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141 ST GEORGE'S TERRACE

PREPARED FOR:

Main Roads Western Australia

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Date:

August 1993

INVITATION

The Environmental Protection Authority (EPA) invites people to make a submission on this proposal.

The Consultative Environmental Review (CER) proposes the bypassing of the Northam townsite by the Great Eastern Highway. In accordance with the Environmental Protection Act, a CER has been prepared which describes this proposal and its likely effects on the environment. The CER is available for a public review period of 4 weeks from August 9, 1993, closing on September 3, 1993.

Following receipt of comments from government agencies and the public, the EPA will prepare an assessment report with recommendations to the government, taking into account issues raised in public submissions.

Why write a submission?

A submission is a way to provide information, express your opinion and put forward your suggested course of action - including any alternative approach. It is useful if you indicate any suggestions you have to improve the proposal.

All submissions received by the EPA will be acknowledged. Submissions may be fully or partially utilised in compiling a summary of the issues raised, or where complex or technical issues are raised, a confidential copy of the submission (or part thereof) may be sent to the proponent. The summary of issues raised is normally included in the EPA's assessment report. Submitters would not be identified to the proponent without the submitters permission.

Why not join a group?

If you prefer not to write you own comments, it may be worthwhile joining with a group or other groups interested in making a submission on similar issues. Joint submissions may help to reduce the workload for an individual or group as well as increase the pool of ideas and information. If you form a small group (up to 10 people) please indicate all the names of the participants. If your group is larger, please indicate how many people your submission represents.

Developing a submission

You may agree or disagree with, or comment on, the general issues discussed in the CER or the specific proposals. It helps if you give reasons for your conclusions, supported by relevant data. You may make an important contribution by suggesting ways to make the proposal environmentally more acceptable.

When making comments on specific proposals in the CER:

- □ Clearly state your point of view;
- □ Indicate the source of your information or argument if this is applicable;
- □ Suggest recommendations, safeguards or alternatives.

Points to keep in mind

By keeping the following points in mind, you will make it easier for your submission to be analysed:

- attempt to list points so that issues raised are clear. A summary of your submissions is helpful;
- refer each point to the appropriate section, chapter or recommendation in the CER;
- if you discuss different sections of the CER, keep them distinct and separate, so there is no confusion as to which section you are considering;
- attach any factual information you may wish to provide and give details of the source. Make sure your information is accurate.

Remember to include:

- □ your name
- □ address
- □ date.

The closing date for submission is September 3, 1993.

Submissions should be addressed to:

The Environmental Protection Authority 'Westralia Square' 141 St Georges Terrace Perth 6000

Attention: Nicholas Wimbush

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1.0 INTRODUCTION

1.1 Purpose of the Document

The purpose of this document is to undertake an environmental impact assessment of the Northam Bypass proposal and to present environmental management strategies and commitments to mitigate the potential impacts.

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1.2 Background

Northam is a moderately sized town (population approximately 6600) on the Great Eastern Highway about 97 kilometres east of Perth (see Plan 1). The town acts as a hub for the local farming community with roads radiating out from the business centre located about Fitzgerald Street which currently forms part of the Great Eastern Highway.

It was during the late 1950's and early 1960's that consideration was first given to a bypass around Northam.

In 1967, two schemes were proposed by the Main Roads and preliminary layouts subsequently submitted to Council. One Scheme involved an alignment over the disused goldfields railway reserve through town, and the other scheme focused on the south bank of the Avon River.

The Northam Town Council opposed the railway reserve scheme and initiated detailed investigation of the south bank scheme in 1971.

Plans were submitted to Council for their deliberation and in 1973 the Town Clerk requested that Main Roads investigate the feasibility of a northern bypass as an alternative to the river side proposal which had numerous problems.

Plans for a staged northern bypass were submitted to Council in 1974 and an agreement in principle to the proposal followed.

The Main Roads advised the Northam Town Council in February 1975 that the Great Eastern Highway was now classified as a National Highway under the National Roads Act, 1974 and that the Commonwealth would be involved in the planning and construction of the highway, including any bypass proposals.

Uncertainty followed the Commonwealth's announcement and it was not until enquiries made through the Minister for Transport in 1978 in support for a bypass road led to a formal response from the Commonwealth. In 1979 the Minister for Transport replied indicating that the bypass proposal was dependent upon finances and other priorities. Furthermore, it was suggested that possible disadvantages of a bypass route, such as loss of business in Northam, could result in opposition from the business community.

At a meeting with the Hon. Minister for Transport in March 1986 both Shire Council and Town Council expressed a desire for the bypass route to be constructed as soon as possible. In September 1986 the Northam Town Council indicated some favourable aspects of a northern bypass route along the north bank of the Avon River, but were concerned over the possible effects on the river and the potential for increased flooding.

A flood study (Binnie and Partners, 1985) had been carried out for the Water Authority by consulting engineers Binnie and Partners in which a computer model of the river through Northam had been created. Given their background in the study area, Binnie and Partners were subsequently commissioned by Main Roads to investigate the effects of various alignments on the Avon River both from the point of view of encroachment into the river by road embankment and also the effect of the various bridge sites (Binnie and Partners, 1987).

The conclusions of this study were that a bypass road along the northern bank of the Avon River would have minimal effect on flood levels in Northam if sited clear of the main flood channel.

At this stage there was still conjecture and uncertainty over the most suitable bypass alignment and in October 1988 the Hon. Minister for Transport and Planning established the Northam Bypass Steering Committee with the following Terms of Reference:

'To recommend to Government a project for the bypassing of Northam townsite by Great Eastern Highway.'



The Steering Committee comprised of representatives from the Town of Northam, Shire of Northam, Environmental Protection Authority, State Planning Commission and the Main Roads Department. The Steering Committee initiated investigations and studies of the various bypass options and embarked on a public consultation process. To assist in this matter, a discussion paper was prepared by Main Roads to present the results of investigations into alternative routes for bypassing Northam.

A total of 9 bypass routes were examined and a comparison of the routes from various engineering, social and environmental criteria was undertaken. The paper put forward rationale for the selection of 3 alternatives known as Routes 6, 6A and 9 which were described as practical alternatives for bypassing Northam (see Section 3.0 for more details).

The Northam Bypass Steering Committee recommended to Government in 1989 that Route 6 be selected as the preferred route alignment. In 1990, this decision was endorsed by the Minister for Transport.

1.3 Scope of Assessment

The Northam Bypass proposal was referred to the EPA and a formal level of assessment being a Consultative Environmental Review (CER) was set. In December 1992 the EPA's CER Guidelines (see Appendix 1) were issued outlining the purpose, objectives, key issues and other relevant information associated with the preparation of the bypass proposal's environmental documentation.

The CER Guidelines require an environmental impact assessment of the three route alignments (ie Route 6, 6A and 9) having regard for the future duplication of the carriageway. The environmental management strategies formulated to overcome or ameliorate the identified impacts was to focus on the preferred route alignment (ie, Route 6).

1.4 The Proponent

The proponent as nominated under the Environmental Protection Act 1986 - Section 38 (6) is Main Roads Western Australia (hereafter referred to as Main Roads).

Main Roads in co-operation with Local Government, manages the States road network for the efficient and safe movement of people and goods as part of an integrated transportation system. This includes the requirement to manage, maintain and upgrade a valuable State asset, in an efficient, effective and environmentally sensitive manner.

Main Roads will be responsible for design and construction of the road and the management of the environmental impacts associated with the project.

Main Roads has over the years, successfully constructed and maintained many roads through areas of regional significance having regard to their value for conservation, roadside display, recreation or scientific study.

Northam Bypass Consultative Environmental Review

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2.0 NEED FOR THE PROPOSAL

2.1 Problems With Existing Alignment

The existing alignment of Great Eastern Highway through the town of Northam has inherent local traffic, environmental and community imposition problems that can be alleviated by a bypass road.

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2.1.1 Traffic

The Great Eastern Highway provides direct access to adjoining residential properties, commercial and retail businesses and serves as an important regional and interstate transport route. The existing alignment therefore operates as a local access, district distributor and primary distributor road. These "hierarchical" functions are clearly incompatible with a National Highway with the problem being exacerbated by the number of right angle turns which traffic must negotiate in using Great Eastern Highway within the town.

