Water Authority
of Western Australia

Next Major Public Water Supply Source for Perth (post 1992)

Environmental Review and Management Programme
Stage 1: Evaluation of Alternatives

Supporting Document

Next Major Water Supply Source for Perth
Preliminary Assessment of
Social/Recreational Impacts

Feilman Planning Consultants
February 1987

Water Authority
of Western Australia

WATER RESOURCES DIRECTORATE
Water Resources Planning Branch

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The document published within these covers is a copy of the Consultant's report to the Water Authority. As such, the Consultant is responsible for the accuracy of the information and statements contained in the report which constitutes specialist technical advice to the Authority.

The Water Authority acknowledges the work of the Consultants for the efficient manner in which they undertook their investigations and provided their advice to the Authority.

NEXT MAJOR WATER SUPPLY SOURCE FOR PERTH

PRELIMINARY ASSESSMENT OF SOCIAL/RECREATIONAL IMPACTS

Prepared for:-

WATER AUTHORITY OF WESTERN AUSTRALIA

By:-

FEILMAN PLANNING CONSULTANTS

FEBRUARY, 1987

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1.0 PRELIMINARY

1.1 BACKGROUND

Four future hills water supply source alternatives for the Perth Metropolitan Region are currently being reviewed by the Water Authority of Western Australia. It is expected that one of these options will need to be commissioned in the early 1990's if the Authority is to meet urban demand for water without reducing the reliability of supply.

The four options (Plan 1 refers) are:

- The raising of the existing Mundaring Weir
- The raising of the existing Canning Dam.
- The construction of a new dam on the South Canning River upstream from Canning Dam.
- The construction of a new dam on the North Dandalup River upstream from the existing North Dandalup Pipehead Dam.

The Authority has undertaken to evaluate the economic, environmental and social/recreational impact of each proposal.

1.2 STUDY OBJECTIVE

The primary objective of this Study is to describe the social/recreational environment of the four project areas in sufficient detail to form an input to:

- A multi-objective analysis of the alternative sources to choose the option which best balances the engineering, technical, economic, social, recreational and environmental considerations resulting from the development of the next major source.
- An Environmental Review and Management Programme documenting the impacts of the development of each source, thereby enabling the selection of the preferred option for development

1.2.1 Specific Objectives

Detailed objectives of this Study are:-

- To describe the existing and potential social/ recreational use of each of the project areas.
- To assess the losses of social/recreational potential arising from the development of the water sources.
- To describe the social/recreational opportunities created by the development of each source.
- To reach conclusions about the relative significance of each development option to social/recreational activity and/or potential.

1.3 METHODOLOGY

The conduct of this preliminary Study involved:

- Collection and review of relevant literature and data.
- Meetings with Officers of the Water Authority of Western Australia, the Department of Conservation and Land Management (CALM), the Department of Sport and Recreation, and State Planning Commission.
- Meetings with Officers of the Shires of Mundaring, Kalamunda, Wandering and Murray and the City of Armadale.
- Liaison with representatives of the Department of Conservation and Environment, Western Australian Tourism Commission, National Trust of Australia (W.A.), Western Australian Heritage Committee.
- Liaison with representatives of various recreational organisations.
- Site inspections.
- Analysis of the potential of each site using recently developed techniques to quantitatively assess recreation potential.

2.0 EXISTING ENVIRONMENT AND USE

In considering the four proposed projects the Water Authority of Western Australia's Helena, Canning, South Canning and North Dandalup catchment areas were reviewed as the primary study areas. The immediate environments downstream of the damsites are also discussed (Plan 1 refers).

As there are only two State Government agencies, the Water Authority of Western Australia and the Department of Conservation and Land Management (CALM) with statutory control over the catchment areas and the environs downstream of the dams, which are the subject of this study, a brief description of their responsibilities is detailed below:

Water Supply Catchments

Through the Metropolitan Water Supply, Sewerage and Drainage Act, 1982 and the Country Areas Water Supply Act 1980, the Western Australian Water Authority has drafted by-laws to safeguard the quality of stream water and storages within catchment areas. Current policy formulated for the regulation of public access on hills catchments is categorised as follows (WAWRC, 1984):

- Class I - Developed Catchment - Small Domestic Diversion Dam. These catchments and reservoirs are generally small, therefore susceptible to pollution. Thus vehicular and pedestrian access is only permitted along open roads, marked walk trails and designated picnic areas. Public access to these reservoirs is prohibited. Access to the dam walls is generally also not permitted (e.g. Churchman Brook).

- Class II - Developed Catchment - large Domestic Dam. General access to the dam walls is permitted. Within two kilometres of these reservoirs, pedestrian access is permitted along open roads, marked walk trails and at designated picnic areas only. Unrestricted pedestrian access is permitted outside the two kilometre band around the reservoirs. Vehicular access is permitted on public roads, open tracks and designated dam access roads only (e.g. Canning).

- Class III - Developed Catchment. Irrigation Dam. Pedestrian access to these reservoirs (except, for safety reasons, the area within 250m upstream of the dam wall), the dam walls, and the catchment areas is permitted. Vehicular access is only permitted on public roads, open tracks and designated dam access roads (e.g. Waroona).

- Class IV - Undeveloped Catchment. Selected areas are designated as undeveloped catchments in order to meet future needs. Pedestrian access to these catchments is permitted (e.g. Lower Bickley).

In July, 1985, the Western Australian Water Resources Council published a report detailing the findings of an examination of access policies relating to recreation on water catchments and reserves (WAWRC 1985). This report was prepared in response to increased public interest in recreation on catchment areas; attributed to general population increases, greater leisure time and increased levels of participation in a range of recreation activities.

The central recommendation embodied in the study identified the need for catchment recreation management plans to be prepared prior to the modification of existing policy governing public access on catchments. Moreover a number of guidelines were documented which provide the framework for the progressive introduction of various recreation activities if it is proven that they will not impair water quality.

As only one, unpublished, management plan has been prepared to date; for the Canning Catchment (Blackburn, 1986), the restrictions on recreational access described above within the Water Authority's catchments remain in force. It is possible that the progressive relaxation of current restrictions on access relating to some recreation activities within catchments will occur over the next few years with the publication of future recreation catchment management plans. However, the existing policy relating to the four catchment classes has been adopted for the purposes of this study.

State Forest

The Department of Conservation and Land Management is responsible for managing State Forest and additional sections of Crown land, vested in the Department, for various purposes.

Multiple use objectives for the Forest region administered by CALM shown on Plan 1 include (Forests Department of W. A., 1982):

- Wood Production
- Forest Protection
- Water Production
- Water Catchment Protection
- Scientific Study and Education
- Flora, Fauna and Landscape Protection
- Recreation
- Public Utility
- Mining

The current CALM management priorities within the localities surrounding the Water Authority reservoirs, complementing the Water Authority classification, are Water Production and Catchment Protection.

Coupled with the catchment protection legislation enforced by the Department of CALM and the Water Authority, is an additional legislative mechanism controlling public access within State Forest along the Darling Plateau - namely the Forest Diseases Regulations. Promulgation of these regulations in 1976 resulted in the declaration of extensive sections of State Forest as a Disease Risk Area (DRA). These areas of the forest are subsequently subject to indefinite periods of quarantine. The extent of quarantined forest is shown on Plan 1. Public access through sections of State Forest classified as DRA is currently only permitted by vehicle along specified routes or on foot throughout the forest if not restricted by catchment policy (CALM, 1980).

As the introduction of the quarantine restrictions were successful in containing the disease during the late 1970's the then Forests Department of W. A. reviewed the D.R.A restrictions and subsequently formulated guidelines which were to form the basis for progressive re-entry into sections of the forest.

In 1982 the Department published a policy document (Forests Department of W. A., 1982) which enumerated conditions under which the Department would consider controlled access within sections of quarantined forest. Prior to the introduction of any forest based operations, or public activity, the following factors are evaluated; type of operation proposed, degree of hygiene, risk of introducing dieback, forest type, likely impact, land use and consequences of impact on land use. Since 1982 a number of forest based industries have been granted access to sections of quarantined forest after satisfying the requirements of the Forests Department (now CALM). However general public access has yet to be countenanced by the Department of Conservation and Land Management.

The Department of Conservation and Land Management has indicated that the progressive relaxation of access restrictions to selected sections of quarantined forest can be expected over the next 2 - 10 years (D. Haswell, CALM, Pers. comm.)

2.1 MUNDARING WEIR/HELENA RESERVOIR/HELENA CATCHMENT AND ENVIRONS

2.1.1 Existing Environment

Mundaring Weir, on the Helena River, which is readily accessible via the Great Eastern Highway or via Mundaring Weir Road, through Kalamunda, is located approximately 30 kilometres east of the Perth Central Business District (C.B.D.).

The extent of the Helena Catchment is illustrated on Plan 1. Comprising an area of 1,470 square kilometres the watershed encompasses:

- Helena Reservoir (7.6 sq.kilometres) and Mundaring Weir;
- Helena River;
- Helena Brook;
- Darkin River;
- Beraking Brook; and
- Various tributaries of these rivers.

The western sector of the catchment in the vicinity of the reservoir is predominantly characterised by deeply incised river valleys and associated vegetation complexes of the Murray landform and soil associations of the Darling Plateau. Exposed outcrops of granite rock are common throughout the catchment.

An array of unsealed forestry roads traverse the catchment which embodies a large proportion of State Forest No. 7.

Many of these trails in the western sector of the catchment provide panoramic views over the reservoir. A loop road circuit around the water body was a popular scenic recreation route prior to its closure by the Forests Department in 1976 under the Forest Disease Regulations (Section 2.0 refers) (Water Purity Advisory Committee, 1977).

A number of pine plantations interspersed throughout the western sector of the catchment are managed by the Department of Conservation and Land Management (CALM).

Mundaring Weir was constructed in 1900 to supply water to the Goldfields. The capacity of the reservoir was increased in 1952 through raising the height of the wall. The erection of spillway gates in 1959 further increased the storage capacity of the Helena Reservoir which now services, in addition to the Goldfields, agricultural areas and contributes to the Perth Metropolitan Region water supply.

Two picnic areas located at the northern and southern ends of the dam wall respectively have been provided by the Water Authority. The northern picnic area, which is accessible by road, or by foot across the dam wall, provides expansive views over the Helena Reservoir.

The historic O'Connor Museum which was originally the Number One Pumping Station to the Goldfields, is located on the northern bank of the Helena River below the Weir. The boilers and pumps within the complex have been restored and complement historical documentation on the Goldfields Water Supply pipeline displayed within the Museum.

Three additional picnic areas introduced and managed by CALM are:

- Jacoby Park - 14 hectares of land opposite the CALM Divisional Headquarters, on Mundaring Weir Road approximately 500m north of the Weir, developed as a major regional recreation site. Extensive grassed picnic areas, a variety of exotic trees and shrubs, an adventure playground, short nature trails and barbecues and toilets have been progressively introduced by the Department.

- North Ledge Picnic Area and Lookout - located north of the Helena River approximately 700m downstream from the Weir, this area boasts sweeping views of the reservoir and the wall of the Weir.

- South Ledge Lookout and Picnic Area - Is located opposite the North Ledge Facility on the southern side of the Helena River. Similar facilities and views are provided at this site.

2.1.2 Land Use and Management

Although the catchment is located within the Shires of Mundaring and Kalamunda, the Water Authority of Western Australia and the Department of Conservation and Land Management (CALM.) are the sole authorities responsible for administering the greater part of the catchment and sections of the River Valley downstream of the Weir which is predominantly comprised of Crown land. Selected parcels of freehold land are located south of the Great Eastern Highway at the northern extremity of the catchment.

The Helena Catchment is almost entirely located within State Forest No. 7.

Public use of the resources within the catchment is limited: the Water Authority enforces statutory restrictions upon access to maintain water quality and supply and CALM has responsibility for the State Forest and other Crown land which is largely covered by the Disease Risk Area.

The Helena Catchment is currently classified as a Class II - Developed Catchment - Large Domestic Dam. Public access, as governed by the Authority, is therefore restricted to the dam wall and open roads, marked walk trails, designated picnic areas and the balance of the catchment, 2 kilometres from the reservoir. However, additional Forest Disease Risk restrictions (discussed in Section 2.0) imposed by CALM essentially confine public access, in the vicinity of the reservoir to Mundaring Weir and adjacent nodes downstream of the Weir.

The Department of Conservation and Land Management and the Water Authority effectively control all land use and public access within the area through water catchment and Jarrah dieback disease policies

The entire Helena Catchment is currently covered by mining leases and agreements for the extraction of bauxite (CALM, 1980). Excavation within these leases is not anticipated before the turn of the century. Additional minor mineral leases for purposes such as gravel and sand extraction, controlled by the relevant authorities, are located within the catchment.

2.1.3 Recreation Use

Type of Activity

Sightseeing, touring, picnicking and barbecuing are the most popular recreational activities in the locality. Additional activities carried out include (CALM, 1985):

- Viewing flora and fauna
- Bushwalking
- Orienteering
- Trail bike riding
- Car rallies
- Cycling
- Painting/photography
- Horse riding
- Firewood gathering
- Off-road driving

Although legally restricted to areas outside the Helena Catchment (except pedestrian access which is permitted 2 kilometres from the reservoir), illegal use of the catchment for a number of these activities has been observed by field staff of the Department of CALM and the Water Authority.

Levels of Use

Comprehensive visitor surveys of recreational activity in and around the catchment have not been conducted since the Forest Department's 1978 Forest Visitor Survey (Section 3.2 refers). The Department at that time estimated that the level of visitor use in the Mundaring Division of the State Forest was 115,000 visitor days per annum. These figures were predicated upon findings of the Survey which concentrated on the collection of data relating to the use of formal Forest Department picnic sites. Regional officers of the Department of CALM have, however, indicated that during weekend recreation patrols:

- On average, 400 vehicles (1500 people) are regularly counted at midday or 2pm on Sundays and Public Holidays at Jacoby Park picnic areas adjacent to the Weir, and North and South Ledge. As these counts are often only carried out once during the day, turn-over of visitors cannot be accurately measured. Actual numbers are estimated to be much higher than those recorded.

- The number of visitors to the Water Authority and CALM facilities downstream of and adjacent to the Weir appears to have doubled over the past two years (1984-1986). (CALM, 1985)

These visitation levels are expected to rise significantly due to the recent increase in entrance fees to National Parks - a number of which are located within close proximity to the Helena Reservoir.

It has also been established that the central facilities administered by CALM, and the most popular with the public, are often at or near capacity. Overcrowding at or near these existing picnic sites has clearly indicated that there is a need for visitors to be accommodated at alternative venues. Adverse impacts upon the immediate environments of existing facilities can be expected if visitors are not directed elsewhere. (CALM, 1985)

2.2 CANNING DAM/CANNING RESERVOIR/NORTH WESTERN SECTOR - CANNING CATCHMENT

2.2.1 Existing Environment

Canning Dam is located approximately 35 kilometres south east of the Perth Central Business District. Access to the dam, illustrated on Plan 1, is possible from the north west via Brookton Highway or the south via Albany Highway.

The area of the Canning Catchment in review includes the western sector of the catchment, (i.e. excluding the proposed South Canning Dam Catchment) west of Kinsella Road, and CALM's Quarantine Area boundary (Plan 1 refers). Canning Reservoir comprises an area of 4.87sq. kilometres and is located within a valley system of the Murray landform of the Darling System. The Canning Reservoir landform is similar to the Helena Reservoir environment. The entire catchment is located within State Forest No. 22.

