block	1.90
Koki	0.22
Kermedec	0.12
Lepas	0.66
Gorobe	10.05
TOTAL	64.16
% of Study Area	11.25

4.4.1 Settlement Categories

For purposes of consistency, the different types of settlement are defined in a manner akin to that used in the Urban Services Study (1996: Vol 3 pp23-6) which identifies four types of Settlements.

a Government Assisted Settlements

Parts of the settlements of Gorobe, Talai and Ranuguri, which are located on State land, belong to this category.

b Older Migrant Settlements on Traditional Land

These are settlements of mainly people from the south coast (Papuan) who were given permission by the traditional land owners to settle near their villages. The northern portion of the Gorobe Settlement, the north-eastern part of Talai and parts of Ranuguri settlements fit into this category. Mailokaum is a classic example of one such settlement.

c More Recent Settlements on Traditional Land

These are settlements on traditional land, which are set up with the consent of the traditional landowners. The settlement of Vanama 1, Vanama 2 and the western part of Talai on the Konedobu fit into this category.

d Squatter Settlements

These are settlements on either State owned land or on traditional land that have been built without the consent of the landlord or landowners. For this reason, these settlements have often been referred to as illegal settlements. In the study area, the settlements of Paga Point and Bomai Camp in Newtown belong to this category.

4.4.2 Settlement Committees

Most settlements have established a committee to provide for better management of their particular settlement area and to act as advocates for the interests of the settlement. These committees are self-generated and also take on the roles of:

- attaining services (Eda Ranu, PNG Power Ltd, etc);
- liaising with the police;
- representing the interests of settlers in negotiations with landowners in some instances; and
- liaising with the Special Parliamentary Committee on Urbanisation and Development, which has been established to address the issue of settlements and customary land ownership across the country.

Committee membership is typically drawn from prominent people living in the settlements. Further detail regarding committees in each settlement is provided below.

4.4.3 Paga Point

a Overview

The settlement is located on State land at the western tip of Paga Point with a population of over 800. It extends all the way from the seafront to the road going to the top of Paga Point. The origin of the Paga Point settlement is presented in detail by Norwood (1984:43) and summarised below.

In the 1960s, Mr. Mairi Nakaia from Gulf Province was working as a night soil collector in Port Moresby, where he had to arrange dumping of night soil into the sea at Paga Point. He was later asked to look after his employer's equipment at Paga Point, so built a shelter nearby. Later his *wantoks* and other people working at the waterfront joined him.

There is a 15-person settlement committee in operation, which includes representatives for Church Affairs, Literacy, Youth Affairs and Women's Affairs, as well as a President, Vice-President, Treasurer and Secretary.

Photo 4: Paga Hill Settlement

The settlement is of mixed composition. Initially it was made up of people from Lake Kutubu in the Southern Highlands and Kikori and Baimuru people from the Gulf Province. Today, there are also people from Tari in the Southern Highlands and Simbu people living in the settlement.

b Services

Presently there is only one functioning water standpipe for approximately 800 people living at Paga Point.

The road into the settlement is a dirt road.

There are no formal sewerage facilites, and during heavy rains, latrines overflow and sewage is washed overland.

c Commercial Activities

There are no major activities being undertaken in the settlement. A few derelict cars at the top end of the settlement are the only evidence of what as once a workshop. The settlement has seven canteens that are in operation and most dwellings have a pit latrine.

4.4.4 Gorobe

a Overview

Gorobe is located in a small valley to the west of Three Mile Hill, within easy walking distance of the Badili shops and industrial area and has a population of over 1000 persons. The settlement is located on both State and customary land.

According to a lifetime resident interviewed for this report, the settlement was set up in 1953. Original settlers came from Kerema and settled with the permission of the traditional landowner.

The settlement is slowly extending uphill and westwards. Norwood (1984:35) mentions that there were distinct clusters of homesteads belonging to distinct ethnic groups. Fieldwork for this study reveals that the settlers are more integrated, even though it is still regarded as a predominantly Kerema and Goilala settlement. Some Highlanders are now also present in the settlement.

A settlement committee exists, though it appears that external matters are directed through the family that claims to be the traditional landholders.

b Services

Presently, the sealed road into the settlement is full of potholes at the lower end. It has deteriorated into a dirt road at the top end of the settlement.

Residents at the lower end of the settlement have access to water from taps to individual households. Even though there are pipes leading to some of the houses further up, the water flow stops at the roundabout. Residents further up have to fetch water.

Most of the houses have pit latrines.

c Commercial Activities

Apart from five small canteens in operation in the settlement, there is no other commercial activity.

4.4.5 Talai

a Overview

The Talai settlement is the largest settlement in the study area, occupying both state land and customary land. It has a year 2000 population of almost 2,500 persons and has a settlement committee in operation. It extends from Badili - in a north westerly direction, all the way to the top of the low ridge that separates Badili from Konedobu. The settlement has extended over that ridge to the top of the Vanama settlement in Konedobu, and it is noted that this extension has not yet joined up with the Vanama settlement

In was observed during fieldwork that people were still building new homes and these were extending up the northern ridge that separates Badili from Hohola. With the current rate of expansion, the settlement will extend uphill from both the Gorobe and Talai sides.

The settlement composition has changed drastically since the early 1960s when there were distinct clusters of ethnic groups living in distinct locations. Presently, the breakdown of the residents by ethnic groups – from east to west - is as follows:

- the lower (eastern) part of the settlement, near Badili is predominantly occupied by people from the Eastern Highlands, these people being mainly from Okapa and Asaro
- the middle part of the settlement is occupied by Finschhafen people of the Morobe Province; and
- the upper (western) part is occupied by people from Kerema, mainly from the Orkolo region.

The current ethnic groupings reflects the history of settlement as summarised by Norwood (1984:59):

> *"Originally in 1972 living in 3 distinct clusters comprising Varipi (Gulf Province people), Finschhafen (Morobe Province people) and Goilala (Central Province). The first two clusters were upgraded by the Housing Commission 1973-74.*
>
> *The upgrading process also created 70 new building plots on previously vacant land to the north of the original settlement. These were taken up by people with higher incomes and better jobs than the residents in the original settlement.*
>
> *The northern original settlement (Gulf Province people) is on Government land. This has been subject to planned expansion … as part of the upgrading process. The Goilala settlement on customary land could not be touched because of the land tenure problem. Land owners of this customary land are the Saraga Sina clan of Koita people.*
>
> *The Goilala community was not affected by the upgrading. All the houses in the community were deserted after a big fight in 1976. By 1978 these houses were semi derelict. In 1980 they were reoccupied by Goroka people."*

b Services

The road into the settlement is badly deteriorated and abounds with potholes.

While some houses have water taps, the bulk of households utilise water standpipes. The bulk of the households experience very poor water pressure, with inadequate pressure meaning that water is often only available in the early hours of the morning.

The settlers at the top of Talai as well as those living on the other side of the ridge on the Konedobu side do not have any water. They have to come down the hill to collect their water from a standpipe.

Most of the houses have pit latrines.

c *Commercial Activities*

Apart from the usual canteens, snooker tables and dartboard combination found in other bigger settlements, there is no major commercial activity taking place in Talai.

The only commercial activity witnessed in the settlements was the production of lime (Kambang) for chewing betel nut. A few families at the top end of the settlements were fully involved in this.

4.4.6 Vanama

a *Overview*

This settlement is located in two small valleys – running in a north and north-easterly direction – behind the Post Courier building, with a total population of around 500 persons. These settlements are known as Vanama 1 and Vanama 2 by the residents. The land where the two settlements stand as well as the top part of Talai on the Konedobu side, currently occupied by the Orokolo people, is on traditional land. It is unclear whether there is a settlement committee in operation, with most external discussions directed through the traditional landowner.

According to Norwood (1984:42), Newtown settlement was started in 1961 by Mr. Momoa Sasae who moved to Port Moresby from Gulf Province and was allowed to settle there by Lohia Doriga, the customary landowner, who still lives in the settlement. New settlers are now required to obtain permission from Mr Doriga's son, Dirona Lohia, before putting up new buildings. Several attempts were made to interview the landowner, but were unsuccessful.

Photo 5: View towards Vanama and Talai Settlements

b Services

Access to the area is by dirt road. The water supply into the area is unreliable and most of the houses do not have access to water. Water is collected from outside the settlement. Most dwellings have pit latrines.

c Commercial Activities

There are no major commercial activities in the settlement apart from a few canteens.

4.4.7 Bomai Block in Newtown

a Overview

Bomai Block in Newtown is by all appearances a relatively new settlement compared to some of the other ones in the area. Informants within the settlements were vague about its history, though it appears that the settlement started in the late 1980s. It is unclear whether a settlement committee is in operation.

Vehicle access to the settlement is via a dirt road about 10m from the junction of Elanese Road and Lawes Road. It is sandwiched between the housing estates on the lower northern part of Ela Makana and the government buildings in Newtown and is not located on customary land.

The bulk of the population in the settlement is made up of people who are from the Chuave region of the Simbu Province; hence the name, Bomai Block. The residents refer to their settlement as Newtown settlement.

b Services

The settlement has standpipes to some of the houses, so water does not appear to be a problem. The vehicle road leading into the settlement is a dirt road but appears to be an all weather road. There are pit latrines in the settlements.

c Commercial Activities

The only commercial activity is a small number of tucker shops.

4.4.8 Kerema Block

a Overview

This settlement is located between the Australian High Commission residential buildings and the Trukai Rice Depot in Konedobu. It is 'tucked' away behind the buildings and is not visible from the road. It is referred to as the Kerema Block because it is predominantly made up of people from the Gulf Province. It is not on customary land and it is unclear whether a settlement committee is in operation.

Nearby is a 'settlement in the making', to the east on Kabua Crescent next to the Express Freight Management premises. This appears to be built around government houses that have been altered and added on to by the occupants. It is likely that this settlement will expand westward and meet up with the Kerema Block in the near future.

b Services

There are some water standpipes in the settlement that everyone uses. There is no road into the settlement. Access is by walking along the edge of the storm water drain. It is understood that these settlements are in the process of being upgraded.

c Commercial Activities

The only economic activity is two small canteens.

4.4.9 Ranuguri

a Overview

Ranuguri is a small Koita settlement site located near a natural spring. It almost doubled in size between 1990 and 2000 and now has a population of around 1400. Norwood (1984:53) mentions that in the 19th century the site was intermittently occupied. The construction of the Poreporena Highway has meant that the spring supplying water to the settlement is now on the western side of the Highway and is therefore much more accessible for those people living in Mailakoum than those living in Ranuguri.

The settlement is located in the valley running parallel to the Poreporena Highway on the southern side.

The land situation here is complex. The southern part of the settlement at the base of the hill is located on customary land, while the western section is located on Government land. The traditional portion of the land is claimed by the Mavara Idiliana clan who collect rent from the squatters living on this land (Norwood 1984:53). Representation on behalf of the settlement occurs through the traditional landowners.

Ranuguri was one of the settlements that was selected for the Self-Help Housing Scheme, initiated by the government through the National Housing Commission. Between 1975 and 1977, the settlement on the Government portion of the land was upgraded by the Housing Commission. Those on the traditionally owned portion were not upgraded. From the aerial photos used by Norwood, it appears that the present expansion of the settlement has been in the portion that is on traditional land.

b Services

Those houses that are located on State land do have access to water in the form of taps and standpipes. Standpipes only service those located on traditional land at the top end of the valley. There is an access road into the area, in need of maintenance.

c Commercial Activities

The only commercial activity is a small number of canteens.

4.4.10 Mailakoum

a Overview

The settlement is located in a very small valley north of the Highway underground turnoff to Badihagwa, and was started up in 1967 by Mr. Nohore from the Gulf Province. The details of its origin are provided by Norwood (1984:55). In the late 1950s Mr Nohore's family had given hospitality to Kiowa Koke's husband (a Hanuabadan) who was serving as a Government officer in Kerema. In 1973 Mr Nohore came to Port Moresby, accidentally met Koiwa Koke who remembered the previous hospitality to her late husband and offered Mr Nohore a site to build a house. Mr Nohore then invited his *wantoks* to live with him.

This settlement is low key and obscured from view. The people living there are all related to each other through kith and kin and it is doubtful whether there is a settlement committee in place. With the construction of the Poreporena Highway, this settlement has been cut off from the rest of Konedobu.

b Services

Water is collected from the natural spring and there are pit latrines. The area is accessed by a dirt road.

c *Commercial Activities*

There is no commercial activity in the settlement

4.4.11 Settlements in the Making

In several locations, there is clear evidence of settlements emerging. People have moved into unoccupied allotments and started building their houses. Those with five dwellings or more and some sign of permanence (eg pit latrines) have been identified as part of this study. These are located at Kermedec, Koki United Church and at Konedobu. There are understood to be no services at these settlements.

a *Kermedec*

Presently, a group of Enga people are living in what used to be the Kermedec government hostel on the Ela Beach Road. In the strictest sense, it is a group of families living on a block of land.

Attempts to interview some of the residents there have so far proved futile partially because the residents are aware that any information disclosed might be used for evicting them. They have already been served with demolition notices but have no plans for relocation.

b *Koki Corner*

This emerging settlement is located next to the Lutheran Pastors residence at Koki near the Koki United Church. A visual survey has revealed five homes, four of them being made of scavenged building material and the other awhile a low brick structure. There is no water into the area and only one pit latrine was recorded. It is presently occupied by Simbu people.

It is likely that the number of shacks will increase uphill onto areas that are presently being used for gardening.

c *Lepas' Settlement Konedobu*

This is a small settlement of over a dozen houses made from corrugated iron, wood and scrap metal located next to the Shell Service Station on the Sir Hubert Murray Stadium roundabout. It is located on reclaimed land.

The land was reclaimed by a Mr Lepas. The late Lepas started dumping rocks and other material from road constructions into the sea. He then built a house on the reclaimed land and lived there until his death, when his body was flown to Rabaul to be buried in his village. His two sons reside on the reclaimed land.

Presently, people from the Simbu Province have moved in and are living on the narrow strip of land, though not necessarily with the consent of the original settlers.

4.5 Culture & Conservation

4.5.1 Archaeology

a Methodology

An archaeological survey of the study area has been undertaken in three phases:

a) consulting the national site registry of archaeological sites held in the National Museum;

b) traversing the study area on foot; and,

c) holding discussions with the curator of prehistory and the impact archaeologists at the National Museum.

Archaeological sites identified were recorded using forms from the National Museum. These have been registered as archaeological sites in the national registry.

b The National Site Registry

A thorough search of the national site registry of archaeological sites held in the National Museum revealed that only two sites in the study area have been recorded. In both instances, these were surface collections of pottery and shells. The first one (Site ABS[6]) was recorded by S. Bulmer. This was a surface scatter of archaeological material at Ela Beach kindergarten. The other reported site (ANX[7]) is recorded for Badili by Owen McCaw. This is also a surface scatter of archaeological material.

c Physical Survey of Study Area

All recreation areas, settlements and vacant land were surveyed on foot. A number of minor scatters of archaeological material were found on some of the hilltops, and one old village site of significance was discovered. The location of these sites was recorded and each was given an identification to be registered in the National Site Registry in the National Museum. All cultural material collected will be lodged with the National Museum.

d Village Site with Associated Midden Deposit.

One archaeologically significant site has been found within the study area. It has been registered in the National Museum as site AAEA. The site is located on a low ridge between the present settlement of Gorobe in Badili and the little valley behind the PNG Power Ltd headquarters in Hohola, and is marked on **Map 8**. This has been confirmed as the old village site and is probably at least 1000 years old.

[6] National Site Registry reference number.
[7] National Site Registry reference number.

While the ridge top is flat for around 200m, the deposit is confined to the eastern end of the flat area in what is a slight dip. The bulk of the midden is located on the western side of the ridge facing Gorobe.

Bones, tools and pottery shards have been found at this site, some of which are shown in photos 6 and 7.

Photo 6: Stone Tools Found at Archaeological Site AAEA

Photo 7: Pottery Shards Found at Archaeological Site AAEA

e Surface Scatter of Archaeological Material

Surface material is located along the ridge from the site described to where it has been cut off by the Poreporena Highway. Sample material collected from this scatter does not differ in any significant way from the surface collection made at the site itself.

f Potential for other sites

Formal consultation has been held with the Head of the Prehistory Department of the National Museum and the Curator of Prehistory at the Museum. Discussions focused on the results of the archaeological survey, in particular the paucity of additional archaeological sites.

It was generally agreed that in the past, the physical landscape of the study area offered little in terms of an environment that would have been suitable for human settlements. Furthermore, the study area is a very highly built-up area, which would have resulted in disturbance of all surface archaeological evidence. This is particularly so for the area of the present day settlement of Ranuguri where there is historical evidence that there had been a Koitabu settlement by the natural water spring there (Norwood, 1984).

4.5.2 Culturally Significant Sites

The term "culturally significant sites" generally refers to features of the social landscape that are held to be of cultural significance to the occupants and traditional owners of the areas concerned. In most of these instances, significance is determined by the beliefs, values and traditions of the traditional landowning groups who occupy this area. Examples of sites of cultural significance are origin sites, prominent landmarks that feature in traditional myths and legends, burial sites as well as meeting places and singsing grounds, to name a few.

For Port Moresby, one has to take into consideration that apart from the traditional Motu and Koita people living here, there are other people who have made this place their home. Therefore, any site of contemporary cultural value must also be considered for inclusion in the category of culturally significant sites. In this regard, culturally significant sites are sites that feature in the culture of Port Moresby Town Area in particular, and the city as a whole.

Using the above criterion, three types of culturally significant sites have been identified. These are: (a) the contemporary cultural site of Ela Beach, (b) all burial sites within the study area and (c) old settlement sites.

a Ela Beach

Ela Beach is considered a culturally significant site because it is the site of the annual staging of the Hiri Moale festival. The Hiri Moale festival was traditionally a feast to wPNG Power Ltde loved ones, husbands and sons, who had returned safely home from the often treacherous journey to the Gulf of Papua on trading missions to bring back food (sago) and other items of utilitarian use (timber for canoes) as well as trade (shell ornaments). Ela Beach is the sing sing grounds of contemporary Port Moresby.

b Burial Sites

Burial sites are a very sensitive issue. Not only are they held sacred but they also legitimise the groups' claim to their area of residence. The logic of the claim is as follows:

> *My ancestors and parents are buried here. This is their dwelling place. Therefore I have a right to live in this area.*

Unauthorised burials are illegal within the study area under the jurisdiction of the NCDC, but this is contentious where burials occur on customary land.

In some instances, people who are burying their dead in the study area are not the traditional landowners. They are migrants who have settled on the land. This will become a matter of contention in the future if the traditional landowners decide to move the settlers from that area.

i Old Burial Site at Gorobe

According to informants, there is an old traditional burial site in Gorobe. This site has been built over with houses. A visual inspection of the area did not reveal any indicators to show that the burials were there.

Only the older residents in the settlement were aware of the existence of the burial site. It was considered best to let the matter rest and not bring it up with the residents presently living on the site.

ii New Burial Site at Talai

A contemporary burial site is located at the very end of the Talai settlement on the Konedobu side. This contains well over ten burials, the most recent at the time of writing being July 2001. People living at the top of the settlement of the Konedobu side have buried their dead in that area.

In light of the social and cultural sensitivity of burials, it is important that the city authorities, along with the traditional landowners are aware of this so that action can be taken before ongoing burials become a major issue in the area.

c Old Settlement Sites

Three traditional sites are known to have existed in the study area:

- The first was an old settlement site mentioned in the traditions of Koita migration stories. It is said to have been located somewhere at Gorobe.

- The other old settlement site is reported to have been where the present Ranuguri settlement is located (Norwood 1984:).

- The third one is mentioned by Seligman (1910), who places the site somewhere in the location of Burns Peak.

There are no physical remains of these sites.

4.5.3 Historical Buildings

All historical buildings in the study area have been identified and visually surveyed. Their present state and use has been noted along with ownership and function. Background research into the origin of these buildings has been initiated and will continue in order to determine their historical significance.

Presently in Papua New Guinea, there is no legislation to list or protect historic buildings. Whilst PNG is a signatory to the World Heritage Commission, there is no legislation in place to enable the protection of sites.

This is a significant issue for the study, given that many of the country's historically significant buildings occur within the study area. Some of these buildings are significant to the heritage and history of PNG. The practical question for the study is to identify whether and how these buildings should be conserved for future generations.

At this stage, the study has made an inventory of all the public buildings that remain from the colonial era, as well as old church buildings within the study area. This will need to be supplemented by additional primary research into the history of these buildings as part of Phase 2 of the study.

Material presented in this section has been informed by discussions with officers in the Department of Environment and Conservation, the National Cultural Council, the National Museum and Art Gallery, as well as with academics from the University of Papua New Guinea and the National Research Institute.

The location of buildings listed below is shown on **Map 8**.

a Old Colonial Buildings in Town

The line of buildings which house the Westpac Bank, the Steamships store and the Department of Transport and continuing to the Post Office presents the only block in the study area that is retained from the colonial era (see photos). Options to ensure that this streetscape is retained and possibly upgraded should be investigated in Phase 2 of the study.