More specifically there are a number of additional factors that contribute to the unsatisfactory traffic and transport characteristics of the existing Great Eastern Highway alignment through Northam namely:

- Serious congestion presently occurs in Fitzgerald Street (Northam CBD) which has an annual average daily traffic (AADT) of approximately 7000 vehicles per day (VPD), including 10% heavy vehicles.
- Accident history during the 1/1/85 to 31/5/90 period revealed that 257 traffic accidents were recorded on the Great Eastern Highway in the vicinity of and within the Northam townsite, including two fatalities. Statistics of interest include:

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-	Collisions at right angles	32%
-	Sideswipe accidents	21%
-	Rear end collisions	17%
-	Non-collision accidents	7%

Of the accidents recorded, 82% occurred on straight and level sections of Great Eastern Highway/Fitzgerald Street due to existing congestion and conflict between local and through traffic.

- □ On technical terms, the deficiencies of the existing highway, including geometric design, is highlighted by current National Association of Australian State Road Authorities (NAASRA) levels of service ratings. During Normal working hours, drivers along Fitzgerald Street are severely restricted in their freedom to select their desired speed and to manoeuvre within the traffic stream. The document "Standards and Guidelines for the Construction of National Highways" (March 1987) reveals that consideration should be given to relocating the highway if service levels are unacceptable or adverse environmental impact on the town community exists (see Section 2.1.2). On both of these counts, it appears a warrant exists for a bypass at Northam.
- □ The NAASRA Guidelines also suggest that as far as practicable, all "at grade" railway crossings (ie road and railway at same level) should be eliminated and also the control of access should be obtained where driveways will affect the level of services or safety on the highway.

For the bypass route, grade separation between road and rail is necessary for two locations where the bypass and standard gauge railway intersect. This involves road overpasses immediately to the west of the Avon River (north-west of town), and to the east of the Mortlock River (north-east of town).

Further to the above, to control access to/from the bypass route, three other locations along the bypass require grade separation with existing road networks, these being:

- □ Bypass over Northam-Toodyay Road;
- □ Bypass over Moore Street;
- □ Northam-Pithara Road over Bypass.

Northam Bypass Consultative Environmental Review

At each of these locations, access road connections with the bypass will be provided.

2.1.2 Environmental

The abovementioned traffic problems transpose into actual and potential environmental problems. Slow moving traffic under constant acceleration, deceleration and braking constraints produce greater amounts of air and noise pollution.

The main air pollution constituents of concern relate to carbon monoxide (a greenhouse gas), hydrocarbons (organic compounds) and heavy metals (principally lead from leaded petrol) which emanate from the combustion of petroleum based fuels.

Carbon monoxide (CO) mixes with atmospheric gases and has been identified as a greenhouse gas. Hydrocarbons and lead are heavier than air and settle out in close proximity to the road surface. Once settled, these contaminants may be washed off the road and incorporated into the stormwater drainage system.

The stop-start traffic movements and high incidence of right angle turns also increases the risk of the accidental spillage of toxic and/or hazardous materials. To date, the Northam community has been fortunate in this regard, however, many Northam residents have expressed their concerns regarding the implications of potential chemical spills and believe the present alignment relates to "an accident waiting to happen" situation.

Noise related environmental impacts on the Northam community is a result of vehicle engines and other moving parts (particularly truck and motor vibrations) as traffic moves through the Northam townsite. Residents have noted their concerns with respect to truck and general traffic movements particularly during the night hours. The condition of the road, numerous rail and bridge crossings together with the stop-start nature of the existing Great Eastern Highway/Fitzgerald Street alignment combine to produce elevated noise levels along the route. Whilst no studies have been undertaken in this regard, community input received during the assessment process confirms this observation.

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2.1.3 Community Imposition

The current alignment of Great Eastern Highway/Fitzgerald Street through Northam also creates additional problems for the Northam community apart from the aforementioned road user and environmental aspects.

The majority of Northam's business and retail community is concentrated around Fitzgerald Street and therefore attracts a significant amount of people wishing to utilise these services. Kerbside parking facilities feature along key locations of Fitzgerald Street in order to cope with demands. As Fitzgerald Street also functions as a primary distributor, there is always conflict between the users of commercial/retail facilities (ie the local community) and through town traffic (ie local, regional and interstate travellers). Traversing one side of Fitzgerald Street to the other during business hours can result in considerable delays due to persistence of traffic flows.

The dual use of this main street therefore constitutes a safety problem that can be resolved with the provision of a bypass road to take through traffic away from Fitzgerald Street and out of the Northam townsite.

2.2 Community Needs

Key issues raised by the Northam community regarding problems with the existing alignment of Great Eastern Highway through Northam are as follows:

- reduces the amenity of shopping in premises on the main road;
- reduces the accessibility and circulation of vehicles to the commercial areas and throughout the town generally;
- □ reduces the amenity of the surrounding residential environment;
- increases the chance for pedestrian/vehicle and vehicle/vehicle conflicts and property damage through accidents; and
- □ the current alignment has localised noise and pollution problems.

The realignment of Great Eastern Highway will reduce these adverse community impacts. The new alignment whilst resolving these problems, will need to retain the accessibility and convenience to Northam's business district. Through examination of the current adverse situation, historical events leading to the present and consideration of issues and concerns raised during the CER's public participation and consultation program, it is possible to identify community needs to be taken into account during the assessment of a bypass proposal.

These include:

- relocating through traffic (particularly heavy vehicles) to a route alignment removed from Northam's main street (ie Fitzgerald Street);
- improving the local traffic flows and access around Northam's CBD in order to achieve a safer, less polluted environment for the local and regional uses of the town's retail and commercial facilities;
- maintaining a degree of visual contact to the Northam townsite that benefits local business houses;
- □ the need to encourage people to stop in Northam by -
 - having easy access to the Town Centre;
 - designing appropriate signage; and
 - constructing information bays.

3.0 EVALUATION OF ALTERNATIVES

The three Northam Bypass alignments under consideration in the evaluation of alternatives and assessed from an environmental impact perspective in this CER are Routes 6, 6A and 9 (see Plans 2, 3 and 4 respectively). Consideration was also given to the "do nothing" approach which relates to retaining the existing Great Eastern Highway through the town centre.

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Northam Bypass Routes 6, 6A and 9 all commence along the Great Eastern Highway at 88.9 SLK (ie straight line kilometres from Perth) and rejoin the existing highway at 102.0 SLK. This corresponds to 3.5 kilometres west of Northam and 7.5 kilometres east of Northam respectively. The existing Great Eastern Highway/Fitzgerald Street alignment is 13.1 kilometres long between these points.

3.1 Route 6

Route 6, selected as the preferred bypass alignment by the Northam Bypass Steering Committee, was subsequently approved and publicly announced by the Minister for Transport in 1990 (see Plan 2).

The route is 13.4 kilometres long and traverses two railway lines, two rivers and three roads. A total of eight new bridges are required for Route 6 which includes the Northam-Pithara Road bridge over the bypass. In 1993 terms, the Route 6 alignment would cost approximately \$38 million to construct.

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The initial section of the bypass passing to the north of Mount Ommanney and bridging over the Northam-Toodyay Road is common to all three alignments. Route 6 then traverses the Standard Gauge Railway and Avon River requiring bridge structures of 80 metres and 190 metres long respectively.

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The Route 6 alignment continues along the north bank of the Avon River for some 2 kilometres, passing the Cemetery and a re-aligned Irishtown Road before a small bypass bridge over Moore Street is required.

Travelling toward the Doctors Hill locality, the Northam-Pithara Road will require a 71 metre long bridge structure (including a dual use pathway) over the bypass road where two one-way connections will provide bypass entry and exit points, primarily for local traffic purposes.

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Route 6 passes through the Doctors Hill locality where large cuts will be required in order to achieve acceptable grades. The cuts will assist in attenuating traffic generated noise, thereby minimising noise impacts to residents. Another two bridges are required over the Mortlock River (north branch) and a bridge over the narrow gauge railway before the Route 6 alignment runs behind the Northam Racecourse to finally link up with the existing Great Eastern Highway.