Kinsella Road is a major forestry road accessible to the public, flanking the eastern boundary of the sector which provides a linkage between Brookton Highway and Albany Highway.

A number of minor management trails are located north and south of the reservoir within the forest.

Constructed in 1940, the Canning Dam supplies a large proportion of the Perth Metropolitan Region's water supply.

Three Water Authority picnic areas are located at the damsite. Two of these sites are located at either end of the dam wall and the third below the spillway on Lady McNess Drive, which is the northern access road to the Brookton Highway. Historic walk trails have been provided around the river valley close to the base of the dam wall.

The only additional formal recreation nodes within this sector of the Catchment are located at Boulder Rock and Lesley south of the Brookton Highway inside the northern boundary of the Catchment (Plan 1 refers).

2.2.2 Land Use and Management

Located within the municipality of the Armadale City Council, the north western sector of the Canning Catchment (west of Kinsella Road) is comprised of State Forest and classified as a Class II - Developed Catchment - Large Domestic Dam (Section 2.1.2 refers). The area is thus almost entirely Crown land vested in the Water Authority or CALM and administered by the two agencies.

Although the catchment is located outside quarantined forest, public access is confined to open roads, marked walk trails and designated picnic areas.

Bauxite mining leases held by Alcoa of Australia cover the entire Canning catchment. Extraction of the resource is not anticipated within the next 20 years (Blackburn, 1986). Other minor mineral leases are also located within the catchment.

2.2.3 Recreation Use

Type of Activity

The predominant forms of recreation in the locality are sightseeing, picnicking and barbecuing at the existing formal recreation sites located at the Dam, and along Brookton Highway (Personal communication Water Authority Catchment Supervisor). Churchman Brook and Wungong Dams located nearby are also popular picnic and sightseeing destinations (Plan 1 refers).

An array of illegal recreation uses, such as marroning, trail bike riding, off-road four wheel driving and horse riding, are also carried out within 2 kilometres of the Reservoir.

Discussions held with the City Planner, City of Armadale revealed that the Armadale Council is jointly, with the Main Roads Department, investigating the concept of a heritage drive which would incorporate the facilities at Canning Dam. The proposed circuit, which starts and finishes at Pioneer World, includes sections of the Albany Highway, Bungendore Park, Wungong Dam and Gorge, Canning Dam, Araluen, Lady McNess Drive, Croydon Road, craft shops in the area, Churchman Brook Reservoir and the Elizabethan Village.

Levels of Use

Regular weekend patrols of the facilities located at Canning Dam, Churchman Brook Dam, Wungong Dam and along Brookton Highway are carried out by Water Authority field staff. During these patrols, car and head counts are undertaken at various times during the day. It is therefore difficult to accurately assess the existing levels of use of these facilities as periodic counts take no account of the turnover of people and vehicles during a given day.

These surveys have, however, revealed the following: (Personal communication with Water Authority Catchment Rangers)

- That the facilities provided are most heavily patronised on Sundays.
- Levels of use are highest at Canning Dam, (ranging between 25 - 60 cars) during the Spring months of September and October.
- Consistent use of the picnic areas at the dam occur during Autumn (March, April, May) and Winter (June, July, August).
- Lower levels of use at the dam facilities occur during the summer months of December, January and February.
- Lesley and Boulder Rock are popular wayside stops for people sightseeing along Brookton Highway and are heavily used during weekends throughout the year.
- Churchman Brook Dam is one of the most popular picnic and barbecue sites in the Hills Region near Perth. The facilities provided are often at capacity with up to 750 cars parked in the area below the dam.

Although routine catchment inspections are conducted by Water Authority field officers throughout the catchment surrounding the reservoir, it is difficult to predict the extent of illegal recreational activity in this area. It is thought that illegal recreation activity levels are generally low in comparison to the general use of formal facilities provided for the public.

2.3 SOUTH CANNING RIVER/SOUTH CANNING CATCHMENT

2.3.1 Existing Environment

The locality under review generally accords with the boundary of the proposed South Canning River Catchment and is located between 50 and 80 kilometres south east of the Perth Central Business District.

Access to the area is possible via the Albany Highway to the south west and Brookton Highway and Kinsella Road to the north and east respectively.

The South Canning Catchment is located within the municipalities of the City of Armadale and the Shire of Wandering. However, as the catchment is comprised of and bounded by State Forest there are no urban settlements within a 12 kilometre radius of the area. The Town of Jarrahdale is the nearest populated centre which is located south west of the catchment. Armadale Town Centre is situated some 20 kilometres north west of the proposed damsite along Albany Highway.

Incised valleys and associated vegetation complexes of the Murray Landform and soil associations of the Darling System are evident throughout the western sector of the catchment. The headwaters of the South Canning River and its tributaries are characterised by flat broad swampy valley floors of the Pindalup landform. The north-western tributaries are typically of the Yarragil Landform.

The area ranges in elevation from approximately 230 metres AHD at the site of the proposed damsite to over 400 metres AHD along the summits of the Mt Cooke-Mt Randell chain of monadnocks (granite rock outcrops) located along the north eastern boundary of the Albany Highway. These rock outcrops rise several hundred metres above the Darling Plateau and are therefore one of the most significant landscape features in this region of the forest (CALM, 1984). The monadnocks not only provide extensive views across the range from their peaks, they also support a diverse range of vegetation and are of high scenic value when viewed from the Highway or forest.

Public access to the monadnock chain in this locality is currently possible only by foot from Albany Highway as the area is within the Disease Risk Area.

Sections of three System 6 Areas which cover the chain of monadnocks flanking Albany Highway have recently been amalgamated, viz:

- C36 Eagle Hill Management Priority Area
- C38 Cooke Management Priority Area
- C39 Windsor Management Priority Area

and now comprise the Monadnock Reserve.

Previous management priorities under CALM's Working Plan No. 87 were Conservation of Flora, Fauna and Landscape. These areas are also within the Alcoa mining lease and have medium term potential for bauxite mining (DCE, 1983).

The declaration of the Monadnock Reserve was ratified by Parliament in December, 1986. It is understood that the purpose of the Reserve is to protect the conservation value of the area and that human use will be directed to recreation in the natural setting. The Reserve is to be vested in the National Parks and Nature Conservation Authority (DCE Officers - Pers. comm.)

Existing infrastructure within the South Canning Catchment is limited to minor forest trails interspersed throughout the locality and, picnic and barbecue facilities along Albany Highway at the Glen Eagle Pine Plantation, Sullivan Rock and Mount Cooke. A 132kV State Energy Commission transmission line traverses the entire catchment in a north-south direction.

2.3.2 Land Use and Management

Water and Timber Production Policies administered by the Water Authority and CALM respectively are the two major land uses within the catchment. The catchment is located within State Forest No. 22 and is classified as a Class II - Developed Catchment - Large Domestic Dam.

The catchment is subject to CALM's quarantine regulations as Jarrah dieback is prevalent in the western valleys of the locality. This effectively restricts public access within the catchment as there are no open roads or developed picnic areas. The extent of the Disease Risk Area is shown on Plan 1.

A minor land use within the body of the catchment is honey production.

Private companies currently log hardwoods within the catchment under permit or licence issued by CALM. Softwood production is also carried out by CALM. Two pine plantations, the Gleneagle and Cooke plantations are located along the south western boundary of the catchment and Albany Highway.

The South Canning Catchment is covered by Aloca's existing bauxite mining lease. Extraction of the resource is not anticipated within the next 25 years (Water Authority, pers. comm.). Additional minor leases (e.g. gravel and sand) are current within the catchment.

2.3.3 Recreation Use

Recreation activity is generally restricted to designated picnic sites at Mt Cooke and Mt Sullivan along the Albany Highway as there are no open roads within the catchment. These sites are popular wayside stops for people travelling to or from the Great Southern Region.

Bushwalking, backpacking, nature study and photography are permitted activities within the catchment and are increasing in popularity, particularly throughout the monadnocks (Water Authority Catchment Supervisor, personal communication).

Illegal recreation activities are also prevalent within the Catchment. Activities most often identified are:

- Trail bike riding;
- Kangaroo/pig hunting;
- Four wheel driving; and
- Horse riding.

2.4 NORTH DANDALUP CATCHMENT

2.4.1 Existing Environment

A small pipehead dam constructed in 1970 is located on the North Dandalup River immediately downstream of the proposed North Dandalup Damsite. The dam is approximately 75 kilometres by road from the Perth C.B.D and 3 kilometres east of the North Dandalup Townsite and the South Western Highway. Access to the site is possible via Hines Road from the west, Scarp Road from the north and Del Park and Scarp Roads from the South.

The North Dandalup catchment is similar in nature to the three catchments reviewed. It is comprised principally of a deep scenic river valley system of the Murray/Myara and Yarragil Landforms and soil associations of the Darling System.

2.4.2 Land Use and Management

Located within the municipality of the Shire of Murray, the catchment is 132 square kilometres in area, is classified as a Class I - Developed Catchment - Small Domestic Dam, and is predominantly located within the State Forest. Public access is therefore limited to open roads and marked walk trails (Bibbulman Track - Refer Plan 1) as there are no formal picnic areas provided in the locality.

A System 6 recommendation covers Reserve C21038 - within the North Dandalup River valley downstream of the pipehead dam. The prime feature of the lower section of the Reserve is the Darling Scarp vegetation which is not well represented elsewhere.

Moreover, due to its high conservation value, the Reserve comprises open space, within the Darling Range, of regional significance.

The existing pipehead dam is located adjacent to the north eastern sector of the Reserve. The Environmental Protection Authority (1983) has acknowledged that the proposed development of a major dam on the river will impinge upon the reserve. It is maintained by the Authority that the proposed works should be designed so as not to detract from the conservation value of the Reserve.

The entire North Dandalup Catchment is within Alcoa's existing Mining Lease. Extraction of the ore is unlikely to occur before the turn of the Century. Other minor leases for resources such as sand and gravel are current within the catchment.

2.4.3 Recreation Use

The Bibbulman Track which trends through the western extremity of the catchment and across the North Dandalup River in a north-south direction, and Scarp Road which generally runs parallel to the track, are the only recreation routes/facilities available for public use. Field Officers of CALM have indicated that the number of bushwalkers using the Bibbulman Track has increased significantly over the past few years. CALM representatives have, however, confirmed that the realignment of the track onto a more easterly alignment through the forest is imminent. This initiative has been proposed due to a number of incursions which have occurred within the western sector of the forest; viz:

- Bauxite mining;
- SEC activity;
- Increased logging; and
- High levels of forest dieback.

The realignment of the Bibbulman Track east of the proposed North Dandalup Reservoir will provide a more diverse, natural landscape for bushwalkers.

Scarp Road provides a link between Serpentine Dam and Dwellingup through the Darling Range, but is not publicised, therefore existing traffic flows are generally low.

Pig hunting, trail bike riding and four wheel driving are illegal activities which occur in the watershed of the North Dandalup River.

2.5 SUMMARY

The preceding description of the existing environment and use of the four catchment areas reviewed has revealed the following:

- The Water Authority and CALM have total jurisdiction over the landholdings and access within each catchment. Each locality is situated within State Forest and subject to catchment regulations. Moreover the Helena and South Canning Catchments are within CALM's Disease Risk Area.

- That although each catchment is located within a single or two local government municipalities, no urban development currently exists within any of the catchments. Moreover the management and administration of these localities lies with CALM and the Water Authority.

- Aloca's bauxite mining lease covers the four catchment areas. Extraction is not anticipated in any of the catchments before the turn of the century. Minor mineral leases are located within each catchment.

- Existing recreation opportunities are currently limited to; the use of formal picnic areas at and around the base of the dam walls of the Mundaring Weir and Canning Dam; designated sites on the perimeters of the Helena and South Canning Catchments and along Brookton Highway within the Canning Catchment; pedestrian access in the Helena and Canning Catchments 2 kilometres from the reservoirs and throughout the South Canning Catchment; and use of open roads which traverse the Canning and North Dandalup Catchments.

- Existing formal recreation sites provided by the Water Authority and CALM are generally at or near capacity on weekends when public use of recreation facilities is highest.

- Public Access to the reservoirs (water bodies) behind all dams being reviewed is currently prohibited.

In light of the above it is apparent that the proposed development of the four alternative water supply sources will have a significant impact upon recreation. It is therefore appropriate to review the overall regional demand for, and characteristics of, recreation. Section 3.0 examines the significance of recreation within the Darling Range.

3.0 REGIONAL DEMAND FOR RECREATION

3.1 TRENDS WITHIN SYSTEM 6

Based on growth trends in economic activity, population, education, technology, leisure time and an assessment of demand for outdoor recreation facilities, the Tourism and Recreation Committee of the Environmental Protection Authority's System 6 Study (1978) concluded that the most conservative estimate of future demand for outdoor recreation in the System 6 region was a trebling of existing demand by the year 2000.

A number of specific findings of the System 6 Recreation Project, of direct relevance to this Study, are:

- That overall demand for outdoor recreation facilities is increasing at a greater rate than is the population.
- Land and water resources suitable for recreation activities are diminishing.
- Existing camping and picnicking facilities are often at capacity. Adverse impacts are evident in selected localities. Thus a diverse range of recreation opportunities is required to meet demand.
- Foreshore and aquatic environments are highly sought after by the recreating public.
- That concern was expressed at the overcrowding of the Swan and Canning Rivers and increasing demand for additional boat launching facilities.
- That demand for continuing access to water catchment areas is likely to increase.
- That most water based recreation within the Central and Northern Forest Region is confined to the Waroona and Logue Brook Dams and the Murray River, (located within irrigation supply catchments) due to the prohibition of water based recreation on all other water reserves and catchments in the Region. (Plan 1 refers)
- That the provision of recreation facilities in close proximity to the Perth Metropolitan Region will ensure the highest frequency of use and most economical access.

3.2 FOREST VISITOR SURVEY 1980

Comprehensive visitor surveys of forest based recreation were last conducted by the Forests Department of W. A. in 1978. The findings of this study were published in 1980 in the "Forest Visitor Survey".

It should be noted that the estimates in the Visitor Survey exclude recreation activities which occurred in National Parks or at the dam facilities provided by the Water Authority.

Significant results of the Survey which reaffirm the findings of the System 6 Tourism and Recreation Committee documented in Section 3.1 are summarised below:

- The Northern Forest Region* due to its proximity to the Perth Metropolitan Region caters for approximately 60% of the estimated total level of recreation activity in the State Forest. This is illustrated in Table 3.2(a).

- Forest Department (now CALM) Divisions which attract the highest levels of recreational use in descending order are:

  Jarrahdale
  (Canning, Churchmans Brook, Wungong, Serpentine Catchments);

  Mundaring
  (Helena, Victoria, Bickley, Kangaroo Gully Catchments); and

  Dwellingup.

  This trend is expected to continue with substantial increases in the demand for forest based recreation in close proximity to the Perth Metropolitan Region predicted.

- Northern forest areas are visited on average, more often than other regions. This finding is indicative of the effect that distance of the resource from the recreating public has on levels of visitation (Table 3.2(b) refers).

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* Northern Forest Region includes all Catchments under review in this Study.

TABLE 3.2 (a)

FORESTS DEPARTMENT ESTIMATE OF RECREATIONAL USE OF STATE FOREST

Administrative Unit	Estimated 1978 Level of Visitor Use (visitors days)
Wanneroo	20,000
Mundaring*	65,000
Jarrahdale*	150,000
Dwellingup	65,000
NORTHERN REGION	300,000
Harvey	12,000
Collie	50,000
Kirup	4,000
Nannup	8,000
Busselton	20,000
CENTRAL REGION	94,000
Manjimup	30,000
Pemberton	70,000
Walpole	25,000
SOUTHERN REGION	125,000
STATE FOREST	519,000

* The estimates for Mundaring and Jarrahdale division do not reflect the recent change in divisional boundaries which have occurred. Under the current boundaries the difference in level of use between the two divisions would be much less.