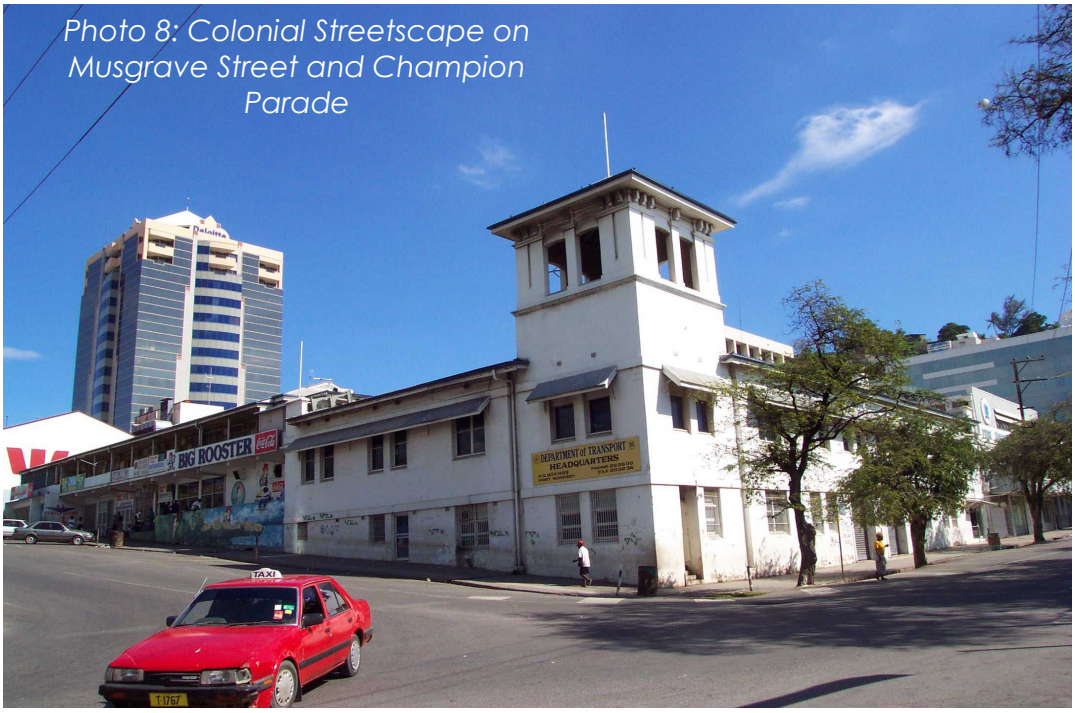


Photo 8: Colonial Streetscape on Musgrave Street and Champion Parade

b *Central Provincial Government Building*

The Central Provincial Government building was also constructed in the colonial period and is in need of renovation.

Photo 9: Central Provincial Government Building

c *Old Parliament House*

The National Museum has set up a trust fund to restore the old House of Assembly (later to become the Parliament House). Much publicity has gone into this, and an exhibition was officially opened in what was the chamber of the House under the banner 'Hall of History'.

Since then, there has been little additional activity. According to the Deputy Director of the Museum, the effort is still continuing.

d St Mary's Catholic Cathedral

This building has a traditional flavour in its design with the motifs on the front and is culturally significant. Also important is the Bishops residence behind the church.

e United Church Building

The 1890 United Church building in Douglas Street has recently been removed and the site is being developed. It is understood that this building may be relocated elsewhere, though this has not been confirmed.

f Anglican Church

The Anglican Church in Douglas Street behind the Crowne Plaza Hotel is a sturdy structure and still maintains its original form.

g Seventh Day Adventist Church

The SDA church along Ela Beach is located in an area that has a high demand for redevelopment because of its location along the beachfront. It has been an important monument to the SDA community, for whom it is considered cultural significant. However the old fibro-clad is in derelict condition, and unsuitable for use. It is unlikely that rehabilitation is either practical or worthwhile

h Rev. Sir Percy Chatterton Memorial United Church Koki

This church is located at Koki opposite Andersons Foodland. It appears to have been recently renovated.

i Good Shepherd Lutheran Church Koki

This church is the oldest of the Lutheran church buildings set up in Port Moresby. It is located in Koki and is still in good condition.

j Private Residences and Hostels

There are a large number of private residential buildings (houses and hostels) from the colonial era. It has not been possible to survey these in detail at this stage of the study.

4.5.4 War Monuments

The discussion on war relics is provided in four zones on the basis of geographical location. These are: Paga Point, Touaguba Hill, Ela Makana and the Badili/Konedobu Ridge.

a The Paga Point Area

Paga Point has by far the highest and most impressive remains of war structures. A total of eleven different features are known to exist on the Hill. The use of the report by Mr. Herman Mandui who did a rapid appraisal of the area in 1998 is acknowledged here.

i Feature 1: Ordinance Store

This concrete bunker is right beside the road to the top of Paga Point after the turn-off to the Paga Point settlement. It measures 14m x 8m and has two rooms. At the time of observation (July 2001) the rooms were littered with rubbish including human excrement. Graffiti adorned the walls, both inside and inside.

ii Features 2 and 3: Gun Emplacement, Observation Point and Directory Building

The second set of features is located on the western tip of Paga Point at the end of the Paga Point Settlement. The Port Moresby Downtown Development Plan 1984 (**Figure 13**) identifies the function of the two sites. The lower feature was a 6-Inch gun emplacement, while the upper structure was an observation post and directory building.

Presently these are occupied by people who have 'converted' them into homes. According to a long time resident of the settlement, the bunkers are occupied by people from the Kikori Delta who have been living in them for many years.

Photo 10: Features 2, 3 & 4 on Paga Hill

iii Feature 4: Searchlight, Light Gun Emplacement

This bunker is located near the road slightly below and to the east of the Old Police Club. According to Mandui (1998) this is a Searchlight and Light Gun Emplacement. Given its commanding vantage location it would have also served as one of the numerous lookout posts. The room is partially underground because the floor is sunk below ground level. Apart from the graffiti adorning the walls and rubbish on the floor, the structure is intact.

Photo 11: Feature 4 – Searchlight & Gun Emplacement

iv Feature 5: 6 Inch Gun Emplacement

The site is located on the western side of the hill under the road where it curves around the corner near the first lookout point. It comprises two features, these being the actual gun emplacement platform and underground compartment slightly behind the gun emplacement. The area of the gun emplacement is kept clean with a clearing and the underground compartment is currently occupied.

v Feature 6: Underground Store

This is an underground storage facility. It is located very near the road and appears to actually go under the road where it turns to go up the hill. A family from Mt Hagen currently occupies the facility.

vi Feature 7: Observation and Directory Building

This bunker is well preserved. It is located on the right-hand side of the road to the top of Paga Point lookout. It has two rooms and a front entrance with a storage area, which is located immediately below the entrance. The bunker is adjacent to houses. The floor is littered with rubbish but does not appear to be occupied.

vii Feature 8: Bunkers

Three solid bunkers are located near the summit of Paga Hill just below the Telecom tower. They are occupied and access was denied.

The area is actually fenced off and has a gate in front. From the growth of shrubs and food crops like banana around the bunkers, it appears that these bunkers have been home to the people who are living there for many years.

According to local people, these bunkers and Feature 9 (below) are occupied by people from the Mt. Hagen area who are renting out space to people from the Southern Highlands. This has not been confirmed.

viii Feature 9: Search Light and Light Gun Emplacement

This bunker is located further up the road from Feature 8. The author was not able take a close observation of the building because the people occupying it had been known to be hostile to previous researchers. Observations from the road revealed that in two places, concrete walls had been put up in what would have been open spaces in the past. Windows have also been installed. The bunker has been renovated in such a manner that by all appearances it looks like a house (apart from the concrete roof).

ix Feature 10: Bunkers within the Telikom tower perimeter.

Mandui (1998) reports that this feature consists of a bunker and a tunnel. The tunnel is believed to lead down to the western side of Paga Hill, which had a jetty during the war. It was not possible to access the property during the study.

According to local residents, the tunnel was never completed. It starts as a single tunnel and then forks into two and is understood to be snake-infested.

x Feature 11: Bunker

The final feature in the Paga Hill area is a small bunker located within the Sea Park area behind the top end of Ela Beach. It stands about 10 meters above sea level and measures 6m x 6m. Currently, people from Tari occupy it.

b Touaguba Hill Area

It was not possible to survey residential properties on Touaguba Hill for historic sites and the survey was therefore confined to the north-eastern end of the hill, which is still unoccupied. Access to the top of the area is from the northern ridge at the top of Lawes road. All the features describe below are located at the summit of the hill.

i Feature 12: Underground Bunker

There is one underground bunker on the summit of the hill. The steps down are intact and lead to an open area. The whole area is full of debris and warrants further investigation through the files in the Museum of Modern History.

ii Other features

Other features include the remains of what might have been a concrete hole in the ground as well as a gun mound. Also present are two hollowed out areas that are surrounded by rusty 44-gallon drums. Further research is needed to verify the use of this area during WWII.

c *Ela Makana Area*

Apart from the built up area, Ela Makana also includes the hilltop running north-westwards and terminating at the top of the Talai settlements. There are no bunkers in the area but there are numerous areas along the ridge, which appear as holes that were dug during WWII. These are referred to as foxholes and may have been observation posts during the war. Most of these areas do not appear to have any physical remains from WWII.

d *Two Mile Hill to Burns Peak Ridge Area*

There are numerous foxholes on the ridge tops and the spurs running into the valley. These may have simply been observation posts.

4.5.5 Areas Recommended for Protection

Legislation is in place to protect specific areas from destruction and tampering. These areas include archaeological sites and sites of cultural significance, protected under the National Cultural Property (Preservation) Act, and war relics, protected under the War Surplus Material Act (1958).

Presently there is no legislation in place for the protection of other historical sites.

a *Archaeological Sites*

The archaeological site located on the ridge above Gorobe should be protected from further destruction resulting from gardening activities.

The surface scatter of archaeological artefacts along the ridge needs to be sampled. This would ensure that some of the material is retained for further study and analysis.

b *Cultural Sites*

The obvious importance of Ela Beach as a contemporary cultural site means that this site should be protected under the National Cultural Property (Preservation) Act. This will ensure the protection of the site from being rezoned for other purposes.

c *Burial Sites*

By law, the present burial site on the Konedobu side of Talai will be recorded. As to whether the people should continue this practice within the NCD is a matter for the city authority to consider and pursue. Experienced personnel should be engaged to deal with this very sensitive issue.

d War Relics

All the war relics mentioned in this report are protected by legislation under the War Surplus Material Act. The question is therefore not of protection but one of curatorship of these protected items.

This matter has been discussed with the Head of the Modern History Division of the National Museum and Art Gallery. The outcome of the discussion is that the museum is currently unable to take any positive action to restoring these facilities.

There are several other options, including:

1. Eviction of the people currently living in these war relics, in particular the bunkers and make these places inaccessible, although even if this was done, the sites would always be prone to acts of vandalism.

2. Close working with the Office of Environment and Conservation and NCD to ensure that protection and managed access is provided with any further development of the Hill. The Museum may be able to assist with plans on how best to improve and manage these facilities as important national monuments. This option is discussed below.

The bunker on Touaguba Hill is relatively safe provided the summit is left undeveloped. On Paga Hill, the land that was previously open space has been rezoned for commercial and residential use. A five-year urban development lease was subsequently granted in 1998 to the Paga Hill La d Holding Company, which encompasses the land on which the Second World War fortifications (gun emplacements, ammunition bunkers and fortified stores) are located. The lease includes a condition requiring appropriate treatment of these relics. Options under consideration have included dedication of the relics as public open space and their dedication to the NCDC. The developer released a planning study for the land in June 1998, which refers to the incorporation of the features within the development of the area for use as lookouts, refreshment areas, rest stops or 'entry statements'.

e Buildings

The following buildings are recommended for protection, though it is noted that there is no current legislative basis for this.

- The line of buildings along Musgrave Street which house the Westpac bank, the Steamships store and the Department of Transport building present the only block in the study area remaining from the colonial era.

- The Central Provincial government building should ideally be retained, with renovation encouraged. However, it is noted that the building is now zoned commercial.

- The Anglican Church, the Catholic Cathedral, the United Church building and the SDA Church are all culturally very significant.

- Old Parliament House - the National Museum had plans to restore the building at the time of survey, but whether it will proceed is unclear.

f Parklands

It is noted that in the town centre there is only one designated park, this being Coronation Park situated between St Mary's Cathedral and the Police Station. The War Memorial, which appears to have lost all prominence could also be classified as a park. Presently, the significance of Coronation Park is lost because of the PMV stop, and it is little used. The War Monument also suffers as a result of the busy adjacent road.

There is potential for improvement to this precinct to create a more significant and useful open space area, possibly involving relocation of the Police Station and PMV stop. Under such a plan, the War Memorial could be relocated to Coronation Park.

g Social and Recreational Facilities

Social and recreational facilities, including Ela Beach, Paga Hill Nature Reserve and Ela Beach Sea Park are discussed in **Section 4.6**.

4.6 Open Space & Recreation

4.6.1 Social and Recreational Facilities

For the purpose of this report, recreational areas are divided in two categories: (1) public recreational areas and (2) private recreational facilities. Public facilities are areas within the study area that are accessible to the general public free of charge, and include Ela Beach, Paga Point Lookout and Hubert Murray Stadium and surrounds. Private recreational facilities are areas of recreation which are accessible only though membership, and include the Royal Papuan Yacht Club and the Aviat Club. Phase 1 of this study concentrated on the public facilities.

4.6.2 Public Recreational Facilities

Physical monitoring of the use of recreation facilities was conducted at Ela Beach and the seafront, and at the recreation area at the top of Paga Hill. At both locations, field assistants were employed to conduct surveys.

Public recreation facilities are divided into three categories, (a) Beaches and Pubic Parks, (b) Scenic Lookouts, and (c) Sporting Facilities. Each of these are discussed below in turn.

a Beaches and Public Parks

Beaches and Parks include Ela Beach, Sea Park, Coronation Park and the War Memorial.

i Ela Beach

Ela Beach has been used as a public beach since the establishment of the city with the planting of casuarina trees – supposedly brought from the highlands - along the road. In the past the Public Library and the bowling club were located on the beachfront. These have since been removed and replaced by a basketball court. Presently there are three food bars located along the beachfront, which serve cooked food, soft drinks and confectioneries. There is only one shower/ toilet facility located at the western end of the beach.

As well as being used as swimming area, the beach is an anchoring area for visiting boats. During the survey period (July 2001), a total of four canoes from other parts of the Central Province were anchored there. The people had come to Port Moresby to visit relatives and do their shopping.

People have also been observed fishing on the reefs at Ela Beach. At low tide, women and children go out and collect shells.

As a recreational area, Ela Beach in the only public beach that is easily accessible by public transport. Families come from the suburbs across Port Moresby to use the beach and it is well used during daylight hours.

As part of this study, a survey was conducted to gauge the opinion of those who use the beach, and the results are presented here. Of approximately 500 people approached for the survey, only 100 (20%) were willing to be interviewed over the two weeks of interviews. Key questions related to frequency of use of the Beach, purpose of visit and comments about the facilities available. Results are presented in **Tables 4.8 and 4.9**.

Table 4.8: Frequency of Use of Ela Beach

Frequency of Use (%)	
Daily	17
Weekends	54
Irregular	29
Total	100

Over half of the people interviewed indicated that they came to the beach during the weekends. 17% were daily users, while another 19% stated that they did not come to the beach on a regular basis.

Table 4.9: Purpose of Visit to Ela Beach

Purpose of Visit (%)	
Relaxation	46
Exercise	36
Accompanying Children	11
Selling Ice Blocks, Buai	3.5

Meditation	3.5
Total	100

Nearly half (46%) of the people who came to the beach indicated that they came to relax. 36% used the beach to exercise while 11% accompanied their children to the beach. About 3% came to meditate, while vendors of buai and ice-blocks made up 3.5%.

Comments of Existing Conditions and Facilities

The interviewees were asked to make general comments about the beach. Generally speaking, all those interviewed said that there was an urgent need to improve on the current facilities that were available to those using the beach. The following suggestions for improvements were forwarded.

Rubbish

There was unanimous agreement that there was too much rubbish on the beach at most times.

Security and Security Lights

Many felt that security should be provided both during the day and night to ensure the safety of people using the beach. There was also a desire to improve the lighting on the beach. People thought that illumination of the beach would provide an attractive feature as well as deter crime.

More Toilet Facilities

The current toilet facility, located at the western end of the beach, was considered to be unhygienic. It was felt that as well as improving the cleanliness of the facility, an additional facility should be provided at the eastern end of the beach.

Showers and Fresh Water Taps

It was thought that showers should be installed for use after swimming, and that these should be located in a partially open brick enclosures which gave some privacy while maintaining safety and security by not being too secluded. Open fresh water stand-pipes should also be included for younger children to use. These should be located in several places along the beach.

Better Food Outlets

The existing canteens, selling food, soft drinks and confectionery, should be required to improve on the quality of the food being sold. Many people interviewed felt that rather than selling lamb flaps, boiled scones and fried food, these canteens should sell healthier and more traditional foods. Local vendors of fresh fruits should be encouraged.

Children's Park

There was a significant demand for additional play areas for children.

Water Cleanliness

Nearly all the interviewees raised concern about the cleanliness of the sea itself. In the past, the beach has been closed off to the public because of wave and currents, which have carried human effluent onto the beach from nearby discharges. Many of those surveyed also believed that the stormwater outlets along the beach were raw sewage outlets.

ii Ela Beach Sea Park

The Ela Beach Sea Park is currently out of bounds to the general public, though appears to be used for private parties. Numerous suggestions have been made for the use of the area ranging from opening it up to the general public as the southern extension of the beach to setting up entertainment facilities or building a hotel.

iii Coronation Park

This small park is located between the St. Mary's Cathedral and the police station. Winter Street separates it from the police station. It would appear that many members of the public are unaware of the existence of this small park. Most view it as the entrance to the Welfare and Children's Court located behind the park.

Throughout the survey, it was observed that not many people use the park, but instead tend to crowd around the PMV stop. This is identical to the pattern of park use observed during the 1984 survey.

Photo 12: Coronation Park

iv War Memorial

The War Memorial is located in a secluded corner of the town and is under-utilised.

b Scenic Lookouts

Scenic lookouts include Paga Hill, Touaguba Hill, Poreporena Highway, and Burns Peak.

i Paga Point Lookout / Paga Hill

In April 1983, Paga Hill was declared a National Park by the Papua New Guinea Town Planning Board following a successful application by the National Capital District National Parks Board to the Department of Lands. Picnic areas and sheds were set out at the top of the hill overlooking the city. These have all but been demolished and the area is now bare apart from concrete foundations of old buildings and water tanks.

In 1998, Paga Hill Land Holders Company lodged an application and was awarded the title to that land.

Survey of Use Paga Hill

Two field assistants were placed at the top of Paga Hill at the old picnic area over a period of 10 days to monitor the use of the area as well as seek the views of visitors. These observations were made during daylight hours only.

A total of 124 vehicles were recorded visiting the area. A total of 165 people in 48 vehicles were interviewed. Some vehicles simply turned around on the summit and went back. Only 20 people walked up to the area. These were people who were living in the settlements and the government hostels. Results are presented in **Table 4.10 and 4.11**

Table 4.10: Vehicles visiting Paga Hill Lookout

Vehicle types	Number	Percent
Private vehicles	40	32.3
Government vehicles	36	29.9
Company vehicles	29	23.4
Taxis	15	15.3
TOTAL	124	100

Table 4.11: Purpose of Visit to Paga Hill Lookout

Purpose	Number	Percent
Relax	73	44.2
Sightseeing	40	24.3
Have lunch	30	18.2
Seeking Privacy	22	13.3
TOTAL	165	100

ii Touaguba Hill Lookout

There is a small lookout point at the top of the residential area on Touaguba Hill, comprising a small car park located between two residences. Discussion with the security personnel manning the gates to the residences revealed that members of the public rarely used the lookout.

There is a flat area that is near to this lookout overlooking the Konedobu area but this can only be accessed by clambering up the side of the road. It provides an excellent view to the north of the city.

iii Poreporena Highway Lookout

Located on the southern slope of Poreporena Highway, this lookout is accessible to the public. There is a shed to provide shade, even though the benches that were put in the shed have now been removed. It has a commanding view of the Konedobu area.

iv Burns Peak Lookout

The Burns Peak Lookout is one of the highest peaks in the region and provides a breathtaking view of the whole city. This area is rarely used, as access is through the Mailakoum settlement.

c *Sporting Facilities*

The main sporting facility in the study area is the Sir Hubert Murray Stadium. Other smaller facilities are also identified here.

i The Sir Hubert Murray Stadium

With the construction of the Poreporena Highway, the area of the Sir Hubert Murray Stadium sports complex is conveniently divided into two sections. The main stadium is accessible to the public at a fee, and is for organised sporting activities.

