

KIAMA MUNICIPAL COUNCIL

JERRARA DAM

PLAN OF MANAGEMENT

27 August 1996

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1.0 INTRODUCTION

1.1 Background

The Jerrara Dam site is situated approximately 5 km west of Kiama and comprises approximately 54 hectares including a disused water supply dam and its immediate surrounds.

The site offers a rich and varied landscape which makes a very real contribution to the scenic quality of the Jamberoo Valley. It is clearly visible from Saddleback Mountain, one of the main tourist lookouts in the area.

The site possesses a number of environmental values, including a freshwater wetland habitat and pockets of remnant subtropical rainforest.

The Jerrara wetland is potentially one of the most valuable freshwater wetland habitats in coastal Illawarra. This manmade wetland has been degraded over the past thirty years due to a heavy infestation of Water Hyacinth. The control of the noxious weed and revegetation with native wetland species will provide the Municipality with an outstanding wetland resource of regional significance.

Two rare rainforest species, *Zieria granulata* and *Daphnandra* sp. *Micrantha* occur in the remnant rainforest. The former is listed in Schedule 1 of the Threatened Species Act 1996 and the latter is the only rainforest species endemic to the Illawarra. It occurs in very limited populations in the area and its preservation at Jerrara Dam site is essential.

Overall the remnant rainforest located at Jerrara Dam represents a small part of the Illawarra Brush (Mills, 1995) which remains in the Illawarra after clearing. This rainforest has been described by Dr Kevin Mills as floristically the richest rainforest in southern NSW and part of the largest concentration of rainforest in south eastern Australia. Today only 17% of that rainforest remains. The management plan proposes to establish an Arboretum for native species indigenous to the Jamberoo Valley. This will greatly assist in the conservation and regeneration of the remnant rainforest and particularly the endangered species found on the site.

Due to the high environmental and scenic values of the Jerrara Dam site, there is scope to provide an educational and recreational opportunity, where people can enjoy and learn about the natural attributes of wetlands and rainforest. These opportunities include bushwalking, picnicking, botanical research, birdwatching and fishing.

It is envisaged that an appropriate use of the site should be of a low impact, environmentally compatible nature.

1.1 Background (Cont)

The Local Government Act, 1993, requires the classification of all Council property as either community or operational land. Generally speaking, community land refers to property which Council retains for use by the general public, whilst operational land need not be retained for such use. Further, the Acts states that all community land is to be the subject of a plan of management.

This management plan is not only a response to the requirements of the Local Government Act, but it reflects the desire of Council to prepare a set of uniform guidelines for the management of the municipalities open space network. The plan is divided into three basic sections as follows:-

- * **Section 2.0:** Overall management basis - has a currency of about 20 years and details the longterm aims and objectives of Council in relation to the planning and management of neighbourhood parks.
- * **Section 3.0 and 4.0:** Management procedures - these policies are the medium term strategies Council will subscribe to in order to fulfil its long term corporate goals and objectives. This section of the plan has a currency of 5-10 years.
- * **Section 5.0:** Action plan - this plan contains details of the actions that Council will undertake in regard to the management of the site and the methods by which the success of these actions will be monitored. This plan is short term, with a currency of five years although it is envisaged the actions to be undertaken will be reviewed annually.

1.2 Community Land Covered by the Plan

The community land covered by this plan is Lot 41, DP 841082 and is shown on Councils Plan No. 1217. This land generally includes the dam water surface area and the adjoining community lands upstream of the stored water. It should be noted that it does not include land included in Lot 40 DP 841082 which is operational land and leased to the Riding for the Disabled Association.

1.3 Function and Value

The Jerrara wetland is potentially one of the most valuable freshwater wetland habitats in coastal Illawarra. With a surface area of nearly nine hectares, Jerrara Dam represents the largest open freshwater body in the coastal region between the Shoalhaven River and south of Sydney. In his study of Illawarra wetlands in 1970, Goodrick stated that "open freshwater bodies have the highest habitat value as feeding and breeding areas for water fowl and few of these areas occur on the South Coast".

The site also contains remnant rainforest including two rare species endemic to the area, *Zieria granulata* and *Daphnandra* sp. *Micrantha*. The former is registered in Schedule 1 of the Threatened Species Act 1996 and the latter is the only rainforest plant endemic to the Illawarra (Mills, 1983).

1.3 Function and Value (Cont)

These pockets of forest such as occurring at Jerrara Dam are remnants of the Illawarra Brush which once covered much of the Kiama and Shellharbour Municipalities. Today only approximately 17% of that forest remain and it is of the utmost importance that these remnants be conserved and regenerated to maintain the biogenetic diversity of the region.

Because of its physical characteristics and its environmental qualities the site has high scenic and scientific values which offer a potential for the site to be utilised as an educational and passive use recreation area.

1.4 Community Participation

Community and user group consultation is a fundamental source of information necessary to provide the most efficient and effective plan of management for community land.

Such participation creates the opportunity for interested parties to become actively involved in the development of a plan which reflects the needs, opinions and priorities of the people most affected by the plan itself.

Accordingly Council established a community based management committee, the Jerrara Dam Management Committee, to assist in managing the site and formulating this plan.

2.0 CORPORATE RESPONSE

2.1 Aim

To develop a plan of management for the site to comply with the 1993 Local Government Act which is consistent with Council's existing land management plans.

2.2 Corporate Goals

Parks and Recreation:

- * To provide and maintain an open space system which meets the diverse needs of the community and enhances the quality of the natural environment and the quality of life.

Other:

- * To provide an efficient and effective delivery of services which is responsive to the community's needs;
- * To promote the principle of ecological sustainability in environmental planning through implementation of Council's environmental goals;
- * To develop an organised culture which encourages innovation and flexibility and which strives for continual improvement;
- * To exercise the regulatory functions of Council consistently and without bias;
- * To encourage community participation in the processes of Council by consulting widely on its activities and policies;

3.0 MANAGEMENT

3.1 Issues

Through liaison with community and interest groups, Council has been able to identify major issues regarding the management of the land covered by this plan.