3.2 Route 6A

Route 6A (see Plan 3) was put forward as an amended alignment of Route 6 with the intent of improving rail and Avon River crossings with less direct intrusion on the Cemetery and Avon River floodplain. Route 6A is 13.7 kilometres long and crosses two railway lines, two rivers and three roads. A total of nine new bridges are required for Route 6A which includes the Northam-Pithara Road bridge over the bypass and an additional bridge over Katrine Road. In 1993 terms, the Route 6A alignment would cost just over \$40 million to construct.

The initial section of this alignment up to the Northam-Toodyay Road is common to all three route alignment alternatives, however a wide arc extending behind the Cemetery allows shorter bridge structures over the standard gauge railway and Avon River due to skew reductions. A large cutting is required behind the Cemetery with associated additional costs.

Route 6A then aligns along the north bank of the Avon River and rejoins the Route 6 alignment around Irishtown Road. The total distance Route 6A travels along the Avon River bank is approximately 600 metres.

Travelling toward the Doctors Hill locality, the Northam-Pithara Road will require a 71 metre long bridge structure (including a dual use pathway) over the bypass road where

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two one-way connections will provide bypass entry and exit points, primarily for local traffic purposes.

Route 6A passes through the Doctors Hill locality where large cuts will be required in order to achieve acceptable grades. The cuts will assist in attenuating traffic generated noise, thereby minimising noise impacts to residents.

Another two bridges are required over the Mortlock River (north branch) and a bridge over the narrow gauge railway before the Route 6A alignment runs behind the Northam Racecourse to finally link up with the existing Great Eastern Highway.

3.3 **Route 9**

The Route 9 alignment (see Plan 4) was put forward as an alternative that did not run along the north bank of the Avon River or traverse the Doctors Hill locality, thereby negating the environmental and social impacts associated with Route 6 and 6A. Route 9 does however possess property severance problems that may jeopardise the economic viability of some farming operations within the vicinity.

Route 9 is 14.5 kilometres long and crosses two railway lines, two rivers and four roads. A total of eight new bridges are required to pass over these features. In 1993 terms, the Route 9 alignment would cost approximately \$32 million to construct.

The initial section of this alignment up to Northam-Toodyay Road is common to all three route alignment alternatives. Past this point, Route 9 traverses an arc through rural farming land requiring bridges over the railway, Avon River, Katrine Road and Irishtown Route 9 then passes over the Northam-Pithara Road, behind the Doctors Hill Road. locality and to the north of the Northam Racecourse to finally link up with the existing Great Eastern Highway.

The "Do Nothing" Approach 3.4

In the evaluation of alternatives, it is also necessary to examine the existing situation where the Great Eastern Highway passes through Northam. This is termed the "do nothing" approach. The implications of the "do nothing" approach have been previously considered in the discussion regarding the Need for the Proposal (Section 2.0).

There are a range of traffic, environmental and social related problems with the existing alignment and these are reiterated accordingly.

3.4.1 Traffic

The Great Eastern Highway provides direct access to adjoining residential properties, -commercial and retail businesses and serves as an important intra regional and interstate transport route. In Northam, the highway effectively operates as a local access, district distributor and primary distributor road. These "hierarchical" functions are incompatible with smooth traffic flows and this problem is exacerbated by the number of right angle turns which traffic must negotiate in using Great Eastern Highway within the town.

More specifically, the existing Great Eastern Highway possesses the following:

Serious congestion presently in Fitzgerald Street (Northam CBD) which has an average annual daily traffic volume of 7,000 vehicles per day, including 10% heavy vehicles;

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- □ In terms of accident history, during the 1/1/85 to 31/5/90 period, 257 traffic accidents were recorded on Great Eastern Highway in the vicinity of, and within the Northam townsite, including two fatalities. Statistics of interest include:
 - Collisions at right angles 32%
 - Sideswipe accidents 21%
 - Rear end collisions 17%
 - Non-collision accidents 7%

Of the accidents recorded, 82% occurred on straight and level sections of Great Eastern Highway/Fitzgerald Street, resulting from existing levels of congestion on this road in addition to conflict between local and through traffic;

- Pavement condition of the existing Great Eastern Highway is sub-standard, as over half the road is in excess of 30 years old and is deteriorating, with cracking and deformation being ongoing problems;
- □ The service levels required to maintain the Great Eastern Highway to an acceptable standard are excessive.



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□ No Control of Access throughout the town of Northam constitutes a safety problem.

3.4.2 Environmental

There are a range of environmental adversities with the existing alignment, such as:

□ Air pollution problems through stop-start traffic movements;

□ High risk of chemical spillage associated with the heavy vehicle through traffic which must negotiate a number of railway crossings, right angle turns and a set of traffic lights; and

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□ Elevated noise levels due to the close proximity of traffic movements to the town centre and nearby residential areas.

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3.4.3 Social

There are also social impacts such as:

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- loss of amenity in town centre;
- inconvenience of vehicle access and pedestrian crossing due to congested traffic movements;

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- conflict between local road users and through traffic (particularly trucks).

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These factors combine to create a relatively unpleasant town centre in Northam where the "do nothing" approach will effectively continue to result in unacceptable community impacts indefinitely.

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3.5 The Preferred Bypass Alignment

During the Steering Committee investigations, Routes 6, 6A and 9 were the focus of further bypass route option analysis and formed the basis of the public meeting held at the Northam Town Hall in December 1989.

Information and written submissions collected from this public participation process did not show that there was a clearly favoured bypass route. Most people did, however, agree that a bypass was needed. In addition to the written submissions, a petition containing 445 signatures in favour of Route 6, which was organised by the Northam Chamber of Commerce, was forwarded to the Steering Committee and the Minister for Transport. Route 6 was also supported by the Northam Region Promotion Association and by the Central Regional Development Advisory Committee.

The main reason for the Chamber of Commerce supporting Route 6 was the perceived --need to have a bypass alignment as close as possible to the town centre to ensure travellers can still see Northam.

Two meetings involving both the Northam Shire and Town Councils were held as part of the process of considering the bypass route options.

The first joint Council meeting was held in November 1989 and its prime purpose was to explain to all Councillors the information which was to be presented at the aforementioned December 1989 public meeting.

Prior to the public meeting, the Shire Council expressed a preference for Route 6 whilst the Town Council preferred the Route 9 alignment.

The second joint Council meeting was held in August 1990 and chaired by the Commissioner of Main Roads. The work of the Steering Committee and the results of the public participation was reported at the meeting. The main items to emerge from the discussion were:

- \Box the cross-town function offered by Route 6 which was closer to the town centre;
- the additional costs likely to be required to address the severance affects on large farms traversed by Route 9;
- \Box the effects of noise from Route 6 in the Doctors Hill locality;
- the significance of environmental impacts along the Avon River associated with Route
 6;
- Route 6 was likely to require a formal level of environmental assessment whereas Route 9 would probably require a lower level of environmental assessment, possibly informal.

A vote was taken at the conclusion of this meeting and a majority of Councillors preferred Route 6.

Main Roads Western Australia also expressed preference for Route 6 based on overall planning considerations including the facilitation of cross-town movements offered by Route 6. Also, given that the alignment has been known for a long period of time, a significant number of properties along this alignment had been acquired over the years. In addition, planning of adjacent development has taken account of the proposed bypass road along the Route 6 alignment.

Having considered the results of the investigations and studies regarding various route options, as well as the results of the public meeting, written submissions and the outcome of joint Council meetings, the Northam Bypass Steering Committee recommended the following:

- □ Route 6 be developed as the bypass to Northam;
- Detailed planning, engineering and environmental impact investigations proceed and that necessary clearances be obtained for Route 6;
- □ The Main Roads Department seek appropriate funding for the project; and
- An Advisory Committee with membership based on the existing Steering and Technical Committees be established to assist with development of the bypass project.