The western portion of land between the stadium and the Highway is now a rugby field that is used for local competitions. This area has potential for further development once drainage problems have been resolved.

ii Konedobu Netball Field

The area in front of the Konedobu Post office is often used as a netball field during the weekends by local residents and Hanuabada field teams to play competition netball.

iii Ela Beach Basketball Court

There are presently two public basketball courts at Ela Beach, which are extensively used by beach visitors throughout the week.

iv Gorobe Rugby Oval

This informal field is located between Gorobe and the bottom of Talai settlement, within the Gorobe settlement area. Because of its imprecise boundary it is not included on the land use map (Map 11). It is regularly in use with teams from the settlement playing touch football, and is the central meeting place of most of the people living in both Gorobe and Talai.

v Talai Rugby Oval

This oval is located at the top of the Talai settlement. It is little used at present, as most games are held at the Gorobe Oval, which is closer to the bulk of the residents of both Talai and Gorobe.

4.7 Health & Education Facilities

4.7.1 Health Facilities

Most of the population living in the Koki Badili area go to the Badili Clinic, to the east of the study area. The majority of the people who live in the Newtown and Konedobu area attend the clinic in Newtown. A clinic at Koki needs to be re-opened but has no staff. It is open only on Wednesdays for the treatment of diabetes.

There are only two private general medical practitioners (GP's) in the study area, located opposite the bus station above Johnsons Pharmacy and in Era Rumana buildign. There is only one private dental clinic operating in the study area, located in the Deloitte Towers.

4.7.2 Education Facilities

With the shifting of the government centre from Konedobu to Waigani in the mid 1980s, many of the training institutions have also been moved away from the area. These included the College of External Studies (now College of Distance Education) to Ward Strip. It is noted that most of the local children from the north of the study area walk to Badihagwa High School and Hagra Community School.

Table 4.12 shows the educational facilities that are currently in operation in the study area.

Table 4.12: Education Facilities in the Study Area

Facility	Location	Agency	Current Enrolment
Primary Schools			
Koki Primary School	Koki	Gov't.	1,400
St. Francis Primary School	Koki	Anglican	1.100
International Schools			
Ela/Murray International Primary School	Ela Beach	IEA	440
Vocational Centres			
Koki Vocational Centre	Koki	Gov't.	450
Training Institutions			
Port Moresby Institute of Bankers	Torobert Centre, Konedobu	Private	Not Available

* *Note – at August 2001, this was due to be relocated.*

4.8 Law & Order

Law and order problems have become a very significant local issue for the Government, business houses, the Police and the general population. This discussion of law and order is only general in nature and could very well apply to the situation in the whole city.

Crime takes many forms and its impacts are manifested both physically and psychologically. Fear of crime can be as traumatic as actual incidents.

Metal fences tipped with razor wire, remote control gates, surveillance cameras and around the clock security guards greet the visitor to most of the residences on Paga Hill, Touaguba Hill and Ela Makana and are the dominant characteristic of these residential areas. Whilst giving an outwards appearance of security, the very fact that these security measures exist is symptomatic of a very unsafe living environment.

Photo 13: Security on Touaguba Hill

Previous planning studies have paid little regard to the opportunity for urban design and planning decisions to influence the law and order problems that exist. These could include mechanisms such as increased natural surveillance of the public domain, greater public activity outside of daylight hours and better planned public spaces.

The views of those living and working in the study area are also an important consideration in attempting to deal with this issue.

4.9 Economic Context

Within the NCD there is a multitude of diverse economic sectors, both informal and formal. However, the availability of up to date information on the economy is limited, especially at the detailed level of the study area.

The study team has obtained a database of all businesses in the NCD from the National Statistical Office. This database, which contains several thousand businesses, is yet to be analysed to determine the type and distribution of businesses in the study area. This is a potential task for Phase 2 of the study if necessary.

For these reasons, this discussion of economic context is limited in its scope.

4.9.1 Overview

As a hub of business activity within the NCD, the study area is an indicator of the health of the local economy, particularly in relation to the construction, import/export and service sectors. According to the PNGBC Quarterly report (Sept 2000), employment in the business services and finance sectors has declined in recent years, showing a significant drop of 9.1% in the June 2000 quarter, on top of a decline in previous quarters. The town centre has

experienced this decline, which is apparent through both the limited construction activity and apparently high vacancy rates in commercial towers.

4.9.2 Economic Role

Despite government policy that seeks to supplant the role of the town centre with Waigani, the area continues to be the preferred place of business for the private sector and a number of government owned corporations. Reasons for the ongoing attractiveness of the town centre are well-documented in previous planning studies and include:

- the traditional and historical role of the area as the commercial heart (the 'incumbency factor');
- the relative superiority of infrastructure over Waigani;
- improved accessibility with the opening of the Poreporena Highway and current upgrading of Koki bends, Ela Beach Rd;
- the dramatic natural setting and views;
- agglomeration benefits for a variety of businesses and professional offices (including finance, law, and accountancy);
- proximity of the Port and traditional trade areas; and
- proximity to high covenant housing.

There has been much speculation over many years regarding the impact of the Government's 1979 policy position that Waigani should be the seat of the National Government and also the financial and commercial centre for PNG as a whole. To date it would appear that the impact on the town centre of this decision has been minimal. Recent and current public spending on infrastructure improvements relating to the town centre, most notably road building and upgrading, in conjunction with other factors listed above, indicate that there is unlikely to be a shift away from the current role and commercial dominance of the town centre, either in relation to other NCD areas or nationally.

4.9.3 Economic Interrelationship

Economic factors and considerations are present throughout this report and in many respects are difficult to separate from 'locational' considerations. For example, the land use analysis set out on **Maps 9-11** contains a wealth of data on the spatial arrangement of business and other activity. These maps also provide an overview of the number of sites that are available for development if mobilised.

Section 4.1 deals with population growth and density of population. These are important economic considerations, as well as social considerations, with current growth rates

(preliminary) indicating a slow-down across the NCD. This section also provides an overview of the potential population and number of dwellings that could be accommodated within the study area, given the right economic circumstances.

The role of the Local Development Plan as a contributor to economic activity is important. It is able to establish a clear framework for development and identify public sector spending that will support development. However, the LDP will not in itself generate economic activity, but rather promote and guide economic activity.

5 Built Environment

5.1 Urban Form

5.1.1 Overview

The study area has a wide landward interface to the north east, extending as a narrowing peninsula to the south west. The main visual features, and constraints to growth, are its dominating hills, which are both difficult to access and expensive to service. The high north eastern slopes have remained undeveloped, but for the incursion of unserviced informal settlements.

The focus of development, and the only area having a grid plan is the town centre, with a width of half a kilometre, extending from the port waterfront in the north to the Ela Beach coastline in the south. This area of some 25 hectares contains the highest density of buildings and greatest building heights, as well As a number of vacant and underdeveloped sites. It represents the quintessential commercial centre of Port Moresby, juxtaposed between the dramatic Paga Hill and Touaguba on one axis and spectacular water views on the other.

Konedobu in the north contains the only other area of relatively flat land; and has developed with a variety of low-density uses, from old government building complexes in the north, sporting fields behind the yacht club, and a mix of mostly single-storey industrial and commercial buildings. The area lacks planning discipline, the streetscape is generally poor and land use efficiency is somewhat haphazard.

The coastal fringe of the peninsula is very narrow, in most places affording little more than sufficient width for access roads. However, due to main road exposure and good vehicular accessibility, adjacent sites on foothills have a number of modern high and medium-rise apartment blocks enjoying immediate water views.

The core of the study area comprises the domineering Touaguba Hill, with Ela Makana Hill beyond, and the smaller but distinctive Paga Hill at the tip of the promontory. The steepness of these hill slopes has limited access to narrow, winding roads. Large tracts of hilltop land remain undeveloped and little used, while circumventing local roads elsewhere service large, expensive detached housing which has been built to take advantage of the views, using engineering techniques and layout which overcome the steep gradient.

5.1.2 Entry Points & Landmarks

Construction of the Poreporena Highway in 1998 has created a dramatic visual entrance to the town area and perhaps strengthened its character as a dynamic harbour side precinct. The drive past Burns Peak on the Highway also reinforces the physical separation of the area from the rest of Port Moresby by the imposing peaks and associated ridges.

Photo 14: View from the Poreporena Highway

The first impression of arriving in the town area along this route is from the viewing area on the western slopes of Burns Peak. Key town area landmarks are obvious from this location, which provides a good view of the entire area. These landmarks include dominant views of Fairfax Harbour, Touaguba Hill, the Port and Konedobu, all of which are significant in their own right as distinctive landmarks within the town area.

The second key entry point to the town area is along Healy Parade. This approach to the town is much less visually dramatic than the Poreporena Highway entry. The route is distinguished by its vistas of Koki, with its settlement and markets, and beyond to the parkland and esplanade facing Ela Beach.

Although a less dramatic entry point, a more intimate perspective of the town is afforded from this approach, with gradually unfolding vistas. Water frames many views, with the Harbour, recreational activity along the Beach and high-rise residential apartments being dominant. The current upgrade of Healy Parade on reclaimed land between Koki and Ela Beach will provide yet a further visual opportunity in reinforcing a sense of entry to the centre of Town.

Photo 15: Upgrade of Healy Parade on Reclaimed Land

A further significant entry point to the area is by passage into Fairfax Harbour by boat. Though less important than road transport as a means of travel, the Port, marinas and informal moorings along Ela Beach provide the point of entry for coastal village travellers bringing their wares to Port Moresby, international cruise tourists and an assortment of other trade and recreational vessels that arrive regularly in the Harbour. The image of Port Moresby from Fairfax Harbour is one of a busy and commercially active tropical city, with a mix of modern and traditional architecture in a dramatic setting.

5.1.3 Precincts

The main precincts within the study area are illustrated in **Figure 5.1**. Each of these is described briefly below, commencing in the north.

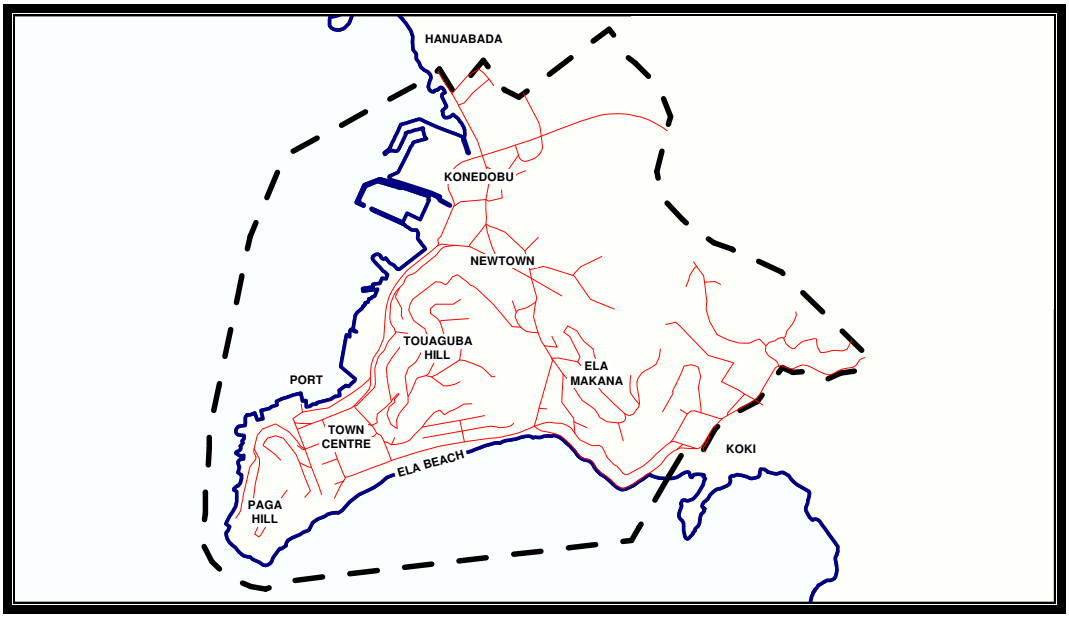


Figure 5.1: Main Precincts in the Study Area

a Kaevaga

This northernmost extent of the study area is an older, mainly residential area, developed as high-covenant housing in a landscaped setting characterised by lush canopies of rain trees. The area shows signs of age with lack of maintenance, degradation of buildings and vacant land, but has a distinctive presence separating the traditional village of Hanuabada stretching northwards from Konedobu. A large portion of Kaevaga is occupied by the elevated and stately colonial residence of the Governor-General, surrounded by impressive manicured lawns.

b Konedobu

Konedobu is the original centre of Government in Port Moresby. It continues to house a large number of government offices, mainly in low-scale (1-2 storey) older-style buildings within a mature landscaped setting, but suffering from age and a general lack of maintenance. In particular, the policy of the 1984 Downtown Local Plan designate Konedobu as a Comprehensive Development Area (see Section 6), but this has never been implemented.

Recent development includes the Salt Factory at Ranuguri and Harbour City at the water's edge in the north of the area. The recent construction of the Poreporena Highway has isolated the northern side of the precinct, with access to the southern part maintained through the Konedobu underpass. There are acute safety concerns in the Konedobu tunnel

area from fast-moving traffic, and no designated bus stops. The further development of the salt factory is expected to exacerbate this problem. Overall, development in this area is of poor quality, with hostels and squatter housing interspersed with waste and vacant land.

The 1984 Downtown Local Plan recommended that "*in order to take account of the Government's policy of establishing Waigani as the main government administrative centre in Port Moresby, it is proposed that this area be designated as a Comprehensive Development Area*". It would appear that this designation was never implemented.

The current Harbour City development is located centrally to the area and has the potential to dramatically change the character and nature of activity in Konedobu.

Photo 16: View of Konedobu, Harbour City site and Hanuabada from Touaguba Hill

c *Newtown*

Newtown is located on a wedge of low-lying and relatively flat land that extends from the coastal plain into the foothills of Touaguba and Ela Makana. The Town's two major sporting grounds, the Sir Hubert Murray Stadium and an open field, lie to its west.

The area contains a mix of industrial uses, and is the only precinct within the study area zoned for general industry. However, as can be noted from the land use maps (Maps 9-11), it comprises a range of other land uses such as warehousing, commercial, residential and a burgeoning informal settlement.

The built form is mainly low-scale one and two-storey buildings, of generally poor quality, much of which is suffering from lack of maintenance. Many sites are underdeveloped, and there is a visible lack of planning control.

Photo 17: Typical Industrial Building in Newtown

d Touaguba Hill

At 179m above sea level, Touaguba Hill is the highest point in the study area and one of the most dominant landmarks. The summit of the hill is prominent, as is the very steep and vacant expanse of its eastern escarpment. The remainder of the hillslopes are almost fully developed with residential buildings, and serviced by narrow, winding roads. The northern, western and parts of the southern sides of the hill generally have slopes between 10 degrees (20% slope) and 20 degrees (40% slope) and have been developed for high-covenant housing. The eastern side is steeper (at 20-45 degrees, 40-100% slope) and is largely undeveloped.

Housing is characterised by a mixture of 1-3 storey high-covenant houses, high rise residential towers, and a number of older developed sites with potential for redevelopment.

Photo 18: Development on the Southern Slope of Touaauba Hill

e Port

The area known as 'Port' stretches from the northern end of Paga Hill, approximately 1.5 km to the Royal Papua Yacht Club marina to the north, and the reclaimed site known as 'Harbour City' beyond. The most dominant activity in the Port area is the commercial port of Port Moresby, managed by the PNG Harbours Ltd. Port facilities include wharfs, access roads, workshops, warehousing, an open container storage compound, and offices. Other activities include commercial operations linked to the Port and a naval defence facility.

The current layout of the Port Moresby commercial port provides for coastal shipping (mainly bulk cargo) in the older part of the Port (near Paga Hill) and the more modern container terminal in the new portion to the north.

Photo 19: View of Port Moresby Port from Paga Hill

In recent years there have been a number of studies commissioned to investigate future development of the existing Port and/or relocation to a new site. These are discussed in more detail in **Section 5.3.7**.

The cross-government committee overseeing the preparation of the Local Development Plan (the Plan Management Team) has directed that the study should provide options for the future use of the whole commercial Port area should it relocate.

f Town Centre

The Town Centre is the commercial heart of the study area and of Port Moresby as a whole. It is mainly located on a narrow topographic 'saddle' between the peaks of Paga and Touaguba Hills. Soils are hill slope deposits and the minor Koki fault line runs through its centre along Musgrave Street. The built environment follows a grid pattern laid out in the original Cuthbertson Town Plan of 1886. It is now characterised by a mixture of modern high-rise towers, lower level commercial buildings and 1-2 storey buildings. Many sites are suitable for redevelopment, as shown on the land use maps (Maps 9-11).

Recent development is characterised by commercial towers of largely generic modern style within glass curtain walls. Although these buildings play an important role in housing the majority of modern commercial floorspace within Port Moresby, their design adds little to the character of the area. These buildings have also been criticised for their high levels of reflectivity and lack of shading, causing heat loads that require large air-conditioning systems and high levels of energy consumption. There are some exceptions, notably the PNG Banking Corporation building.

Photo 20: Town Centre from Paga Hill, looking towards Touaguba Hill

With the exception of a few high-rise apartment buildings, there is little residential development within the town centre area. This is despite the 1984 Plan (Policy O4) which provides a generous floor space bonus for the incorporation of residential activity into commercial buildings. This initiative was intended to achieve the aims of:

- liveliness in the town centre;
- enhanced business for facilities such as restaurants, cafes, shops and entertainment; and
- additional housing choices for those who may wish to live in the town centre.

The town centre also contains the main remnant historical buildings in Port Moresby, which are described further in **Section 4.5.3**.

g Paga Hill

Paga Hill is one of the primary landmarks that characterises the town area of Port Moresby. It is currently part-developed, mainly on the southern and eastern sides, by high covenant housing that overlooks the town centre and Ela Beach. On the peak of the hill exists a public lookout, enabling panoramic views in all directions. The northern and western sides of the hill are largely undeveloped and contain a number of significant WWII artefacts (refer to **Section 4.5**).

The area was, until recently, a National Park, zoned as public open space in the 1984 Downtown development plan. It has since been de-gazetted, and rezoned to commercial and residential use. An urban development lease has been issued to the developer - the Paga Hill Land Holding Company - and a planning study has been submitted demonstrating how the land could be used for commercial, residential and tourist-related development.

Particular considerations for the redevelopment of the area include:

- **Public utilities infrastructure on the site** – there are a number of facilities including the Paga Hill reservoir and pumping station and a radio mast in the area. These are excluded from the commercial and residential zoning but have been included in the urban development lease on the site (as such they have inappropriately been doubly allocated in land use terms). Any development will be required to incorporate these facilities.
- **National Housing Corporation flats on the site** – these are all in a poor condition and redevelopment is assumed to require their removal. However, they are occupied and as yet there are no identified solutions for the relocation of residents. It is unfortunate that relocation provisions were not written into the lease.
- **World War 2 relics** – there are a number of relics on site requiring protection, which are addressed in **Section 4.6**.

Photo 21: Easterly view of Paga Hill and Ela Beach

The coastal fringe of the hill is undeveloped except for a large informal settlement on the western edge, adjacent to the Port.

h Ela Beach

Ela Beach runs for approximately 1km along the southern fringe of the town area. It provides the main recreational area within the town area and is actively used for land-based activities.

Although it is the most accessible public beach within the greater Port Moresby area, there is limited swimming due to the discharge of raw effluent at Koki and Paga outfalls (see **Map 17** for the location of these outfalls).

The NCDC has a current proposal to significantly upgrade the recreational facilities available along the Ela Beach coastal strip, in association with the upgrade and duplication of Ela Beach Road. An indicative plan for this upgrade shows basketball and volleyball courts, more substantial parking areas and an ampitheatre.

On the northern side of this coastal strip, across Ela Beach Rd, are low-lying properties backing onto Touaguba Hill. Prominent along this strip are a number of older-style 4-7 storey residential buildings and a large number of undeveloped sites. Many of these vacant sites have been zoned since the 1984 Plan exclusively for hotels (1984 Plan Policy H1).

A 'Sea Park' was constructed in the 1980s at the western end of Ela Beach and provided marine-based shows for a number of years, but is now closed and in disrepair.

i Ela Makana

Ela Makana Hill provides the easterly entry point to the town area and is the third of the major natural landmarks in the area. It is developed mainly on its western side and lower

slopes and is fringed to the north by the large settlements of Gorobe and Talai, which have undergone substantial growth in recent years. On the eastern slopes of the Hill is the edge of the Koki area, which falls partly within the study area

5.2 Land Use

5.2.1 Land Use Survey

Section 45 of the Physical Planning Act 1989 requires that a land use survey form part of the preparation of a Local Development Plan. Such a survey of the study area has been undertaken over several weeks. The methodology for the survey involved:

a) a trial survey to determine categories for land use and other matters for recording;

b) a detailed survey by two person teams;

c) a second survey of sites where land use was unclear; and

d) verification and random checking of data by NCDC staff.

Categories selected for recording were:

- residential;
- civic (including government offices, churches, schools, health facilities, etc);
- general industry;
- hospitality;
- office;
- retail;
- public recreation/open space;
- road;
- settlement; and
- vacant land.