3.1.1 Conservation & Regeneration of Indigenous Native Plant Species

The site contains remnant rainforest and isolated stands of Eucalypts and Melaleuca species. Two rare rainforest species, *Zieria granulata* and *Daphnandra* sp. *Micrantha*, occur on the site.

A vegetation survey was done on the site by Mills in 1983, however further detailed surveys are needed to improve the database for the existing vegetation on the site. This data will be of assistance in future monitoring of the site and in compiling data bases of fauna and flora which may be at risk either nationally or regionally.

The regeneration of these plant communities is vital in preserving and enhancing habitats and hence the biodiversity of the site. The draft plan of management adopted by Council in 1994 proposed the establishment of an Arboretum for Indigenous Rainforest species. Because of the presence of dry sclerophyll species on the site and the desire to enhance the wetland with native wetland species, it is considered that the arboretum should include species other than rainforest species but exclude species which are not indigenous to the Jamberoo Valley. To allow development of the Bush Food Garden native bush food species not indigenous to the area may be planted in that part of the site. This aspect of the plan is discussed in further detail in Section 3.1.7.

Whilst the term "arboretum" refers to the establishment of a "botanic garden of trees" this should not be seen as excluding the regeneration and conservation of native shrubs and grasses indigenous to the Jamberoo Valley

Wherever possible plants grown from locally collected seed and cuttings should be used in replanting programs. Bush regeneration programs should follow standard accepted practices for such schemes and be carried out generally in accordance with the details shown on Plan 1217 in Appendix I.

3.1.2 Recreation

Because of its location and physical attributes the site offers great opportunities for passive recreation use. These uses need to be sympathetic to the environmental goals and the scientific value of the site. Activities such as walking, bird observation and picnicking in defined locations, as shown on Plan 1217, would be in keeping with the management objectives on the site.

Recreational fishing on the dam is also seen as an appropriate recreational pursuit. This may involve stocking the dam with native fish, and possible modifications to the spillway to provide a fish ladder to allow migration of fish.

3.1.3 Education Resource

Because of its significance as a regional wetland, the presence of a wide variety of habitats, the presence of remnant rainforest species and its many other natural values, the site has great potential as an educational resource.

Interpretative signage would assist in implementing some of the objectives of the Plan of Management. These signs will help in explaining some of the more obscure values and functions of the site and lead to an increased appreciation of these values.

Schools and other educational institutes should be encouraged to use the site and learn about it. Studies or monitoring programs done will assist in building up a valuable scientific data base for the area.

3.1.4 Weed Infestation and Exotic Trees

Water Hyacinth almost completely covered the dam water surface area in 1992. This posed a serious problem for the development of the site as a wetland habitat and also as a major source for the spread of the noxious weed downstream into the Jerrara Creek and Minnamurra River. Various options were investigated (McLaren, 1989) and in 1994 a control program was commenced under the supervision of the Noxious Weeds Authority involving spraying the stranded Hyacinth with Roundup. This has been most successful in reducing the Hyacinth to seedlings germinating on the shoreline at the water line. Follow-up programs will minimise the risk of the Hyacinth regenerating. Accordingly, the Water Hyacinth removal plan included in Appendix 3 has been amended to take these factors into account.

Other nuisance weeds occurring on site include lantana, Noogoora Burr, Castor Oil Plant, Thornapple and other exotic trees such as Coral trees, Camphor Laurel and Privet.

These weeds should be controlled through appropriate methods depending on site conditions and availability of resources. In areas of remnant bushland or rainforest standard bush regeneration techniques should be employed. In areas of pasture where there are no signs of natural regeneration, these may be periodically slashed to control noxious or nuisance plants. Allowing agistments rights over areas which are not ready to be revegetated or which are to remain as open grasslands will also assist in controlling the spread of unwanted plants. In the areas proposed for revegetation the establishment of a closed canopy will greatly reduce the occurrence of these plants. However, while the degree of control may be reduced, long-term maintenance will be necessary to ensure the site is kept free of noxious weeds and nuisance plants do not inhibit the growth of native species or form a serious source for the spread of nuisance plants.

3.1.5 Wildlife Habitat

The dam provides the largest open freshwater body on the coast between the Shoalhaven River and south of Sydney. Goodrick, 1970, stated that "open freshwater bodies have the highest habitat value as feeding and breeding areas for water fowl and few of these occur on the south coast".

The immediate surrounds of the dam (as indicated on Plan 1217) which have the potential for development as a wetland zone are presently invaded by weeds and in places are accessible to cattle. The development of the zone will be assisted by the exclusion of cattle and the replacement of the existing grasses and weeds with wetland species indigenous to the Jamberoo Valley.

This revegetation and exclusion of stock must be staged as immediate complete exclusion of cattle from this area may allow an increase in weed infestation. However, this revegetation should be a priority in the development of the site.

The regeneration of the rainforest, *Zieria granulata* and Riparian zones will protect and enhance the range of habitats on the site and hence the diversity of wildlife on the site. Their overall regeneration will depend on the availability of resources and also must be staged and viewed as a long-term project.

Habitat areas, particularly those of birds, may be affected by the presence of feral and domestic animals. Domestic dogs and cats should be prohibited entry to the site by regulations. Investigation should be made into control baiting programs for foxes and feral cats.

Access for vehicles, except for emergency and maintenance vehicles, must be limited to the existing access road and carpark to minimise disturbance into habitat areas.

3.1.6 Sedimentation and Pollution

The dam ultimately acts as a sediment and nutrient sink for runoff from the catchment. The creeks and wetlands which surround the dam may act as temporary traps, the storage time dependent on the type and quantity of pollutant entering the system, catchment hydrology and vegetation cover.

Erosion in the catchment is generally low to moderate (Hazleton, 1993). Generally any serious increase in the bed load or suspended load entering the dam would be due to stream bank erosion or a major disturbance in the catchment. A large increase in bed load could result in sedimentation which could cause smothering of wetland species or benthic fauna. Similarly a serious increase in suspended load would cause increased water turbidity. Presently the volume of sediment entering the site does not warrant the construction of sediment or pollution control basins. The revegetation of the riparian zone and the establishment of the wetland vegetation, together with preventative measures within the catchment, are considered more desirable and effective in preventing erosion and trapping sediment.