The Steering Committees recommendations regarding the Northam Bypass Route 6 alignment were presented to the Minister for Transport and subsequently accepted as the preferred bypass alignment. On October 11, 1990 the Minister's decision was publicly announced and pre-construction activities were initiated.

4.0 DESCRIPTION OF THE PROPOSAL

4.1 Approach/Design Philosophy

4.1.1 General

Standards to be adopted for this project are in accordance with the document "Standards and Guidelines for the Construction of National Highways - March 1987" except that the shoulder and sealed shoulder widths are to be to the higher standard for consistency with the adjacent sections.

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A brief summary of these standards is as follows:

Horizontal Design Speed	110 km/h minimum
Vertical Design Speed	110 km/h minimum
Sealed Pavement Width	7.0m
Shoulder Width	2 x 2.0m
Sealed Shoulder Width	2 x 1.0m
Road Markings	lane separation and edge lines

Where widening will be undertaken through major cuttings to allow for future duplication, a median width of 15m will be allowed for.

All new river bridges will be designed to cater for a 100 year Average Recurrence Interval (ARI) flow while other transverse drainage structures will be designed to cater for a 50 year ARI.

These standards are consistent with the adjacent sections except that the total seal width west of the Bypass is 9.4m compared to the proposed 9.0m for the Bypass.

4.1.2 Cross Section

The proposed cross section for the Bypass, which is typical along the entire route, is shown in Plan 5. All bridges less than 20m long will be 11.0m wide between kerbs to match the carriageway formation width on the approaches. Bridges greater than 20m long will be 9.4m wide between kerbs (traffic lanes plus 2.4m). Plans 5 and 6 show typical cross sections along the Avon River and Doctors Hill locality.

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4.1.3 Longitudinal Profile

The proposed longitudinal profile for the Bypass results in 4.2% maximum grades. The difference between the proposed levels on the Bypass and the existing levels at major bridge locations are 4.2m at Northam-Toodyay Road, 8.1m at Moore Street and 6.75m at Northam-Goomalling Road. Significant earthworks at certain points of the Bypass result in large cuttings of up to 8.2 metres deep and fills up to 12.0 metres high.

4.1.4 Pavement

Pavement thickness design will be in accordance with Main Roads Engineering Route Note 9, "Procedure for Thickness Design of Flexible Pavement" which is based on the NAASRA Structural Design of Road Pavements - A Guide (1987). Engineering Road Note 9 incorporates the results of research and investigations which relate specifically to Western Australia.

Pavement design life for this project is 40 years.

4.1.5 Intersections

All intersections will be upgraded according to their importance with left and right turning lanes being provided in the majority of cases. The treatment of intersections will be based on NAASRA "Guide to Traffic Engineering Practice - Intersections at Grade (1988)."

4.2 **Project Scope**

4.2.1 Roadworks

It is proposed to construct a bypass of the Northam townsite by the Great Eastern Highway commencing at 88.90 SLK and rejoining the existing highway at 102.00 SLK. The total length of the Bypass is 13.4km.

A concept plan of the Route 6 bypass alignment and its intersection with the existing road network is provided on Plan 2.

In order to make provision for eventual duplication, roadworks for Stage 1 will include widening of the major cuts to the ultimate duplication width and the placing of excess fill material on the duplication alignment where appropriate. It is anticipated that the



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NORTHAM BYPASS PROPOSAL

TYPICAL CROSS SECTION OF ROUTE 6 ALIGNMENT ALONG NORTH BANK OF AVON RIVER NEAR CEMETERY



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construction of the Northam Bypass Stage 1 would commence in mid 1996 and require 2-3 years to complete.

During this period, all intersections will be upgraded according to their importance with left and right turning lanes being provided in the majority of cases.

4.2.2 Bridges

A total of eight new bridges are required for the construction of the Bypass as detailed below:

- Bypass over Northam-Toodyay Road (16.5m long, 11.0m wide, 25° skew)
- Bypass over Standard Gauge Railway (3 tracks)
 (80m long, 9.4m wide, 53° skew)
- Bypass over Avon River (190m long, 9.4m wide, 25° skew)
- Bypass over Moore Street and the state of the street street st
- Northam-Pithara Road over Bypass (71m long, 8.2m wide + 2.5m dual use path, 8° skew)
- Bypass over Mortlock River (2 bridges)
 (both bridges 54m long, 9.4m wide, 30° skew)
- Bypass over Narrow Gauge Railway (1 track)
 18m long, 11.0m wide, 25° skew)

The location of each bridge is shown on Plan 7.

For all routes, bridges are required at the Avon and Mortlock Rivers. For Route 6, the bridge across the Avon is on a skew of 47° compared with 22° for Routes 6A and 9 and hence, the bridge for Route 6 is required to be 50m longer. Details for the bridges which include the type, number of piers and abutment details (their buffer and extent of intrusion into the flood plain) have not yet been finalised by Main Roads at the time of writing this CER. However, a Waterways Investigation Report (Binnie & Partners, 1987) has assessed the impact on floodplain associated with predicted bridge abutments and embankments along the Route 6 alignment and review of this information by the Water Authority

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indicates that acceptable floodplain impacts would result (see Section 5.2 for more details).

4.2.3 Stormwater Drainage

Drainage of the highway surface will generally be via a conventional system of lateral table drains discharging into natural water courses. Cross-flow in these natural water courses will be catered for by the culverts designed and constructed to comply with the appropriate National Highway Standards. Surface runoff from catchments adjacent to the road will be intercepted by the table drains which discharge to low lying ground via culverts.

Special provisions to be discussed later will be required for the drainage on bridges and where the road alignment is adjacent to the Avon River.

4.2.4 Roadside Stopping Places

It is intended that as part of the detailed design, suitable rest areas will be provided where appropriate and information bays will be included at both approaches to the Bypass.

4.2.5 Landscaping

Extensive landscaping will be undertaken along the Bypass as part of this project. Emphasis will be given to areas which are currently devoid of vegetation and where clearing will be undertaken, such as cut and fill batters. Where appropriate, stands of native vegetation will be established with species indigenous to the area.

4.3 Traffic and Access Movements

The Northam Bypass proposal entails numerous transport benefits for the study area. These specifically relate to a number of issues, including:

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- establishing a functional road hierarchy;
- □ traffic volume reduction, particularly for the Northam CBD;
- □ the likelihood of associated traffic accident reductions;
- □ diversion of heavy goods vehicles away from the townsite; and
- □ improving local and regional access conditions.



4.3.1 Functional Road Hierarchy

At present, Great Eastern Highway provides direct access to adjoining residential properties, commercial and retail businesses, whilst also serving an important intraregional and interstate transport route.

As a result, it effectively operates as a local access, district distributor and primary distributor road, which is clearly undesirable.

The preceding classifications are pertinent to the existing function of Great Eastern Highway through the townsite, based on the following hierarchal definitions (documented within the State Planning Commission's Development Control Policy Manual-Policy No DC 1.4).

- Primary Distributors: carry longer distance traffic to, from and across an urban area, with some connecting with State or National road networks running between urban areas;
- District Distributors: carry traffic between different industrial, commercial and residential areas and link these cells to the primary network;
- □ Local Access (Distributor) Roads: carry traffic within a (land use) cell with direct lot frontage appropriate where volumes do not exceed 3,000 vehicles per day.

Consequently, the bypass proposal develops a more practical road hierarchy system for the study area. The bypass would represent the sole primary distributor road as the main through traffic carrier. The existing section of Great Eastern Highway/Fitzgerald Street that currently services the townsite would be downgraded to district distributor status.

4.3.2 Traffic Volumes and Accidents

In terms of the most recent traffic volume data pertaining to the Great Eastern Highway, counts taken during November 1988, and documented within the "Great Eastern Highway Town of Northam Cordon Number Plate Survey" report (Uloth and Associates) indicated that 3,170 vehicles per day (vpd) utilised the highway west of the township, with this figure reduced to 1,860 vpd on the highway east of Northam (refer Plan 8). However, within the CBD core area, Great Eastern Highway/Fitzgerald Street has an average annual daily traffic (AADT) count of approximately 7,000 vpd.