SOURCE: Forest Visitor Survey 1980
Forests Department of W. A.

TABLE 3.2(b)

AVERAGE NUMBER OF VISITS TO STATE FOREST PER ANNUM BY PERSONS INTERVIEWED

Division	No. of Visits per person
Northern Region	3.1
Central Region	1.5
Southern Region	1.3
State Forest (Total)	5.9

Source: Forest Visits Survey 1980
Forests Department of W.A.

- Eighty six percent (86%) of visitors surveyed within the Northern Region, excluding Dwellingup, were on one day trips. Day visitors to Dwellingup, which is approximately 90 kilometres from Perth comprise only 53% of the sample. Overnight visits to the Dwellingup Division comprise 43% of the sample. These results again reflect the proximity of the greater part of the Northern Region to Perth and the current restrictions on camping in water supply catchment areas.

- Recreation activity/level of use, within the Northern Forest Region, although relatively well balanced over all seasons of the year, is slightly lower in summer, possibly reflecting the lack of water related recreation opportunities in the Region.

- Future recreation development in the Northern Region of the forest should be directed towards providing a greater range of facilities/activities at individual sites to cater for both day and overnight visitors.

- Additional picnic areas and associated facilities were requested by over one third of all visitors within the Jarrahdale and Mundaring Divisions. This indicates the popularity of picnicking in State Forest Areas near Perth and suggests that existing sites are unable to satisfy present weekend levels of visitor use. The findings also indicate that many visitors would like to see a greater diversity in the range of facilities provided. Additional forms of development sought included signposting and scenic drives.

Conclusions of the Report relevant to this Study are that:

- The level of recreation use in the Forest is estimated to double over the decade 1980 - 1990.
- The Northern Divisions of the forest will continue to experience the greatest visitor pressures due to their proximity to Perth.
- There will be growing public pressure for access into and recreational use of domestic water supply catchments.

3.3 OTHER RELEVANT RECREATION STUDIES

The findings of a number of additional reports on demand for forest based recreation point up specific issues which relate to the four options being reviewed and their impacts on recreation. Several of these findings are instructive and have been summarised and listed below:

- Lake Leschenaultia (Plan 1 refers) which accommodates a range of water oriented and water based activities, is an exceptionally popular recreation destination with up to 5,000 cars counted at the site on weekends (MRPA 1978; Shire of Mundaring, Recreation Officer - pers. comm.).
- Recreation areas providing shade, water, toilets and grassed picnic areas are generally well patronised during summer months (Blackburn, 1986).
- The selection of a recreational site for the majority of the recreating public is directly related to the presence of surface water features. More importantly this strong preference for water oriented/based environments appears to predominate, regardless of the type of activity undertaken (Dunn 1981, Lime 1971, Schmidt 1977, Elliot 1980).

A recent study completed for the Water Authority by the Murdoch University School of Environmental Science documented the recreational use of the Logue Brook and Waroona Dams (Murray 1985). This report is of direct relevance when considering the demand for water based recreation. The Report concluded that the reservoirs are the only two within 100 - 130 kilometres of Perth gazetted for power boating and water skiing. As a result the reservoirs have become very popular. Although some distance from the Perth Metropolitan Region the facilities are well patronised by Perth Residents.

This trend is shown in Table 3.3(a) which was compiled from the results of a questionnaire survey carried out by the University.

TABLE 3.3(a)

WAROONA/LOGUE BROOK RESERVOIR - PUBLIC USAGE SURVEY RESULTS - EASTER 1985

ORIGIN OF VISITORS

Site	% Breakdown by Response	
	Local (Postcode 6213 - 6224)	Other (Primarily Perth Metropolitan Region)
Waroona Dam (Lake Navarino Reservoir)	41.6%	58.4%
Logue Brook Dam (Lake Brockman Reservoir)	58.4%	41.6%
TOTAL	45.0%	55.0%

Source: Murray F., et al (1985)

Waroona and Logue Brook Reservoirs, Environment and Recreation Study

School Environmental Science, Murdoch University for Water Authority of Western Australia.

The Study also revealed that the number of visitors to the two sites, particularly during summer long weekends, grossly overload existing facilities.

3.4 SUMMARY

The preceding review of demand for Recreation within the System 6 Region and more particularly the Northern Forest Region of the Darling Range has revealed that:

- "The most conservative estimate that can be made is that there will be at least a trebling of demand for outdoor recreation in System 6 by the Year 2000." (DCE, 1978)

- The 1980 level of recreational activity in State Forest will double by 1990 with the Northern Divisions (Mundaring and Jarrahdale) continuing to absorb the demand for recreation due to their proximity to the Perth Metropolitan Region.

- There will be a marked increase in the demand for access to and recreational use of domestic water supply catchments due to the propensity of the recreating public to seek activities that are water oriented or water based.

- Many existing picnic and barbecue facilities which are highly sought after, are currently operating at capacity.

- A greater diversity in the type of facilities provided is required.

4.0 DESCRIPTION OF PROPOSED DEVELOPMENTS AND IMPACTS AND ANALYSIS OF EFFECTS ON THE SOCIAL ENVIRONMENT AND RECREATIONAL USE OF THESE RESOURCES

4.1 PROPOSED RAISING OF MUNDARING WEIR - IMPACT ON THE SOCIAL ENVIRONMENT AND RECREATION

4.1.1 Project Details

Mundaring Weir is proposed to be raised by approximately 11 metres. The authenticity and original appearance of the structure (including the existing original control tower) will be retained. The existing full supply level of 138.5 metres AHD will increase to approximately 150 metres AHD. Existing and future reservoir levels are indicatively shown on Plan 1. The area of land which will be inundated as a result of the raising of the weir is not extensive as the existing reservoir is situated within a deeply incised river valley section. The Helena Catchment will retain its existing classification, namely a Class II - Developed Catchment - Large Domestic Dam. A construction workforce of approximately 200 and construction period of 2 years is anticipated by the Water Authority. Most construction materials will be obtained from existing quarries within the catchment (Water Authority Dam Design Engineers - pers. comm.). On-site accommodation will not be provided as employees are expected to be available from Perth.

The Water Resources Management Section of the Water Authority has confirmed that the status of riparian landowners and occupiers downstream of the weir and the lower Helena Reservoir will be unaffected by the raising of Mundaring Weir as the Helena River is a Proclaimed Stream under the Country Areas Water Supply Act (1980). In the process of managing water flow of the River under the Act, the Authority will continue to liaise with downstream landowners contiguous to the River (Water Authority, Pers. comm.)

4.1.2 Impacts

Social Environment

Modifications to the social environment resulting from the Mundaring project are expected to be minimal. The workforce required will be drawn from the entire Perth Metropolitan Region which will generate few localised impacts in the urban settlements of Mundaring or Kalamunda which are located approximately 6 and 10 kilometres respectively from the dam site. However as the project workforce will have to commute to the site from Perth and vehicles transporting construction materials will have to access the site via Mundaring Weir Road it is possible that residents in the fringe localities around Kalamunda and Mundaring and local traffic may be temporarily inconvenienced. These issues should not be of major concern as Mundaring Weir Road is sealed and provides access to the site from the north and the south.

As the Weir is located well within State Forest Mundaring or Kalamunda residents are unlikely to experience any adverse impacts during reconstruction such as noise, dust, or disruption of services. Discussions have been held between the Water Authority and Alcoa regarding bauxite deposits in the catchment. Minor mineral leases will not be affected by the project.

Recreation

Localised effects resulting from the reconstruction of the dam wall and the new reservoir level, likely to impact upon recreation, are:

- The inundation of a section of Mundaring Weir Road (approximately 250 metres), which is used as a popular scenic recreation route south of the Weir. The Water Authority has undertaken to divert this section of the road onto a more south-eastern alignment in consultation with the Shire of Kalamunda. Officers of the Shire have indicated that the preferred location for the small section of road affected is acceptable in principle. (Personal communication, Planning Section, Kalamunda Shire 1986)

  A potential benefit of the road realignment is the possible introduction of an additional picnic/barbecue/parking facility. This site could be located north of the realigned section of Mundaring Weir Road and adjacent to the southern extent of the proposed weir wall. Visitors would be afforded views over the Reservoir and, more importantly, the site would assist in relieving pressure on existing recreation areas administered by CALM. (Sections 2.1.3 and 3.2 refer)

- The flooding of a number of sections of Reservoir and Allen Roads which are the main formed vehicular accessways providing continuous linkages around the Reservoir. Public access on these roads is currently prohibited. However should quarantine restrictions be lifted in the future by CALM, this route could be reinstated as a scenic drive around the water body. The overall impact on recreation of those stretches of road likely to be submerged, is not considered to be significant. Realignment of the road system in selected areas, to more elevated positions, would ensure the maintenance of a circuit around the Reservoir, possibly with the advantage of providing more extensive views of the water body.

- That the incidence of overflows at the weir, which are popular public attractions, will be reduced.

- Temporary closure (possibly two years) of the two Water Authority picnic and barbecue facilities located at either end of the Weir during the construction phase of the project. Reinstatement of these facilities will occur at the completion of the Project (Water Authority Dam Design Engineers, pers. comm.). As these picnic areas are very popular with the public, due primarily to Mundaring Weir's closeness to Perth, it is anticipated that existing high levels of use will not abate. The public, seeking reservoir based recreation facilities, will attempt to use adjacent areas provided by CALM. This is likely to create temporary management problems for CALM as their facilities are often at or near capacity.

4.1.3 Overview

Impacts on the social environment arising from the project will be minimal as the workforce will be drawn from the entire Perth region rather than selected neighbouring local communities and as the damsite is buffered from private landholdings by State Forest. Temporary inconvenience to local residents may however result from the use of Mundaring Weir Road by the commuting workforce and vehicles transporting materials to the site.

The proposed raising of Mundaring Weir will result in the temporary closure of existing Water Authority picnic facilities during the construction phase of the operation. A section of Mundaring Weir Road south of the reservoir will be realigned which may provide an opportunity for the Water Authority to create an additional recreation facility at the completion of the project. The provision of this site in addition to the two existing Water Authority recreation areas will assist in relieving existing pressure on CALM facilities which are often at capacity.

The overall impacts generated by the Mundaring option are considered to be of a minor nature only. General recreation activity, in the long term, will not be adversely affected as recreation facilities at the dam wall will be reconstructed and possibly expanded and the catchment will retain its existing status.

4.2 PROPOSED RAISING OF CANNING DAM - IMPACT ON THE SOCIAL ENVIRONMENT AND RECREATION

4.2.1 Project Details

This option involves the raising of the Canning Dam wall by approximately 10 metres. The extent of the new full supply level (215m AHD) is illustrated on Plan 1. As the Canning Catchment environment is similar in nature to the Helena, the net increase in surface water area will generally be most noticeable in the upper reaches of the three arms of the Reservoir. The Canning Catchment will retain its existing status, i.e. Class II - Developed Catchment - Large Domestic Dam.

The construction period for the proposed raising of Canning Dam is expected to be two years. Approximately 200 personnel would be employed during the construction phase of the operation. Most construction materials are expected to be available from on-site quarries (Water Authority Dam Design Engineers, pers. comm.). Due to the closeness of the dam to the Perth Metropolitan Region on-site accommodation will not be provided. It is expected that the construction workforce will be drawn from Perth and rural communities in the region.

The Canning River is a Proclaimed Stream under the Rights in Water and Irrigation Act. The status of riparian landowners and occupiers downstream and continguous to the River will not be affected by the raising of Canning Dam. The Canning River Advisory Committee, formed under the provisions of the Act, will continue to liaise with landowners. (Water Resources Management Section - Water Authority. Pers. comm.)

4.2.2 Impacts

Social Environment

As the most accessible route to the site for construction workers and vehicles transporting materials will be from the west via Lady McNess Drive, traffic conflicts may be generated. It is likely that Lady McNess Drive would be closed during the construction phase of the operation. (Water Authority, Pers. Comm.) However as the damsite is located within State Forest administered by the Water Authority and CALM.; private properties are distanced from the dam by the forest and Water Authority land holdings. The project workforce is expected to commute from suburbs throughout the metropolitan area. Therefore modifications to the social environment will be negligible. Lots 1 and 2, which are located approximately 2 kilometres north-west of the damsite on the northern bank of the Canning River, and from which it is possible to see the dam wall, are in private ownership. The Water Authority has acknowledged that the owners of these properties may be temporarily inconvenienced during the construction period and will therefore liaise closely prior to and during construction of the Dam.

Discussions have been held between the Water Authority and Alcoa regarding bauxite mining in the catchment. Small mineral leases current within the Catchment will not be affected by the proposal.

Recreation

The overall effect of this proposal on recreational activity will be limited to:

- The likely temporary closure of Lady McNess Drive during reconstruction of the dam which would restrict public access to Canning Dam Road which is a less direct route to the damsite.

- The temporary closure (approximately 2 years) of the existing Water Authority picnic sites below the dam wall. Although these facilities will be reopened or reinstated at the completion of the Project, the number of visitors to the locality, due to its proximity to Perth, can be expected to at least remain at existing levels. This will have a direct impact on recreation facilities provided by the Water Authority at Churchman Brook Dam. As previously identified, some of these sites are frequently at or near capacity.

- The need for the southern realignment of a small section of Canning Dam Road: the main entrance to the Dam, in the vicinity of the southern end of the dam wall, which will be inundated by the new reservoir full supply level. Re-routing this section of Canning Dam Road will result in temporary inconvenience only. Moreover there may be an opportunity to introduce an additional recreation node north of the realigned section of Canning Dam Road which would provide expansive views over the Canning Reservoir.

- The flooding of a number of minor internal catchment management trails within 2 kilometres of the reservoir on which public access is currently prohibited.

- The frequent inundation of a section of the Canning River within the northern sector of the recently declared Monadnock Reserve (Section 2.3.1 refers).

- The extraction of granite from an on-site quarry located approximately 100m south-west of the dam wall along Lady McNess Drive. There is scope, however, for the quarry, once extraction has been completed, to be converted into a novel picnic area which could mirror that provided at Wellington Dam on the Collie River.

- A reduction in the incidence of overflows at the Dam.

4.2.3 Overview

The impacts generated by the raising of Canning Dam will be similar in nature to those arising from the raising of Mundaring Weir. Likely impacts upon the social environment generated by this proposal are considered to be minor in nature due to the location of the damsite within State Forest and the Canning Catchment Protection Area; the fact that the construction period will be limited to 2 years; and that the workforce required will not have to be accommodated on site and can be drawn from the entire Perth Metropolitan Region. The reservoir at the new full supply level would require the realignment of a section of Canning Dam Road near the southern end of the dam wall. The temporary closure to the public of existing recreation facilities adjacent to the dam and Lady McNess Drive would also be likely during the reconstruction of the dam.

There would, however, be an opportunity for the Water Authority to introduce additional recreation sites, to supplement the three existing areas near the Dam. The first would involve the construction of picnic and barbecue facilities and viewing areas north of the diverted section of Canning Dam Road. Secondly, the creation of an extensive recreation site within the quarry south of the dam, once extraction of rock for the dam wall was completed, would provide a new type of facility for the public. Based on levels of use of an identical site developed for recreation at Wellington Dam, this facility would be very popular with people seeking diversity in recreation sites.