3.1.7 Bush Food Garden

Following submissions made to Council by the local Baha'i Community in January 1994 Council gave approval for the incorporation of the Bush Food Garden proposal in the Plan of Management for the site. The development of the site was to be done by the Baha'i Community through the Landcare Group. Basically the proposal involves establishing native plant species, which are a source of "bush food, on that part of the site indicated on Plan 1217 ". The proposal has been developed as a result of the specific request of the Baha'i Community with the support of the Landcare Group.

As indicated in the original proposal for the Bush Food Garden (Appendix (vi) of the Jerrara Arboretum, Wetland and Wildlife Refuge) the area is to be developed in sympathy with the overall objectives of the Jerrara Dam Plan of Management. However, to allow development of the garden as proposed, non-indigenous native species shall be permitted to be planted in that area.

The potential impact of such species on the genetic integrity of the site and possible weed problems which may develop will require monitoring. In order to minimise such impacts, the use of introduced species should be minimised. As noted in the original proposal "management of the project will be through the Jerrara Dam Landcare Group and will be in accordance with the Plan of Management. The development and operation of the bush food garden will be the sole responsibility of the Landcare Group and will be subject to any requirement that might be determined by Council from time to time".

Accordingly prior approval should be obtained from Council for planting of any species on the site and this work should be subject to ongoing monitoring. If in the opinion of council problems are being caused or are likely to be caused by the planting of specific introduced species, Council shall direct that appropriate action be taken.

Given the specialised nature of the proposal and the desire of the Baha'i Community to establish the facility the maintenance of the area would best be the responsibility of the Baha'i Community through the Landcare group. A detailed plan should be prepared for this site and approved by Council.

3.1.8 Threatened Species

Mills, 1989, recorded the presence of two rare rainforest species, *Zieria granulata* and *Daphnandra* sp. *Micrantha* on the site. The former is listed in Schedule 1 of the Threatened Species Act 1996 and the later, according to Mills, in the only rainforest plant endemic to the Illawarra region.

That part of the site where the *Zieria* occurs has been identified as a *Zieria granulata* Zone to assist in the regeneration of the plant; bush regeneration works have already been carried out in that zone and these have been successful in regenerating plants in that area. Because this is an endangered species, a permit is required from National Parks and Wildlife Service to collect seed or cuttings from these plants for propagation.

3.1.8 Threatened Species (Cont)

The vegetation survey needs updating and further detailed vegetation surveys should be undertaken to identify not only the threatened species but regionally significant species which are in danger of local extinction.

Similarly a detailed fauna survey is required to build up a data base for monitoring of the site.

3.2 Aims

The aims of the plan are as follows:-

- * To establish the Jerrara Wetland as a wetland of regional significance;
- * To establish the Jerrara Dam site as an arboretum for native species indigenous to the Jamberoo Valley;
- * To establish the site as an educational and passive use recreations resource for the Municipality.

3.3 Objectives

The objectives are as follows:-

- * To eradicate Water Hyacinth;
- * To protect and enhance the wildlife and wildlife habitat;
- * To minimise sedimentation and pollution to the wetland;
- * To improve aquatic biodiversity;
- * To conserve and regenerate rare and threatened plant species, remnant rainforest and other native species indigenous to the Jamberoo Valley;
- * To outline a future direction for the Jerrara Arboretum;
- * To provide basic infrastructure for passive use recreation on the site;
- * To investigate recreational fishing opportunities on the dam;
- * To encourage the use of the site for educational purposes and to promote awareness of environmental values; and
- * To investigate establishing a demonstration Farmforestry plot and native "bush food" garden.

4.0 POLICY

Council policy for the site has been determined by its corporate objectives, management aims and the general issues identified through liaison with community groups, outlined in Section 3.2.

4.1 Planning

Council will:

- * consider, and attempt to balance, the need for community recreation facilities with the impact development of such sites will have on local residents;
- * attempt to balance the provision of active and passive recreational facilities;
- * consider access to recreational facilities for young families and disabled users;
- * consider the integration of disabled access into existing facilities;
- * integrate access for disabled users in plans for future developments;
- * limit facilities on the site to those facilities which are compatible with the aims of the Plan of Management;
- * attempt to provide safe pedestrian links and corridors between components of the open space network; and
- * have regard to Council's Environmental Goals and Biodiversity Policy when approving works on the site.

4.2 Management

Council will:

- * reserve the right to grant easements for utilities and access, as required;
- * reserve the right to control the use of, and access to, community land;
- * create opportunities for community consultation and participation in the planning and development of community land;
- * facilitate a system whereby enquiries and complaints from the public can be efficiently and promptly dealt with;
- * consider the integration of disabled access to existing facilities; and
- * integrate access for disabled users in plans for future developments.

4.3 Development of New, and Improvement of Existing, Facilities

- * Council approval is required prior to any development or improvement made to community land.
- * All major developments and improvements to be funded (solely or partially) by Council will be approved through inclusion in Council's Capital Works Schedule.
- * Works included in Council's Capital Works program will be funded from income generated from Council's entrepreneurial activities, Section 94 contributions and external funds in the form of Government grants. If the anticipated yields from these sources are not achieved it will result in the proposed works being delayed to later dates.
- * The development of the site is a very long-term project and Council cannot fully finance all the works proposed in this plan and therefore will require community assistance in the development of new facilities, as well as maintenance of existing facilities, through the co-operation and assistance of the Jerrara Dam Landcare Group.

4.4 Weed Control

Whilst the control of noxious weeds in general shall remain with the Illawarra Noxious Weed Authority, on this site this work, along with the control of nuisance weeds, may be carried out by Council.

This shall involve the use of minimum disturbance methods but will, where appropriate, involve the use of herbicides or mechanical methods.

4.5 Maintenance

- * Carry out maintenance and inspection as detailed in the Strategic Asset Maintenance Program for Parks and Reserves, Recreational Facilities, Foreshores, Boat Ramps, Disused Quarries and Cemeteries.
- * Review maintenance service levels outlined in the Strategic Asset Maintenance Program for Parks and Reserves, Recreational Facilities, Foreshores, Boat Ramps, Disused Quarries and Cemeteries, annually, to ensure that facilities are maintained efficiently and within budget constraints.
- * Carry out maintenance works to ensure the conservation and regeneration of native plant species on the site and the conservation and rehabilitation of natural habitat areas.