The area of land allocated to each of these land uses is presented in **Table 5.1**. Please note that these are preliminary figures and require further review and verification, although, they provide a reasonably accurate overview of the relative amounts of land allocated to each use.

Table 5.1: Land Use Areas

Land Use Category	Area (ha)	% of total
Vacant Land	172.3	32.3
Residential	115.1	21.6
Roads	88.4	16.6
Settlements	64.2	12.0
Civic	27.5	5.2
General Industry	25.5	4.8
Public recreational/Open space	19.4	3.6
Utility	5.52	1.0
Office	5.5	1.0
Hospitality	5.3	1.0
Retail	4.7	0.9
TOTAL	**533.2**	**100**

Further analysis of the land use survey will take place in Phase 2 of the project. **Maps 9-11** present the detailed results of the survey.

5.2.2 Development Potential

The development potential of the study area was assessed as part of the land use survey. This involved identifying those sites that fell into the following categories:

B0: Vacant or under-utilised site in poor condition with development potential.

B1: One or two storey building in good condition.

BH: Modern, multi-storey building, with number of storeys noted (eg BH12 would indicate a 12-storey building).

In residential areas, all sites not labelled are in the B1 category. Others are labelled B0 or BH.

The results of the development potential survey are provided on the land use maps (Maps 9-11).

A detailed assessment of the location, area and other characteristics of sites with development potential will be undertaken as part of Phase 2.

5.2.3 Current Approvals

Current planning approvals that have not been implemented, but which are still valid (within the 5 year implementation period), have also been reviewed. The major approvals in this category are illustrated on **Map 12**.

Please note that only major development proposals have been included on this Map. It is possible that there are others not yet identified.

5.3 Road Traffic & Transport

This section of the report provides an assessment of the road network in terms of its routes and condition, hierarchy, parking, PMV service and pedestrian activity and facilities.

5.3.1 Road network & hierarchy

a Overview

The NCDC administers and maintains all of its designated NCD roads, and maintains National roads within the project area.

The functional road network classification, as described in the NCDC Subdivision Draft Code provides for the categories of arterial, distributor, collector, local access, and cul-de-sac. The classification of roads in the study area is shown on **Map 13.** The length of roads under each of these categories in the study area is shown in **Table 5.2.**

Table 5.2: Length of Roads by Classification

Road Classification	Road Length (m)
Arterial	9,234
Distributor	1,431
Collector	8,934
Local Access	13,076
Cul-de-sac	2,753
Total	**35,428**

It is noted that the majority of Collector and Local Access roads are constrained by a lack of reserve width, due to their historical development and topography, with reserve widths as low as 6.2 metres (Huxley Street). The major arterial roads and distributors on the other hand have adequate widths, with arterial road reserves at least 14 metres wide (Ela Beach Road) and distributor roads at least 20 metres wide.

There are a number of roads within the study area not gazetted as roads, including the Poreporena Highway. Conversely, there are some areas where gazetted roads are shown in the cadastral database, but which do not exist. This could be a result of either incorrect cadastral information or illegal development. In other cases, it is clear that roads cannot be economically constructed within the nominated reserve and have either remained undeveloped or have been developed as illegal settlements.

A number of roads have also been truncated (shortened), for reasons that are unclear.

Designated 'National Roads' in the study area are shown in **Table 5.3.**

Table 5.3: Designated National Roads in the Study Area

National Road	Road Length (km in study area)
Ela Beach Road	1.29
Le Hunte Road	1.08
Healy Parade	1.04
Champion Parade	2.90
Koki Street	0.23
Moyon Street	0.19
Hubert Murray Highway	1.35
Musgrave Street	0.38

A draft Memorandum of Understanding has been prepared for the transfer of assets of the National Roads administered by the Department of Works to the NCDC. It is understood that since 1993, the NCDC have maintained the National Roads without any financial assistance from Department of Transport and Works.

b Road Conditions and Maintenance

The following summarises the current road maintenance practices:

- although it was found in the Road Needs Study[8] and Urban Development and Services Study[9] that most of the roads are in a substandard condition, the pavement condition survey conducted for the project area during Phase 1 of this project found that the bituminous surfaces were generally well maintained;

- in contrast, maintenance of the structural component of the road (or pavement) has not occurred. Typically, the pavements in the project area are now 20 years old[10] and many require either rehabilitation or reconstruction;

- road maintenance is responsive and not programmed, suffering from limited funding; and

- road roughness or pavement strength has not been measured during the last ten years.

[8] Road Needs Study, Arup Pacific, 1991
[9] Chapter 15, Section 8.1.2, Urban Development and Services Study, Wilbur Smith Associates, 1996
[10] Chapter 15, Section 8.1.3, Urban Development and Services Study, Wilbur Smith Associates, 1996

A pavement condition survey was conducted on 18 July 2001. The objective of the survey was to ascertain the condition of the pavements and determine the probable cause of failure. The outcomes of this survey are shown on **Map 14** – Road Conditions. This Map shows three classes of road condition, based on the defects and attributes shown in **Table 5.4**[11].

Table 5.4: Road Condition Classes

Defect	Attributes	Attributes Range		
		Class 1	Class 2	Class 3
Deformations	Depth	0-10	11-20	>20
Shoving	Depth	0-15	15-40	>40
Cracking	Crack Width	0-0.5	0.5-2.0	>2.0
Block Cracking	Crack Width	0-2.0	2.0-5.0	>5.0
Edge Drop-off	Depth	0-20	20-50	>50
Edge Break	Width	0-75	75-150	>150
Pothole	Depth	0-25	25-100	>100

Table 5.5 provides an assessment of the causes of pavement failure by road classification.

Table 5.5: Causes of Pavement Failure

Road Classification	I	ii	iii	iv	v	vi	vii	viii	Ix	x	xi	%
Arterial	14%	12%	16%	3%	2%		3%	1%	6%	20%	23%	100
Distributor	17%	13%	36%	5%						4%	26%	100
Collector	12%	16%	17%	1%		6%	1%	2%	4%	11%	29%	100
Local Access	6%	13%	20%		2%	7%	2%		2%	18%	29%	100
Cul-de-sac	8%	12%	21%			7%			8%	19%	25%	100
Average	10%	14%	19%	1%	1%	4%	2%	1%	4%	16%	27%	100

The causes of failures noted in this table are:

i. Volume change of subgrade.

ii. Embankment instability.

iii. Inadequate pavement strength. .

iv. (including low modulus and inadequate thickness).

v. Fatigue cracking in embrittled asphalt surface.

[11] A Guide to the Visual Assessment of Pavement Conditions, AustRoads, 1987

vi. High stress due to braking and acceleration.

vii. Inadequate pavement width.

viii. Excessive application of binder.

ix. Polishing of surface stones

x. Deterioration of binder.

xi. Poor drainage.

xii. Other.

The following preliminary conclusions can be made in relation to pavement failure:

- there is a high rate of inadequate pavement strength. Therefore, in due course a number of roads will require rehabilitation or reconstruction;
- roadside drainage is generally inadequate or requires maintenance;
- there are a number of roads that have slope stability problems. These sections of road will require reconstruction.

Road grades are a major constraint for traffic, particularly for heavy vehicles. Generally, the desirable maximum grade is 12% for collector and distributor roads and 16% for local access roads. Road grades for selected roads were calculated during the pavement condition survey and are presented as part of Map 14.

With regard to other miscellaneous aspects of road condition:

- provision of streetlights throughout the project area varies considerably, from nonexistent in some residential street to well lit arterials. Streetlights consist of mainly halogen/vapour lamps and various types of casings. The remainder are fluorescent lights. The condition of the lamps and lamp casings also varies, however, in general most streetlights are in working condition;
- most guardrails and other forms of safety barriers are in poor condition throughout the study area;
- street signs have been recently replaced throughout the NCD. These signs are of a high quality construction and appear vandal resistant;
- regulatory Signs (mainly Stop and Give Way signs) are generally in poor condition and many sign are missing;

- warning signs (mainly for pedestrian crossings) are also generally missing. Both regulatory and warning signs are non-existent in the low-cost housing areas. A lack of Regulatory and Warning Signs is of particular concern for driver and pedestrian safety; and

- most line marking and other pavement marking (such as pedestrian crossings) are either in poor condition of non-existent.

c *Traffic Accidents*

Traffic accident data has been collected for the study area January 1999 – July 2001 and is summarised in **Table 5.6.**

Table 5.6: Traffic Accidents in Study Area, Jan 1999 - July2001

Accident Severity	Vehicle Only		Pedestrian	
	No.	%	No.	%
Fatal	3	1.5	1	6
Hospitalised	15	7	6	33
Not Hospitalised	24	11	9	50
Vehicle Damage Only	170	80.5	2	11
TOTAL	212	100	18	100

The majority of vehicular accidents in the study area occurred on the Hubert Murray Highway, Ela Beach Rd, Champion Parade and the Poreporena Highway. These roads are arterial roads as classified under the NCDC Subdivisions Code/ Physical Planning Act 1989.

The majority of the accidents involving pedestrians occurred along the Hubert Murray Highway, Ela Beach Road and Champion Parade. The main reasons identified for pedestrian accidents, according to police reports, are pedestrian ignorance and lack of basic road safety knowledge. It is apparent, however, that pedestrian facilities in many areas are quite limited.

62% of all accidents occur mid-block, 18% at give way signs, 10% at roundabouts, 9% percent at stop signs and 1% percent at pedestrian crossings. Of all reported accidents, 80% involved vehicle damage only, while 1% resulted in fatalities.

The major attributed cause of accidents is driver error; including driving without care, negligence and lack of attention followed by high speed and poor design of roads. Volume capacity of road, pedestrian ignorance, mechanical fault and other factors contribute less than 13%. Others factors include drink driving, hitting an object on the road or trying to avoid a hold up. In some cases there are multiple causes for accidents.

Accident data will be the subject of further review in Phase 2 of the project.

d Road Network Improvements.

The Urban Development and Services Study (UDSS) recommended a number of improvements over a twenty-year period to maintain the anticipated traffic loads. It is noted that population and vehicle registration growth that had been assumed by the UDSS has not been realised.

Most of the works affecting the project area were to be completed within the first ten years. **Table 5.7** summarises progress to date.

Table 5.7: Road Works Progress

Improvement Works	Program	Remarks
Short term (1995-2000)		
Poreporena Highway	Completed 1998	
Medium term (2000-2005)		
Ela Beach Road	2003	Design Started
Healy Parade	2002	Construction Completed
Lawes Road	2004	Planned but not implemented.
Long term (2005-2015)		No Works in Project Area

The NCDC currently undertakes little strategic planning for transport infrastructure. This is attributed to recent disruptions to the Commission's administration and a lack of confidence in future funding. Works contracts are therefore provided when funding is secured. Generally, the design and procurement process then occurs in haste.

The current capital works programmed for the project area are:

- Healy Parade 4-lane (~K11.5 million) under construction, completion 2002; and
- Lawes Road Upgrade (no estimate available), completion 2004.

The maintenance program is also responsive and not programmed. Funds are expended on an as-required basis, responding to immediate maintenance needs. Of the K6.8 million allocated in Year 2001 for maintenance of roads, roadside furniture and lighting across the NCD, about 10% or K680,000 is expected to be allocated to the project area.

The current 2001 budget has allocated the following amounts for the entire NCD road and drainage network:

- Capital Works Design K1.25 million
- Drainage Construction and Improvement K2 million
- Road Construction and Improvement K39 million[12]
- Engineering Works (road maintenance) K6.8 million

e Shortcomings of the Road Network

The following shortcomings are apparent at this stage:

- **Discrepancies -** there are a number of roads that are, not gazetted, missing and truncated. Further investigations will reveal the legitimacy of these discrepancies and accuracy of existing cadastral information.
- **Physical constraints** - there is a general lack of road reserve width on collector and local access roads. Hunter Street has an excessive grade of 20%.
- **Regular maintenance program** – there is no routine and periodic road and drainage maintenance program and no with data collection and record keeping.
- **Roadside furniture, pavement markings and lighting** - there is little apparent planning. The condition of these varies in different locations but is generally poor.
- **Strategic planning** - there is little strategic planning for both road upgrade and maintenance works for both road and drainage for reasons noted above.

5.3.2 Traffic circulation

The route network for PMVs through the study area is shown on **Map 15**. PMVs are the only form of public transport in the study area, but their coverage is limited, as can be seen from Map 15. For example the health clinics at Koki and Newtown are not easily accessible by public transport.

The circulation of traffic through the study area is based on the two major entry routes along the Poreporena Highway and Healy Parade. These two routes meet in the town centre, where circulation is facilitated by a one-way system utilising Musgrave Street, Champion Parade, Hunter Street and Douglas Street. The movement of traffic through the town centre is often slow and subject to congestion. It is noted that a further one-way street is in operation on Port Road, running in a north-south direction. There are no other one-way systems in the study area.

[12] This budget was exceeded.

There are variations on the route between town and the Poreporena Highway, with some vehicles turning around at Street 4 before reaching the Poreporena Highway, whilst others join the Highway, exiting at the Hanuabada bypass road to return to town.

The other area of congestion is between Ela Beach Rd, Lawes Rd and Healy Rd/Le Hunt Rd, though this may ease with the current upgrade of Healy Rd and planned upgrade of Lawes Road

5.3.3 Vehicle ownership

The registration of vehicles in the NCD between 1996 and 2000 is shown in **Table 5.8**.

Table 5.8: Vehicle Registrations, 1996-2000

Vehicle Type	NCD 1996	NCD 1997	NCD 1998	NCD 1999	NCD 2000	Change 96-00	Central Province 2000
Car/Utility	16,727	18,098	16,243	18,955	17,256	3%	4,368
Bus (25+pp)	1,120	1,449	1,702	2,754	2,457	54%	507
Passenger van (15pp)	2,118	1,873	1,412	617	515	-311%	233
Motor cycle	81	87	62	92	66	-23%	12
Trailers	81	96	103	123	118	31%	49
Trucks	2,244	2,307	2,091	2,478	2,219	-1%	922
Total*	22,873	24,323	21,965	25,444	23,333	2%	6,091

Source for NCD data: Motor Vehicle Registration Services, Department of Transport
Source for Central Province data: Traffic Registry data, Central Province Transport Authority.
*total includes other miscellaneous categories

Of most interest from this table are car registrations and bus/passenger van registrations. The growth in car/utility registrations is very low, at 3% over 5 years, probably indicative of the economic circumstances and import tax changes over this period. It is understood that the 'Bus' category applies to 25+ seat buses, typical of PMVs which operate within the NCD. These have shown a much larger increase in registrations than cars (54%) and it is likely that public transport trips now represent a higher percentage than the 61% estimated in **Table 5.11** below.

In contrast, 'Passenger Vans', which are typically 15 seats and operate between the NCD and surrounding villages, have shown a massive decrease in registrations from 2118 vehicles in 1996, to 515 in 2000. Discussions with the Department of Transport indicate that this could be caused by the deterioration in road conditions and inability to maintain vehicles. Alternatively it may be due to vehicles increasingly being registered with the Central Province. Information on vehicles registered in Central Province is included in Table 5.8 for the year 2000.

5.3.4 Parking

An on-street car park survey has been conducted for the commercial precinct during Phase 1.

The goal of the study was three-fold:

- to determine the revealed demand of major town centre streets that have designated on-street parking areas;
- to determine periods of highest demand; and
- to identify other relevant parking characteristics.

The area surveyed is shown in **Figure 5.1** and results of the survey, which was undertaken during weekdays only, are set out in Table 5.9 below. Figure 5.1 indicates only those spaces that are marked on-street parking bays. It does not show areas where general on-street parking occurs.

Figure 5.2: Area of Parking Survey

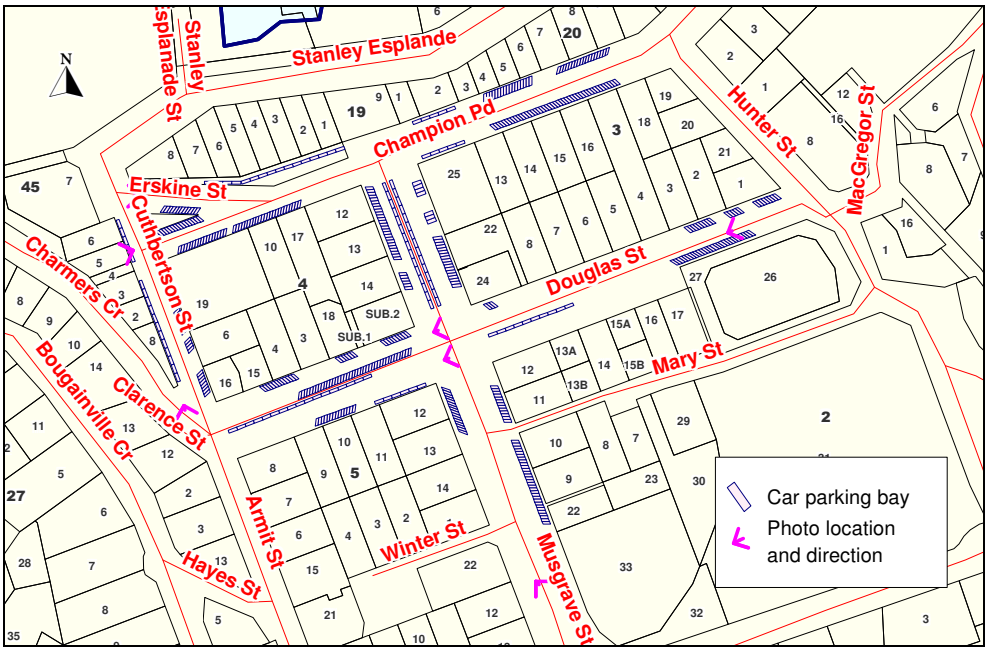


Table 5.9: Parking Demand – Town Centre

	9.00am	12.00 noon	3.00pm	Average Demand	Revealed demand %	Total Spaces
Champion Pde – East	82	82	83	83	93	89
Champion Pde – West & Erskine Street	49	61	55	55	56	98
Cuthbertson Street	37	31	34	34	90	99
Douglas Street – East	41	53	48	47	65	73
Douglas Street – W	86	88	88	87	88	38
Musgrave Street – North	78	80	79	79	91	59
Musgrave Street – South	28	34	33	32	54	87
Total spaces	401	428	420			543

Note

Table shows number of spaces occupied at 9.00am, 12.00 noon and 3.00 pm.
Average demand is the average number of spaces occupied based on the survey times.
Revealed demand is the average demand as a percentage of total spaces.

The survey was carried out on the following days: Thursday 19/07/01, Friday 20/07/01, Tuesday 24/07/01, Thurday 26/07/01, Friday 27/07/01, Monday 30/07/01 and Wednesday 01/09/01.

Demand ranged between 54% average occupancy (or revealed demand) in Musgrave Street South to 93% in Champion Parade East. This level of parking demand indicates that the capacity of some of these streets is close to saturation, though still coping with the level of demand. Other streets on the other hand experienced significantly lower demand levels, indicating that there is street parking available for those willing to walk a little further from their vehicle to their destination.

Other pertinent issues worth noting in relation to demand are:

- the very uniform spread of parking demand tends to indicate that many of the spaces are being occupied by workers whose vehicles will remain throughout the day;
- a lack of time restriction on parking and lack of enforcement where restrictions do exist (eg Musgrave Street);
- a lack of dedicated space for commercial vehicles and loading/unloading;
- a lack of use of publicly available spaces above the Steamships Store in Champion Parade, with access from Douglas St; and
- the difficulty that members of the public experience in accessing visitor spaces within commercial buildings.

These are all matters that warrant further exploration as part of Phase 2 of the project.

5.3.5 Public transport

The study area is served by the PMV routes set out in **Table 5.10** and shown on **Map 15**.

Table 5.10: PMV Routes serving the study area

Route No.	Start	Transit	Terminates
1	Gerehu	Tokarara/Hohola/Badili/ Koki	Town centre
4	Gordons Market	Tabari/ 4 Mile/ town centre	Konedobu
8	Morata	Waigani/Boroko	Konedobu
10	7 Mile	Boroko/Kilakila/town centre	Konedobu
11	Waigani	Waigani Offices/Tabari/ town centre	Konedobu
22	Tatana	Baruni	Town centre

PMV routes follow the major road pattern of the study area as indicated on Map 15, except that they are not permitted to travel on the Poreporena Highway and must therefore double-back through the town centre. The primary PMV terminus in the study area is on the corner of Musgrave and Douglas Streets.

Travel routes and recognised PMV stops throughout the study area are shown on Map 15, although it is recognised that PMVs stop anywhere.

There is a very strong dependence upon PMVs throughout the NCD area and they provide the primary form of transport for trip to work, far outstripping private motor vehicles. Table 5.11 provides the modal split for daily trips (1995) and shows that PMVs account for 61.1% of trips within the NCD, averaging 247,500 person-trips per day and 0.99 trips per day per capita.