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However, with bypass construction, an average 20% reduction in vehicle traffic through the townsite was estimated. Plan 9 estimates that the bypass would attract 720 to 820 vpd. Further to this, short, medium and long term volume estimates for the bypass reveal that approximately 1,040 vpd would utilise the new road upon its scheduled opening in 1997. This figure subsequently increases to 1290 vpd (year 2002) and up to 1530 vpd (year 2017).

In terms of accident history, Main Roads' accident records during the 1/1/85 to 31/5/90 period, indicate that 257 traffic accidents were recorded on Great Eastern Highway in the vicinity of and within the Northam townsite, including two fatalities. Of accidents recorded, 82% occurred on straight and level sections of Great Eastern Highway/Fitzgerald Street, resulting from existing congestion levels and local/through traffic conflict, notably at the numerous crossover points along the highway.

Accordingly, provision of the bypass proposal with its effect on reduced traffic volumes through central Northam, would in turn result in a potential decrease of vehicle accidents in Fitzgerald Street. Additionally, the bypass itself is proposed to have stringent controlof-access within its design parameters which would serve to reduce the potential number of accidents on it.

4.3.3 Heavy Goods Vehicles (HGV's)

Northam has been proposed by the State Government as a regional centre for future industrial development. An industrial estate has been defined at Meenaar, adjacent to Great Eastern Highway and approximately 20km east of Northam. Planning for this estate addressed the future transport requirements of the region, and identified the need for a future dual carriageway on Great Eastern Highway between Perth and Meenaar.

The Main Roads WA "Project Proposal Report" (August 1992) reveals that a Northam bypass will eliminate the need for the majority of HGV's to access the townsite. Of the maximum 820 vpd which would use the by-pass 17% (140 vpd) would consist of heavy vehicles. For short, medium and long term scenarios, a HGV linear growth rate of 3% p.a. has been estimated, thereby entailing HGV volumes of 200 vpd by the year 2002, and 260 vpd in 2017.





4.3.4 Transport of Dangerous Goods

Information supplied by the Department of Minerals and Energy (Explosives and Dangerous Goods Division), indicated that of the total number of goods movements currently traversing the Northam townsite via Great Eastern Highway, between 10-12% (ie. 50-60 vehicles per day) potentially involve the transport of dangerous/hazardous materials.

The materials transported would be constituted from all nine classes of hazardous goods defined within the "Australian Dangerous Goods Codes" listing.

Thus, material currently transported through the Study Area may include the following:

- Class 1 : Explosives
- Class 2 : Compressed gases (LPG, oxygen, ammonia, nitrogen, chlorine gases, etc.)
- Class 3 : Flammable gases (automotive fuels, cleaning agents, farm chemicals, etc.)
- Class 4 : Solid and liquid wastes
- Class 5 : Oxidising agents
- Class 6 : Poisons (farming and industry related, sodium cyanide, etc.)
- Class 7 : Radioactive material (only very small amounts would be involved)
- Class 8 : Corrosives (acids, alkalines, etc.)
- Class 9 : Miscellaneous goods (eg. dry ice).

Accordingly, the EPA has recently commissioned a Working Party to investigate existing levels of dangerous goods transport within the region. Issues including the definition of appropriate road (and rail) transport routes would be expected to come under consideration.

4.3.5 Local and Regional Access

Section 4.3.2 has already discussed the undesirability of crossover access frequency with the existing Great Eastern Highway alignment through the townsite. As previously stated, provision of the bypass potentially results in the downgrading of Great Eastern Highway in Northam thereby creating safer access conditions at crossovers, and at connecting side streets. In a regional perspective, the bypass proposal would connect the highway with the four major roads extending north of the township (Toodyay Road, Katrine Road,

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Irishtown Road and Northam-Pithara Road) and provide for more direct access to the Army Camp, railway marshalling yards, wheat sites, tannery, quarry, concrete works, abattoir and racecourse.

4.3.6 Summary

In summary, although the bypass effectively provides for diversionary access around the townsite for east-west regional traffic, it is situated close enough to the Northam CBD to not only be generally visible from central Northam, but that direct access to the CBD and adjacent residential/commercial areas off the bypass would also be easily obtained.

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5.0 DESCRIPTION OF THE ENVIRONMENT

5.1 Introduction

This section of the report describes the salient components of the physical, biological and human environments in the vicinity of the Northam Bypass proposal. The components are considered from a local and regional perspective, where appropriate, and detailed further in the environmental impact assessment of each bypass route (see Section 6).

5.2 Available Information and Studies Conducted

Soils of the Northam Advisory District - Lantzke (Jan, 1993)

This manual describes the soils of the Department of Agriculture's Northam Advisory District and includes information on the characteristics of soil, their capability and other relevant land use details.

The manual is primarily designed to assist farmers within the region and provides useful information on soil identification, land use/land capability, farm productivity, land qualities and techniques for the minimisation of land degradation.

Avon River Flood Study (June 1985)

The Public Works Department of Western Australia commissioned the consulting engineering firm Binnie & Partners Pty Ltd to define the magnitude of flooding from the Avon River in a number of townships on its route.

Floodplain maps for both 25 and 100 year ARI flood events were created for the following townships:

- 1) Northam
- 2) Beverley
- 3) York
- 4) Toodyay
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Waterway Investigation for the Proposed Northam Bypass (June 1987)

As an extension of the Avon Fiver Flood Study, the consulting engineering firm Binnie & Partners Pty Ltd were commissioned by Main Roads Western Australia to model the Avon River reach affected by the proposed bypass for a 25 and 100 year ARI flood event and determine the backwater effects for a number of alternative road alignments and bridge

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sizes. The results were to be used by Main Roads WA for the selection of the optimum alignment and bridge size. The Water Authority's requirement was for zero backwater effect at the junction of the Mortlock and Avon Rivers with the 100 year ARI flood.

No acceptable solutions for zero backwater effect were found and further investigations were undertaken for bridge sizes which meet a 25mm increase in water level for the 100 year ARI flood. The report recommends that Main Roads negotiate with the WAWA to relax the criterion of zero backwater effect at the Avon/Mortlock River confluence.

This report was assessed by the Water Authority and a maximum backwater effect of 25mm at the confluence of Avon and Mortlock Rivers for a 100 year ARI flood event and a 150m long bridge was considered acceptable.

Avon River System Management Strategy - Waterways Commission (Jan 1993)

The Management Strategy is a broad based document used to direct future management of the river system. During its development the following was undertaken:

- □ Identification of the issues facing the Avon River System and tasks necessary to address these issues.
- □ Identification of common management directions for agencies involved in management.
- Definition of roles and responsibilities of agencies involved in management.
- Provision of a management framework for existing and future issues to be addressed in a co-ordinated manner.

The Management Strategy provides an overall plan for management of the Avon River by identifying action that needs to be taken and roles and responsibilities of various agencies for carrying out action.

The Management Strategy will form the guiding document for the soon to be established Avon River Management Authority in Northam.

Northam Bypass Geotechnical Observations of Preliminary Site Visit - Main Roads (June 1988)

This report outlines the findings of a preliminary site investigation of the preferred alignment (ie Route 6) of the Northam Bypass proposal. Engineering properties of the

various geological units traversed by the alignment are discussed along with recommendations with respect to further geotechnical investigation and alignment changes.

Assessment of Vegetation. Flora and Fauna on the Proposed Great Eastern Highway Northam Bypass - Woodman and Associates (Aug 1992)

The general objectives of this assessment were to provide detailed descriptions, through intensive field surveys, of the biological environment along the preferred alignment (ie Route 6) of the Northam Bypass proposal with particular reference to:

Climate; Soil classification; Vegetation Associations; Flora; Fauna; and Wetlands.

The achieve this, the biological survey undertook the following:

- Produced an inventory of the vascular plant species and vertebrate fauna species present or likely to occur and constructed a list of any of the above considered to be priority species or rare and endangered species in need of conservation.
- Described and mapped existing vegetation communities within the survey area including any introduced noxious weed species.
- Assessed the relationships between vertebrates and the plant communities present as well as the value of future roadside areas in providing habitat and facilitating movement between conservation areas.
- Made recommendations on the conservation of flora and fauna within the survey area and the types of vegetation to be planted following construction.
- Provided an inventory and assessment, including conservation value, of any wetlands encountered during the survey.