4.3 PROPOSED CONSTRUCTION OF A NEW DAM ON THE SOUTH CANNING RIVER - IMPACT ON THE SOCIAL ENVIRONMENT AND RECREATION

4.3.1 Project Details

The proposed site of the South Canning Dam is located approximately 1.5 kilometres north of Eagle Hill on the South Canning River and 16 kilometres upstream from Canning Dam. Plan 1 shows the location of the damsite which is 59 kilometres from the Perth C.B.D. via Albany Highway and approximately 63 kilometres via Brookton Highway.

With a full supply level at 267 metres AHD, the reservoir created will have a surface water area of approximately 24.5 square kilometres. The size of the reservoir in comparison to existing reservoirs within the Darling Range is shown in Table 4.3.1.

TABLE 4.3.1

CHARACTERISTICS OF EXISTING DARLING RANGE RESERVOIRS

RESERVOIR	BASIN AREA	PURPOSE ACTIVITY	RECREATION	ACCOMM.
HELENA	7.6sq.km	Water Supply	Sightseeing and Picnicking	Nil
CANNING Supply	4.87sq.km	Water	Sightseeing and Picnicking	Nil
WUNGONG	3.5sq.km	Water Supply	Sightseeing and Picnicking	Nil
SERPENTINE	12.1sq.km	Water Supply	Sightseeing and Picnicking	Nil
SOUTH DANDALUP	19.6sq.km	Water Supply	Sightseeing and Picnicking	Nil
WAROONA	1.44sq.km	Irrigation	Waterskiing, Fishing, Swimming, Camping	Caravan Park
SAMSON BROOK	1.06sq.km	Water Supply, Irrigation	Fishing	Nil
DRAKES BROOK	0.41sq.km	Irrigation	Picnicking,	

RESERVOIR	BASIN AREA	PURPOSE ACTIVITY	RECREATION	ACCOMM.
LOGUE BROOK	0.99sq.km	"	Fishing, Sailing, Waterskiing, Picnicking, Camping	Caravan Park
STIRLING	3.94sq.km	Water Supply & Irriga-tion	Sightseeing Camping Fishing	Nil
HARVEY WEIR	1.5sq.km	Water Supply & Irriga-tion	Sightseeing Camping Fishing	Nil
WELLING-TON	16.1sq.km	Water Supply & Irriga-tion	Sightseeing Camping Fishing	Nil

The peak construction period for the proposed South Canning Dam is expected to be limited to 2 years. A construction workforce totalling no more than 200 is likely to be readily available from the Perth Metropolitan Region. On-site accommodation is not expected to be required. A large proportion of the materials required for the construction of the dam will be obtained from the proposed reservoir basin upstream of the dam.

At full supply level, the reservoir will be the largest in the Darling Range.

The upstream section of the South Canning River will effectively be altered from an incised valley to form a relatively large lake with a fluctuating water level and variable depth (Water Authority, 1982). Computer simulation has revealed that substantial areas of the cleared upper basin may remain exposed above the waterline for long periods. However it is possible that some regeneration of vegetation could occur on the cleared banks between flooding periods (Water Authority, 1982). As extensive swamps exist in the upper valley areas of the catchment, it is likely that these areas may not have to be cleared and this may in turn have a beneficial effect on water quality within the River. (Water Authority, 1982)

A reduction in the number of downstream high river flows and subsequent reductions in the frequency of overflows at Canning Dam would also result from the project. The Water Resources Management Section of the Water Authority has indicated that the Canning River is proclaimed under the Rights in Water and Irrigation Act and that the status of riparian landowners downstream of the Canning Dam will be unaffected by the construction of the South Canning Dam. The Canning River Advisory Committee, formed under the provisions of the Act, will continue to liaise with landowners downstream of the Canning Dam. (Water Authority Officers - Pers. comm.)

Water released from the proposed dam would flow down the South Canning River and into Canning Dam, to supplement the domestic water supply stored for distribution to the Perth Metropolitan Region. The South Canning Dam would thus be a non-terminal structure.

A formalised access road to the dam will be required to enable construction traffic to gain access to the site and to provide future public access to the facility. Access to the South Canning River and the proposed damsite is currently obtained from Albany Highway via Kinsella Road and a third class forestry road-Scenic Drive. Scenic Drive follows former railway cuttings considered to be of historic interest (Blackburn 1986) and traverses the Monadnock Reserve. For these reasons it has been suggested that alternative means of access to the damsite from Albany and Brookton Highways be investigated. (Blackburn 1986, Tooby undated)

Access to the damsite from Perth, via Albany Highway, would be shorter than an alternative route via Brookton Highway and there are a number of popular existing recreation sites located west of Albany Highway in the Gleneagles Forest and Kinsella Road area. Damsite access from Albany Highway would therefore increase its recreational use but would impinge upon the Monadnock Reserve. It is understood that the Water Authority favours access to the proposed damsite off Brookton Highway and Kinsella Road. Discussions have been held between Alcoa and the Water Authority regarding bauxite mining in the catchment. Minor mineral leases within the catchment will be unaffected by the proposal.

4.3.2 Impacts

Social Environment

As the proposed South Canning damsite is located 12 kilometres from the nearest urban centre and the immediate landholdings surrounding the site are in public ownership there will be no adverse impact upon residents of the Shires of Wandering and Armadale. There will be no significant localised impact within the neighbouring towns of Jarrahdale and Armadale as the construction workforce is expected to be drawn from Perth.

Noticeable impacts on the social environment will be limited to:

- The construction of the access road to the dam site should it pass through the Monadnock Reserve.

- The clearing of areas of the State Forest within the proposed basin of the reservoir. The Department of Conservation and Land Management has, however, indicated that the locality likely to be inundated has been extensively logged in anticipation of the South Canning Dam project proceeding.

- The inundation of approximately 18 kilometres of forest management tracks. These trails will need to be realigned.

- The flooding of approximately 4.5 km of SEC 132kV electricity transmission powerline corridor. This section of the corridor will be realigned to span a narrower expanse of the basin which will require 8 kilometres of new line.

It is understood that although sections of the recently declared Monadnocks Reserve are located within the South Canning Catchment the Reserve will not be affected by the new reservoir.

Minor forest products such as honey production will not be adversely affected by the project. (Water Authority, 1982)

Recreation

The river section which will be inundated by the South Canning Reservoir is considered to rate a score of approximately 64 on the Visual Landscape Quality Scale developed by the W. A. Institute of Landscape Architects and documented by the Darling Range Study Group (1982).

As such it is contended that the valley has little unique scenic value. However a number of the valleys of the Murray Landform have now been dammed and it has been noted that the value of remaining undeveloped valleys has been enhanced by their increasing rarity (CALM, 1984).

It has been shown that existing recreational use of the South Canning Catchment is limited due to Water Authority catchment policy, CALM quarantine regulations and a dearth of open roads. However, it is evident that the Monadnocks Reserve currently provides and will continue to provide an ideal setting for semi-remote recreational activity such as bushwalking and back packing. For this reason the construction of the South Canning Dam may adversely impact upon the quality of the experience enjoyed by people visiting the Monadnocks. The major impact could result from extensive clearing along the River and the introduction of a large man-made water body with fluctuating water levels. People visiting the dam may also detract from the experience sought by those visiting the Monadnocks. It will be difficult to alleviate this problem as the South Canning Dam may provide an array of recreation opportunities (detailed below) which will cater for a much larger proportion of the public than those that will choose or be permitted to use the Monadnocks Reserve.

The construction of the proposed dam will result in the creation of additional picnic and barbecue facilities at the dam wall. The location of these recreation areas within the 50 - 60 kilometre range of central Perth will assist in providing a respite for heavily used existing formal recreation sites at neighbouring damsites. These facilities, described in Sections 2 and 3 are currently often near or at capacity. Moreover CALM has indicated that there is a paucity of developed sites in the locality. Thus any additional sites of this nature will be of benefit to the general public.

More importantly there appears to be the potential at South Canning Reservoir for the staged introduction of an array of water based and water oriented recreation activities. In 1977 the then Metropolitan Water Supply Sewerage and Drainage Board, indicated in a submission to the System 6 enquiry, that due to the non-terminal nature of the source:

"It might be possible to consider recreational use of the water body, being of the upstream reservoir type." (M.W.S.S. & D.B. 1977).

Moreover Blackburn (1986) in his study of the Canning Catchment stated that:

"The Water Authority currently envisages considerable recreation on the water body including sailing, rowing and canoeing but excluding power boating" (Blackburn 1986, PP 64).

Rather than supply water direct to the public, the water with South Canning Reservoir would be stored for relatively long periods before regulated discharge into the Canning Reservoir. These longer retention times are considered adequate to eradicate bacteria generated by some types of recreational activity. The Source Operations Section of the Water Authority has confirmed that: (Water Authority Officers, Kelmscott, pers. comm.)

- A range of water-based recreation activities such as sailing, rowing and canoeing may be countenanced on selected areas of the reservoir.

- The Water Authority is currently co-ordinating a detailed study of the reservoir dynamics of Canning Reservoir in an attempt to establish operating strategies for the selective withdrawal of water to control the effective retention time for point sources of pollution; relying upon natural means of purification rather than having to resort to chemical treatment. The findings of this study, to be completed in 1987, will have a direct bearing on the nature and extent of recreation activities permitted on the South Canning Reservoir. At the completion of the reservoir dynamics study it will be necessary for the Water Authority to clarify the physical form of the reservoir - depths, area, water level fluctuations - before clear recreational use potential can be identified.

- The preparation of a detailed management plan evaluating the demand for recreation activity on the reservoir; identifying possible impacts on adjacent quarantine areas; identifying temporal and spatial methods for controlling recreation activities; the determination of the carrying capacity of the reservoir environment, and an assessment of the extent of de-stumping of dead trees required in the reservoir would precede the introduction of any water based recreation activity.

- Following the preparation of the management plan, identifying operational policies relating to recreation, selected activities could be progressively introduced and monitored.

It is considered that the introduction of water oriented recreation activities at the South Canning Reservoir would be of immense value to a public increasingly seeking diversity in recreational opportunities in the Darling Range. This assumption is based on the observations of a number of the authors who have evaluated the recreational needs of the outdoor recreation areas in the Darling Range and the availability and popularity of similar alternative resources, some of which are documented in Section 3.0. The following is a summary of those findings.

- As the Waroona Dam (Lake Navarino) and Logue Brook Dam (Lake Brockman) are irrigation dams, they are the only reservoirs in the hills on which water-based recreation is permitted (Table 4.3.1 refers). Although these two resources are located more than 100 kilometres from Perth, a recent environment and recreation study of these two resources revealed that fifty five percent of visitors to the dams were from the Perth Metropolitan Region and also that:

  "the numbers of visitors coming to these areas especially during long weekends over the summer grossly overload current facilities" (Murdoch University, 1985).

- Recreation sites adjacent to water are most preferred by the public (Dunn, 1981; Schmidt, 1977; Lime, 1971; Elliot, 1980).

- CALM has indicated that up to 1,000 requests per week for camping and water-based recreation are received during summer. Although these requests are mostly directed to the Lane Poole Reserve on the Murray River, demand is increasing for access to Metropolitan Catchments (Forests Department, 1980; Blackburn, 1986).

- The popularity of Lake Leschenaultia, on which water based recreation, including swimming, is permitted, is indicative of the need for recreational access to a hills reservoir. Located approximately 40 kilometres from the Perth C.B.D, the lake and environs is reported to accommodate up to 5,000 cars each Sunday (CALM, 1985; Shire of Mundaring personal communication, Recreation Officer)

- A diverse range of recreation opportunities will be required to meet the estimated trebling of demand for recreation by the year 2000 (DCE, 1978).

- Access to recreation sites within close proximity to Perth will be most sought after due to factors such as travelling costs, mobility, and available leisure time.

4.3.3 Overview

Minor social impacts arising from the construction of a dam on the South Canning River can be summarised as follows:

- The innundation of selectively cleared forest.

- The need to realign the S.E.C 132 kV powerline corridor.

These impacts are localised in nature and appear to have been resolved through negotiation.

As the workforce for the project will be available from the Perth Metropolitan Region and the damsite is located within State Forest the effects of the proposal on nearby residents and urban settlements will be negligible.

The most significant adverse effect of the proposed reservoir on recreation is the inundation of the South Canning River and the possible negative impact upon semi-remote recreation activity in the Monadnock Reserve. However it is contended that the potential for water based recreation on the new reservoir and the possible introduction of recreation facilities at the damsite would outweigh the existing and potential value of the River and the Monadnocks for recreation.

It is maintained that the potential benefits of the project will be extensive as the Water Authority may consider the selective introduction of water based activities after establishing demand for certain pursuits and the ability of the reservoir to accommodate these activities. Further research may, however, be required to establish whether certain types of vegetation can be introduced along the banks of the reservoir, large areas of which are expected to be exposed for long periods of time. These exposed earth areas around the reservoir may detract from the suitability of the area for certain types of recreational activity such as sightseeing and picnicking. For this reason the Water Authority is considering investigations into the establishment and maintenance of vegetation able to tolerate periodic inundation.

4.4 PROPOSED CONSTRUCTION OF A NEW DAM ON THE NORTH DANDALUP RIVER - IMPACT ON THE SOCIAL ENVIRONMENT AND RECREATION

4.4.1 Project Details

The designated site for the proposed North Dandalup Dam is located approximately 100 metres upstream of the existing North Dandalup Pipehead Dam (Plan 1 refers).

With a full supply level at approximately 219m AHD, the resultant surface area of the reservoir will be 4.33 square kilometres. The dam wall will rise 51 metres from the base of the valley.

The status of the North Dandalup Catchment will be modified from the existing Class I - Developed Catchment - Small Domestic Diversion Dam to Class II - Developed Catchment - Large Domestic Dam. This reclassification will enable the public to access the dam wall, currently prohibited under the existing classification.

The peak construction period for the project is expected to be limited to approximately 2 - 3 years(G. Meink. Water Authority, Pers. Comm.) It is anticipated the construction workforce (approximately 200) will be drawn from local communities such as North Dandalup, Pinjarra, Mandurah, Rockingham and the Perth Metropolitan Region. On-site accommodation is not expected to be required due to the proximity of the dam site to these communities. The Water Authority has indicated that although a small construction camp was provided during the construction of the South Dandalup Dam, most workers commuted to the site (Water Authority Dam Design Engineers, Pers. comm.). It is possible that a number of contractors may choose to provide some accommodation at North Dandalup. Should this occur, the facilities would have to meet all relevant government and local government by-laws and regulations. Most construction materials are available on site, upstream of the proposed dam wall.

Access roads to the site include Hines Road which provides a link from the west and Scarp Road from the north and south. Both of these roads are unsealed. Scarp Road will be realigned onto a more westerly route, which will pass over the top of the dam wall as a 2 kilometre section of the road will be inundated by the reservoir behind the dam. Scarp Road may need to be temporarily closed and detours provided for a period during the construction phase of the project. Hines Road would be sealed and extended to join Scarp Road which will cross the dam wall.

4.4.2 Impacts

Social Environment

A minor boost to the economies of local communities such as North Dandalup, Mundijong, Serpentine, Pinjarra and Mandurah can be expected.

There are not expected to be any major modifications to the social environment generated by the project. The workforce required for the construction of the dam will be temporary and sought from an array of communities in the region and Perth. Localised impacts such as dust and noise will not inconvenience local residents as the site is located within State Forest. Hines Road would be upgraded to provide access to the site. The road traverses a number of farming properties east of the North Dandalup townsite.