Council will:

- * encourage community groups, especially the Jerrara Dam Landcare Group to assist with maintenance. The development and maintenance of the Bush Food Garden shall be the responsibility of the Baha'i Community in association with the Landcare Group but will be subject to any requirements that might be determined by Council from time to time;

4.5 Maintenance (Cont)

- * ensure the efficient and conservative use of water, pesticides, herbicides and fertilisers on Council ground; and
- * carry out bush regeneration in accordance with standard accepted practices for bush regeneration.

4.6 Fees

Council applies fees for the use of Council reserves. An application must be lodged with Council prior to the event. All applicable fees must be paid prior to the hire/use of the reserve.

The fees associated with the hiring of Council reserves for major events, concerts, functions etc, are detailed in Council's Fees and Charges Schedule. Council's fee structure is reviewed on an annual basis.

4.7 Uses and Activities

4.7.1 Uses and Activities Requiring Council Approval

- * all activities defined in Part D Section 68 of the Local Government Act 1993;
- * fetes/cultural activities;
- * exhibitions/displays;
- * commercial photographic/film shoots;
- * concerts/performances;
- * large, formal gatherings; and
- * recreational and environmental facilities under the care, control or management of Council, rehabilitation of wetland systems, essential public works.

4.7.2 Prohibited Activities

- * Activities in the view of Council may be damaging, disruptive and/or may represent a danger to either users of the reserve, neighbouring properties or the site or which are not consistent with the aims of the plan.

4.8 Sale of Alcohol

- * The sale of alcohol on Council property must be approved by Council. Before approval is sought, a Functions Licence must be obtained from the NSW Police Department. This licence must be produced in every instance where an application involving the sale of alcohol on Council property is sought.
- * Applications must meet the requirements set down by the Licensing Board, Courts of NSW and Council.

4.9 Signage

Council uses signs to regulate the activities carried out on community land and to provide educational information so as to provide a safe and enjoyable place for passive and active recreational pursuits.

Whilst signs are a crucial source of information, they have a significant impact on the aesthetics of a reserve. All signs must meet a design standard and be approved by the Manager of Parks and Environment. All signs must be sympathetic to their environment in their design, construction and location.

All Council signs erected under Section 632 of the Local Government Act, and as part of the Strategic Asset Management Program (SAMP) plus reserve name signs, traffic and safety signs, are permissible. All other signs must be approved by Council before erection.

4.10 Easements

- * Council reserves the right to grant easements as required for utilities and access, bearing in mind the impact of such easements on the site.

4.11 Leases and Licenses

- * Whilst Council supports the multi-purpose community use of Council owned facilities, particulars regarding the use of public amenities will be detailed in individual lease and licence agreements.
- * When issuing leases and licences for community land and buildings for a period exceeding four years and 11 months (including any period for which the lease or licence could be renewed by the exercise of an option), Council will adhere to Section 47 of the Local Government Act 1993.
- * Council will not grant a lease or licence for a period of more than 21 years (including any period for which the lease or licence could be renewed by the exercise of an option).
- * Use of leased areas shall be consistent with the Wetland Zoning.

5.0 ACTION PLAN

Management strategies relevant to the issues identified in this plan of management have been developed and are set out in the Action Plan. These actions will be developed and reviewed annually.

Because of the long term nature of the aims, objectives and the issues set out in the plan these will need to be reviewed less frequently, approximately every five years.

5.0 ACTION PLAN

AIM	OBJECTIVE	ACTION	RESPONSIBILITY	COMPLETED BY	PERFORMANCE EVALUATION
Establish Jerrara Wetland	Eradicate Water Hyacinth	Implement Water Hyacinth control program as outlined in Appendix III	Director Engineering and Works Jerrara Landcare Group Illawarra District Noxious Weeds Authority	Ongoing	Control of Water Hyacinth
	Protect and enhance Wildlife and Wildlife Habitat	Prohibit by regulation the entry of cats and dogs onto the site	Director Environmental Services	Ongoing	Cats and dogs prevented from entering the site
		Investigate appropriate feral animal baiting and trapping program under NP & WS supervision.	Director Engineering and Works Landcare Group	1997/98	Report to Council on possible baiting program and results of trapping
		Implement recommendations of report	Director Environmental Services Director Engineering and Works	Ongoing	
		Establish a small island refuge as a waterfowl breeding area	Director Engineering and Works	Completed	Improved breeding area

AIM	OBJECTIVE	ACTION	RESPONSIBILITY	COMPLETED BY	PERFORMANCE EVALUATION
Establish Jerrara Wetland (Continued)		Carry out revegetation works in accordance with Plan 1217	Director Engineering and Works Jerrara Landcare Group	Ongoing	Improved amenity Stabilisation of streambanks Establishment of Wetland vegetation
		Erect cattle-proof fences to exclude cattle from streambanks and the foreshore of the dam	Director Engineering and Works Jerrara Landcare Group	2000	Exclusion of cattle from sensitive areas. Stabilisation of streambanks etc Regeneration of vegetation
	Improve aquatic biodiversity	Investigate modifications to the spillway to create a fish ladder, so that fish can move between the Minnamurra River and the dam for breeding purposes	Director Engineering and Works	1997/98	Report to Council
		Implement Council recommendations	Director Engineering and Works	2000	
		Investigate the viability of introducing Australian Graylings and bass from local genetic stock into the dam	Director Engineering and Works	1998/99	Improved aquatic habitat