Report on a Survey for Aboriginal Sites at the Proposed Northam Town Bypass - R O'Connor, G Quartermaine and C Bodney (Dec. 1988)

A survey for Aboriginal sites in the vicinity of the preferred alignment (ie Route 6) of the Northam Bypass proposal was carried out on behalf of Main Roads in November 1988. The survey, which covered both archaeological and ethnographical aspects, was conducted by R O'Connor, G Quartermaine and C Bodney.

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The aim of the research was to identify and delineate areas of Aboriginal significance to enable Main Roads to fulfil its obligations under the Western Australia Aboriginal Heritage Act.

5.3 Physical Environment

5.3.1 Climate

The climate in the Northam region is generally warmer and drier than Perth with an average annual rainfall of 433mm.

Average maximum temperatures range between 17.0°C and 34.4°C with mean minimum temperatures declining to 5.6°C during the winter months.

Table 1 below provides detailed climatic data for Northam.

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· · · · · · · · · · · · · · · · · · ·	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ост	NOV	DEC	YEAR
MEAN RAINFALL (MM)	8	13	19	24	57	84	84	62	37	25	11	9	433
RAINDAYS MEAN Nº	2	2	3	·5	10	15	16	14	11	7	4	2	91
DAILY MAX TEMP (DEG C)	34.4	33.9	30.7	25.7	21.3	18.0	17.0	17.8	20.1	24.3	28.2	32.3	25.3
DAILY MIN TEMP (DEG C)	17	18	16	13	8.5	6.6	5.6	5.7	6.7	9.3	13	16	11
AM MEAN RELATIVE HUMIDITY (%)	47	52	56	70	80	86	91	87	75	61	50	46	67
PM MEAN RELATIVE HUMIDITY (%)	26	27	29	42	50	59	59	56	49	39	29	51	41

Table 1: Detailed Climatic Data for the Town of Northam, Western Australia

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5.3.2 Landforms and Soils

The "Zone of Rejuvenated Drainage" consists of a dissected, undulating landscape with fairly steep narrow valleys containing rivers and creeklines that flow every year.

The zone can be divided into soil landscape units that occur in specific parts of the landscape and have a particular set of soils associated with them.

The main soil landscape units in the study are illustrated on Plan 10. Only those soil landscape units in the vicinity of the three bypass route alignments have been expanded upon as follows:

- Steep Rocky Hills (R).York (Y)
- \square Avon (A).

The Steep Rocky Hills (R) soil landscape unit contain areas of bare rock and steep exposed hills. The higher relief hills range from about 200-275 metres above Australian Height Datum (AHD) with slopes ranging from 10% to greater than 30%.

The stony soils of the steep rocky hills are commonly coarse granitic sands and brownish grey granitic loamy sand. Both these soils are formed from decomposing granite rock and are usually found adjacent to and overlying large sheets of granitic or quartzitic rock.

These free drainage soils are capable of contributing to groundwater recharge, although large amounts of water can run off rock outcrops and increase surface water recharge.

The York (Y) soil landscape unit consists of steep irregular hills with slopes of 3-12%, which are commonly found on the mid to upper slopes of the landscape adjacent to rock outcrop, between 160 and 200 metres above AHD.



Common soils occurring throughout this unit include rocky red brown loamy sands ('York gum-jam soil'), brownish grey granitic loamy sands and red brown doleritic clay loam. These soils are predominantly formed from parent material with variable characteristics and qualities depending upon the parent rock from which it originated.

The natural fertility of these soils is often high and therefore valued for their productivity. Soils on steep, long slopes are most at risk of erosion, particularly when water is flowing off nearby rock outcrops.

The Avon (A) soil landscape units consists of alluvial terraces and floodplains adjacent to the Avon and Mortlock Rivers between 140 and 155 metres above AHD. The slopes in these low-lying areas are usually less than 1% with the dominant soil types being orange alluvial loamy sands, red brown alluvial loam and grey alluvial clays.

The soils are naturally fertile, but are susceptible to waterlogging and inundation, particularly when these soils occur low in the landscape.

5.3.3 Hydrology

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The Avon River System comprises four main river systems, the Avon, North Mortlock, East Mortlock and Dale. These rivers flow for at least part of the year, usually winter and dry up nearly completely during summer (Waterways Commission 1993).

The main Avon River flows from Yenyening Lakes downstream to Wooroloo Brook where it changes its name to the Swan River. The Avon is dry during the summer months with the exception of a number of river pools which have permanent water throughout the year (eg upstream of the Northam Town Weir).

The Mortlock rivers join each other just east of the Northam townsite and link with the Avon downstream from the Northam Town Weir. The Northam Mortlock drains an area within the Wongan-Ballidu Shire and the East and South Mortlocks drain a large area of salt lakes within the Shires of Cunderdin, Tammin, Dowerin, Wyalkatchem and Koorda.

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The vast section of the river basin only contributes water intermittently to the Avon River. Extensive lake systems are found throughout the area which act as compensating basins for rainfall that would otherwise become river flow (Waterways Commission, 1993).

5.3.4 Floodplain Characteristics ---

In the last 150 years or so since European settlement, the Avon River has breeched its banks on a number of occasions seriously flooding the town of Northam. Records show that in 1862 and 1872 flooding in Northam, equivalent to 100 year average recurrence interval (ARI) flood levels, caused extensive damage and inconvenience.

It was not until 1985 that the Public Works Department (now the Water Authority of Western Australia) commissioned the 'Avon River Flood Study' (Binnie and Partners 1986) in order to assess the floodplain characteristics in the towns of Northam, Toodyay and York.

Shortly after the completion of the 'Avon River Flood Study', the Water Authority produced floodplain maps along sections of the Avon and Mortlock Rivers close to Northam showing the extent and levels associated with a 100 year ARI flood. Upon examination of the floodplain maps, it is apparent that extensive residential and commercial areas of Northam (including the Great Eastern Highway/Fitzgerald Street) would become inundated in a 100 year ARI flood.

Main Roads commissioned Binnie and Partners to extend their study data and floodplain models in order to ascertain the impact on flooding associated with a number of bypass routes to the north of Northam, including the Route 6 alignment.

The Waterways Investigation Study (Binnie and Partners, 1987) concluded that the bridges and embankments along the Route 6 alignment would result in a 25mm backwater effect at the confluence of the Avon/Mortlockc Rivers for a 100 year ARI flood.

The Water Authority reviewed the Waterways Investigation Study and considered the impact on flooding as acceptable.

5.3.5 Water Quality

The water quality of the Avon River has slowly declined over the past one hundred years since the clearing of vast areas of the catchment for agricultural land use. The main water quality problems that have emerged are as follows (Waterways Commission 1993).

Salination

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Salination of the river system has severely increased since clearing of the native vegetation and the planting of shallow rooted introduced crop and pasture species. The reduced water uptake from this change in vegetation cover has resulted in a rise in the water table and an associated mobilisation of salts usually stored in the saturated soil profile. Increases in water flow throughout the catchment have resulted in saline ground and surface waters reaching the river system.

Salinity levels in the river system have risen from their original fresh to brackish levels of between 400 and 3000 mg/L to the extremely saline conditions of between 2000 and 17,000 mg/L observed today (Walker, 1986). This has resulted in the loss of many species of flora and fauna that once inhabited the river system and the colonisation of many new species adapted to the saline conditions.

Nutrient Enrichment

Eutrophication (or nutrient enrichment) has become a problems in recent years mainly as a result of the widespread use of phosphate fertilisers in the catchment. The increased level of nutrients entering the system has resulted in the remaining river pools experiencing algal blooms and associated odours during the summer months.

Point sources such as stormwater and sewage discharge, run-off from rubbish tips and high effluent land use such as piggeries may also contribute to the river's nutrient load.

Pollution

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Pollution of the river system from toxins including pesticides, heavy metals and other industrial pollutants is also a potential problem.

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These pollutants can enter the river system by means of spray drift, erosion of contaminated soils, careless disposal of chemical containers and direct discharges from industry.