Construction of the dam wall and associated spillway will impinge upon the north eastern sector of Reserve 21038, as detailed in Section 2.4.1. Negotiations between the Water Authority and the agency responsible for managing the reserve, National Parks and Nature Conservation Authority have been initiated to ensure that works associated with the facility do not adversely affect the function of the reserve. (Water Authority, Pers. Comm.).

Areas of State Forest and small bauxite deposits will be inundated. These matters are currently being reviewed by the Water Authority and Alcoa.

A significant reduction in the frequency of overflows at the proposed dam will occur. This will not affect the general public as access to the existing pipehead dam is currently prohibited.

The reduction in the frequency of overflow may, however, result in the availability of streamwater for owners and occupiers of land downstream of the dam and contiguous with the river, being reduced.

The North Dandalup River has, since 1968, been a 'Proclaimed Stream' under the Rights on Water and Irrigation Act, administered by the Water Authority. The existing Pipehead Dam was built under the Water Authority Act (1984) and a new storage dam would also be built under that Act. The Water Authority will liaise with affected landowners and the Murray-Serpentine-Dandalup River Advisory Committee (Water Authority - Pers. comm.)

Recreation

The inundation of an extensive area of the North Dandalup River valley which would currently rate a score of approximately 70 on the Visual Landscape Quality Scale mentioned in Section 4.3.2.2, (Darling Range Study Group, 1982) will result in the loss of what appears to be a significant landscape resource. However this section of the North Dandalup River is currently included within the existing Class I Catchment, which precludes unrestricted public access. The status of the catchment would be unlikely to change if the dam was not constructed thus confining recreation activity to the Bibbulman Track and scenic driving along Scarp Road. Moreover, as the entire locality is within Alcoa's lease area, the ultimate potential of this section of the river valley to provide scenic vistas of the natural environment are limited.

Construction of the dam will generate a number of benefits to recreation. These are:

- The introduction of additional picnic and barbecuing facilities in a formal recreation node to be located on the northern embankment of the river valley overlooking the dam. It is understood that formal recreation activity will be confined to an area on the northern side of North Dandalup River to prevent the degradation of Reserve 21038. The creation of this recreation facility, strategically located between the Serpentine Dams and South Dandalup Dam, will complement existing facilities at these destinations and assist in alleviating current pressure on facilities along the Serpentine River at peak times.

- The realignment and upgrading of Scarp Road which will pass over the dam wall and two saddle dams north of the main dam, and provide panoramic views over the reservoir. The progressive upgrading and promotion of Scarp Road as a 'Hills Tourist Route' connecting Serpentine, North Dandalup and South Dandalup Dams and Dwellingup, will provide a greater range and diversity of recreation opportunities along the Darling Range which are currently highly sought after.

Upon completion of the dam the locality will be classified as a Class II Catchment. Catchment protection regulations will therefore enable public access to made roads, the Bibbulman Track and designated recreation sites at the dam wall. Pedestrian access will be subject to Class II Catchment conditions, where previously restricted to the Bibbulman Track and open roads.

4.4.3 Overview

The social impacts which will result from the construction of the North Dandalup Dam include:

- A minor economic boost to nearby local communities and possibly some additional employment opportunities. Local businesses may also experience increases in patronage.

- The inundation of approximately 2 kilometres of Scarp Road, which will be realigned to pass over the top of the dam wall. Scarp Road may be closed or detoured during the construction of the dam, which would cause a temporary inconvenience to the public and forest based industries.

- Encroachment of the base of the dam spillway into Reserve 21038 located downstream of the dam. The Water Authority and the National Parks and Nature Conservation Council are currently reviewing this matter.

- The inundation of State Forest and potential bauxite deposits. Negotiations between the Water Authority, and Alcoa are currently underway to resolve these issues.

- Increased levels of construction and commuter traffic on Hines Road which would necessitate the upgrading of this route which passes a number of private farming properties.

- Reduced river flows downstream of the proposed damsite. The North Dandalup River has, since 1968, been designated a Proclaimed Stream under the Rights In Water and Irrigation Act, administered by the Water Authority. The existing Pipehead Dam was built under the Water Authority Act (1984) and a new storage dam would also be constructed and operated under that Act. The Water Authority will consult with riparian landowners and the Murray-Serpentine-Dandalup River Advisory Committee (Water Authority, Pers. comm.).

Impacts on recreation generated by the construction of the dam are generally beneficial, viz;

- The potential for the creation of a recreation site, including barbecue and picnic facilities on the northern embankment of the river valley which will complement limited existing facilities along the Serpentine River and at South Dandalup Dam.

- The upgrading and realignment of Scarp Road which will pass over the dam wall. The new route will provide expansive views over the North Dandalup Reservoir and effectively complete the crucial link in a potential hills tourist/recreation route between Serpentine and South Dandalup Dams which is currently unrecognised by the general public.

- Access to the dam wall which is currently prohibited at the North Dandalup Pipehead Dam as it is classified as a Class I Catchment.

- Relaxation of restrictions relating to public access due to the transfer of the locality from a Class I to Class II catchment.

Adverse recreational impacts of the proposal include the loss of a relatively scenic river valley, although the locality is subject to strict Water Authority catchment management restrictions and possible future bauxite extraction.

4.5 SOCIAL/RECREATIONAL BENEFITS AND CONFLICTS AND RANKING OF THE PROPOSED OPTIONS

The preceding review of the four options has clearly identified the value of each proposal in terms of its impact on the social environment and recreation. It is evident that the overall social impact of each of the proposals will be minimal.

Major intrusions upon existing environments are unlikely to occur as:

- The peak construction periods for all projects are expected to be limited to approximately 2 - 3 years.
- The construction workforces required at Mundaring Weir, Canning Dam and South Canning Dam will be readily available from the entire Perth Metropolitan Region.
- The workforce required for the construction of the North Dandalup Dam is expected to be drawn from a range of nearby communities and the Perth Metropolitan Region. This will ensure that no single community has to bear the brunt of the socio-economic requirements of the construction workforce and the benefits should be distributed throughout towns in the region.
- Each damsite is located within State Forest which will effectively buffer the proposed developments from most neighbouring private land owners.

It is apparent from the evaluation of the impacts of the four future source options that a number of minor localised conflicts would occur at each dam site, viz;

- Forest clearing prior to inundation in all instances
- Flooding of certain road sections at each reservoir site.
- Temporary closure of selected picnic areas during the construction phase of the project at Mundaring Weir and Canning Dam.
- The periodic inundation of the upper reaches of the Canning River within the Monadnock Reserve.
- The need to reconstruct a section of the 132 kV transmission line over a narrower span of water at the proposed South Canning Reservoir.
- The possible adverse impact of the South Canning Dam and Reservoir upon semi-remote recreation in the Monadnock Reserve.
- Possible negative effects of traffic flows to and from each damsite.

These matters can be adequately addressed by the relevant government agencies responsible for management and administration within each catchment at the detailed planning stage of assessment and development.

In light of the above it is apparent that the social impacts generated by each option will be minor and similar in nature in each locality. Major impacts generated by the four projects will relate to recreation. Thus, the selection of the preferred option and ranking of the three remaining proposals are detailed in the following sections principally in terms of their significance to recreation.

4.5.1 Preferred Option

It is considered that the construction of a new dam on the South Canning River will generate the most beneficial recreational impacts and least adverse impacts of the four options.

Specific advantages of the project include:

- The creation of additional picnic and barbecue sites at the proposed dam wall. These facilities located within 60 kilometres of the C.B.D will complement neighbouring recreation nodes at Canning, Churchman Brook, Wungong and Serpentine Dams, which during peak times are often at or near capacity.

- The possible selective and progressive introduction of a range of reservoir based recreation activities which, in the hills region, are currently restricted to Lake Leschenaultia west of Chidlow and Lake Navarino (Waroona Dam) and Lake Brockman (Logue Brook Dam) south east of Waroona. Numerous authors and agencies have identified the need for additional opportunities for water based recreation within close proximity to Perth.

4.5.2 Ranking of Remaining Alternative Sources

The construction of the North Dandalup Dam is regarded as the preferred alternative after the South Canning Dam. The introduction of this source will provide a number of recreational benefits, viz;

- The development of a recreation site, incorporating picnic and barbecue facilities on the northern ridge of the North Dandalup Valley. Visitors to the site will enjoy expansive views over the reservoir. An additional facility such as that proposed, accessible during a day trip, will greatly assist in diverting existing recreation traffic from Wungong, Serpentine and Canning Dams, which are frequently in high demand due to their proximity to Perth.

- Formalisation of the existing scenic tourist/ recreation route between Dwellingup, South Dandalup Dam and Serpentine Dam which will be realigned to cross over the North Dandalup main dam and two saddle dam walls. This will provide a novel feature along the route which currently supports little recreational traffic as it has not been promoted in the past.

Raising of the existing Canning Dam wall is considered to be the third most beneficial option. There appears to be scope for the introduction of two additional picnic and barbecuing facilities; one north of the realigned section of Canning Dam Road which would boast views over the reservoir and a second within the on-site quarry. This site has the potential to rival the existing quarry picnic area at Wellington Dam.

There would appear to be limited scope for the development of extensive additional recreation facilities at Mundaring Weir as there are a large number of existing facilities provided by both the Water Authority and CALM which are heavily used throughout the year. However there is potential for one additional site to be introduced by the Water Authority and CALM, north of the realigned section of Mundaring Weir Road, adjacent to the southern end of the proposed dam wall. This facility could provide views over the Helena Reservoir. Although the Helena Valley is perhaps the most scenic of the four sites, current levels of use are high and it is maintained that the diversion of additional visitors to alternative venues should be encouraged.

5.0 REVIEW OF PREFERRED OPTION AND RANKING OF ALTERNATIVE SOURCES USING WATER AUTHORITY'S RIVERS AND WETLANDS ASSESSMENT METHOD

In an attempt to confirm conclusions reached about the relative significance of each development option to recreation in the Darling Range an assessment of the project localities was conducted using a method recently developed by the Authors for the Water Authority. The method was formulated to establish the potential of all rivers and wetlands, within the Perth to Bunbury region of the State, for recreation.

5.1 RECREATIONAL OPPORTUNITIES OF RIVERS AND WETLANDS IN THE PERTH TO BUNBURY REGION

5.1.1 Methodology

The object of Stage I of this Study was to develop a set of criteria, based on existing methods, which could be used to classify the recreational value of rivers and wetlands in the Perth to Bunbury region.

The criteria developed was based on local environmental conditions and existing and probable recreational activity type and habits.

Stage 2 of the project involved the application of the assessment method to the rivers and wetlands of the Region, and the ranking of the water bodies according to their value for recreation.

A list of 31 recreation activities was prepared to reflect all the activities likely to occur on rivers or wetlands in the South West of the State. The list basically accords with that prepared by the Working Party formed for the preparation of the Water Resources Council's "Recreation on Reservoirs and Catchments in Western Australia" publication.

This comprehensive list detailing recreation activities dependent upon, and/or oriented to, rivers or wetlands was analysed to identify characteristics of the water bodies affecting each use. The characteristics of rivers and wetlands were divided into four categories, viz;

- Physical
- Social
- Economic
- Political

These categories are aggregations of the more specific characteristics listed below;

- Waterbody Area/Shape
- Summer/Winter Water Depth
- Summer/Winter Water Movement
- Water Quality
- Obstructions
- Fishing Value
- Wildfowl Value
- Bank Slope/Backshore Slope
- Shore Type
- Fringe Vegetation - Size/Density
- Fringe Landscape - Naturalness/Diversity
- Access - Proximity/Type
- Proximity to Population
- Ownership
- Fringe Land use - Current/Future
- Current Recreational use
- Statutory Requirements
- Other Special Characteristics

A computer programme was prepared which enabled the 'matching' of wetland characteristics and activity requirements to establish suitability for recreation. Standard sheets detailing the waterbody characteristics determining the suitability of each of the recreation activities were compiled and subsequently stored on computer file. The characteristics of all river sections and wetlands in the study area were then determined from; aerial photography, various maps, literature documenting vegetation and other characteristics and advice from the Water Authority and CALM field staff familiar with local conditions. This information was then 'matched' by the computer and scores obtained which ranked each waterbody against all rivers and wetlands in the region. The suitability of entered wetlands for recreation was also established. It should be noted, however, that the last three characteristics of the waterbodies detailed i.e. current recreation use, statutory requirements, and other special characteristics have not been entered on the computer. An assessment of the impact of these characteristics on the suitability of various wetlands for recreation is essentially a management decision which has to be made manually once a 'Raw Score' has been determined.

5.1.2 Application of the Method - Helena, Canning, South Canning , North Dandalup Catchments.

The Method has been used to evaluate the 'potential' - that is with the exemption of existing statutory restrictions and other special characteristics - suitability of the four existing sites and modified sites, to accommodate recreation and to establish their significance (overall ranking) for recreation in the South West of Western Australia. The results of a comparison of the range of activities able to be accommodated in a 'before' and 'after' scenario is shown in Table 5.1.2(a) and Appendix A.

Wetland Unit Detail sheets prepared for the existing and proposed sites are included as Appendix B.

TABLE 5.1.2(a)

POTENTIAL NUMBER OF SUITABLE RECREATION ACTIVITIES BY SOURCE WITHOUT EXISTING STATUTORY REGULATIONS AND OTHER SPECIAL CHARACTERISTICS CONSIDERED

Wetland Unit	Total Number of Suitable Activities	
	Existing Site Conditions	Proposed Site Conditions (Raised reservoir or new reservoir)
Helena Reservoir	27	27
Canning Reservoir	27	27
South Canning River/Reservoir	21	28
North Dandalup Pipehead/Reservoir Main Dam/Reservoir	22	27

SOURCE: Extract from *Recreational Opportunities of Rivers and Wetlands in the Perth to Bunbury Region.* Prepared by Feilman Planning Consultants for the Water Authority (unpublished).