Table 5.11 – Modal Split for Resident Trips in the NCD, 1995

Mode	Percent	Person-Trips	**Trips/ Household**	Trips/ capita
PMV	61.1	247 500	5.67	0.99
Car/Motorised	13.6	55 000	1.27	0.22
Walk	24.1	97 500	2.22	0.39
Taxi/Motorcycle	1.2	5 000	0.10	0.02
Total	100	405 000	9.26	1.62

Source: Urban Services Study, 1996

5.3.6 Pedestrian facilities/walking paths

As shown on Table 5.11, walking continues to be an important form of transport throughout the NCD and is apparent throughout the study area. 24.1% of trips, averaging 97,500 per day (in 1995) are travelled on foot. This is an exceptionally high figure by international standards, particularly given the very low density of development within the NCD, and underlines the importance of catering for this mode of transport in any planning exercise.

The difficulties confronting pedestrians as a result of inadequate footpaths and crossing points throughout the NCD are substantial and contribute to the many accidents involving pedestrians each year. The 1996 Urban Services Study estimated that 9% of total accidents involved pedestrians and of these 12% resulted in a fatality.

The town centre and Ela Beach areas are probably better served than many other parts of the NCD in relation to footpaths, though also experience the largest volume of pedestrians in the NCD. Pedestrians surveys from the Urban Services Study (1996) show that Musgrave Street carried a daily weekday volume of 17,743 pedestrians, with 12.00pm-1.00pm the busiest period (2563 pedestrians). Douglas Street carried 27,277 weekday pedestrians, with 11.00am – 12.00pm the busiest period (3,113 pedestrians).

The acute crowding on the town centre footpaths is exacerbated by informal street vending. The number of serious pedestrian-related accidents in the town centre is limited only by the congested nature of the streets and generally slow traffic speed. Any improvement in traffic conditions within the town centre will increase traffic speeds and so will need to be accompanied by a significant improvement in pedestrian facilities.

5.3.7 Port & Sea Transportation

a Overview

Port Moresby Port provides for both containerised and break-bulk operations, servicing international shipping and coastal (domestic) traffic.

There are six main wharfs at the Port, summarised in **Table 5.12.**

Table 5.12: Port Moresby Port Berths

Berth No.	Depth (m)	Length (m)	Main use
1	8.5	106	Coastal
2	8.5	107	Coastal
3A	3.8	67	Coastal
3B	4.5	113	Coastal
4A	10.6	125	Container
4B	3.0	25	Small ships

Cargo movement for 1998 is shown in **Table 5.13.**

Table 5.13: Inward & Outward Cargo Movement – Port Moresby 1998

Cargo Type	Inward (t)	Outward (t)
Containers	440 000	135 000
Break Bulk	227 000	129 000
Bulk Fuel	68 000	52 000
Total	735 000	316 000

These figures illustrate the extent to which trade through Port Moresby is import oriented, no more strongly than the fact that over 82% of containers that are imported leave Port Moresby empty. The outward figures provided in Table 5.13 include cargo transported to other PNG coastal ports.

b Recent Port studies

There have been two major studies into the future of Port Moresby Port since 1990. These are summarised below.

i Second Port Development Study, Maunsell Consultants Pty Ltd, 1990

This report proposed developments for Port Moresby including new berths and back-up area for coastal feeder trade that presently operates over private facilities. The benefits identified included reduction in cargo handling costs and a reduction in vessel turnaround time.

The facilities proposed include:

- quay wall 160m;
- hardstand area 10,000m3 (reclaimed); and
- two boat ramp platforms.

The study recommends the development of a dedicated inter-main port coastal facility. This is the area between the Main Wharf and Container Terminal, owned by Burns Philp and Steamships.

A major problem identified in the report for the development of the Port was the limited access. The Poreporena Highway has solved this issue. The other major constraint identified was the lack of cargo/container storage and handling areas.

The Chief Engineer of the PNG Harbours Board (now PNG Harbours Ltd) in 2001described the report as the current '*Masterplan'* for the Port of Port Moresby.

ii Draft Final Report of the Port Moresby Port Relocation Study, Tong Woo Engineering and Construction Co., 1999

A separate study was commissioned in 1998 by the Harbours Board to investigate the possible relocation of the Port.

The study recommends the relocation of the Port to Tatana Island and redevelopment of the existing site for commercial, industrial and residential development.

Two stages of relocation are proposed, the first being relocation of coastal facilities that currently exist at the south-western end of the Port (close to Paga Hill) within the next 10 years, to be followed by container facilities over 20-30 years.

The report also proposes very substantial amounts of reclamation at the site of the current Port and along the coast to the north to create additional land for redevelopment.

As noted elsewhere in this report, the terms of reference for this Local Development Plan, as advised by the Plan Management Team, are that the Plan should consider the future use of the current Port land should the Port relocate.

5.4 Services Infrastructure

5.4.1 Methodology

The objective of Phase 1 is to collect information on the infrastructure assets and respective service providers, in order to identify shortcomings, priorities and constraints and then make a preliminary assessment. The nature of infrastructure dictates that an individual component cannot be considered in isolation. Impacts on the environment and social issues also compound the assessment of infrastructure constraints.

Phase 2 will analyse these impacts and rate the engineering and associated environmental and social constraints. The rating of constraints will ultimately facilitate the rationalisation of all constraints and simply map the results.

The Urban Development and Services Plan published by Wilbur Smith in 1996 provided a good and useful overview of the infrastructure. However, this Plan did not consider the study area in sufficient detail to provide concise and comprehensive information for engineering and physical planning analysis.

The Road Needs Study conducted by Ove Arup and Partners Pacific in 1991 was also a useful document. However, construction work in the study area during their study changed the traffic flows and rendered the results partially useless for later analysis.

At the time of writing, all public utilities are under investigation or in the process of being privatised. In the case of telecommunications, the industry will be deregulated to allow private competition. Whilst the government owned shares in Eda Ranu, it may in future be partially or wholly sold.

Other documents have been used and referenced in the current review.

5.4.2 Codes and Standards

a Physical Planning Regulation 1990

The Regulations set out the requirements for urban subdivision and road design standards under Part VI. The details are summarised in Table 5.14 below.

Table 5.14: Provisions of the Physical Planning Regulations 1990 for infrastructure and roads

Reg no	Regulation	Provisions
22	Interpretation of boundaries	Sets the approach to be undertaken in measuring and interpreting boundaries.
23	Roads	Sets the issues for consideration in designing the road system, basic parameters (including maximum gradients and widths) and establishes the road hierarchy.
24	Residential allotments	Sets the requirements for allotment size and access arrangements. Places particular restrictions on battleaxe developments.
25	Commercial and industrial allotments	Sets the requirements for allotment size and access arrangements
26	Recreational facilities	Sets the requirements for public open space provision.
27	Educational requirements	Establishes minimum area requirements for educational facilities.
28	Site coverage	Requires that site coverage complies with the development plan, or in the absence of such plan, with the appropriate Board.
29	Minimum distance from boundaries	Requires that minimum distance complies with the development plan, or in the absence of such plan, with the appropriate Board.
30	Height of buildings	Requires that building heights comply with the development plan, or in the absence of such plan, with the appropriate Board.
31	Density of development	Requires that density complies with the zoning plan, or in the absence of such plan, with the appropriate Board.
32	Service and utility reserves	Sets a minimum width requirement.
33	Variation of urban subdivision and road design standards	Gives power to the board to vary the standards set out in the regulation, subject to written notification to the Chief Physical Planner of any variation below the minimum requirements.

The Physical Planning Regulation 2003 Draft contains similar provisions in relation to subdivision control.

b Subdivision draft code

The NCDC Subdivision Draft Code, as the name implies, has not been formalised. According to the NCDC Principal Legal Officer, the Draft Code has never been enacted through a bylaw, and therefore represents only 'guidelines'. It does not have any legal standing, apart from when it is specified within legal documents such as contracts.

For Engineering Design, the standards of the Subdivision Draft Code can be applied provided the status of the code is correctly specified within contract documents or otherwise clearly stated as a reference.

However, the Draft Code refers to numerous procedures and standards that a developer must follow and adopt. According to NCDC's Principal Legal Officer, depending on the nature of the application of this document, it may not be legally enforceable.

The Draft Code is also out-of-date. For example, and most significantly, the Draft Code refers to functions currently undertaken by Eda Ranu under its own 'Code of Practice'.

As the Draft Code has been widely adopted by developers, Engineers, Surveyors and the Commission's staff, it is used in this report as a reference for comparison purposes.

The National Institute of Standards and Industrial Technology (NISIT) produces Papua New Guinea standards and regulates the use of foreign standards. There are no NISIT endorsed standards to subdivision design, urban roadworks and urban stormwater drainage. There are environmental standards for the provision of drinking water and wastewater discharge (typically World Health Organisation). Numerous standards are listed for Power and Telecommunication services.

5.4.3 Water Supply

a Organisational structure

Water supply in Port Moresby is undertaken by Eda Ranu, the trading name of NCD Water and Sewerage Pty. Ltd., who took control of the running of the water and sewerage services of Port Moresby on 1 November 1996. Prior to this, services had been provided by the NCDC.

Capital investment in the City's water infrastructure is undertaken by a consortium of local and international companies led by engineering consultancy JC-KRTA under separate agreements that were initiated by the NCDC and then continued by Eda Ranu:

a) Consumer Services Agreement - responsible for water and sewerage billing.

b) Management Improvement Agreement (now complete) - involves metering, leakage control, information systems, distribution analysis, tariff studies and management development.

Eda Ranu is responsible for the management of the entire system together with maintenance of the distribution system, extensions to the system and responding to emergencies.

A Build-Operate-Transfer (BOT) Agreement operates with PNG Water Ltd. This governs the provision of raw and treated water and upgrading of the treatment, transmission and distribution systems.

b General Description of the Network

The general layout of the water supply network is shown on **Map 16**.

Raw water enters the Mt Eriama Water Treatment Plant (WTP). It is generally of very good quality due to factors such as the geology of the region, the lack of development in the higher reaches of the catchment and the location of the extraction points for the raw water. Eda Ranu provides water to Quality Standards according to the World Health Organisation. Under a Build-Own-Transfer (BOT) Concession, PNG Water Ltd., a separate private water supply company, undertakes water treatment at Mt Eriama. The process involves:

- **Coagulation** - a chemical (aluminium sulphate) is added to the water to bring together the small suspended particles.

- **Settlement** - larger particles and the coagulated particles are allowed to settle to the bottom of a large settling tank, these are then removed.

- **Filtration** - the settled water is passed through pressurised sand filters which trap the smaller particles not previously removed.

- **Chlorination** - to kill any bacteria present in the water, chlorine is added as the final stage of treatment. The water leaving the treatment works also has a low level of chlorine (called the residual) that prevents bacteria entering the water supply on journey from the treatment works to the customer's taps.

c General Capacity

The Urban Development and Services Plan indicates that the water source capacity dictates that the NCD's population should be capped at the 530,000 people (Wilbur Smith Associates, 1996) that it expects by 2015. This figure is based on a low growth scenario with urban development constraints applied through legislation to restrict urban population growth. It also assumes a complete reticulation of water supply services to villages and 'legal' settlements by 2015.

According to the Chief Engineer of Eda Ranu, however, there is no policy or quantified limitation on the existing and future population. There is significant uncertainty over whether the population limit of 530,000 is robust.

The raw and treated water capacity has been inadequate for many years. There is a significant shortfall using standard planning figures based on per capita population. It is expected that the current demand is approximately 200Mld compared to the actual consumption of 119Mld (Wilbur Smith Associates, 1996). The latest census figures will be a guide to future demand. Additionally, the adequacy of resources depends upon the level of development permitted by the plan for the study area.

Currently, the raw and water treatment plants are also under-performing. Eda Ranu understands that the treatment plant at Mt Eriama is operating close to full capacity but lack of supply is compounded by a lack of operational efficiency by PNG Water Ltd.

Illegal connections and other losses account for 35% of water produced. Significant savings are expected with the reduction in illegal connections and leak detection program. Eda Ranu has undertaken a pilot program with settlements through a representative committee to assist in finding way of providing and selling water to these areas and reducing the volume of stolen water.

d Existing Policies and Plans

The NCDC Water Supply Asset Transfer Act (1996) and National Capital District Water Supply and Sewerage Act (1998) provide the legislative framework for the operation of Eda Ranu. Notably neither act allows for the provision of water to residences that do not pay municipal rates, such as villages and settlements.

Eda Ranu has based its plan for the next 10-15 years on the Japan International Cooperation Agency study (1994). Whilst the study recommends a BOT scheme for the provision of water, which was later adopted, the implementation and management of this concession was not provided.

Eda Ranu has its own Code of Practice for connection of new services. It is currently being reviewed. The Code is essentially a copy of the relevant extracts from the NCDC Draft Subdivision Code. Eda Ranu has adopted the policy of restricting the provision of services to up to the 90m contour. Beyond this elevation the developer is responsible for 100% of the cost of works and ongoing maintenance.

The Water and Sewerage Headworks Policy, 1999 was accepted by the Eda Ranu Board, based on three Acts:

- the Physical Planning Act 1986 (Section 5 and 81);
- the National Capital District Water and Sewerage Act 1998; and
- the Price Regulation Act.

The Headworks Policy does not specifically mention the exclusion of services above the 90m contour, conditions for accepting applications above 90m or the calculations of costs for providing services in these areas.

e Current Program and Commitments

Maintenance work and public awareness programs currently being undertaken by Eda Ranu include:

- installing pressure-reducing valves to reduce leakage;
- measuring and controlling the flow to the many settlements around Port Moresby;
- informing the public about the need to conserve water; and
- addressing the problems of water supply to those areas with inconsistent supplies.

The system upgrading works are to be undertaken through the BOT Agreement. As such the works and program are bound by this Agreement. Eda Ranu has requested a revision to the priorities (yet to be agreed by both parties) of the works to meet the immediate needs of the network, including:

1. upgrading of reservoirs;
2. support from the Concessionaire for the current accelerated road developments in NCD;
3. a review of Water Demand (Treated and Raw Water);
4. the Bomana Pumping Works; and
5. extension of Filtration Facilities at Mt Eriama (48MLD).

Priority 1 includes increasing the inlet mains to most reservoirs to 600mm. According to Eda Ranu this will noticeably reduce the head losses and increase capacity in these pipes and allow existing reservoirs to remain full during peak periods. Also Eda Ranu wish to fast-track the construction or upgrade of numerous reservoirs including a new reservoir in the project area on Touaguba Hill.

Priority 2 allows Eda Ranu to take advantage of potential cost savings to install new mains concurrent with new road construction in the NCD.

Priority 3 is a general review of the current performance problems experienced in the raw water and treated water plants and providing solutions.

Priorities 4 and 5 relate to fast-tracking the increase of raw water capacities by 48MLD (48 million litres par day). This will assist Eda Ranu in the meeting the current demand.

f Budget Framework and Sources of Funding

Under the National Capital District Water Supply and Sewerage Act 1998, Eda Ranu can set rates and charges based on its operational costs and subject to approval by the Price Controller as per the Price Regulation Act.

Funds are received through water and sewerage rates. The latter is based on the water consumed.

g Preliminary Assessment

Eda Ranu is in the process of planning and implementation of works carried out based on the recommendations of the JICA study (1994), although funding has not yet been secured.

Shortcomings in the system have been identified including:

- inadequate raw and treated water capacity - the reasons for the lack of provision of treated water are unclear. However it is understood by Eda Ranu that the treatment plant at Mt Eriama is operating at full capacity compounded by a lack of management and operation efficiency by PNG Water Ltd.;
- 35% of purchased supply (represents K6 million annually) is lost to illegal connections and leakage;
- current legislation prohibits the provision of water to residences on customary land or illegal dwellings; and
- there is currently a lack of consensus between Eda Ranu and PNG Water Ltd. on the prioritisation of works, consistent with immediate needs of the network.

5.4.4 Sewerage System

a General Description of the System

The general layout of the sewerage system is shown on **Map 17**.

The Paga Point outfall receives sewage from two trunk mains: Ela Beach and Champion Parade/Stanley Esplanade. Apart from grit removal, the sewage is not treated before pumping to the outfall, which is dispersed through a 3km underwater pipeline.

There are six pumping stations in the study area. On the northern side:

a) Konedobu (PS-10);

b) Yacht Club (PS-9); and

c) Stanley Esplanade (PS-8) including a rising main over Musgrave Street to Paga Point.

On the southern side:

d) Lawes Road (PS-5);

e) Dawara (PS-6); and

f) Paga Point (PS-7).

The project area has an extensive collection system classified as; reticulation sewers, trunk sewers and rising mains. Most of the mains are either vitrified clay pipes (used up to the 1970's) or concrete pipes. The remainder are old asbestos cement and the newer PVC pipes.

PVC pipes are now used to replace old pipes or new connections up to 300mm diameter. Concrete pipes are used for larger mains.

Septic tanks are used on parts of Touaguba Hill, Ela Makana and Gorobe settlement. Other settlements use either pit latrines or bush toilets.

Under the Environmental Contaminants Act, the Office of Environment and Conservation issue licenses for discharge of pollutants into the environment. Licenses have been issued to Eda Ranu for sewer outfalls.

Under the Water Resources Act (Sections 15, 19 and 28), Water Permits are required by the Department of Environment and Conservation for all outfalls and overflow pipes. The permits issued to Eda Ranu provide discharge fee rates, discharge quality and quantity parameters of effluent.

There is one outfall at Paga Point and all pumping stations have overflow pipes in the event of power failure. All pumping stations, with the exception of PS-8, have back-up generators.

Eda Ranu's Quality Control Unit undertakes internal monitoring. Samples are regularly taken at discharge points and tested independently. However, at this stage the extent of external monitoring through the Office of Environment and Conservation for compliance to either discharge licences or water permits is unclear. NCDC Health Division is also responsible for conducting regular bacteriological tests along the coastal areas. These issues will be explored further in Phase 2.

b General Capacity

At present, about 15,000m^3/day of sewage is pumped at Paga Point to the outfall in the Papuan Lagoon. The collection system is extensive with only small areas currently using either septic tanks or pit latrines. A significant constraint is that current legislation prohibits the connection of residences in villages and settlements to the sewer collection system, because the land is not registered or paying municipal rates.

As also noted in the water quality section of this report, the new PNG Water Quality Standards have been drafted in 2000 adopting World Health Organisation Water Quality Standard 1997-98. Most importantly the new standards include biological criteria (that are currently excluded from existing permits). These standards also require a classification of the marine bodies in the project area to their *protected environmental value (PEV)*. These new standards, when adopted, will require a review of the current and future effluent discharge quality at Paga Point and the overflow pipes at the pumping stations. Water Permits currently issued to Eda Ranu for wastewater discharge will remain under the current system until the permits expire, when the new Water Quality Standards will apply.

Eda Ranu has its own Code of Practice for connection of new sewerage services. It is currently being reviewed. Similar to provision of water supply, Eda Ranu has adopted the policy of restricting the provision of sewerage connections to up to the 90m contour. Beyond this elevation the developer, if approved by Eda Ranu, is responsible for 100% of the cost of works and ongoing maintenance.

Eda Ranu's Water and Sewerage Headworks Policy provides the framework for provision and cost of sewerage services. However, the 90m contour limit is not mentioned.

c Current Program and Commitments

Eda Ranu has adopted the findings of the Masterplan in the 1994 JICA study and is preparing for the implementation of works. Works related to the project area fall in Phase 2 (2003-2005) of JICA's Masterplan. The works include:

- an upgraded trunk main (Paga Point to Tatana via Konedobu);
- four upgraded pumping stations; and
- a sewage treatment plant (sedimentation and secondary clarification) at Paga Point.

Eda Ranu has engaged a consultant to undertake investigation into the location of future trunk main lines and to check land ownership. In the project area, this investigation extends along Champion Parade to Hanuabada Village.

Eda Ranu has advised that it is committed to the connection of sewerage in the area as the connection of water and wastewater is considered inseparable from an environmental perspective.

d Budget Framework and Sources of Funding

Eda Ranu can set rates and charges for the provision of sewerage based on their operational costs and subject to approval by the Price Controller as per the Price Regulation Act.

Funding for the proposed works in JICA's Masterplan is not confirmed. This is complicated by the potential of Eda Ranu being either partially or wholly sold.

e Preliminary Assessment

The following shortcomings in the sewerage system are apparent:

- a backup generator is required at Pump Station No 8;
- no external monitoring is conducted for compliance with environmental licence or water permits;
- legislation prohibits the connection of sewerage to residences on customary land or settlements; and
- there is a lack of funding for proposed works under JICA's Masterplan.

5.4.5 Stormwater Drainage

a General Description of the Network

An overview of catchments and the stormwater drainage system is provided on **Map 18**.

The study area naturally drains both sides of the central spine of high ground. Natural drainage routes are clearly defined. The area generally has a high density of construction and extensive impermeable areas, such as roads, paving and building roofs. As a consequence, times of concentrations (time to reach maximum discharge) for stormwater drainage are relatively short and some areas flood quickly.