5.4 Biological Environment

5.4.1 Vegetation

The vegetation of the Northam region belong to the Avon Botanical District, however, it is estimated that 75% of the Avon River catchment has been cleared for agricultural purposes (Binnie and Partners, 1985). Completely open field now covers 48% of the catchment where introduced annual plant pasture and crop species have eliminated all native annual grasses and inhibited the regeneration of native trees and shrubs (Walker, 1986).

The natural vegetation that remains is fragmented with the main vegetation associations in the Northam region being:

- □ Wandoo (Eucalyptus wandoo), sheoak (Allocasuarina huegeliana) and blackboys (Xanthorrhoea preissii) on the upper slopes and ridges.
- □ York gum (Eucalyptus loxophleba), jam (Acacia acuminata), salmon Gum (Eucalyptus salmonophloia) and needle bush (Hakea preissii) on the mid to lower slopes.

Flooded Gum (Eucalyptus rudis), swamp sheoak (Allocasuarina obesa), jam (Acacia acuminata) and paperbark (Melaleuca rhaphiophylla) along the floodplain and river banks.

Agricultural clearing along the Avon River and grazing of stock on the banks has resulted in destruction of much of the natural foreshore vegetation (Waterways Commission, 1993). In most areas a thin line of vegetation now exists with a large number of introduced species present.

The vegetation composition along Routes 6, 6A and 9 of the Northam Bypass proposal is typical of the western wheatbelt as determined by a biological survey of the preferred alignment (ie, Route 6), undertaken in August 1992 by Consulting Ecologists (Woodman and Associates 1992). A description of the vegetation at each alignment (ie, Routes 6, 6A

and 9) is provided in the following text with a full description of survey sites together with field recording sheets and plant species lists provided in Appendix 2.

5.4.1.1 Vegetation along Route 6 Alignment (Figures 1A and 1B)

Starting from approximately 3.3 kilometres west of Northam (ie adjacent to the Northam Army Camp) and moving in an eastern direction, the general vegetation associations may be described as follows.

Site 1:

Opposite entrance to Northam Army Camp York gum woodland with jamsheoak understorey in healthy condition and high weed invasion. Little native groundcover present. Small seasonal wet area near the rifle range contained native species such Jacksonia furcellata, Drosera platystigma, Wurmbea pygmaea, Juncus pallidus and Juncus pauciflorus. A total of 40 vascular plant species were recorded, 16 of which were introduced species.

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Site 4:

Alongside rifle range. Granite outcrop with jam-sheoak overstorey in a degraded condition due to heavy grazing in the past. Very high weed invasion. A total of 23 vascular plant species were recorded, 7 of which were introduced including the declared noxious weed Patersons Curse (Echium plantagineum).

Northam Scout Block. Marri (Eucalyptus calophylla) woodland with jam understorey and scattered York gum. Weed invasion high, but overall the site was very healthy with little disturbance. Not recorded during the survey, but known to have been seen in the area, were native orchids (Caladenia hirta, Caladenia flava, Diuris longifolia, Thelmitra antennifera) and everlastings (Helipterum manglesii, Podolepis sp.). A total of 44 vascular plant species were recorded, 13 of which were introduced including noxious weeds, Cape Tulip (Homeria miniiata) and Oxalis cernua.

To the north of Site 3 was a pastured area containing scattered marri, York gum and jam.

Just north of Northam Scout Block. Granite outcrop with marri-York gum overstorey, heavily grazed and degraded with almost no native understorey remaining. A total of 14 vascular plant species were recorded of which 5 were introduced.

To the east of Site 4 was an extensive pastured area with scattered jam and York gum.

Sites 5 & 11: Northern portion of Council common, south west of Toodyay Road (Site 5) and just north of Northam Racecourse (Site 11). Open York gum woodland with jam understorey, heavily grazed, weed infested with little native

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groundcover present. A total of 22 vascular plant species were recorded of which 7 were introduced including Patersons Curse and Oxalis Cernua.

Just east of Site 5 was a mixture of pastured farm land containing scattered jam, open pasture and scattered York gum/jam.

Between Toodyay Road and Standard Gauge Railway: Degraded jam shrubland, highly disturbed with subsequent weed invasion and only a few native understorey or groundcover species present. A total of 14 vascular plant species were recorded of which 7 were introduced including noxious weeds, Paterson's Curse and Cape Tulip.

Site 7:

Site 6:

Along the banks of the Avon River just north of the Shire of Northam/Town of Northam boundary. Riverbank with paperbark (*Melaleuca rhaphiophylla*) and swamp sheoak (*Allocasuarina obesa*) overstorey subject to heavy stock use in the past resulting in very high levels of weed invasion. A total of 8 vascular plant species were recorded, of which 6 species were introduced including the declared noxious weed *Oxalis cernua*.

Inland from the riverbank, and to the north of Site 7, were some low floodplain areas containing flooded Gum and jam over pasture.

Sites 8 & 10: Along the north bank of the Avon River near Northam Cemetery (Site 8) and just west of Moore Street (Site 10). Flooded Gum and York gum overstorey over pasture where stock and human use have degraded the area with very high weed invasion. Few native understorey species present. A total of 23 vascular plant species recorded of which 15 were introduced including declared noxious weed species Cape Tulip and Oxalis cernua.

Further to the east approaching the Mortlock River (Site 9) was an area of pasture with scattered York gum and jam. On the other side of the Mortlock River was a mixture of crop and pasture with the occasional York gum. This extended through Site 11 and joined with the planted road verge (Site 12).

- Site 9: Banks of the Mortlock River. Flooded Gum over swamp sheoak where river banks have been heavily grazed with subsequent weed invasion. A total of 14 vascular plant species were recorded, of which 9 species were introduced, including Cape Tulip and Oxalis cernua.
- Site 12: Planted road verge where bypass rejoins Great Eastern Highway. Area replanted with York gum and River Gum (*Eucalyptus camaldulensis*). Understorey consists largely of introduced grasses and weeds. A total of 12 vascular species were recorded of which 7 were introduced including Paterson's Curse.





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Contraction of the set of the	TDK JULY93	FIGURE 1B		

5.4.1.2 Vegetation along Route 6A Alignment (Figures 2A and 2B)

Starting from approximately 3.3 kilometres west of Northam (ie adjacent to the Northam Army Camp) and moving in an eastern direction, the general vegetation associations may be described as follows.

Site 1: Opposite entrance to Northam Army Camp York gum woodland with jamsheoak understorey in healthy condition and high weed invasion. Little native groundcover present. Small seasonal wet area near the rifle range contained native species such Jacksonia furcellata, Drosera platystigma, Wurmbea pygmaea, Juncus pallidus and Juncus pauciflorus. A total of 40 vascular plant species were recorded, 16 of which were introduced species.

Site 2:

Alongside rifle range. Granite outcrop with jam-sheoak overstorey in a degraded condition due to heavy grazing in the past. Very high weed invasion. A total of 23 vascular plant species were recorded, 7 of which were introduced including the declared noxious weed Patersons Curse (Echium plantagineum).

Site 3: Northam Scout Block. Marri (Eucalyptus calophylla) woodland with jam understorey and scattered York gum. Weed invasion high, but overall the site was very healthy with little disturbance. Not recorded during the survey, but known to have been seen in the area, were native orchids (Caladenia hirta, Caladenia flava, Diuris longifolia, Thelmitra antennifera) and everlastings (Helipterum manglesii, Podolepis sp.). A total of 44 vascular plant species were recorded, 13 of which were introduced including noxious weeds, Cape Tulip (Homeria miniiata) and Oxalis cernua.

To the north of Site 3 was a pastured area containing scattered marri, York gum and jam.

Just north of Northam Scout Block. Granite outcrop with marri-York gum overstorey, heavily grazed and degraded with almost no native understorey remaining. A total of 14 vascular plant species were recorded of which 5 were introduced.

To the east of Site 4 was an extensive pastured area with scattered jam and York gum.