AIM	OBJECTIVE	ACTION	RESPONSIBILITY	COMPLETED BY	PERFORMANCE EVALUATION
Establish an Arboretum for native plants indigenous to the Jamberoo Valley	Ensure conservation and regeneration of rare and endangered species and remnant rainforest species and other indigenous species indigenous to the Jamberoo Valley	Update vegetation surveys	Director Engineering and Works Jerrara Landcare Group	1997/98	Production of report Improved data on threatened species
		Carry out bush regeneration programs in identified areas	Director Engineering and Works Jerrara Landcare Group	Ongoing	Regeneration of endangered species
		Erect cattle-proof fences to progressively exclude cattle from regeneration areas	Director Engineering and Works Jerrara Landcare Group	2000	Exclusion of cattle from target areas
		Propagate plants from seed and cuttings collected in the Jamberoo Valley	Director Engineering and Works Jerrara Landcare Group	Ongoing	Propagation of indigenous plant species
	Outline a future direction for the Jerrara Arboretum	Identify species and communities that occur in the Municipality	Director Engineering and Works Jerrara Landcare Group	1997/98	Production of Report

AIM	OBJECTIVE	ACTION	RESPONSIBILITY	COMPLETED BY	PERFORMANCE EVALUATION
Establish an Arboretum for native plants indigenous to the Jamberoo Valley (Cont)		Prepare a staged revegetation plan for the site	Director Engineering and Works Jerrara Landcare Group	1997/98	Production of Plan
		Implement staged planting	Director Engineering and Works Jerrara Landcare Group	Post 2000	Improved amenity Progressive revegetation of site
Education and passive use recreation resource	Provide basic infrastructure for recreation access	Provide facilities as shown on Plan 1217 in stage construction	Director Engineering and Works Jerrara Landcare Group	2000	User satisfaction
	Improve recreational fishing of the dam	Investigate modifications to the spillway to create a fish ladder, so that fish can move between the Minnamurra River and the dam for breeding purposes	Director Engineering and Works	1997/98	User satisfaction Improvement in recreational fishing
		Investigate the viability of introducing Australian Graylings into the dam	Director Engineering and Works	1998/99	Improvement in recreational fishing
	Encourage the use of the site for educational purposes	Provide information signage	Director Engineering and Works	1996/97	User satisfaction

AIM	OBJECTIVE	ACTION	RESPONSIBILITY	COMPLETED BY	PERFORMANCE EVALUATION
Education and passive use recreation resource (Cont)		Produce an educational pamphlet for the site	Director Engineering and Works	1996/97	User satisfaction
		Encourage schools and other educational institutes to visit the site	Jerrara Landcare group	ongoing	Use by schools etc
	Establish a demonstration Farmforestry plot and native Bush Food Garden	Prepare a detailed development plan showing planting layout and species lists Establish a Bush Food Garden in the area shown on Plan 1217	Director Engineering and Works Baha'i Community Jerrara Landcare Group Baha'i Community	1996/97 Ongoing	Detailed site plan prepared Use of site for research by schools etc.

6.0 REFERENCES

Department of Conservation and Land Management, Mandis Roberts Consultants. Land Management Local Government Act 1993 Manual. October, 1993.

Kiama Municipal Council. Kiama Council Draft Management Plan 1994-1997.

McLaren, N, 1989 Water Hyacinth and Biological Control on Jerrara Dam

Kiama Municipal Council, 1994, The Jerrara Arboretum, Wetlands and Wildlife Refuge

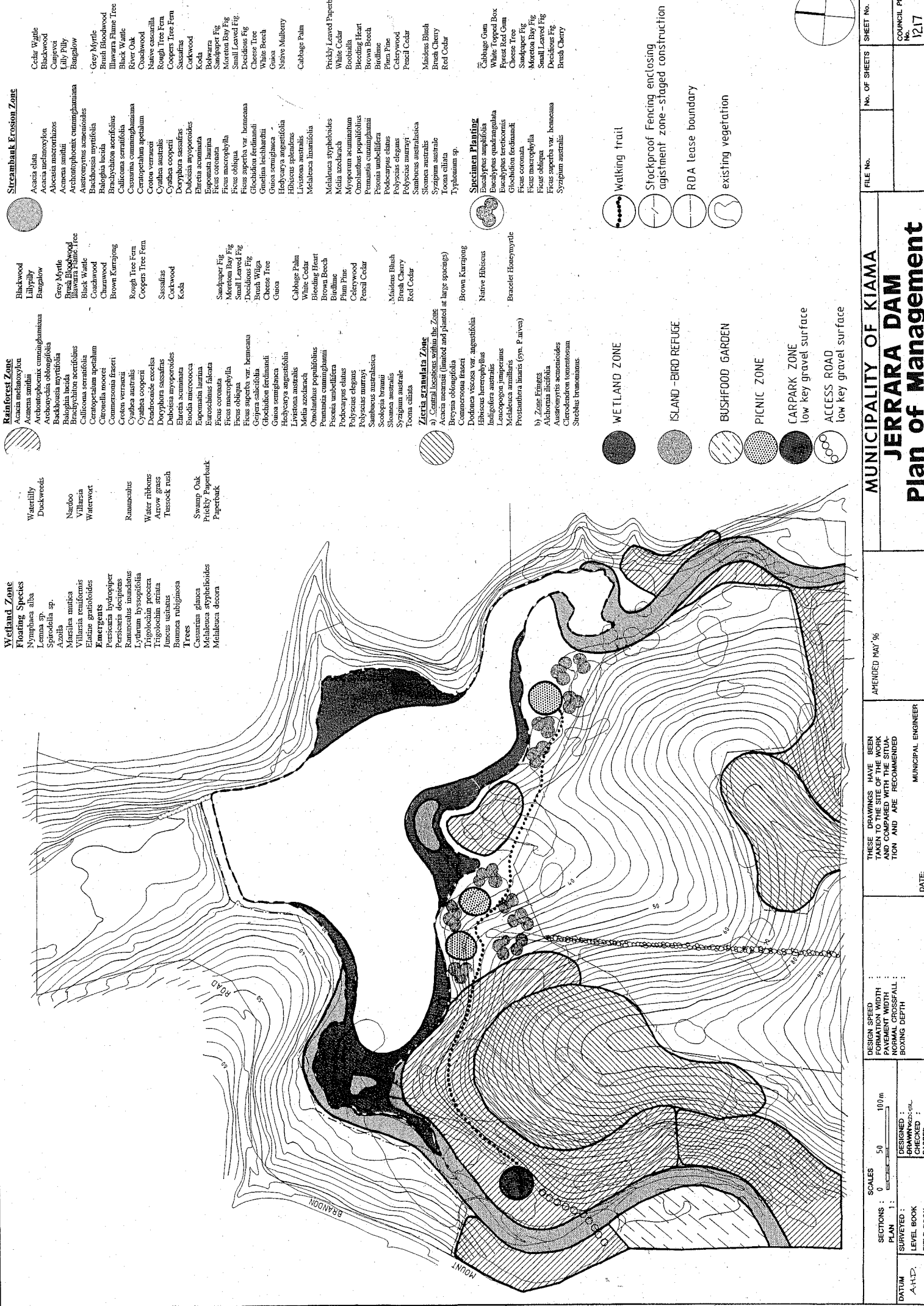
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7.0 APPENDICES