A number of complicating factors exist for the development and maintenance of the drainage system:

- rezoning and leasing of drainage reserves;
- gardening;
- erosion and sedimentation;
- the cementaceous nature of the eroded material;
- a lack of stormwater management; and
- the failure of planning controls to secure funding or works from developers to address the additional loading on the drainage system from new development.

The Average Recurrence Interval (ARI) is the average time expected between storms that equal the capacity of the drainage structure. The NCDC Draft Subdivision Code quotes that the minor system must be capable of a 5-year ARI. However, the DoW Road Design Manual (1985) recommends a higher capacity of a 10-year ARI. The major system normally accommodates a 100-year ARI.

Typically, an overall drainage network consists of minor and major systems. The existing minor system is well defined and includes the kerb, gutters, channels and underground pipes. However, the major system consisting of road reserves and open spaces functions poorly and is less defined.

As a result of observation and discussions with NCDC staff, it is clear that the minor system is incapable of accommodating the peak flow associated with an average recurrence interval of 5 years. This occurs because of a lack of strategic management and maintenance. Also, a number of drainage reserves have been developed, denying the opportunity to maintain or improve these drainage reaches.

Kerbs and channels generally do not exist outside the commercial area, arterial roads and small sections of local access roads. This allows the water to sometimes run indiscriminately along the road causing pavement damage and water flow onto adjoining properties. It is a ubiquitous problem, but is most evident in McGregor Street and Port Road.

Stone-pitched drains and interconnecting culverts are slowly degrading through a lack of routine maintenance. Underground drainage pipes could not be inspected, but it is expected that this part of the system is also poorly maintained.

The drainage reserves connecting residential streets on Touagabu and Paga Hills are normally 5m wide, overgrown and poorly maintained. These reserves cannot properly function as a major system and flooding of adjacent properties is common. Because of the topography, roads in the project area generally bisect the natural drainage routes and therefore cannot contribute to drainage of peak flows, with the exception of a few roads, such as Lawes Road and Aviat Street.

The NCDC Draft Subdivision Code describes the procedures to approve private developments. In the past, there has been little emphasis on the stormwater management within the planning and approval process. In July 2001, NCDC implemented new measures to ensure that stormwater management together with other engineering and architectural aspects were reviewed by the NCDC's Engineering Division before submission to the Physical Planning Board.

Unfortunately, numerous past development proposals have not been vetted through the appropriate engineering staff. Most noticeably, inadequate drainage for the Deloites Tower has contributed to the need for nearly K500 000 worth of improvements to the local drainage system.

The system is not being managed as an infrastructure asset. There are no plans for the current drainage system. Therefore planning, reference and scheduling of works is almost impossible. Most importantly, NCDC Engineering staff cannot make technical judgements on new developments or drainage improvements, as the entire system is not understood.

About 2,000m^3 of sediment is removed from drainage canals and structures each year. The cost of this operation absorbs most of the drainage system budget. Calcerous and siliceous mudstone, eroded from the upper reaches of the catchments, quickly consolidate in

culverts and pipes. This is a significant and costly maintenance headache. For example, if the underground structures are more than 2/3 full then they generally cannot be cleaned out using a water jet and have to be excavated and re-laid.

There are no gross pollutant traps within the system. Therefore rubbish either contributes with sediments to block drainage structures or freely discharges into Fairfax Harbour and onto Ela Beach and contributes to maritime pollution. Ever-present plastic bags have the greatest impact. They are not biodegradable and easily block grates on gully pits, culverts and other structures.

Building contractors have a practice of mixing concrete on the road pavements and flush concrete waste into the stormwater system. This is evident on Lawes Road near Ela Beach. As a result, the concrete solidifies in the pipes and reduces their capacity.

b General Capacity

As previously described, it is clear that the minor system is not capable of accommodating a 5-year ARI. The major system is also ill defined and inadequate.

As the drainage network is not capable of handling even low intensity storms, road pavements are readily damaged and some areas regularly flood. Erosion of the road pavements is the most obvious impact of stormwater, although poor drainage also penetrates under the sealed surface and weakens the pavement. As described above, poor drainage is the most common source of pavement failure. Poor stormwater drainage affects the entire infrastructure. For example, flooded Telikom pits and cable cause costly disruptions to communications. Flooded underground electrical cables can be extremely dangerous. Sewerage pits flooded by stormwater, allow sewage to come to the surface and cause pollution. Stormwater that has ingressed the sewerage mains is a costly contributor to wastewater flows and treatment.

Photo 22: Flood-damaged Telikom Pit

Flooding: Apart from the damage of infrastructure, flooding also causes significant damage to private property and cause general frustration amongst the community. The areas prone to flooding are indicated on Map 18.

Maintenance: Similar to the road network, current maintenance of the drainage network is responsive and not programmed. Basically, a drainage structure is repaired only when a complaint is received. The following deficiencies are evident:

- no plans for the stormwater network;
- no register of assets;
- no regular inspections; and
- no regular maintenance program.

c Existing Policies and Plans.

SMEC International undertook the Port Moresby Urban Stormwater Management Study in 1994. This document has been used successfully as a general plan for the maintenance and upgrade of the system. However, the document did not consider the specific minor system requirements in this project area.

NCDC does not have any other policies and plan in regards to stormwater management.

The application of Headwork Charges for wastewater is of particular concern. The problems experienced by the construction of the Deloittes Tower are a notable case. Under the Physical Planning Act (Section 81), developers may be instructed to contribute to the cost of providing additional infrastructure costs (including stormwater drainage). However, according to the Acting Principal Legal Officer for NCDC, under the repealed Sales Tax, payment of headwork could be recovered as a tax credit or tax exemption from Sales Tax. The Value-Added-Tax system has been introduced, repealing the Sales Tax Law. However, it appears that some developers are still claiming that a tax credit or exemption is valid if headwork charges are applied. This issue requires clarification during Phase 2.

d Current Program and Commitments.

Drainage improvements are planned as part of roadworks. Reconstruction of Ela Beach Road and Stanley Esplanade are two examples. Apart from these works, no programmed improvements are evident.

e Budget Framework and Sources of Funding.

The 2001 budget allocated K2 million for stormwater drainage maintenance and upgrade. Approximately 10% or K200,000 was expected to be spent on stormwater maintenance in the project area in 2001. However, as the budget amount was considered as a lump sum

and funds allocated to any area depending the immediate need, rather than on strategic priorities.

f Preliminary Assessment

The following observations have been made:

- the current network, both minor and major systems are incapable of handling the anticipated peak flows;
- no account has been taken of the increased load applied to the stormwater drainage system as a result of new development – developers have in some cases been required to provide appropriate measures by way of works or financial contributions;
- gross pollutant traps are not used;
- the drainage network is not properly maintained;
- many reserves have been rezoned and leased to private developers. This has limited access to some drainage structures and restricted the opportunity to maintain and upgrade the drainage reaches; and
- deposits of eroded mudstone are noted around the project area. The deposits are cementaceous and readily block drains. Gardening and uncontrolled runoff from construction sites are the main contributors to erosion.

Measures to address these problems will need to include the following:

- erosion must be controlled;
- stormwater runoff needs to be identified as a serious environmental pollutant;
- other means of reducing rubbish being dumped in street and drains need to be explored; and
- a public awareness campaign would be appropriate together with fining those dumping rubbish.

A major concern is that the network is not being managed or maintained as an infrastructure asset. For example headwork charges are not being secured from developers through the planning process. Under the planning and development system, the NCDC is now taking a more proactive approach to the assessment of building and subdivision applications to identify the additional load they will place on the existing system. In doing so they will seek to ensure that the developer provides appropriate stormwater drainage, and that sedimentation from construction is properly controlled.

The existing minor system is incapable of managing a 5-year ARI, and the major system (drainage reserves and roads) is impeded by poor design and management, erosion and sedimentation and squatter development.

5.4.6 Power Supply

a General description of the Network

The layout of the power supply network is provided on **Map 19.**

PNG Power Ltd is a Statutory Authority and through the Commission's Act, operates as a commercial entity. As such, it will provide services on an economic basis.

The current network within the project area consists of Transmission Lines (66kV), Konedobu Substation and Distribution Lines consisting of high voltage (11kV) and low voltage (240V/415V). The service extends to most areas with the exception of some settlements.

Transmission to the Project Area is via 66kV Lines parallel to the Poreporena Highway. At this stage, the Transmission Lines are not located in a reserve or easement. The substation at Konedobu reduces the supply from 66kV to 11kV.

PNG Power Ltd uses a variety of poles, transformers, crossheads, stays and insulators. Generally, they are in good condition. Some of the Service Lines, connecting the distribution system to consumers, are low and impede and endanger traffic.

b General Capacity

Power generation comes from three sources:

- Rouna Hydro-electric Power Station (4 x 60MW) (PNG Power Ltd).
- Kanudi Thermal Power Station (2 x 12MW) (Private).
- Moitaka Thermal Power Station (4 x 7.5MW) (PNG Power Ltd)

At present the system remains at peak load. The breakdown of one of the diesel generators at Kanudi Power Station and landowner disputes have increased the demand on the remaining plants, resulting in well publicised power disruptions. This situation is not new, as the power generation has continually not kept pace with the demand.

c Existing Policies and Plans

No information could be gathered on future plans or programs and while the privatisation of PNG Power Ltd was being considered, there appears to be a general reluctance to undertake strategic planning.

The PNG Power's Act and By-laws (conditions of supply, service and installation) set out the statutory requirements that domestic, commercial, industrial and institutional users must agree to before supply will be connected.

PNG Power Ltd has produced a Village Electrification Booklet, describing funding policy and provision of services. There are no villages in the project area, but there are several settlements. Whilst electricity is being provided to settlements, there is no policy for electrification of illegal developments.

d Current Program and Commitments

In 2001 PNG Power experienced a budget crisis, fuelled by low tariffs. According to PNG Power Ltd, the tariffs have failed to keep abreast of inflation and the cost of services. As a result of this and potential privatisation, PNG Power Ltd was reluctant to consider future developments apart from meeting the immediate service needs.

Therefore, only funded projects (ie private developments) and responsive repairs and basic upkeep are undertaken. As there have been many defaulting developers, PNG Power Ltd was also reluctant to undertake any design and installation of services until the developers start works. This has resulted in some extended delays in the provision of electricity. It also creates a problem with forward planning, as most developer decisions are hasty or reactive.

e Budget Framework and Sources of Funding

In general, PNG Power Ltd will provide services once it is satisfied it can achieve an economic return. There are two modes of financing:

a) Commission Funded Extensions: if PNG Power Ltd is satisfied that it can achieve a 20% return on the extension costs over 5 years, it will fund the extension. PNG Power Ltd may require the customer to enter into an agreement that will ensure a 20% return over this period.

b) Consumer Funded Extension: consumers are required to provide to PNG Power Ltd a Capital Advance, as an interest free loan for extensions that cost more than K50,000 or where extensions do not guarantee a return of at least 15% or Government projects. After five years, PNG Power Ltd will refund an amount equivalent to the total electricity charges.

PNG Power Ltd produces a standard set of tariff rates. Rates have to be approved by the Independant Consumer and Competition Commission.

f Preliminary Assessment

Issues and shortcomings evident at this stage are:

- current levels of power generation are insufficient to meet overall demand;

- a reserve is required for the two sets of power lines leading from Burns Peak to the Konedobu Substation;
- the prospect of privatisation has resulted in little forward planning;
- tariffs appear to be too low compared to operational costs, which will undermine improvements; and
- PNG Power Ltd will only respond to a developer's request for connection when the development has either started or is complete.

The problem of a lack of power generation will continue in the short term. Potential privatisation and low tariffs will deny improvements to the system.

It is therefore expected that the quality of service to the project area will remain the same and possibly degrade until either of the aforementioned issues are resolved.

5.4.7 Telecommunications

a General Description of the Network

The general layout of telecommunications infrastructure is shown on **Map 20.**

The Telecommunication Act 1996 states that the exclusivity granted to the incumbent (Telikom PNG Ltd) to provide telecommunication services will end after 20 December 2001. De-regulation will provide an opportunity for competitors to enter the telecommunications market. Already a number of companies have either received a telecommunications license or are intending obtain one. The telecommunications industry is licensed and regulated by the Papua New Guinea Radiocommunications and Telecommunications Technical Authority (PANGTEL).

Telikom's current telecommunications system in the project area comprises of the following:

a) Microwave and cellular receivers - the radio mast on Paga Hill has a microwave dish for communications offshore - two sets of cellular receivers masts are located in the project area; Touaguba Hill and Paga Hill. Additionally, planning approval was granted in 1999 for a cellular receiver mast on Ela Makana Hill.

b) Junction cables - there are two junction cables interconnecting exchanges; Ela Beach Exchange to Waigani Exchange and Ela Beach Exchange to Boroko Exchange.

c) Main distribution cables - these cables are for either 2,400 or 1,200 lines (copper core or fibre optic) and either inter-connect pillars with the exchange at Ela Beach.

d) Local access distribution cables - cables for less than 1,200 lines and service an area or large premises.

e) Individual lines - a line servicing a single customer.

After deregulation there are a number of additional services that may become available from incoming competitors, such as:

- micro-wave;
- wireless loop (HF); and
- an expanded cellular phone network.

b General Capacity

A large number of lines are available from the Ela Beach exchange. All cables have faults that may render 5% of the lines as inoperable. Distribution cables terminate at pillars that then service customers in the immediate area. However, not all cables and pillars function close to capacity. Whilst a 1200 line cable may terminate at the same size pillar to service an area, only 25% or 300 lines are actually used. This allows Telikom to readily expand the service when required. Unfortunately, cables and pillars cannot be easily moved.

As Telikom may be unaware of the future system requirements in an area such as the project area, a considerable amount of planning is required. Under these circumstances, not all of their decision may be correct. Consequently, in some cases lengthy delays may occur in the connection of new lines. Fortunately, Local Development Plans proposed for the NCD will assist in future telecommunications planning.

Deregulation will increase the levels of service to the community. Based on experience of previous de-regulated telecommunications industries, the service should be cheaper and more responsive to the customer's needs.

c Existing Policies and Plans

Apart from the government's intention to deregulate the industry later this year, no other information was gathered. Understandably, Telikom is sensitive to the amount of information made available to the general public.

d Current Program and Commitments

Deregulation has resulted in a general reluctance of Telikom to plan for future works. However, the project area is a major centre of customers and expansion for Telikom. Three new projects are planned over the next two years:

a) A new exchange in Konedobu. Possibly at the end of 2002.

b) Upgrading of the voice switches at the Ela Beach Exchange to a DMS100 system with an ultimate capacity of 15,000 lines in the next five years.

c) Replacing the current Digital Data Network (DDN) at Ela Beach Exchange with a multi-service data switch capable of carrying all forms of data transmission.

e Preliminary Assessment

Issues and shortcomings evident are:

- deregulation means that the future trends and plans of telecommunications services are essentially unknown;
- current planning by Telikom is limited; and
- there is little interaction between Telikom and NCDC for new road construction works. Relocation of large pits can be prohibitively expensive for disruption to services and new cable costs. The proposed Ela Beach Road upgrade is an example of this problem.

Deregulation is imminent and will affect Telikom's operation and management. Deregulation, based on similar experience in other countries, will also be an opportunity to provide customers with the levels of service they require at a competitive price.

However, the short and long term impacts on the project area are unclear. Telikom may be privatised, which will have a short-term effect on its operations, and the rate of mobilisation and take-up by competitors is unknown. The telecommunications industry is also experiencing is greatest technological growth since the industry first started. The nature of services provided in the longer term is therefore unknown.

5.4.8 Service-Demand Areas

The study area can be considered as three service-demand areas - high, medium and low – in terms of roads, water, power, telecommunications and wastewater disposal. The demand for this infrastructure has been generalised to gain an understanding from a strategic viewpoint of spatial service needs.

High service demand areas

These are generally confined to areas of slopes less than 15% (8.5°) in the saddle between Touagabu and Paga Hills of the town centre and Port and the Industrial district in Newtown. The Port facilities have the single largest demand on the infrastructure in the project area. The relocation of the Port elsewhere in the NCD will have a converse impact. These areas require a high service need to function. Because of their location and topography these areas are in most respects cheap and straightforward to provide and maintain infrastructure services, although a major issue is their need to manage stormwater runoff from the surrounding hillslopes.

The industrial area of Newtown is constrained within a small flat area, bounded within a large runoff catchment and steep terrain. Other areas of high demand are the small commercial precinct at Koki and the small institutional precinct at Konedobu adjacent to

the Poreporena Highway. These areas also have a high demand for utilities and infrastructure and have physical constraints for further growth.

Medium service demand areas

These are confined to the high cost residential housing around Touagabu Hill and the Eastern face of Paga Hill. These areas have a lower concentration of service requirements compared with the commercial and industrial areas. Although, water consumption and power demands peak during the morning and early evening periods and are comparable to those required of the commercial and industrial precincts. The high cost residential areas have utilised the higher elevations (and normally higher slopes) to gain better views. Construction has occurred up to the highest elevation of 165m on Touagabu Hill. This high cost development, by its nature, requires higher service demand and costs of infrastructure.

Low service demand areas

These typically include settlements and low cost housing areas. The provision of infrastructure services to these areas is poor, therefore the demand is also low. There are a number of reasons why the services are inadequate: the inability of residents to afford to pay rates and so be eligible for services; illegitimate developments security of physical assets and service staff; and a history of high numbers of defaulting utility customers. The provision of services to these areas is an important consideration for the study.

A preliminary review of service demand areas is provided on **Map 13**.

6 Policy Context

This section of the report provides an overview of factors that combine to create a 'policy context' for the Local Development Plan. These could be classified as factors that are not specifically related to the geographic boundaries of the study area. They are the overlay of regulations, institutions and policies that combine to influence or direct the way that development may occur.

The section is divided into three main components:

- regulation and institutions;
- policy; and
- current development parameters.

6.1 Regulatory & Institutional Framework

6.1.1 Physical Planning Act 1989

The Physical Planning Act was established to provide a comprehensive mechanism for physical planning at the National/Provincial levels of Government and to provide powers for the planning and regulation of physical developments & land use in Papua New Guinea.

The Act is the core statute of relevance to this study. It sets out the requirements for the creation of a Local Development Plan and for the consideration of development that will flow from the Plan.

The main provisions of relevance to this study are summarised in Table 6.1.

Table 6.1: Key Provisions of the Physical Planning Act

(PART VI – DEVELOPMENT PLAN)

Section /Title	Summary of Provision
S (44) / DEVELOPMENT PLANS	This section specifies the different types of development plans
S (45) / CONTENTS OF A DEVELOPMENT PLAN Ss (2)(a) Ss (2)(b)	The development plan must include measures for the improvement of the Physical Environment & Management of Traffic and Zoning - the physical, social & economic impact on the development plan area and the neighbouring areas. - The size composition & distribution of the population in the development plan area

Section /Title	Summary of Provision
S (48) / LOCAL DEVELOPMENT PLAN	A local development plan must be prepared within the context of an urban development plan, and contain more detail than is provided in a UDP.
S (50) ORDER FOR PREPARATION OF DEVELOPMENT PLAN BY THE MINISTER SS (2)	The Minister, having considered the advice of the Physical Planning Board, Chief Physical Planner and after consultation with the NCDC, by notice in the national Gazette order the preparation or review of a development plan. An order under SS (1) (C) shall specify the development plan area, the type of development plan to be prepared and any other matter that shall be covered by the development plan.
S (52)/ ORDER FOR PREPARATION OF A DEVELOPMENT PLAN BY THE NATIONAL CAPITAL DISTRICT INTERIM COMMISSION SS (2)	The National Capital District Interim Commission with the advise of the National Capital District Physical Planning Board and the Senior Physical Planner of the NCD may specify; -The development plan area -The type of development plan to be prepared -The type of matter to be covered by the development plan. The consent of the Minister is needed in order to prepare a Plan.
S (54) (1) (c) S (54)(2)(c)/ PREPARATION OF DEVELOPMENT PLAN	Subject to subsection (2) the Senior Physical Planner in the NCD is responsible for the preparation of a development plan where the area is wholly within the NCD. This particular section allows the National Capital District Commission to order another person to take the responsibility of preparing the Local development plan
S (56) LAND FOR PUBLIC PURPOSES	This section allows for the designation of land, and its being reserved from a lease, for public purposes as prescribed in the Land Act 1996.
S(57) & (58) DRAFT DEVELOPMENT PLAN & SUBMISSION	This section specifies that a development plan will be prepared in draft form and then will be submitted later for approval with the approving authority.
S (59) PUBLICITY OF THE DRAFT DEVELOPMENT PLAN APPROVED IN PRINCIPLE	Where the approving authority has approved the draft development plan in principle: • copies will be sent to the the Minister, any dept. or statutory body likely to be affected by the Plan, the appropriate Physical Planning Board for any comments within a period of not less 28 days; and a copy of the draft plan will be exhibited in a public place for a period of not less than 28 days,

Section /Title	Summary of Provision
	ensure it is made accessible to the public, invite comments by public advertisement to be submitted within a period of not less than 28 days.
S (60) PERSON MAY COMMENT OR OBJECT TO A DRAFT DEVELOPMENT PLAN	This section allows for the public to make comments & objections to the Draft Development Plan to the appropriate authority
S(61) FURTHER CONSIDERATION OF A DRAFT DEVELOPMENT PLAN	When there are no comments or objections to the draft development plan a final development plan can than be lodged but if in the case where there have been comments & objections lodged the person responsible for the draft development plan must lodge the development plan with amendments if any are specified by the approving authority.
S (62) APPROVAL OF A DEVELOPMENT PLAN	The approval of the Development plan lies with the approving authority
S (63)(1) PROCEDURE FOLOWING APPROVAL SS(2)	Where an approving authority has given approval to a development plan under S (62) (a) it shall in the case of a plan approved by the National Physical Planning Board or the NCD Physical Planning Board submit the plan to the Minister. The minister may within a month of the plan submission refer the plan to the approving authority for further consideration of any matters specified by the Minister. The approving authority shall consider the matters specified by the Minister and where necessary carry out amendments prior to resubmission to the Minister.
S (64) GAZETTAL OF FINAL APPROVAL	Where the Minister does not refer the development plan back to the approving authority, the approving authority shall by notice in the National Gazette declare the approval of the development plan. The date of the gazettal is the effective date of operation of that development plan.
S(65) APPROVING AUTHORITY TO TAKE INTO CONSIDERATIO THE CONTENT OF A DRAFT DEVELOPMENT PLANPRIOR TO GAZETTAL OF FINAL APPROVAL	Where a draft development plan has been submitted to the approving authority the authority shall in making decisions on matters in the plan or affected by the plan take into consideration the contents of the plan not withstanding that approval to the final development plan has not been gazetted.
S (66) REVIEW OF AND CHANGES TO DEVELOPMENT PLANS	*Subject to subsection (3) a development plan shall be reviewed every 10 years or any time more than two years from the time of gazettal of final approval under S (64) as directed by*

Section /Title	Summary of Provision
	the Minister. The approving authority may make minor changes to the development plan at any time. The variation of a zoning on an individual allotment is a minor change.