It is apparent from the above, that hypothetically the suitability and range of recreation activities at Helena and Canning Reservoirs will be unaffected by the raising of Mundaring Weir and Canning Dam. The South Canning Dam alternative has potential to generate the greatest net increase in suitable recreation activities (7) of each of the options and the construction of North Dandalup Dam would result in an additional five recreation activities being accommodated. Moreover computer analysis of suitability of wetlands for all water related recreation activities (31) in the Perth-Bunbury Region has revealed that the construction of South Canning Dam will elevate the existing site from a ranking sixteenth overall to second position. (This is illustrated in Table 5.1.2(b)

TABLE 5.1.2(b)

RANKING OF RIVERS AND WETLANDS PERTH-BUNBURY REGION FOR RECREATION SUITABILITY WITHOUT EXISTING STATUTORY REGULATIONS AND OTHER SPECIAL CHARACTERISTICS CONSIDERED

WETLAND RATING REPORT

WETLAND CODE	WETLAND DESCRIPTION	AVG RANK	AVG SCORE
R02BAE	*HELENA RESERVOIR	85.7	1.51
R09A	*HELENA RESERVOIR (RAISED)	85.7	1.51
R09C	*SOUTH CANNING RESERVOIR	80.7	1.39
R03BAC	WUNGONG RESERVOIR	76.7	1.09
R03CAB	CHURCHMAN BROOK RESERVOIR	76.2	1.47
R03D	*CANNING RESERVOIR	72.4	0.92
R09B	*CANNING RESERVOIR (RAISED)	72.4	0.92
R04GA	SERPENTINE RESERVOIR (EAST BRANCH)	68.7	0.68
R09D	*NORTH DANDALUP RESERVOIR	68.4	0.82
R02B	SWAN RIVER (HEIRRISON ISLAND-GUILDFORD)	67.3	1.06
R04F	SERPENTINE PIPEHEAD RESERVOIR	67.1	0.75
R04GB	SERPENTINE RESERVOIR (SOUTH EAST BRANCH)	65.8	0.64
R02BAF	DARKAN RIVER (HELENA RESERVOIR - LIMIT)	63.7	1.20
R02BAG	HELENA RIVER (HELENA RESERVOIR - LIMIT)	63.2	1.22
R02D	SWAN RIVER (SCARP TO TOODYAY)	62.6	1.25
R05AAC	LAKE BANKSIADALE (SOUTH DANDALUP DAM)	61.2	0.34
R04H	SERPENTINE RIVER (SERPENTINE DAM - MT SOLUS)	60.2	1.02
R03EE	DEATH ADDER CREAK	59.6	1.44
R05AAAd	*NORTH DANDALUP RIVER (PIPEHEAD DAM TO ORIGIN)	59.6	0.69
R03G	*SOUTH CANNING RIVER	59.2	1.03
R05AAAb	NORTH DANDALUP RIVER (SCARP TO PIPEHEAD)	58.6	0.83

R03AAD	VICTORIA RESERVOIR	58.5	1.07
R06BBC	LAKE KABBAMUP (SAMSON BROOK DAM)	57.7	0.33
R02CAB	JANE BROOK (SCARP TO ORIGIN)	57.4	1.28
R02A	SWAN RIVER (ESTUARY)	56.4	0.52
R03A	CANNING RIVER (SHELLEY BRIDGE TO THORNLIE)	56.2	0.92
R02BAB	HELENA RIVER (SCARP TO PIPEHEAD DAM)	55.0	1.13
R03BAB	WUNGONG RIVER (SCARP TO WUNGONG DAM)	54.1	1.15
R05D	MURRAY RIVER (SCARP ROAD TO BODDINGTON)	53.9	0.31
R05AAD	SOUTH DANDALUP RIVER (LAKE BANKSIADALE - ORIGIN)	53.9	0.28
R03CAA	CHURCHMANS BROOK	53.2	1.07
R01B	MOORE RIVER (ESTUARY TO RUIN)	52.9	0.82
R04GBA	O'NEILL BROOK	52.9	0.82
R01CB	GINGIN BROOK	52.0	0.40
R06F	HARVEY RESERVOIR	51.6	1.06
R06BCC	*LAKE BROCKMAN (LOGUE BROOK DAM)	51.6	0.95
R06BAD	*LAKE NAVARINO (WAROONA DAM)	51.6	0.18

* Waterbodies under review.

SOURCE: Extract from *Recreational Opportunities of Rivers and Wetlands in the Perth to Bunbury Region*, prepared by Feilman Planning Consultants for Water Authority of Western Australia (unpublished)

From Table 5.1.2(b) it is evident that in their existing condition excluding existing statutory restrictions and other special characteristics (i.e. the "potential" range of activities possible) the rankings for recreational suitability, of the four sites against all rivers and wetlands in the Perth to Bunbury region are as follows:

Helena Reservoir	-	No. 1
Canning Reservoir	-	No. 4
South Canning River	-	No. 16
North Dandalup River	-	No. 15

In their modified states the four sites would rank:

Helena Reservoir (Raised)	-	No. 1
Canning Reservoir (Raised)	-	No. 5
South Canning Reservoir	-	No. 2
North Dandalup Reservoir	-	No. 7

The assessment clearly indicates the potential significance of the new dams to recreation and that the suitability of Helena and Canning Reservoirs will be unaffected by modifications proposed.

The assessment clearly indicates the potential significance of the new dams to recreation and that the suitability of Helena and Canning Reservoirs will be unaffected by modifications proposed.

5.1.3 Summary of 'Rivers and Wetlands' Method Assessment And Relevance To The Study.

The 'Rivers and Wetlands' assessment of the potential suitability of the four options to accommodate recreation has confirmed that the construction of a new dam on the South Canning River is the most suitable alternative when considering the benefits, in an unconstrained situation, likely to accrue to recreation. The proposed South Canning Reservoir if constructed, would be the second most suitable location for recreation activity in the South West Region. A total of seven (7) additional activities will be possible with the construction of the dam.

However, given that each reservoir currently is or will be subject to Water Authority, and CALM. restrictions the actual number of activities able to be accommodated is reduced considerably. Recreation at the Helena, Canning and North Dandalup Reservoir's will in fact be confined to scenic driving, picnicking and sightseeing downstream of the dams. Whereas at the South Canning Reservoir in addition to the above activities it is possible that a number of water based recreation activities will also be permitted.

6.0 STUDY CONCLUSIONS

It has been shown that there will be no major adverse social impacts generated by the four dam proposals.

The proposed raising of Mundaring Weir and Canning Dam would result in minor localised effects on the respective existing recreational environments. Recreation at these dams will be largely unaffected, however the opportunities for additional sightseeing and picnic areas at the Canning damsite will be greater than at Mundaring Weir.

The construction of new dams on the South Canning and North Dandalup Rivers will significantly increase the actual and potential range of recreation facilities and opportunities possible at these two sites. Minor social benefits may also occur within the rural settlements located near the two proposed dams.

South Canning Dam is the preferred option as there is the possibility of recreational use of the reservoir being countenanced by the Water Authority in addition to the introduction of formal picnic and sightseeing facilities similar to those to be established at the North Dandalup damsite. Moreover the south Canning Dam will be located some 15 kilometres closer to the Perth Metropolitan Region than the North Dandalup Dam.

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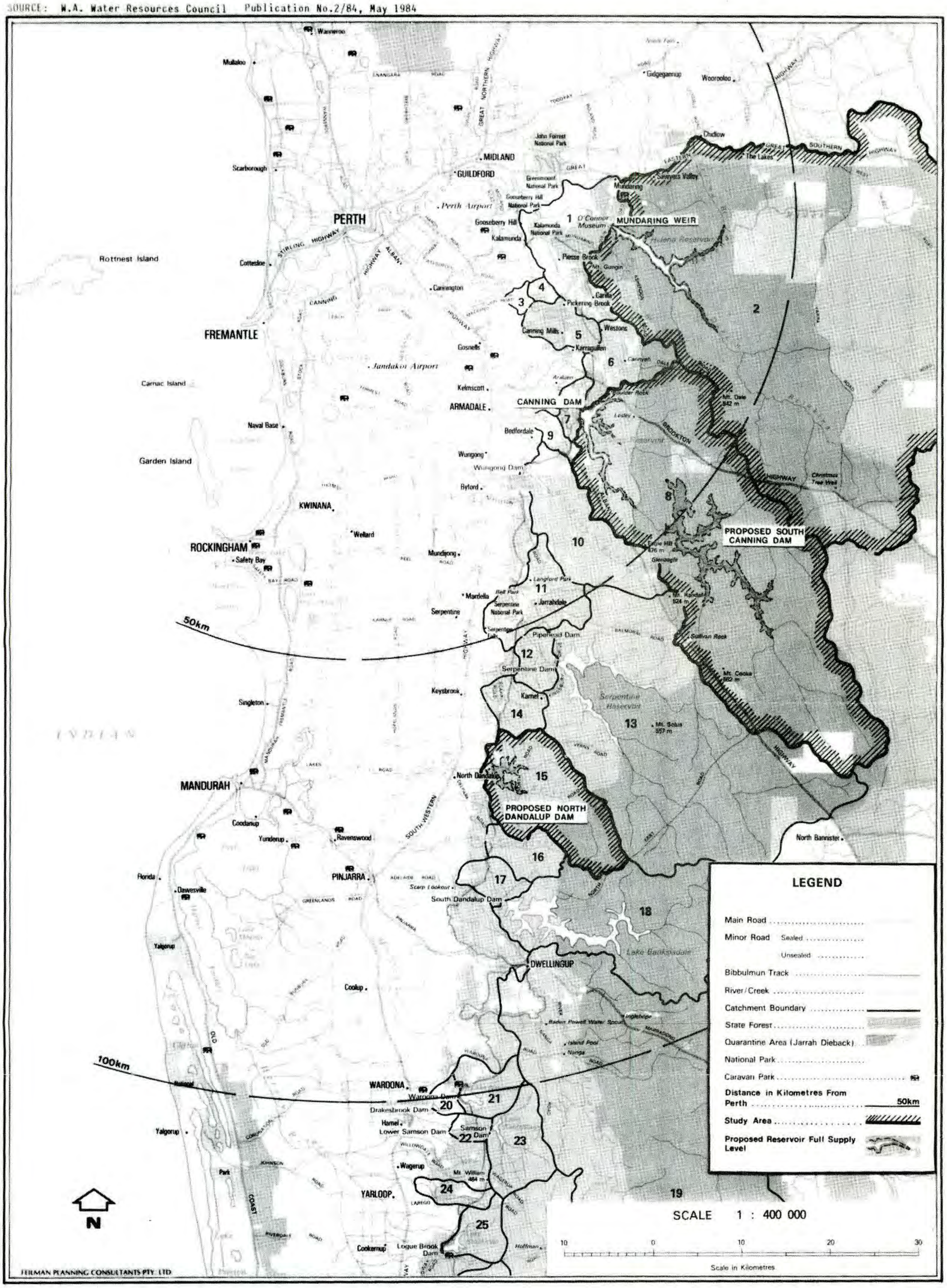

NEXT MAJOR HILLS WATER SUPPLY SOURCE FOR PERTH

Preliminary Assessment of Social / Recreational Impacts

APPENDIX A

WETLANDS USAGE REPORT

CANNING DAM (CANNING RESERVOIR)

** Wetland R03D

Activity Code	Activity Name	Total Items	Match Count	Pcnt Rank	Std Score	Miss Count	Miss Code
04	RACE RALLY DRIVING	16	15	100	1.7	0	
22	POWER BOATING	15	14	98	1.9	0	
06	NATURE STUDY	20	16	97	1.6	0	
23	SOCIAL WATER SKIING	15	14	96	1.8	0	
27	SAILING	16	12	96	1.3	0	
30	MARRONING	16	12	96	1.6	0	
12	TRAILS/CROSS COUNTRY RUNNING	15	13	93	1.1	0	
18	FIREWOOD GATHERING	16	13	93	1.1	0	
20	MODEL BOATING	17	14	93	1.2	0	
29	LINE FISHING	14	12	93	1.4	0	
05	BIRD WATCHING	20	15	89	1.3	0	
31	SWIMMING	15	12	88	0.9	0	
11	BUSH WALKING	18	14	87	0.8	0	
03	OFF ROAD DRIVING	19	15	85	1.1	0	
17	EQUESTRIAN	19	14	84	0.8	0	
13	ORIENTEERING/ROGAINING	18	15	82	0.8	0	
28	WINDSURFING	17	11	80	0.7	0	
07	PHOTOGRAPHY/PAINTING	19	14	77	0.5	0	
10	SIGHTSEEING - GENERAL	22	15	74	0.4	0	
14	BACK PACKING	21	13	74	0.5	0	
16	BARBEQUEING/PICNICKING	21	15	74	0.5	0	
01	COACH TOURS/SCENIC DRIVING	22	15	74	0.4	0	
21	ROWING (CLUB)/CANOE RACING	18	11	72	0.6	0	
15	CAMPING/CARAVANNING	22	15	69	0.4	0	
25	CANOEING (CASUAL)	15	11	64	-0.1	0	
02	CYCLE TOURING	19	12	61	0.0	0	
19 27	TRAIN/EXERCISE DOMESTIC ANIMAL	15	11	55	-0.1	0	
08	ROCK CLIMBING/ABSEILING	13	8	98	1.8	2	8*
24	CANOEING (TOURING MARATHON)	19	15	90	1.2	1	1*
26	WHITE WATER CANOEING	19	12	84	0.8	2	6*
09	ROCK HUNTING	11	7	83	0.5	1	6*

Total number of suitable activities - 27

WETLANDS USAGE REPORT

CANNING (CANNING RIVER SOUTH)

** Wetland R03G

Activity Code		Activity Name	Total Items	Match Count	Pcnt Rank	Std Score	Miss Count	Miss Code
03		OFF ROAD DRIVING	19	18	100	2.1	0	
04		RACE RALLY DRIVING	16	15	100	1.7	0	
05		BIRD WATCHING	20	19	100	2.3	0	
06		NATURE STUDY	20	18	100	2.2	0	
07		PHOTOGRAPHY/PAINTING	19	17	100	2.0	0	
10		SIGHTSEEING - GENERAL	22	18	100	1.9	0	
14		BACK PACKING	21	17	100	2.1	0	
13		ORIENTEERING/ROGAINING	18	18	100	1.9	0	
17		EQUESTRAIN	19	17	100	2.1	0	
24		CANOEING (TOURING MARATHON)	19	18	100	2.2	0	
25		CANOEING (CASUAL)	15	14	100	1.9	0	
01		COACH TOURS/SCENIC DRIVING	22	18	100	1.9	0	
11		BUSH WALKING	18	17	99	2.2	0	
16		BARBEQUEING/PICNICKING	21	18	99	1.7	0	
12		TRAILS/CROSS COUNTRY RUNNING	15	14	99	1.8	0	
18		FIREWOOD	16	14	99	1.5	0	
26		WHITE WATER CANOEING	19	17	99	2.3	0	
15		CAMPING/CARAVANNING	22	17	95	1.3	0	
19		TRAIN/EXERCISE DOMESTIC ANIMAL	15	13	94	1.2	0	
02		CYCLE TOURING	19	14	93	1.2	0	
30	21	MARRONING	16	11	90	1.1	0	
09		ROCK HUNTING	11	8	99	1.4	1	6*
31		SWIMMING	15	13	96	1.5	1	3*
08		ROCK CLIMBING/ABSEILING	13	7	92	1.1	2	8*
29		LINE FISHING	14	11	86	0.9	2	4*
20		MODEL BOATING	17	12	70	0.4	1	2*
22		POWER BOATING	15	10	66	0.1	2	2*
23		SOCIAL WATER SKIING	15	9	38	-0.6	3	2*
28		WINDSURING	17	8	34	-0.7	2	2*
27		SAILING	16	7	34	-0.8	3	2*
21		ROWING	18	4	13	-1.4	5	2*

Total number of suitable activities - 21

WETLANDS USAGE REPORT

PROPOSED NORTH DANDALUP DAM/RESERVOIR

** Wetland R09D

Activity Code		Activity Name	Total Items	Match Count	Pcnt Rank	Std Score	Miss Count	Miss Code
05		BIRD WATCHING	20	16	96	1.5	0	
20		MODEL BOATING	17	15	96	1.7	0	
30		MARRONING	16	12	96	1.6	0	
31		SWIMMING	15	13	96	1.5	0	
03		OFF ROAD DRIVING	19	16	93	1.4	0	
06		NATURE STUDY	20	15	92	1.3	0	
22		POWER BOATING	15	13	92	1.4	0	
17		EQUESTRIAN	19	15	90	1.3	0	
23		SOCIAL WATER SKIING	15	13	90	1.3	0	
04		RACE RALLY DRIVING	16	13	87	1.1	0	
11		BUSH WALKING	18	14	87	0.8	0	
13		ORIENTEERING/ROGAINING	18	16	87	1.2	0	
29		LINE FISHING	14	11	86	0.9	0	
14		BACK PACKING	21	14	86	0.9	0	
21		ROWING (CLUB)/ CANOE RACING	18	12	86	0.9	0	
27		SAILING	16	11	86	0.9	0	
18		FIREWOOD GATHERING	16	12	80	0.8	0	
28		WINDSURFING	17	11	80	0.7	0	
25		CANOEING (CASUAL)	15	12	79	0.6	0	
07		PHOTOGRAPHY/PAINTING	19	14	77	0.5	0	
12		TRAILS/CROSS COUNTRY RUNNING	15	12	77	0.5	0	
10		SIGHTSEEING - GENERAL	22	15	74	0.4	0	
16		BARBEQUEING/PICNICKING	21	15	74	0.5	0	
01		COACH TOURS/SCENIC DRIVING	22	15	74	0.4	0	
15		CAMPING/CARAVANNING	22	14	55	-0.1	0	
19		TRAIN/EXERCISE DOMESTIC ANIMAL	15	11	55	-0.1	0	
02	27	CYCLE TOURING	19	11	37	-0.7	0	
24		CANOEING (TOURING MARATHON)	19	14	86	0.9	1	1*
09		ROCK HUNTING	11	7	83	0.5	1	6*
08		ROCK CLIMBING/ABSEILING	13	6	78	0.4	2	8*
26		WHITE WATER CANOEING	19	11	75	0.5	3	1*