- (i) Plan No. 1217
- (ii) The Jerrara Arboretum, Wetlands and Wildlife Refuge
- (iii) Water Hyacinth Removal Plan



- Wetland Zone**
 Floating Species
 Nymphaea alba
 Lemna sp.
 Spirodella sp.
 Azolla
 Marsilea nativa
 Villarsia unifloris
 Elatine gratioleoides
Emergents
 Persicaria hydropper
 Persicaria decipiens
 Ranunculus inundatus
 Lythrum hyssopifolia
 Triglochin procerum
 Triglochin striatum
 Juncus ustulatus
 Baumea rubiginosa
Trees
 Casuarina glauca
 Melaleuca stypheloides
 Melaleuca decora

- Reinforest Zone**
 Waterlily
 Duckweeds
 Nardoo
 Villarsia
 Waterwort
 Ranunculus
 Water ribbons
 Arrow grass
 Tussock rush
 Swamp Oak
 Prickly Paperbark
 Paperbark
 Acacia melanoxylon
 Acacia smithii
 Arctostaphylos cunninghamiana
 Banksia oblongifolia
 Banksia myrsinifolia
 Banksia grandis
 Callitriche serratifolia
 Ceratopetalum apetalum
 Citronella roosei
 Commersonia fasciata
 Cyathea australis
 Cyathea cooperi
 Dendroica exzela
 Doryphora saxifraga
 Duboisia myrsinoides
 Elaeatia acuminata
 Euodia macrocarpa
 Eupomatia laurina
 Eucosmichus falata
 Ficus coronata
 Ficus macrophylla
 Ficus oblata
 Ficus superba var. hemsleyana
 Geijera salicifolia
 Glochidion ferdinandi
 Guioa semiglaucum
 Hedyocarya angustifolia
 Livistonia australis
 Melaleuca azelara
 Omolanthus populifolius
 Penzancea cunninghamii
 Pisonia unbellifera
 Podocarpus elatus
 Polycarpus elegans
 Polycarpus murrayi
 Sambucus australasica
 Scolopia braunii
 Sloanea australis
 Syzygium australe
 Toona ciliata

- Streambank Erosion Zone**
 Blackwood
 Lillypilly
 Bangalow
 Grey Myrtle
 Fresh Bloodwood
 Black Wattle
 Charwood
 Brown Kurrajong
 Rough Tree Fern
 Coppers Tree Fern
 Sassafras
 Corkwood
 Koda
 Sandpaper Fig
 Moreton Bay Fig
 Small Leaved Fig
 Deciduous Fig
 Bush Wilga
 Cheese Tree
 Guioa
 Cabbage Palm
 White Cedar
 Bleeding Heart
 Brown Beech
 Birdlime
 Plum Pine
 Cateywood
 Pencel Cedar
 Maiden Blush
 Fresh Cherry
 Red Cedar
 Acacia elata
 Acacia melanoxylon
 Alveolaria macrotrichus
 Anemina smithii
 Archontophoenix cunninghamiana
 Austrocyrtis acuminatoides
 Backhousia myrsinifolia
 Baloghia lucida
 Brasylchiton acrifolius
 Callitriche serratifolia
 Casuarina cunninghamiana
 Ceratopetalum apetalum
 Cyathea australis
 Cyathea cooperi
 Doryphora saxifraga
 Duboisia myrsinoides
 Eupomatia laurina
 Ficus coronata
 Ficus macrophylla
 Ficus oblata
 Ficus superba var. hemsleyana
 Glochidion ferdinandi
 Guioa semiglaucum
 Hedyocarya angustifolia
 Hibiscus splendens
 Livistonia australis
 Melaleuca laurifolia
 Melaleuca stypheloides
 Melaleuca decora
 Myoporum acuminatum
 Omolanthus populifolius
 Penzancea cunninghamii
 Pisonia unbellifera
 Podocarpus elatus
 Polycarpus elegans
 Polycarpus murrayi
 Sambucus australasica
 Sloanea australis
 Syzygium australe
 Toona ciliata

- Prickly Leaved Paperbark**
 White Cedar
 Eoobania
 Bleeding Heart
 Brown Beech
 Birdlime
 Plum Pine
 Cateywood
 Pencel Cedar
 Maiden Blush
 Fresh Cherry
 Red Cedar
 Cabbage Gum
 White Topped Box
 Fresh Red Gum
 Cheese Tree
 Sandpaper Fig
 Moreton Bay Fig
 Small Leaved Fig
 Deciduous Fig
 Brancher Flowermyrtle
 Native Hibiscus
 Brown Kurrajong
 Zone Fringes
 Alchornea ficifolia
 Austrocyrtis acuminatoides
 Clerodendron tontonotum
 Strabius brunonianus
 Sarcocolla
 Eucalyptus amplexicaulis
 Eucalyptus tereticornis
 Eucalyptus teretifolius
 Ficus coronata
 Ficus macrophylla
 Ficus oblata
 Ficus superba var. hemsleyana
 Syzygium australe
 Typolobos sp.