6.1.2 The Physical Planning Regulation 1990

The Regulations to the Act set out in greater detail the manner in which aspects of a Local development Plan should be prepared. These are summarised in **Table 6.2.**

Table 6.2: Relevant Aspects of the Physical Planning Regulation 1990

(PART V – DEVELOPMENT PLANS)

Section /Title	Summary of Provision
S (17) DEVELOPMENT PLANS BY ORDER OF THE MINISTER OR THE PROVINCIAL MINISTER	In relation to S (52) of the Act the plan must be prepared according to schedule 2
S(18) MATTERS TO BE INCLUDED IN DEVELOPMENT PLANS SS(4)(a) SS (4)(b)	This section specifies the type of matter to be included in the development plan. The requirement of what must be met in the development plan are; - a land use map showing the existing uses of land and buildings showing the colours as set out in schedule 1 - the development plan shall also show ; i) the proposed zoning ii) all portions, sections and allotment numbers, reserves and roads proposed to be established; and iii) any other matter which the Board with the appropriate authority may require.
S (19)(1) PUBLICITY FOR A DRAFT DEVELOPMENT PLAN	The publicity required under S (59) of the Physical Planning Act as follows once in the National Gazette, at least once a week in the newspapers or by announcement in the radio for 3 consecutive weeks.
S (19)(2)	The appropriate Board may set the date time and place where the draft development plan can be viewed by the public and the date for comments & objections to be received.
S (20) SUBMISSION OF A DEVELOPMENT PLAN TO THE BOARD	Within three months after the period for comments & objections, the Physical Planning Office shall submit to the appropriate Board the recommendations for a final development plan together with the comments a & objections received.
S (21) MODIFICATIONS TO A DEVELOPMENT PLAN	A Board may approve a draft development plan with the modification, the appropriate Physical Planning Office shall submit 3 copies of the development as amended and submit these to the appropriate Board.

6.1.3 Physical Planning Regulation 2003 (Final Draft)

The Department of Lands and Physical Planning is currently preparing an update to the Physical Planning Regulation. Although this is still in draft form, it contains additional matters that are of relevance to the study. These are summarised in **Table 6.3.**

Table 6.3: Relevant Provisions of Draft Physical Planning Regulation 2003

(PART V – DEVELOPMENT PLANS)

Section /Title	Summary of Provision
S (28)(b)(i) FURTHER REQUIREMENT S FOR PLANS COVERING URBAN AREAS	A development plan shall show; i) The proposed predominant zoning of land ii) Areas to be brought into development or reserved in anyway under the plan iii) Any other matter the Board specify within the terms of reference for the development plan
S (32) DECLARATION OF FINAL APPROVAL OF A DEVELOPMENT PLAN	The declaration of the final approval of a development plan shall be in the National Gazette in the form prescribed in schedule 2

6.1.4 Land Act

The Land Act is administered by the Department of Lands and Physical Planning. Under the Act, the government – through the Minister – can acquire land through agreement from the owners or through compulsory means. It provides for the establishment of a Land Board which oversees all matters of land acquisition and disbursements of all government lands.

This Act also covers legislation in relation to the sale of customary land. Under the Land Act, customary land may not be sold, leased or disposed of other than to citizens (Papua New Guinean by birth) and in accordance to custom.

It also makes provisions for rights to compensation for land acquired from land owners.

6.1.5 Building Act

The construction of buildings is controlled under the Building Act through the NCD Building Board. All proposed construction has to be approved by the Board. Under current arrangements, this is currently being administered by the NCDC.

While it is possible to monitor all building and construction within the study area, the jurisdiction of the Building Board stops short of the settlements. In the settlements, there is no building control whatsoever.

6.1.6 Environmental agencies

The Office of Environment and Conservation (OEC) has three main functions as determined under the Public Services (Management) Act (refer to *National Gazette No. G65 of 26th August 1997*). These are:

a) formulate policy proposals and oversee policy relating to environment and conservation;

b) manage, develop, utilise and conserve water resources in the country for the optimum benefit of all its citizens;

c) administer legislation related to environmental planning, conservation and protection of species of flora and fauna, their habitat, and other areas designated for environmental protection, wildlife management and National Parks.

The Ministry or the Office of Environment and Conservations currently administer, amongst others, the following relevant legislations. They are:

- Environment Act 2000
- Conservation Areas Act 1978
- Fauna (Protection & Control) 1974
- National Parks Act 1982

Most relevant of these to the current study is the Environment Act 2000. This Act provides for:

- submission of Environmental Plans to Minister (voluntarily or under requisition);
- assessment and approval of Environmental Plans (EP) (by Minister where Plans are submitted voluntarily or by OEC where the Environmental Plan is requisitioned);
- issuing of guidelines by Minister for Environmental Plan preparation and content; and
- other Government Agencies to advise Minister of any proposal which has significant environmental impact.

Although it is clear that the administration of the legislation related to the environment rests with the Office of Environment and Conservation, some of the responsibilities overlap with other Government Agencies. For instance, the disposal and management waste is within the domain of the OCE under the Environmental Contaminants Act 1978, according to

Chapter 226 of the Public Health Act of 1976, " the Minister for Health shall provide for the removal and disposal of refuse". Such conflicting provisions more often than not impede the efficient implementation of these responsibilities. This is a relevant matter in relation to the disposal of wastewater from the study area.

6.2 Policy Framework

The current study will provide for the first Local Development Plan prepared in PNG under the Physical Planning Act. For this reason, there is little history or precedent to establish a policy context for various aspects of the Plan.

Within the NCD, however, the study does have the benefit of the 1996 Urban Development and Services Study (UDSS), which has been referred to at length throughout this report. The UDSS provided strong policy recommendations for the whole of the NCD generally and study area in particular.

The UDSS has been accepted by the Physical Planning Board as a strategic plan for the NCD. In this context, it provides a series of strategic policy directions that are relevant to the future role of the town area within the NCD and to the manner in which the town area should develop.

These relevant policy statements are summarised in **Table 6.4**, with commentary on their relevance to the Local Development Plan.

Table 6.4: Relevant Policy Recommendations from the UDSS

Ref.	Policy Statements	Comment
	Residential Category	
2.1.1	Designate areas for new development which maximise services and transport efficiency, proximity to commercial and employment opportunities and development ease.	As an area with existing services and infrastructure, the study area is appropriate for consolidation of development.
2.1.2	Designate infill or partially-developed areas to maximise service efficiency.	
2.1.4	Designate areas of special difficulty for development, but offering special amenities, for development in cluster or grouped patterns, taking advantage of and considering steep slopes, fragile land forms, drainage and other natural features.	The management of difficult sites is a key consideration for the study.
2.1.5	Designate Villages and Formal Settlements as growth centres, and prepare specific plans for their future management and growth.	Hanuabada and Koki villages directly adjacent and must be considered in any development plans.
2.1.6	Consolidate and eliminate the number of informal settlements and squatter developments.	Implementing this policy within the study area must have regard to land title, the potential for consolidation of settlements and the provision of alternative housing.
	Commercial and Office Development	
2.2.2	Expand and consolidate existing commercial centres to maximise the efficiency of available parking and adjacent road access.	The potential for consolidation of the town centre is an important issue to consider in the context of parking and traffic service levels.
2.2.3	Encourage the development of office centres within commercial centres,	Implementation of this policy could see some decentralisation of 'lower

	maximising the efficiency of transport networks and location of potential employees.	order' commercial activity to other areas within the NCD, being a trend which is already evident.
2.2.4	Encourage the development of mixed-use centres, combining a mixture of office and commercial uses, with residential opportunities.	The town centre has the potential to strengthen its limited mixed use character.
	Industrial	
2.3.1	Designate significant areas of land for future industrial and business-service development, maximising the availability of the services that industries need: high quality transport, electrical power, water and waste disposal, and the nearness of an adequate employee base.	Future development and the future role of the relatively small but well serviced Newtown industrial area needs careful consideration as part of the study.
	Public & Institutional Uses	
2.4.1	Designate the Waigani Centre as the location within the NCD for all national government structures, excepting those with legitimate public works or social service outreach activities, requiring them to locate in neighbourhoods or industrial-transport areas.	This matter is discussed in greater detail in section 5.10 – Economic Context.
2.4.4	Designate and develop a network of parks and recreation areas throughout the NCD.	The UDSS notes the importance of the "necklace of ridges and seacoast" as a major and dominant natural feature in the NCD. Reserve parklands to protect this attribute are recommended as part of these policy statements.
2.4.5	Designate natural conservation areas in well chosen locations within the NCD.	
2.5.2	Designate and develop radial roadways improving access to the airport and outlying areas and from the port and harbour to the Waigani and Gerehu areas.	It is noted that the Poreporena Highway has been built since this statement was prepared.
	Specific Policies – Town Area	
3.1.1	Strengthen the mixed use character of the downtown, enhancing development opportunities for housing, recreation oriented commercial uses, lodging opportunities and improve transport networks and the ports area.	A matter for consideration during Phase 2 of the study.
3.1.2	Manage growth in the downtown with an understanding of the value (economic and cultural) of the protection of views to and from the waterfront on both sides of the peninsula.	A matter for consideration during Phase 2 of the study.
3.1.3	Strengthen circulation through and around the downtown, evaluating the feasibility of completing the circuit of Ela Beach Rd and Stanley Esplanade (Champion Parade) around Paga Point.	This and other traffic circulation options will need to be evaluated.
3.1.4	Integrate the Sea Park development into the recreational land atop Paga Hill and that along the western side of Paga Point, and create a tie to the downtown mixed-use area and Ela Beach.	The potential to implement this policy may be affected by the recent rezoning approval for Paga Hill.

6.3 Current Development Framework

6.3.1 Port Moresby Downtown Local Plan 1984

a General

The current development framework for the study area (since 1984) is wholly governed by the Downtown Local Plan. Key provisions of this Plan are discussed in this section. Additionally, an appraisal of each of the policies of the plan is set out in Appendix D, considering, for each policy, its effectiveness ie. the extent to which it has been implemented since the plan's publication, and its relevance to future planning for the town.

The Plan was adopted in 1985 as the basis for planning in the town centre (or 'downtown') for the following ten years, and as such the relevance of the plan's policies and provisions have clearly been overtaken by events in a number of areas. Many of the plan's policies seeking site-specific objectives have either been undertaken or replaced by alternative land use outcomes. Some policies, such as those prescribing parking standards, have been replaced by the provisions of the 1989 Act or 1990 Regulations.

The following provides an overview of the key policy objectives and controls of the plan, and raises issues to guide future review and policy development.

b Zoning

Map 21 provides an up-to-date illustration of the current allocation of zoning across the study area. Many sites have been rezoned over recent years, usually to enable greater development than would otherwise be allowed. This pressure for rezoning upon the NCDC is one of the driving reasons for the updating of current zoning through the Local Development Plan.

c Density & height controls

The 1984 Plan provides a series of population density policies and height limits. The area of land allocated to each of these under the 1984 Plan summarised in Table 6.5. Please note that these figures are based on the original 1984 Plan and do not account for rezoning since that time.

Table 6.5: Area Allocated to 1984 Density Zones

Residential Density Area	Persons/ hectare	Dwellings/ Hectare	Height limit (no. storeys)	Total area (hectares)	% residential area
R1	75	15	3	34.82	20.49
R2	76-150	16-30	4	86.41	50.85
R3	151-250	31-50	8	26.97	15.87
R4	251-500	51-100	12	16.05	9.45
Special Policy	N/A	2:1 FSR	N/A	5.68	3.34

TOTAL				**169.94**	**100**

Additional height controls are provided by the plan as follows:

- building heights affected by the roof restrictions on Paga Hill shall not exceed 90 metres above sea level (E8);
- buildings within the port area shall not exceed 16 metres in height (E11); and
- industrial developments in Newtown opposite Lawes Road shall not exceed 16 metres in height (E12).

Commercial density is controlled by policy O3, which prescribes densities between 1:1 and 3:1. A number of special provisions apply, however:

- under policy O3, an additional floorspace bonus up to a maximum 5:1 may be provided through the provision of public car parking if at a rate of 1 parking space per 200 sq m. additional floorspace;
- under policy SH5, shopping floorspace allocated on the ground floor will be excluded from floorspace calculations. No maximum plot ratio is set, but any proposal utilising more than just the ground floor will be considered 'on its merits'.
- with regard to the land allocated to 'Special Policy for Housing in the town centre' (SP Area), policy O4 in the 1984 Plan provides for an effective floorspace bonus of 2:1 above the normal 3:1 floorspace ratio (FSR) allowed for stand-alone office development. That is, a total floorspace ratio of 5:1 can be achieved in this area through mixed office/residential development.

Appropriate density is a matter for review in Phase 2 of this study. In particular, the floorspace bonus provisions of the plan will need to be reviewed for the following reasons:

- parking standards are now prescribed by the 1990 Regulations;
- the additional traffic generated by the provision of retail on the ground floor of commercial buildings will generate significant additional traffic or which no parking and transportation infrastructure provision is made; and
- there are other additional pressures which are placed on the public domain and services as a result of higher densities which are not addressed by the bonus provisions.

d Public domain

The plan makes provision for public open space, landscaping works, pedestrian access routes and footpaths. Specifically:

- policy R2 requires the provision of open space, view points, landscaping and lookouts as part of residential subdivision;

- policies SE5 – SE8 seek to protect existing public open space or create new areas of public open space through rezoning. Land identified includes land along Ela Beach Road;

- policy E13 requires tree planting to be undertaken along major roads and in public open spaces and reserves; and

- policies E1 and E2 require that walkways be developed to provide safe and attractive pedestrian passage between Ela Beach and Koki and Paga Point.

Some objectives, including the rezoning of a number of specific sites to public open space under policies SE5 – SE7 have been carried out. However, overall, the provision of public open space and other public domain improvements has been poor. Residential subdivisions have been carried out with little or no requirements being placed on the developer. Similarly the public domain improvements promoted by policy E13 have not occurred. The Ela Beach Reserve will be diminished significantly by the current widening of Ela Beach Road currently underway. The proposed walkways under policies E1 and E2 have not been provided, and in general provision for pedestrians remains poor in terms of safety and amenity despite the high level of pedestrian activity in the town.

The apparent under-performance of public domain policies may be due to the following:

- policies such as E13 are inadequately prescriptive, neither setting out specific requirements or standards, nor identifying the responsibility for implementation or funding;

- in the past (particularly prior to the establishment of the NCDC as planning authority), inadequate measures have been taken to secure developer contributions. Section 81 of the 1989 Act provides the mechanism for securing developer contributions towards public works, and its application to development projects is improving;

- council funding to cover maintenance of the public domain has been a problem; and

- public open space provision has been undermined by decisions of other major projects such as the Ela Beach road-widening and subdivision of Paga Hill.

e Car parking and traffic

Car parking standards are set by the plan including policy T6, which requires that 50% of commercial parking spaces be available to visitors and not allocated. The plan states under policy T9 that parking provision is the responsibility of the developer and not the council.

To address traffic congestion, the Plan limits the total floorspace provision in the town (policy T7) unless an improved modal split towards public transport can be achieved, and seeks to constrain any increase in the modal share of the private car under policy T10.

A number of issues require further consideration in respect of these policies:

- the requirement for 50% visitor parking allocation has not been upheld, with occupying firms in many buildings allocating well in excess of 50% of spaces to named users;
- measures need to be found to increase revenue for the provision and maintenance of public car parking to overcome the problem outlined by policy T7. Section 81 of the 1989 Act may be an appropriate measure to secure developer contributions, although there continues to be no mechanism for the collection of public car parking charges for ongoing maintenance;
- the scope for restricting private car use in the town in favour of public transport may be unrealistic until the level and quality of service of the PMV network is improved; and
- policy T10 is aspirational in nature and provides no implementation mechanism or standards.

f Role of the town centre

The Plan sees the town centre (or 'downtown') as the primary focus for commercial and major retail development under policies O1 and SH1. The underlying objective is to concentrate facilities in an area where a range of facilities are accessible within walking distance of each other, and on the PMV network. Residential development is additionally encouraged in the town centre through the use of the floorspace bonus in policy O4, as a means of increasing the liveliness of the town and improving the custom of premises such as restaurants and cafes. Similarly policy G2 restricts 'other commercial uses', namely cinema, theatre and amusement parlours to the town centre as a means of improving evening activity in the town and safeguarding environmental amenity elsewhere.

The town centre continues to represent the main focus for commercial development. In respect of retail, policy SH1 must be considered in the light of retail development that has occurred at Harbour City, which raises issues of whether retail development here is complementary to the role of the town centre by serving the needs of the eastern parts of the capital.

Policies intended to improve the vibrancy of the town centre after hours have only been partially successful – there has been no theatre, cinema or other such facilities in the town to date.

g Role of Waigani

Policy O7 specifically seeks to maintain the role of Waigani as the location for government functions by discouraging the locating of government functions in the town centre. Waigani continues to represent the seat of government and is expected to continue to do so.

h Role of the port

Policies O6 and I1 together seek to protect port land for port related development by discouraging industrial and warehousing development which does not need a port location, and requiring that port-related government offices are located at the port unless suitable land cannot be found. In conjunction the policies seek to strengthen the role of the port and minimise unnecessary traffic movements between the port and other parts of town. Furthermore, policy I6 prohibits the expansion of wholesale trade on port land in order to safeguard land for port uses and minimise traffic impacts.

Policy I7 promotes the reclamation of land by the Harbours Board to provide suitable land for the expansion of port activities.

A consideration for future plan making will be whether the potential relocation of the port from its current site will require consideration during the plan period, especially in the light of the current permission for development of a major building on port land as the Harbours Board headquarters.

i Konedobu redevelopment area

The Konedobu redevelopment area was identified by policy G3, which designated the area as a comprehensive redevelopment area. The policy required that a special study be carried out which addressed:

- the implications of construction of the Burns Peak Road;
- the possible relocation of private clubs from Ela Beach Reserve to the area;
- planning and programming the release of surplus government land and buildings from the area.

In practice, neither the relocation of private clubs, nor the relocation of government buildings has occurred as envisaged, and no study has ever been undertaken. The area now comprises degraded government buildings that appear to be in low level use and degraded residential areas. The area is bisected by the Poreporena Highway which runs east-west through the area. The future of the area will need to be addressed taking into account:

- potential suitability of the area for educational, health and other community facilities;
- the potential catchment of the area;
- issues of accessibility (particularly for pedestrians) between the north and south of the area across the highway; and
- the future of the government buildings.

j Conclusion

As the first phase in preparation of a Local Development Plan for the Port Moresby Town Area, this report provides a comprehensive foundation of information and preliminary analysis. This information relates to the wide spectrum of considerations that must be integrated when preparing such a Plan – social, economic and environmental issues; infrastructure standards and implementation; urban design and conservation; and efficiency in urban form, to name a few.

In many respects, this report raises more questions than it answers and highlights the challenges that exists in the study. Most of the information presented in this report is very relevant to the Plan. The challenge will be to utilise it in a way that ensures the Plan is simultaneously practical, achievable and visionary.

Appendix A

References

Please note that this represents a preliminary reference list. It should be read in conjunction with the 'Document Register' utilised for the project (presented as part of the Inception Report) and source data shown on maps.