Total number of suitable activities - 27

WETLANDS USAGE REPORT

Activity Code	Activity Name	Total Items	Match Count	Pcnt Rank	Std Score	Miss Count	Miss Code
PROPOSED SOUTH CANNING DAM/RESERVOIR							
** Wetland R09C							
20	MODEL BOATING	17	16	100	2.1	0	
22	POWER BOATING	15	15	100	2.3	0	
23	SOCIAL WATER SKIING	15	15	100	2.2	0	
29	LINE FISHING	14	14	100	2.4	0	
21	ROWING (CLUB)/CANOE RACING	18	14	99	1.5	0	
31	SWIMMING	15	14	99	2.1	0	
30	MARRONING	16	12	96	1.6	0	
04	RACE RALLY DRIVING	16	14	96	1.4	0	
13	ORIENTEERING/ROGAINING	18	17	96	1.6	0	
17	EQUESTRIAN	19	16	96	1.7	0	
27	SAILING	16	12	96	1.3	0	
15	CAMPING/CARAVANNING	22	17	95	1.3	0	
24	CANOEING (TOURING MARATHON)	19	16	95	1.5	0	
28	WINDSURING	17	12	95	1.2	0	
03	OFF ROAD DRIVING	19	16	93	1.4	0	
11	BUSH WALKING	18	15	93	1.3	0	
16	BARBEQUEING/PICNICKING	21	17	93	1.3	0	
12	TRAILS/CROSS COUNTRY RUNNING	15	13	93	1.1	0	
18	FIREWOOD GATHERING	16	13	93	1.1	0	
06	NATURE STUDY	20	15	92	1.3	0	
14	BACK PACKING	21	15	92	1.3	0	
25	CANOEING (CASUAL)	15	13	92	1.2	0	
07	PHOTOGRAPHY/PAINTING	19	15	87	1.0	0	
10	SIGHTSEEING - GENERAL	22	16	84	0.9	0	
01	COACH TOURS/SCENIC DRIVING	22	16	84	0.9	0	
02	CYCLE TOURING	19	13	81	0.6	0	
19	TRAIN/EXERCISE DOMESTIC ANIMAL	15	12	80	0.5	0	
05 28	BIRD WATCHING	20	13	79	0.7	0	
09	ROCK HUNTING	11	8	99	1.4	1	6*
08	ROCK CLIMBING/ABSEILING	13	8	98	1.8	2	8*
26	WHITE WATER CANOEING	19	13	90	1.1	2	6*

Total number of suitable activities - 28

WETLANDS USAGE REPORT

CANNING DAM/RESERVOIR (RAISED)

** Wetland R03D

Activity Code		Activity Name	Total Items	Match Count	Pcnt Rank	Std Score	Miss Count	Miss Code
04		RACE RALLY DRIVING	16	15	100	1.7	0	
22		POWER BOATING	15	14	98	1.9	0	
06		NATURE STUDY	20	16	97	1.6	0	
23		SOCIAL WATER SKIING	15	14	96	1.8	0	
27		SAILING	16	12	96	1.3	0	
30		MARRONING	16	12	96	1.6	0	
12		TRAILS/CROSS COUNTRY RUNNING	15	13	93	1.1	0	
18		FIREWOOD GATHERING	16	13	93	1.1	0	
20		MODEL BOATING	17	14	93	1.2	0	
29		LINE FISHING	14	12	93	1.4	0	
05		BIRD WATCHING	20	15	89	1.3	0	
31		SWIMMING	15	12	88	0.9	0	
11		BUSHWALKING	18	14	87	0.8	0	
03		OFF ROAD DRIVING	19	15	85	1.1	0	
17		EQUESTRIAN	19	14	84	0.8	0	
13		ORIENTEERING/ROGAINING	18	15	82	0.8	0	
28		WINDSURFING	17	11	80	0.7	0	
07		PHOTOGRAPHY/PAINTING	19	14	77	0.5	0	
10		SIGHTSEEING - GENERAL	22	15	74	0.4	0	
14		BACK PACKING	21	13	74	0.5	0	
16		BARBEQUEING/PICNICKING	21	15	74	0.5	0	
01		COACH TOURS/SCENIC DRIVING	22	15	74	0.4	0	
21		ROWING (CLUB)/CANOE RACING	18	11	72	0.6	0	
15		CAMPING/CARAVANNING	22	15	69	0.4	0	
25		CANOEING (CASUAL)	15	11	64	-0.1	0	
02		CYCLE TOURING	19	12	61	0.0	0	
19	27	TRAIN/EXERCISE DOMESTIC ANIMAL	15	11	55	-0.1	0	
08		ROCK CLIMBING/ABSEILING	13	8	98	1.8	2	8*
24		CANOEING (TOURING MARATHON)	19	15	90	1.2	1	1*
26		WHITE WATER CANOEING	19	12	84	0.8	2	6*
09		ROCK HUNTING	11	7	83	0.5	1	6*

Total number of suitable activities - 27

WETLANDS USAGE REPORT

Activity Code	Activity Name	Total Items	Match Count	Pcnt Rank	Std Score	Miss Count	Miss Code
MUNDARING WEIR HELENA RESERVOIR (RAISED)							
** Wetland R02BAE							
20	MODEL BOATING	17	16	100	2.1	0	
22	POWER BOATING	15	15	100	2.3	0	
23	SOCIAL WATER SKIING	15	15	100	2.2	0	
29	LINE FISHING	14	14	100	2.4	0	
21	ROWING (CLUB)/CANOE RACING	18	14	99	1.5	0	
31	SWIMMING	15	14	99	2.1	0	
14	BACK PACKING	21	16	98	1.7	0	
06	NATURE STUDY	20	16	97	1.6	0	
07	PHOTOGRAPHY/PAINTING	19	16	97	1.5	0	
04	RACE RALLY DRIVING	16	14	96	1.4	0	
13	ORIENTEERING/ROGAINING	18	17	96	1.6	0	
17	EQUESTRIAN	19	16	96	1.7	0	
27	SAILING	16	12	96	1.3	0	
10	SIGHTSEEING - GENERAL	22	17	95	1.4	0	
15	CAMPING/CARAVANNING	22	17	95	1.3	0	
24	CANOEING (TOURING MARATHON)	19	16	95	1.5	0	
28	WINDSURFING	17	12	95	1.2	0	
01	COACH TOURS/SCENIC DRIVING	22	17	95	1.4	0	
03	OFF ROAD DRIVING	19	16	93	1.4	0	
11	BUSH WALKING	18	15	93	1.3	0	
16	BARBEQUEING/PICNICKING	21	17	93	1.3	0	
12	TRAILS/CROSS COUNTRY RUNNING	15	13	93	1.1	0	
18	FIREWOOD GATHERING	16	13	93	1.1	0	
25	CANOEING (CASUAL)	15	13	92	1.2	0	
05	BIRD WATCHING	20	15	89	1.3	0	
02	CYCLE TOURIHNG	19	13	81	0.6	0	
19 27	TRAIN/EXERCISE DOMESTIC ANIMAL	15	12	80	0.5	0	
30	MARRONING	16	14	100	2.6	1	1*
09	ROCK HUNTING	11	8	99	1.4	1	6*
08	ROCK CLIMBING/ABSEILING	13	8	98	1.8	2	8*
26	WHITE WATER CANOEING	19	13	90	1.1	2	6*

* Crucial waterbody characteristic (e.g. rapids - white water canoeing) not present.

Total number of suitable activities - 27

WETLANDS USAGE REPORT

Activity Code		Activity Name	Total Items	Match Count	Pcnt Rank	Std Score	Miss Count	Miss Code
NORTH DANDALUP PIPEHEAD DAM (RESERVOIR)								
** Wetland R05AAAc								
04		RACE RALLY DRIVING	16	13	87	1.1	0	
06		NATURE STUDY	20	14	86	1.0	0	
20		MODEL BOATING	17	13	86	0.8	0	
29		LINE FISHING	14	11	86	0.9	0	
05		BIRD WATCHING	20	14	83	1.0	0	
18		FIREWOOD GATHERING	16	12	80	0.8	0	
07		PHOTOGRAPHY/PAINTING	19	14	77	0.5	0	
12		TRAILS/CROSS COUNTRY RUNNING	15	12	77	0.5	0	
10		SIGHTSEEING - GENERAL	22	15	74	0.4	0	
31		SWIMMING	15	11	74	0.4	0	
01		COACH TOURS/SCENIC DRIVING	22	15	74	0.4	0	
03		OFF ROAD DRIVING	19	13	72	0.4	0	
13		ORIENTEERING/ROGAINING	18	14	72	0.5	0	
14		BACK PACKING	21	12	63	0.2	0	
30		MARRONING	16	9	61	0.0	0	
16		BARBEQUING/PICNICKING	21	14	60	0.1	0	
11		BUSHWALKING	18	12	55	-0.1	0	
15		CAMPING/CARAVANNING	22	14	55	-0.1	0	
17		EQUESTRIAN	19	11	42	-0.5	0	
25		CANOEING (CASUAL)	15	10	37	-0.7	0	
02		CYCLE TOURING	19	11	37	-0.7	0	
19	22	TRAIN/EXERCISE DOMESTIC ANIMAL	15	10	35	-0.7	0	
08		ROCK CLIMBING/ABSEILING	13	7	92	1.1	2	8*
22		POWER BOATING	15	12	86	1.0	1	1*
23		SOCIAL WATER SKIING	15	11	77	0.4	2	1*
24		CANOEING (TOURING MARATHON)	19	12	63	0.3	1	1*
27		SAILING	16	9	56	0.1	2	1*
21		ROWING (CLUB)/CANOE RACING	18	9	53	0.1	2	1*
09		ROCK HUNTING	11	6	48	-0.4	1	6*
26		WHITE WATER CANOEING	19	8	42	-0.4	3	1*
28		WINDSURFING	17	8	34	-0.7	2	1*

Total number of suitable activities - 22

WETLANDS USAGE REPORT

MUNDARING WEIR (HELENA RESERVOIR)

Activity Code		Activity Name	Total Items	Match Count	Pcnt Rank	Std Score	Miss Count	Miss Code
** Wetland R02BAE								
20		MODEL BOATING	17	16	100	2.1	0	
22		POWER BOATING	15	15	100	2.3	0	
23		SOCIAL WATER SKIING	15	15	100	2.2	0	
29		LINE FISHING	14	14	100	2.4	0	
21		ROWING (CLUB)/CANOE RACING	18	14	99	1.5	0	
31		SWIMMING	15	14	99	2.1	0	
14		BACK PACKING	21	16	98	1.7	0	
06		NATURE STUDY	20	16	97	1.6	0	
07		PHOTOGRAPHY/PAINTING	19	16	97	1.5	0	
04		RACE RALLY DRIVING	16	14	96	1.4	0	
13		ORIENTEERING/ROGAINING	18	17	96	1.6	0	
17		EQUESTRIAN	19	16	96	1.7	0	
27		SAILING	16	12	96	1.3	0	
10		SIGHTSEEING - GENERAL	22	17	95	1.4	0	
15		CAMPING/CARAVANNING	22	17	95	1.3	0	
24		CANOEING (TOURING MARATHON)	19	16	95	1.5	0	
28		WINDSURFING	17	12	95	1.2	0	
01		COACH TOURS/SCENIC DRIVING	22	17	95	1.4	0	
03		OFF ROAD DRIVING	19	16	93	1.4	0	
11		BUSH WALKING	18	15	93	1.3	0	
16		BARBEQUEING/PICNICKING	21	17	93	1.3	0	
12		TRAILS/CROSS COUNTRY RUNNING	15	13	93	1.1	0	
18		FIREWOOD GATHERING	16	13	93	1.1	0	
25		CANOEING (CASUAL)	15	13	92	1.2	0	
05		BIRD WATCHING	20	15	89	1.3	0	
02		CYCLE TOURING	19	13	81	0.6	0	
19	27	TRAIN/EXERCISE DOMESTIC ANIMAL	15	12	80	0.5	0	
30		MARRONING	16	14	100	2.6	1	10*
09		ROCK HUNTING	11	8	99	1.4	1	6*
08		ROCK CLIMBING/ABSEILING	13	8	98	1.8	2	8*
26		WHITE WATER CANOEING	19	13	90	1.1	2	6*

* Crucial waterbody characteristic (e.g. rapids - white water canoeing) not present.

Total number of suitable activities - 27

APPENDIX B

WETLAND UNIT DETAILS - HELENA RESERVOIR

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========================    WETLAND UNIT DETAILS    ========================
Wetland code: R02BAE  Loc'n  E1:  420950 N1: 6463900  E2:  430000 N2: 6455500
Wetland name: HELENA (HELENA RESERVOIR)          Province:    0 S6 Veg No.:  21
Wetland type (1-Lake, 2-Stream, 3-Swamp):  1   Catchment type (1 to 999):   6
Length       (m):  12500   Width      (m):    300      Summer flow  (Y/N): N
Summer depth (m):  2.0  Winter depth (m):  2.0         Winter flow  (Y/N): N
Water quality    (1-Polluted, 2-Clean, 3-Potable): 3  Obstructions (Y/N): N
Bank slope            (1-Flat, 2-Medium, 3-Steep): 2  Fish         (Y/N): Y
Backshore slope       (1-Flat, 2-Medium, 3-Steep): 3  Water fowl   (Y/N): Y
Shore       (1-Swamp/marsh, 2-Sand/gravel 3-Rock): 2  Crossings    (Y/N): N
Largest veg'n  (1-Trees, 2-Scrub, 3-Ground cover): 1  Cliffs/Rock  (Y/N): N
Vegetation density  (1-Dense, 2-Medium, 3-Sparse): 2  Marron       (Y/N): N
Landscape type     (1-Natural, 2-Mixed, 3-Farmed): 1
Landscape diversity    (1-Diverse, 2-Homogeneous): 1
Road proximity     (1-Abuttal, 2-Close, 3-Remote): 2
Road type                (1-Nil, 2-Track, 3-Paved): 3
Metro proximity   (1-Close, 2-Moderate, 3-Remote): 1
Fringe land ownership       (1-Public, 2-Private): 1
Current use (1-Urban, 2-Semi/urb, 3-Farm, 4-Bush): 4
Future use  (1-Urban, 2-Semi/urb, 3-Farm, 4-Bush): 4
------------------------------------------------------------------------------
MEMOS (Ctrl-Home):-  Recreational:          Statutory:          Other:
   14  RIVER SECTION: HELENA RESERVOIR
       LANDFORM AND SOIL ASSOCIATION OF DARLING SYSTEM:
       My (Murray)