- Zone Fringes**
 Alchornea ficifolia
 Austrocyrtis acuminatoides
 Clerodendron tontonotum
 Strabius brunonianus

- Walking Fruit**
 Walking fruit
 Stockproof Fencing enclosing agistment zone - staged construction
 RDA lease boundary
 existing vegetation

- WETLAND ZONE**
ISLAND - BIRD REFUGE
BUSHFOOD GARDEN
PICNIC ZONE
CARPARK ZONE
 low key gravel surface
ACCESS ROAD
 low key gravel surface

- Succinea Planting**
 Eucalyptus amplexicaulis
 Eucalyptus tereticornis
 Eucalyptus teretifolius
 Ficus coronata
 Ficus macrophylla
 Ficus oblata
 Ficus superba var. hemsleyana
 Syzygium australe
 Typolobos sp.

- Zieria granulata Zone**
 a) Central locations within the Zone
 Acacia nemoralis (planted and planned at large spacings)
 Bryonia oblata
 Commersonia fasciata
 Dodonaea viscosa var. angustifolia
 Hibiscus heterophyllus
 Indigofera australis
 Lenopogon imparitans
 Melaleuca arillaris
 Prostanthera linearis (syn. P. uives)
 b) Zone Fringes
 Alchornea ficifolia
 Austrocyrtis acuminatoides
 Clerodendron tontonotum
 Strabius brunonianus

MUNICIPALITY OF KIAMA		FILE No.	No. OF SHEETS	SHEET No.
JERRERA DAM				
Plan of Management				
DATUM	A.H.D.	DESIGNED : CHECKED : PASSED :	DATE: MUNICIPAL ENGINEER	
SECTION : 0 50 100m		THESE DRAWINGS HAVE BEEN TAKEN TO THE SITE OF THE WORK AND COMPARED WITH THE SITUATION AND ARE RECOMMENDED		
PLAN : 1:1		DESIGN SPEED : FORMATION WIDTH : PAVEMENT WIDTH : NORMAL CROSSFALL : BOXING DEPTH :		
SURVEYED :		AMENDED MAY '96		
LEVEL BOOK : FILE NO. 870/88				
		COUNCIL PLAN No. 1217		

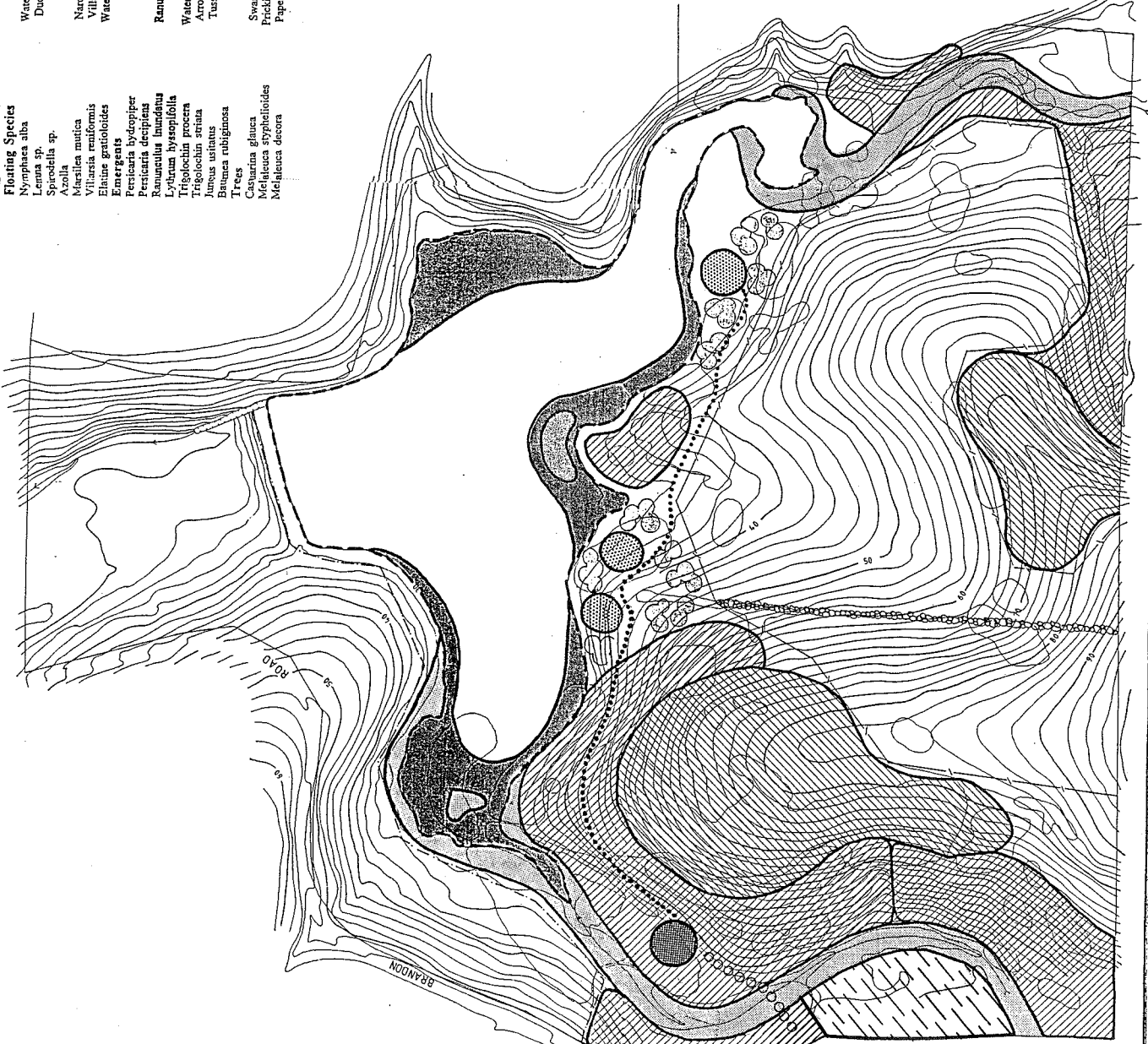
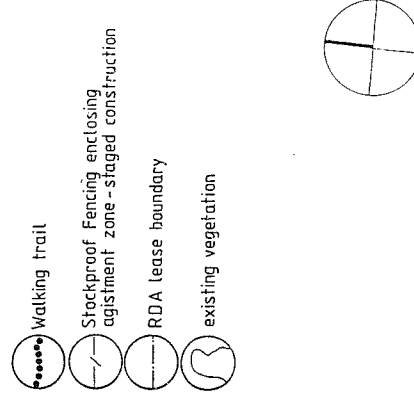
- Wetland Zone**
Floating Species
 Nymphaea alba
 Lemna sp.
 Spirodella sp.
 Najas mutica
 Utricularia reniformis
 Elodea gracilifolia
Emergents
 Persicaria hydropiper
 Ranunculus inundatus
 Lyngbya hyssopifolia
 Triglochin striata
 Ranunculus acris
 Typha latifolia
Trees
 Casuarina glauca
 Melaleuca styphelioides
 Melaleuca decora