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Appendix B

Plan Management Team Members

National Capital District Commssion

Stanley Haru	a/ Director Regulatory Services	Chairman
Don Malsbury	Senior Physical Planner	Coordinator
Dr. Karu	Deputy City Manager (Engineering & Operations)	Member
Mohammed Chowdry	Senior Engineer (Storm water Drainage)	Alternate Member
Leslie Alu	City Engineer	Member

Department of Land & Physical Plnning

Elias Masta	Chief Physical Planner	Member
John Ofoi	Director, Statutory Authorities	Alternate Member

Department of Environment and Conservation

Luke Tanikrey	Senior Environmental Assessment Impact Officer	Member

Department of Works

Robert Aup	Principal Engineer, Roads	Member
Phillip Tabogani	Principal Architect, Architecture & Design	Alternate Member

Png Instiute of Architects

Allan Karo	President PNG Institute of Architects	Member
Gaudi Kidu	Director, Structon	Alternate Member

Port Moresby Chamber of Commerce

Ken Dunn	Relationship Manager, Bank South Pacific	Member

Png Harbours Board

Ilo Koko	Executive Manager, Engineering	Member

Department Of Transport

Paul Unas	a/Asst. Secretary Infrastructure & Planning	Member

Motu Koita Council

Maataio Nou Taboro	Councilor	Member

Eda Ranu

Allan Nema	Manager, Planning and Development	Member

Appendix C

Maps

Map Number	Title
1	Geomorphology
2	Topography
3	Slope
4	Natural Environment
5	Population Change: 1990-2000
6	Population Density
7	Land Tenure
8	Important Cultural & Social Features
9	Land Use 1
10	Land Use 2
11	Land Use 3
12	Development Approvals Not Commenced
13	Road Class & Service Demand Levels
14	Road Conditions
15	PMV Routes & Stops
16	Water Supply System
17	Wastewater System
18	Stormwater Drainage System
19	Power Supply Network
20	Telecommunications Network
21	Existing Zoning

Appendix D

Port Moresby Downtown Local Plan 1984 – Policy Review

Policy ref	Policy (paraphrased)	Comments	Effective ?	Future relevance ?
Residential				
R1	Inappropriate land uses will not be permitted in residential zones	Throughout the town there has been considerable development pressure from the commercial and residential sectors, as well as pressure to increase residential densities. The policy has proved to be effective over the years.	Y	Y
R2	In major residential subdivisions provide open space, lookouts, footpaths and landscaping.	The policy has proved ineffective, in particular prior to the establishment of the NCDC as the planning authority. Many developments have been approved with little or no public amenity provision, and it is essential that this requirement is reinforced in the future plan, through use of Section 81 of the Planning Act. Opportunities for public improvement include limited development on degraded open space in conjunction with remediation and improvement of that open space.	N	Y
R3	Government housing on Paga Hill should be relocated.	The intention of the policy is that the housing be relocated to allow the use of the National Park. Since degazetting of the NP and rezoning of the land to commercial and residential, the policy no longer applies, although the relocation of housing continues to be a relevant issue in the context of development proposals for Paga Hill.	N	N
R4	Residential development should be carried out in accordance with the density plan.	There has generally been pressure to increase densities in the plan area, in particular from R1 to R2 and R2 to R3. In general the plan has been effective in maintaining density controls.	Y	Y
R5	Provision of residential accommodation within non-residential area	The Planning Board only typically permits 1 residential unit per industrial allotment (although this is not a formally recognised	Y	Y

Policy ref	Policy (paraphrased)	Comments	Effective ?	Future relevance ?
	only permitted if necessary, acceptable amenity and compatible.	standard) typically for security staff or a caretaker. No more is permitted on the basis that such accommodation would be remote from facilities and face amenity problems.		
R6	Government offices fronting Armit Street should be released for residential development.	Has now been rezoned to commercial, so policy of no further relevance.	N	N
R7	Private and Government health clinics and surgeries may be relocated at strategic sites in residential areas where environmentally acceptable.	The policy has failed to deliver adequate facilities during the time of the plan. The policy addresses an important issue and in future consideration should be given to a more proactive policy.	N	Y
Offices				
O1	New offices only in the town centre	The town centre has continued to maintain its role as the commercial centre of the study area and of the wider NCD. The location of offices in the town centre continues to be appropriate, despite an earlier initiative to develop the role of Waigani as a commercial centre, which has not occurred.	Y	Y
O2	Plot ratio for offices shall be between 1:1 and 3:1	Maintenance of an appropriate density control is an important component of the plan's controls, and has been applied in the past. Density controls still continue to be a valid component of the planning framework.	Y	Y
O3	A bonus plot ratio over 3:1 (up to 5:1) may be achieved for office development by the provision of additional car parking.	The provision of car parking is now controlled by the 1990 Regulations, which prescribe standards. The provision of parking has, in the past, been subject to the problem of allocation of parking spaces to dedicated private users, which precludes its use by the general public, customers and visitors to a commercial premises.	Y	N
O4	A developer may include residential floorspace in a commercial development, with such development being excluded from plot ratio	The policy is intended to encourage a vibrant town centre with a range of facilities to serve residential needs. It is unclear as to whether this has been achieved, although the policy raises issues of potential overdevelopment.	?	N

Policy ref	Policy (paraphrased)	Comments	Effective ?	Future relevance ?
	calculations.			
O5	Where offices are ancillary to other main land uses, extensions to these offices will be considered.	The policy is appropriate in that it allows for flexibility in the use of ancillary office space to reflect changing needs. Clearly it will be important that the development is ancillary only.	Y	Y
06	Port related government offices should generally be located in Port related industrial zone.	The policy is intended to locate port-related development in the most appropriate place. This policy is appropriate subject to review upon relocation of the port, which appears unlikely in the plan period.	Y	Y
07	Government departments and statutory bodies are strongly discouraged from relocating downtown.	The policy seeks to maintain Waigani as the seat of national government. The respective roles of Waigani and 'downtown' are still maintained.	Y	Y
Hotels				
H1	Allotments occupied by existing hotels (including the approval fronting Ela Beach Road) are zoned commercial and are reserved for hotel development only.	The approval referred to on Ela Beach Road has lapsed. Other than that the policy still remains a valid objective.	Y	Y
Shopping				
SH1	Major retail proposals only in the town centre, and as part of a commercial office or hotel development.	The policy, intended to provide for a concentration of retail alongside other facilities within walking distance, is an appropriate approach, and is complementary to a greater use of public transport / PMVs and promoting a high-quality town centre environment. The development of a supermarket at Harbour City, and the potential future development of further retail here, needs to be addressed to determine its role in relationship to the town. It may be appropriate to maintain the town centre as the primary focus for major retail while developing the Harbour City to serve the retail needs of eastern areas of the city.	Parti - ally	Parti - ally
SH2	Shopping areas along Spring Garden Road to be retained.	No longer specifically relevant, as the land identified has been developed as a trade store and hotel. However, the provision of some alternative retail site may be appropriate, and would need to	N	Y

Policy ref	Policy (paraphrased)	Comments	Effective ?	Future relevance ?
		address issues including pedestrian access across the Poreporena Highway.		
SH3	In the subdivision of Ela Makana Hill, land is to be reserved for a shopping centre to serve local needs.	This has not been progressed, and its relevance will depend on the revised zoning for the site. It may in any case not be necessary to have a policy as such if the zoning allocates retail.	N	N
SH4	The existing commercial land on Section 7 (Healy Parade / Lawes Road) is zoned residential with the existing shopping retained.	The policy is still appropriate in that the need for retention of the shopping facilities to serve local needs is still appropriate.	Y	Y
SH5	In working out commercial plot ratios in the town centre, shopping floorspace on the ground floor will be excluded from calculations and regarded as a bonus	The policy, which seeks to encourage retail space, raises concerns about the significant traffic generation and parking implications of 'free' floorspace for retail. In any case, the parking standards now set out in the Regulations replace requirements for parking provision which will constrain the abilitity to achieve bonus floorspace.	Y	N
Industry And Warehousing				
I1	Industrial and warehousing developments in downtown which do not have a specific need for location near the port are discouraged.	The overall objective may still be appropriate if the Port is to remain in its current location.	Y	Y
I2	Intensification of the existing non-industrial / non-warehousing uses in industrial zones is not encouraged, and relocation of these uses is encouraged.	The relevance of the policy needs to be considered in the light of recent events such as the construction of the salt factory at Konedobu and the land surrounding it.	Parti - ally	N
I3	In the Konedobu Comprehensive Development Area, consideration will be given to the allocation of land for light industrial and warehousing uses.	The Konedobu CDA as a policy designation no longer has relevance, and its impact has been minimal. The policy was founded on the expectation that Government House would be relocated, but this never occurred. The area is now bisected by the Poreporena Highway, and so there will be accessibility issues for the wider catchment. Alternative uses may be appropriate such as cultural, medical or	N	N

Policy ref	Policy (paraphrased)	Comments	Effective ?	Future relevance ?
		educational facilities, given the large local residential population. It is noted that light industrial uses under the 1984 Plan are now classified as general industrial under the 1990 Regulations.		
I4	Encouragement of higher densities for industry and warehousing	The appropriate density standards for the plan will have to be reviewed in the light of current infrastructure capacity, the infrastructure development program and the mechanisms for securing infrastructure funding through development.	?	?
I5	The land used at present for port related industrial should be rezoned as heavy industrial.	No longer relevant as all heavy industrial land became general industrial under the 1990 Regulations.	N	N
I6	The further expansion of wholesale trade not permitted within port land.	The policy has been effective, and continues to prove valid.	Y	Y
I7	Reclamation of land by the PNG Harbours Board is encouraged.	The long-term reclamation program depends upon the possible relocation of the port. However, the reclamation of land continues to be pursued as an objective of the NCDC.	Y	Y
Social and Educational Facilities				
SE 1	Further expansion of schools should occur within present sites.	The study area had 3 schools; Ela Beach International school, Koki primary school and Port Moresby Grammar School, however the latter has now moved out of the study area. The Ela Beach International school (IEA) has expanded but not within its present site, it has taken up the recreational reserve and the open space on the approved 1984 Downtown Local Plan.	No	No
SE 2	Existing temporary car park along the southern boundary of the recreational reserve to be relocated as shown on the approved plan	The area designated for the car park forms part of the courthouse. There is ample capacity for parking elsewhere within the wide are at the end of Winter Street.	Yes	No
SE 3	A community school site	This policy was never implemented.	No	Yes

Policy ref	Policy (paraphrased)	Comments	Effective ?	Future relevance ?
	is reserved in the Newtown area as indicated on the approved plan.	Half of the site is already taken up by squatter settlements as indicated on the land use map. If this policy were to remain the question would be whether there is adequate space left for the school (the minimum land required 2 ha) and the settlement to coexist or whether the settlement should be relocated. An alternative would be a school in the degraded Konedobu area to the north.		
SE 4	Existing clinic on section 35 Lot 11 is to be encouraged to relocate to section 36 lot 9 as indicated on the approved plan.	The clinic still exists on the same site. The proposed relocation site is now a petrol filling station. The current location of the clinic is amongst industrial buildings and is some distance from the public transport facility, and so relocation may still be appropriate possibly to the Konedobu area.	No	No
SE 5	The existing court house (section 28 Allotment 01) is to be relocated to the land zoned as open space	The courthouse no longer exists on section 28 lot 01. Policy objective has been achieved	Yes	Yes
SE 6	Existing Public Library located in Ela Beach is to be relocated to the town center.	The Public Library is now located in the town center.	Yes	No
SE 7	Existing site for RSL & Bowling to be rezoned as open space on Ela Beach.	The clubs no longer exist on Ela Beach. The area is now part of the recreational reserve.	Yes	No
SE 8	No further land shall be allocated for private clubs organizations within Public open space.	At present the only private clubs in the downtown area are the Aviat Sports Club and the Yacht Club.	No	Yes
SE 9	Further expansion or development of private	The yacht Club has relocated but other than this nothing has happened. The	No	No

Policy ref	Policy (paraphrased)	Comments	Effective ?	Future relevance ?
	clubs should occur within their own boundaries.	policy is possibly unnecessary		
SE 10	The Royal Papuan Yacht Club site is to be rezoned Heavy Industry for port related activities.	The royal Papuan Yacht Club has moved site and is now located along the shoreline opposite the Hubert Murray stadium. The old site is now zoned commercial and is currently an office. The heavy industry zone under the 1990 Regulations is now classified as general Industry.	No	No
SE 11	Police and fire are to be relocated on the sites on the approved plan. Further development / expansion should be confined to these areas.	The current land use survey identifies these uses on the designated areas. The buildings are run down and have potential for further improvements and developments. Overall the policy does not appear to serve any overall purpose	Yes	No
SE 12	Parliament building is to be used / retained as a special use for government purposes to be decided	The old parliament building is derelict. It has also been identified in the phase 1 report as a historical site. The policy is therefore in the process of being implemented.	Yes	Yes
SE 13	Land indicated on the approved plan for public utilities will not be rezoned for any other purpose	Public utilities zone mainly refers to the reservoirs on the approved plan with the letter s on the designated areas. The land use identifies three of these. The fact that the zoning map already identifies the public utilities zone suggests that a specific policy may not be necessary. However in the past important public utility reserves have been eroded, and so the policy may be appropriate.	No	Yes
SE 14	The places of worship are zoned as special use and are used by churches. (The places of worship are on allotments zoned for	The land use survey identified / churches under the classification of civic. On the existing zoning map most places of worship come under the public institutional zones / There is no special uses zone. The use of land for churches is	Yes	No

Policy ref	Policy (paraphrased)	Comments	Effective ?	Future relevance ?
	residential or commercial)	already identified on the zoning map and so an actual policy may not be necessary.		
SE 15	Special use zone – place of worship, ancillary use will be allowed only if it is essential to the main use.	The point here was although intended to provide for church associated activity such as workshop and classrooms the policy is really invalid as there is no space to expand for ancillary uses in most places of worship.	Yes	No
SE 16	A site is reserved for a place of worship at the bottom of Ela Makana Hill in Newtown.	The existing zoning shows 1535 as residential. Part of it is almost occupied by the Bomai settlement; Era Dorina takes up part of it. The policy has not been implemented and never can be so it is invalid	No	No
Transport				
T1	Safeguard the reserve for the Burns Peak Road	The reserve was safeguarded for the Poreporena Highway, which has now been built.	Y	N
T2	Direct frontage from development to the main road network is discouraged.	The overall objective, while appropriate, should relate to formal road classifications as defined in the 1990 Regulation (the term 'main road' has no formal status). It is unclear as to whether the policy has been successfully applied in the past.	Y	Y
T3	An alignment should be reserved for an alternative access from Elanese Road to the Ela Makana developments.	This has not to date been implemented, and the land is now occupied by squatters. It is uncertain as to whether the policy could even be implemented – there may be topography constraints.	N	N
T4	Vehicle accessibility will limit the density of cul-de-sac development	The policy has no quantified standards and so has been somewhat ineffective. In any case it is now superseded by the 1990 Regulation which contain standards.	N	N
T5	The existing car parking standards should be retained.	Superseded by the 1990 Regulation.	N	N
T6	Where car parking is provided for commercial developments, at least 50% of spaces shall be reserved for visitors.	The policy has been severely undermined in the past by the allocation of most or all parking spaces for individuals (specifically staff members) to the detriment of visitor provision. Improvement of parking provision has been identified as a key	N	Y

Policy ref	Policy (paraphrased)	Comments	Effective ?	Future relevance ?
		issue.		
T7	Office floor space cannot exceed a certain level (182,000 sq. m) unless at least one of a set of conditions is met.	One of the conditions is the decision to proceed with Burns Peak Road. This has been done and so the restrictive policy no longer applies. In any case, density control may be better linked to density standards in future.	Y	N
T8	Car parking should be reviewed if the level of floorspace in T7 is exceeded.	The level of office floorspace has, in practice, never been monitored, and so a review of parking standards has not been possible. However, parking provision is a key issue.	N	Y
T9	There should be no public involvement (funding) in providing car parking spaces unless the financing problem can be overcome.	The funding of car parking can now be secured under Section 81 of the 1989 Act. There is a further issue of whether rates could be used to maintain parking facilities. This is not, however, a matter for the development plan.	N	N
T10	A major objective of public transport policy is to ensure that there is no deterioration in modal split towards private transport.	While the objective of the policy is appropriate, the policy itself provides no mechanism for implementation, and so serves no actual purpose.	N	N
Environment				
E1	A walkway should be constructed to join Koki to Ela Beach	No such walkway was ever constructed, although improved pedestrian routes continues to be an important consideration. It is noted that the Healy Parade road upgrading will be required to provide a walkway that will be able to serve pedestrians. The existing walkway is narrow and pedestrian safety is a concern.	No	Yes
E2	A walkway is planned to join Ela beach and Paga point	The walkway was never constructed but is still an issue. The walkway would be possible if Seapark was opened to the public. Also residents at Paga hill would benefit from the walkway.	No	Yes
E3	The supplement Plan 7	Supplementary plan 7 was never	No	No

Policy ref	Policy (paraphrased)	Comments	Effective ?	Future relevance ?
	showing the development concept of the Ela Beach as adopted as the action plan for this area	implemented, although there have been some ad hoc improvements to the beach there is now an alternative design for the area which is currently being reviewed by the NCDC.		
E4	Licensed restaurants and snack bars are allowed in Paga National Park and Ela Beach reserve only in identified locations on the detailed Plans	At the moment there are no snack bars or restaurants located at Paga Hill, and the National Park has now been degazetted. There are snack bars at Ela Beach but not in the locations dictated by the plan	No	Yes
E5	Legal title for the proposed national Park on Paga Hill and Ela beach recreational reserve should be given to the NCDIC /other appropriate authority.	At the moment NCDC looks after Ela beach. Paga Hill however is a different matter. It has since been degazetted from National Park status, and was given an approval by the NCD Physical Planning Board for a rezoning for residential use. For Paga Hill it would be appropriate to have a policy of retaining remaining areas as open space. NCDC may acquire legal title over all public open space and recreational reserves under section 50 of the land act.	No	Yes
E6	Buildings, structures and sites which are designated as being of historic / architectural interest are to be preserved.	Such buildings and sites are identified in the Phase 1 report (section 4.5.2, 4.5.3). It is recommended that a policy is developed to enure that these sites are maintained and looked after.	Yes	Yes
E7	High-rise residential buildings are allowed on the sites indicated on the built environment policies proposals plan. Maximum height should not exceed 12 floors; distance between 2 high-rise buildings should be 20m.	The windward apartment is 14 storeys high and the Ela beach tower is 17 storeys. The policy needs to be reviewed because it has not been followed.	No	No
E8	Building height within the area affected by roof level restrictions on	This policy should be reviewed in light of the Paga Hill Land Holdings Company proposals.	Yes	Yes

Policy ref	Policy (paraphrased)	Comments	Effective ?	Future relevance ?
	Paga Hill is not allowed to exceed 90m above sea level.			
E9	Developments on top of Touaguba and Ela Makana Hills should not exceed more than three floors	Developments on both hills have been consistent with this policy.	Yes	Yes
E10	New developments redevelopments, additions and alterations of existing buildings in the town center shall comply with the approved design briefs set out in supplement No.6	The developments in town have never followed the brief so the brief is no longer valid. A review of the town center design issues may be appropriate.	No	No
E11	Buildings within the Port area as indicated in the Built environment policies and proposals plan should not exceed more than 16 m in height.	This policy has now been superseded by a 15m-height control within the 1990 Regulation.	Yes	No
E12	Industrial developments in Newtown on the allotments facing Lawes road should not exceed more than 16m in height.	There is only one tall building in the policy area, which is understood to conform to this policy.	Yes	Yes
E13	Additional tree planting and shrub should be undertaken to strengthen the existing landscape along major roads in public open spaces.	The policy, although setting out a valid objective, has been ineffective. It does not specify who is responsible for such works, or provide any implementation mechanism.	No	Yes
E14	The landscaping of developments is to be given higher priority than it has in the past. Developers are required to preserve existing trees and plant new ones.	The policy has been ineffective - there has been minimal provision for landscaping in new development and engineering projects. This continues to be an important issue.	No	Yes

Policy ref	Policy (paraphrased)	Comments	Effective ?	Future relevance ?
	For new developments on steep hills engineering cuts for roads and footpaths should be minimized and landscaped.			
E15	Developments in Kaevaga should not exceed 3 floors.	Not many developments have taken place in this area. The area mainly consists of old residential houses from the colonial past. A review of the policy is required.	Yes	Yes
General				
G1	Full planning permission should be implemented within 3 years of being granted; outline permission should be supplemented by detailed proposals within 2 years, with implemetation within 3 years thereafter.	Time limits are now prescribed by the 1989 Act	Y	N
G2	Other commercial uses (ie. cinemas, theatres, amusement parlours) are only allowed in the town centre on land zoned commercial.	None of these uses have ever come forward.	N	N
G3	The old government area in Konedobu is designated as a comprehensive redevelopment area and will be the subject of a special study.	This never happened and the policy as it stands is now redundant.	N	N


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