       Deeply incised valleys with red and yellow earths
       on slopes; narrow alluvial terraces.
   14  WAWA Catchment Area - Class II
       Catchment located within State Forest No. 7
       Area of Waterbody in summer extends to confluence
       of Helena River
   14
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WETLAND DETAILS - CANNING RESERVOIR

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========================     WETLAND UNIT DETAILS    ==========================
Wetland code: R03D    Loc'n  E1:  417650 N1: 6442250  E2:  420200 N2: 6435350
Wetland name: CANNING (CANNING DAM)              Province:    0 S6 Veg No.:  20
Wetland type (1-Lake, 2-Stream, 3-Swamp):  1   Catchment type (1 to 999):  10
Length       (m):   9100   Width     (m):    150      Summer flow  (Y/N): N
Summer depth (m):  2.0  Winter depth (m):  2.0        Winter flow  (Y/N): N
Water quality    (1-Polluted, 2-Clean, 3-Potable): 3  Obstructions (Y/N): N
Bank slope            (1-Flat, 2-Medium, 3-Steep): 2  Fish         (Y/N): Y
Backshore slope       (1-Flat, 2-Medium, 3-Steep): 3  Water fowl   (Y/N): N
Shore       (1-Swamp/marsh, 2-Sand/gravel 3-Rock): 2  Crossings    (Y/N): N
Largest veg'n  (1-Trees, 2-Scrub, 3-Ground cover): 1  Cliffs/Rock  (Y/N): N
Vegetation density  (1-Dense, 2-Medium, 3-Sparse): 1  Marron       (Y/N): Y
Landscape type     (1-Natural, 2-Mixed, 3-Farmed): 1
Landscape diversity    (1-Diverse, 2-Homogeneous): 1
Road proximity     (1-Abuttal, 2-Close, 3-Remote): 2
Road type                (1-Nil, 2-Track, 3-Paved): 3
Metro proximity   (1-Close, 2-Moderate, 3-Remote): 1
Fringe land ownership       (1-Public, 2-Private): 1
Current use (1-Urban, 2-Semi/urb, 3-Farm, 4-Bush): 4
Future use  (1-Urban, 2-Semi/urb, 3-Farm, 4-Bush): 4
------------------------------------------------------------------------------
MEMOS (Ctrl-Home):-  Recreational:          Statutory:          Other:
   46  RIVER SECTION:  CANNING RESERVOIR
       LANDFORM & SOIL ASSOCIATION OF DARLING PLATEAU:
       My (Murray)

       Large open water body by Dam Wall (900m x 1100m)
       Paved access to Dam Wall
       Public access within 2km of water body on farm
       roads only.
       Public access to dam wall only.  Access to the
       area within 2km of Reservoir prohibited.

       3 Arms of the Reservoir -  Deathadder Creek
                               -  Sunshine Creek
                                  (East Branch)
                               -  Canning River

   46  WAWA Catchment 8 - Class II
       Catchment located within State Forest No. 22
   46  Existing recreation areas include picnicking and
       barequeing facilities at the Dam Wall and
       downstream of the Weir.
==============================================================================
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WETLAND UNIT DETAILS - SOUTH CANNING RIVER

WETLAND UNIT DETAILS

Wetland code: R03G Loc'n E1: 420200 N1: 6435380 E2: 450300 N2: 6404000
Wetland name: CANNING (CANNING RIVER SOUTH) Province: 0 S6 Veg No.: 20
Wetland type (1-Lake, 2-Stream, 3-Swamp): 2 Catchment type (1 to 999): 0
Length (m): 50000 Width (m): 4 Summer flow (Y/N): N
Summer depth (m): 0.1 Winter depth (m): 0.2 Winter flow (Y/N): Y
Water quality (1-Polluted, 2-Clean, 3-Potable): 2 Obstructions (Y/N): Y
Bank slope (1-Flat, 2-Medium, 3-Steep): 2 Fish (Y/N): N
Backshore slope (1-Flat, 2-Medium, 3-Steep): 3 Water fowl (Y/N): Y
Shore (1-Swamp/marsh, 2-Sand/gravel 3-Rock): 2 Crossings (Y/N): Y
Largest veg'n (1-Trees, 2-Scrub, 3-Ground cover): 1 Cliffs/Rock (Y/N): N
Vegetation density (1-Dense, 2-Medium, 3-Sparse): 2 Marron (Y/N): Y
Landscape type (1-Natural, 2-Mixed, 3-Farmed): 1
Landscape diversity (1-Diverse, 2-Homogeneous): 1
Road proximity (1-Abuttal, 2-Close, 3-Remote): 2
Road type (1-Nil, 2-Track, 3-Paved): 2
Metro proximity (1-Close, 2-Moderate, 3-Remote): 1
Fringe land ownership (1-Public, 2-Private): 1
Current use (1-Urban, 2-Semi/urb, 3-Farm, 4-Bush): 4
Future use (1-Urban, 2-Semi/urb, 3-Farm, 4-Bush): 4

MEMOS (Ctrl-Home):- Recreational: Statutory: Other:

48 RIVER SECTION: CANNING RESERVOIR TO ORIGINS
LANDFORM AND SOIL ASSOCIATION OF DARLING PLATEAU:
My (Murray)

48 River located within Stage Forest No. 22 -
C.A.L.M Quarantine Area and Canning Catchment.

C36 - EAGLE HILL LOCALITY
- Management Priority Area
- Conservation Area for Flora & Fauna
- Inside Alcoa Mining Lease covers entire Canning Catchment.

48

WETLAND UNIT DETAILS - NORTH DANDALUP PIPEHEAD DAM

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========================     WETLAND UNIT DETAILS    ========================
Wetland code: R05AAAc Loc'n  E1:  407200 N1: 6401400  E2:  407500 N2: 6401550
Wetland name: NTH DANDALUP R - PIPEHEAD DAM    Province:    0 S6 Veg No.:  20
Wetland type (1-Lake, 2-Stream, 3-Swamp):  1   Catchment type (1 to 999):   0
Length       (m):    300   Width      (m):     50      Summer flow  (Y/N): N
Summer depth (m):  2.0  Winter depth (m):  2.0        Winter flow  (Y/N): Y
Water quality    (1-Polluted, 2-Clean, 3-Potable): 3  Obstructions (Y/N): Y
Bank slope            (1-Flat, 2-Medium, 3-Steep): 2  Fish         (Y/N): Y
Backshore slope       (1-Flat, 2-Medium, 3-Steep): 3  Water fowl   (Y/N): Y
Shore       (1-Swamp/marsh, 2-Sand/gravel 3-Rock): 2  Crossings    (Y/N): N
Largest veg'n  (1-Trees, 2-Scrub, 3-Ground cover): 1  Cliffs/Rock  (Y/N): N
Vegetation density  (1-Dense, 2-Medium, 3-Sparse): 1  Marron       (Y/N): Y
Landscape type     (1-Natural, 2-Mixed, 3-Farmed): 1
Landscape diversity    (1-Diverse, 2-Homogeneous): 1
Road proximity     (1-Abuttal, 2-Close, 3-Remote): 1
Road type                (1-Nil, 2-Track, 3-Paved): 2
Metro proximity   (1-Close, 2-Moderate, 3-Remote): 2
Fringe land ownership       (1-Public, 2-Private): 1
Current use (1-Urban, 2-Semi/urb, 3-Farm, 4-Bush): 4
Future use  (1-Urban, 2-Semi/urb, 3-Farm, 4-Bush): 4
------------------------------------------------------------------------------
MEMOS (Ctrl-Home):-  Recreational:          Statutory:          Other:
   67  RIVER SECTION: PIPEHEAD DAM
       LANDFORM AND SOILS ASSOCIATION OF DARLING SYSTEM:
       My (Murray)
   67  W.A.W.A Catchment 15, Class I
       Catchment within State Forest
   67
==============================================================================
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WETLAND DETAILS - HELENA RESERVOIR (RAISED)

WETLAND UNIT DETAILS

Wetland code: R09A Loc'n E1: 420950 N1: 6463900 E2: 433550 N2: 6451200
Wetland name: HELENA RESERVOIR (RAISED) Province: S6 Veg No.: 21
Wetland type (1-Lake, 2-Stream, 3-Swamp): 1 Catchment type (1 to 999): 6
Length (m): 16800 Width (m): 400 Summer flow (Y/N): N
Summer depth (m): 2.0 Winter depth (m): 2.0 Winter flow (Y/N): N
Water quality (1-Polluted, 2-Clean, 3-Potable): 3 Obstructions (Y/N): N
Bank slope (1-Flat, 2-Medium, 3-Steep): 2 Fish (Y/N): Y
Backshore slope (1-Flat, 2-Medium, 3-Steep): 3 Water fowl (Y/N): Y
Shore (1-Swamp/marsh, 2-Sand/gravel 3-Rock): 2 Crossings (Y/N): N
Largest veg'n (1-Trees, 2-Scrub, 3-Ground cover): 1 Cliffs/Rock (Y/N): N
Vegetation density (1-Dense, 2-Medium, 3-Sparse): 2 Marron (Y/N): N
Landscape type (1-Natural, 2-Mixed, 3-Farmed): 1
Landscape diversity (1-Diverse, 2-Homogeneous): 1
Road proximity (1-Abuttal, 2-Close, 3-Remote): 2
Road type (1-Nil, 2-Track, 3-Paved): 3
Metro proximity (1-Close, 2-Moderate, 3-Remote): 1
Fringe land ownership (1-Public, 2-Private): 1
Current use (1-Urban, 2-Semi/urb, 3-Farm, 4-Bush): 4
Future use (1-Urban, 2-Semi/urb, 3-Farm, 4-Bush): 4

MEMOS (Ctrl-Home):- Recreational: Statutory: Other:
136
136
136

WETLAND DETAILS - CANNING DAM(RAISED)

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========================     WETLAND UNIT DETAILS    ==========================
Wetland code: R09B    Loc'n  E1:  417650 N1: 6442250  E2:  422200 N2: 6438950
Wetland name: CANNING DAM (RAISED)                Province:      S6 Veg No.:  20
Wetland type (1-Lake, 2-Stream, 3-Swamp):  1   Catchment type (1 to 999):  10
Length       (m):  13100   Width      (m):    500      Summer flow  (Y/N): N
Summer depth (m):  2.0  Winter depth (m):  2.0         Winter flow  (Y/N): N
Water quality    (1-Polluted, 2-Clean, 3-Potable): 3   Obstructions (Y/N): N
Bank slope             (1-Flat, 2-Medium, 3-Steep): 2   Fish         (Y/N): Y
Backshore slope        (1-Flat, 2-Medium, 3-Steep): 3   Water fowl   (Y/N): N
Shore       (1-Swamp/marsh, 2-Sand/gravel 3-Rock): 2   Crossings    (Y/N): N
Largest veg'n  (1-Trees, 2-Scrub, 3-Ground cover): 1   Cliffs/Rock  (Y/N): N
Vegetation density  (1-Dense, 2-Medium, 3-Sparse): 1   Marron       (Y/N): Y
Landscape type     (1-Natural, 2-Mixed, 3-Farmed): 1
Landscape diversity    (1-Diverse, 2-Homogeneous): 1
Road proximity     (1-Abuttal, 2-Close, 3-Remote): 2
Road type                (1-Nil, 2-Track, 3-Paved): 3
Metro proximity   (1-Close, 2-Moderate, 3-Remote): 1
Fringe land ownership       (1-Public, 2-Private): 1
Current use (1-Urban, 2-Semi/urb, 3-Farm, 4-Bush): 4
Future use  (1-Urban, 2-Semi/urb, 3-Farm, 4-Bush): 4
------------------------------------------------------------------------------
MEMOS (Ctrl-Home):-  Recreational:         Statutory:         Other:
  137
  137
  137
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WETLAND DETAILS - SOUTH CANNING DAM

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========================    WETLAND UNIT DETAILS    ========================
Wetland code: R09C    Loc'n  E1:  425100 N1: 6429800  E2:  438900 N2: 6416400
Wetland name: SOUTH CANNING DAM                 Province:      S6 Veg No.:  20
Wetland type (1-Lake, 2-Stream, 3-Swamp):  1   Catchment type (1 to 999):  10
Length       (m):  25100   Width      (m):    750      Summer flow  (Y/N): N
Summer depth (m):  2.0  Winter depth (m):  2.0         Winter flow  (Y/N): N
Water quality    (1-Polluted, 2-Clean, 3-Potable): 3   Obstructions (Y/N): N
Bank slope             (1-Flat, 2-Medium, 3-Steep): 2   Fish         (Y/N): Y
Backshore slope        (1-Flat, 2-Medium, 3-Steep): 3   Water fowl   (Y/N): Y
Shore       (1-Swamp/marsh, 2-Sand/gravel 3-Rock): 2   Crossings    (Y/N): N
Largest veg'n  (1-Trees, 2-Scrub, 3-Ground cover): 1   Cliffs/Rock  (Y/N): N
Vegetation density  (1-Dense, 2-Medium, 3-Sparse): 2   Marron       (Y/N): N
Landscape type     (1-Natural, 2-Mixed, 3-Farmed): 1
Landscape diversity    (1-Diverse, 2-Homogeneous): 1
Road proximity     (1-Abuttal, 2-Close, 3-Remote): 2
Road type                (1-Nil, 2-Track, 3-Paved): 3
Metro proximity   (1-Close, 2-Moderate, 3-Remote): 1
Fringe land ownership       (1-Public, 2-Private): 1
Current use (1-Urban, 2-Semi/urb, 3-Farm, 4-Bush): 4
Future use  (1-Urban, 2-Semi/urb, 3-Farm, 4-Bush): 4
------------------------------------------------------------------------------
MEMOS (Ctrl-Home):-  Recreational:         Statutory:         Other:
  139
  139
  139
==============================================================================
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WETLAND DETAILS - NORTH DANDALUP DAM

WETLAND UNIT DETAILS

Wetland code: R09D Loc'n E1: 407200 N1: 6401400 E2: 411800 N2: 6402250
Wetland name: NORTH DANDALUP DAM Province: S6 Veg No.: 20
Wetland type (1-Lake, 2-Stream, 3-Swamp): 1 Catchment type (1 to 999): 19
Length (m): 3900 Width (m): 600 Summer flow (Y/N): N
Summer depth (m): 2.0 Winter depth (m): 2.0 Winter flow (Y/N): N
Water quality (1-Polluted, 2-Clean, 3-Potable): 3 Obstructions (Y/N): N
Bank slope (1-Flat, 2-Medium, 3-Steep): 2 Fish (Y/N): Y
Backshore slope (1-Flat, 2-Medium, 3-Steep): 3 Water fowl (Y/N): Y
Shore (1-Swamp/marsh, 2-Sand/gravel 3-Rock): 2 Crossings (Y/N): N
Largest veg'n (1-Trees, 2-Scrub, 3-Ground cover): 1 Cliffs/Rock (Y/N): N
Vegetation density (1-Dense, 2-Medium, 3-Sparse): 2 Marron (Y/N): Y
Landscape type (1-Natural, 2-Mixed, 3-Farmed): 1
Landscape diversity (1-Diverse, 2-Homogeneous): 1
Road proximity (1-Abuttal, 2-Close, 3-Remote): 2
Road type (1-Nil, 2-Track, 3-Paved): 3
Metro proximity (1-Close, 2-Moderate, 3-Remote): 2
Fringe land ownership (1-Public, 2-Private): 1
Current use (1-Urban, 2-Semi/urb, 3-Farm, 4-Bush): 4
Future use (1-Urban, 2-Semi/urb, 3-Farm, 4-Bush): 4

MEMOS (Ctrl-Home):-	Recreational:	Statutory:	Other:
138			
138			
138			