- Waterlily**
 Duckweeds
 Nardoo
 Villarsia
 Waterwort
Ranunculus
 Water ribbons
 Arrow grass
 Tussock rush
 Swamp Oak
 Prickly Paperbark
 Paperbark

- Rainforest Zone**
 Acacia melanoxylon
 Acmena smithii
 Arctostaphylos cuneiformis
 Banksia oblongifolia
 Baecklandia myrtilloides
 Brachylaena cuneata
 Callistemon verticillatus
 Centropetalum apiculatum
 Citronella moorei
 Commersonia fraseri
 Cyathochaeta australis
 Cyathochaeta australis
 Dendroica excelsa
 Doryphora saxatilis
 Duboisia myoporoides
 Elaeocharis acuminata
 Eucalyptus nitens
 Eupomatia laurina
 Euroschinus falata
 Ficus coronata
 Ficus macrophylla
 Ficus obliqua
 Ficus superba var. hameana
 Geijera salicifolia
 Glochidion ferridamdi
 Guioa semiglaucata
 Hedycarya angustifolia
 Livistona australis
 Melaleuca australis
 Melaleuca azedarach
 Melaleuca populifolia
 Melaleuca cuneiformis
 Pisonia umbellifera
 Polycarpus ciliatus
 Polycarpus elegans
 Polycarpus murrayi
 Santalum australe
 Stenopetalum australe
 Syzygium australe
 Tonnia ciliata
ZIETH GRANITISTIA ZONE
 a) Central locations within the Zone
 Acacia nearctic (limited and planted at large spacings)
 Bryonia oblongifolia
 Commersonia fraseri
 Dodonaea viscosa var. angustifolia
 Hibiscus heterophyllus
 Indigofera australis
 Metopogon jampyrurus
 Melaleuca armillaris
 Protea laurifolia (syn. P. laevis)
 b) Zone Finings
 Achromia luteifolia
 Austromyrtus acuminata
 Clerodendron toncansum
 Strebita brunneiana

- Streambank Erosion Zone**
 Acacia elata
 Acacia melanoxylon
 Acacia macrocarpa
 Acacia saligna
 Atriplex cuneata
 Atriplex sphaerocarpa
 Banksia laurifolia
 Brachylaena cuneata
 Callistemon verticillatus
 Cassinia cuneata
 Cenchrus ciliaris
 Cyathochaeta australis
 Cyathochaeta australis
 Doryphora saxatilis
 Eupomatia laurina
 Eupomatia laurina
 Ficus coronata
 Ficus macrophylla
 Ficus obliqua
 Ficus superba var. hameana
 Glochidion ferridamdi
 Guioa semiglaucata
 Hedycarya angustifolia
 Hibiscus splendens
 Livistona australis
 Melaleuca laurifolia
 Melaleuca populifolia
 Melaleuca populifolia
 Myoporum acuminatum
 Onoclitus papillifolius
 Penzancea cuneiformis
 Pisonia umbellifera
 Podocarpus elatus
 Polycarpus murrayi
 Polycarpus murrayi
 Sambucus australis
 Steeplecypress
 Syzygium australe
 Tonnia ciliata
 Typhonium sp.
Specimen Planting
 Eucalyptus amplifolia
 Eucalyptus quadrangulata
 Eucalyptus tereticornis
 Glochidion ferridamdi
 Ficus coronata
 Ficus macrophylla
 Ficus obliqua
 Ficus superba var. hameana
 Syzygium australe

- Blackwood**
 Lillypilly
 Bangalow
 Grey Myrtle
 Brush Bloodwood
 Illawarra Flame Tree
 Black Wattle
 River Oak
 Corduroy
 Native Casuarina
 Rough Tree Fern
 Coppers Tree Fern
 Sassafras
 Callerywood
 Cabbage Palm
 Prickly Leaved Paperbark
 White Cedar
 Bloodheart
 Bleeding Heart
 Brown Beech
 Brindle
 Plum Pine
 Callerywood
 Pencil Cedar
 Madiera Blush
 Brush Cherry
 Red Cedar
 Brown Kurrajong
 Native Hibiscus
 Braecliff Honeymyrtle
 Cabbage Gum
 White Flycid Box
 Forest Red Gum
 Chestnut
 Sandpaper Fig
 Moreton Bay Fig
 Small Leaved Fig
 Deciduous Fig
 Cheese Tree
 White Beech
 Guioa
 Native Mulberry
 Cabbage Palm
 Melaleuca styphelioides
 Melaleuca populifolia
 Myoporum acuminatum
 Onoclitus papillifolius
 Penzancea cuneiformis
 Pisonia umbellifera
 Podocarpus elatus
 Polycarpus murrayi
 Polycarpus murrayi
 Sambucus australis
 Steeplecypress
 Syzygium australe
 Tonnia ciliata
 Typhonium sp.



DATE A.M.T.	DESIGNED: DRAWN: M.S.-S.L. CHECKED: PASSED:	DESIGN SPEED FORMATION WIDTH PAVEMENT WIDTH NORMAL CROSSFALL BOXING DEPTH	THESE DRAWINGS HAVE BEEN TAKEN TO THE SITE OF THE WORK AND COMPARED WITH THE SITUATION AND ARE RECOMMENDED	MUNICIPAL ENGINEER	DATE:	AMENDED MAY '96	MUNICIPALITY OF KIAMA	FILE No.	No. OF SHEETS	SHEET No.