Sites 5 & 11: Northern portion of Council common, south west of Toodyay Road (site 5) and just north of Northam Racecourse (Site 11). Open York gum woodland with jam understorey, heavily grazed, weed infested with little native groundcover present. A total of 22 vascular plant species were recorded of which 7 were introduced including Patersons Curse and Oxalis Cernua.

Just east of Site 5 was a mixture of pastured farm land containing scattered jam, open pasture and scattered York gum/jam.

Site 4:

Site 6:

Between Toodyay Road and Standard Gauge Railway. Degraded jam shrubland, highly disturbed with subsequent weed invasion and only a few native understorey or groundcover species present. A total of 14 vascular plant species were recorded of which 7 were introduced including noxious weeds, Paterson's Curse and Cape Tulip.

Site 7:

Along the banks of the Avon River just north of the Shire of Northam/Town of Northam boundary. Riverbank with paperbark (Melaleuca rhaphiophylla) and swamp sheoak (Allocasuarina obesa) overstorey subject to heavy stock use in the past resulting in very high levels of weed invasion. A total of 8 vascular plant species were recorded, of which 6 species were introduced including the declared noxious weed Oxalis cernua.

Around behind the Cemetery was a mixture of crop and pasture with scattered York gum which extended for approximately 1.5 kilometres before merging with the low floodplain area where isolated stands of flooded Gum and jam occurred over pasture.

Further to the east approaching the Mortlock River (Site 9) was an area of pasture with scattered York gum and jam. On the other side of the Mortlock River was a mixture of crop and pasture with the occasional York gum. This extended through Site 11 and joined with the planted road verge (Site 12).

Site 9: Banks of the Mortlock River. Flooded Gum over swamp sheoak where river banks have been heavily grazed with subsequent weed invasion. A total of 14 vascular plant species were recorded, of which 9 species were introduced, including Cape Tulip and Oxalis cernua.

Site 12: Planted road verge where bypass rejoins Great Eastern Highway. Area replanted with York gum and River Gum (*Eucalyptus camaldulensis*). Understorey consists largely of introduced grasses and weeds. A total of 12 vascular species were recorded of which 7 were introduced including Paterson's Curse.

5.4.1.3 Vegetation along Route 9 Alignment (Figures 3A and 3B)

Starting from approximately 3.3 kilometres west of Northam (ie adjacent to the Northam Army Camp) and moving in an eastern direction, the general vegetation associations may be described as follows.

Site 1: Opposite entrance to Northam Army Camp York gum woodland with jamsheoak understorey in healthy condition and high weed invasion. Little native groundcover present. Small seasonal wet area near the rifle range contained native species such Jacksonia furcellata, Drosera platystigma,

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Wurmbea pygmaea, Juncus pallidus and Juncus pauciflorus. A total of 40 vascular plant species were recorded, 16 of which were introduced species.

Site 2: Alongside rifle range. Granite outcrop with jam-sheoak overstorey in a degraded condition due to heavy grazing in the past. Very high weed invasion. A total of 23 vascular plant species were recorded, 7 of which were introduced including the declared noxious weed Patersons Curse (Echium plantagineum).

Site 3: Northam Scout Block. Marri (Eucalyptus calophylla) woodland with jam understorey and scattered York gum. Weed invasion high, but overall the site was very healthy with little disturbance. Not recorded during the survey, but known to have been seen in the area, were native orchids (Caladenia hirta, Caladenia flava, Diuris longifolia, Thelmitra antennifera) and everlastings (Helipterum manglesii, Podolepis sp.). A total of 44 vascular plant species were recorded, 13 of which were introduced including noxious weeds, Cape Tulip (Homeria miniiata) and Oxalis cernua.

To the north of Site 3 was a pastured area containing scattered marri, York gum and jam.

Site 4:

Just north of Northam Scout Block. Granite outcrop with marri-York gum overstorey, heavily grazed and degraded with almost no native understorey remaining. A total of 14 vascular plant species were recorded of which 5 were introduced.

To the east of Site 4 was an extensive pastured area with scattered jam and York gum.

- Sites 5 & 11: Northern portion of Council common, south west of Toodyay Road (site 5) and just north of Northam Racecourse (Site 11). Open York gum woodland with jam understorey, heavily grazed, weed infested with little native groundcover present. A total of 22 vascular plant species were recorded of which 7 were introduced including Patersons Curse and Oxalis cernua.
 - Just to the east of Site 5 was a mixture of pastured farm land containing scattered jam, open pasture and scattered York gum/jam.
- Site 6: Between Toodyay Road and Standard Gauge Railway. Degraded jam shrubland, highly disturbed with subsequent weed invasion and only a few native understorey or groundcover species present. A total of 14 vascular plant species were recorded of which 7 were introduced including noxious weeds, Paterson's Curse and Cape Tulip.

Between Sites 6 and 7 was a pastured area with scattered York gum, jam and sheoak.

Site 7: Along the banks of the Avon River just north of the Shire of Northam/Town of Northam boundary. Riverbank with paperbark

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(Melaleuca rhaphiophylla) and swamp sheoak (Allocasuarina obesa) overstorey subject to heavy stock use in the past resulting in very high levels of weed invasion. A total of 8 vascular plant species were recorded, of which 6 species were introduced including the declared noxious weed Oxalis cernua.

Extending east of Katrine Road, through Irishtown Road, Northam-Pithara Road and joining up with the planted road verge at the end of Route 9 (Site 12) was dominated by crop and pasture land with isolated stands of York gum and the occasional jam. Apart from these few species, there was very little remnant native vegetation along the majority of this route.

Banks of the Mortlock River. Flooded Gum over swamp sheoak where river banks have been heavily grazed with subsequent weed invasion. A total of 14 vascular plant species were recorded, of which 9 species were introduced, including Cape Tulip and Oxalis cernua.

Site 12: Planted road verge where bypass rejoins Great Eastern Highway. Area replanted with York gum and River gum (*Eucalyptus camaldulensis*). Understorey consists largely of introduced grasses and weeds. A total of 12 vascular species were recorded of which 7 were introduced including Paterson's Curse.

5.4.2 Fauna and Habitat

Site 9:

The few remaining large summer pools of the Avon River form a permanent home for a large number of river based fauna (Waterways Commission 1993). Many species have needed to adapt to the changing condition over recent years with increased salinity, pollution and eutrophication (ie nutrient enrichment) of the river system.

Birdlife is the predominant fauna type with 90 wetland and dryland species having been recorded of which 53 species known to breed within the Avon River System (Walker 1986).

Few fish species have been recorded along the river and cobbler is the only large fish in the system. Mullet are known to move up the river in summer during periods of major flood. Other fauna present in the region include molluscs, crustacea, tortoises, snakes, brush-tail possums, grey kangaroos and a few Euros (Walker, 1986).

All areas likely to be affected by construction of the Northam Bypass (Route 6) were surveyed to determine the impact of construction on fauna. During the course of this survey, three broad fauna habitat types were identified:

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River	-	Avon and Mortlock Rivers including fringing vegetation.					
Woodland	121 -	Eucalyptus loxophleba (York	gum)/Acacia	acuminata	(jam)		
		woodland including small granite of	outcrops.	te kore			
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Paddock	-	Paddocks including small groups of	of remnant trees.		1. A.		

Overall, 24 species of bird, 1 species of gecko and 1 species of introduced mammal were recorded during the assessment. Appendix 2 lists all fauna species recorded and those expected to occur within and around the proposed road reserve.

All habitats were found to be very degraded with little native understorey present, restricting the number of predicted species, particularly birds, significantly. No rare or endangered fauna were recorded with the only gazetted species likely to occur being the Peregrine Falcon (*Falco peregrinus*). As this is a cosmopolitan species, the project is unlikely to have any impact on this bird.

5.5 Human Environment

5.5.1 Economic Base

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The precise impact of the current alignment of Great Eastern Highway through Northam is difficult to quantify. As discussed in Section 2.1 the various impacts of a reduced amenity of the shopping environment due to noise and pollution, as well as reduced accessibility and circulation for vehicles, all results in a less attractive shopping environment which can adversely affect the economic base of the town.

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Northam like most country towns functions as a service centre for the surrounding rural hinterland with farmers gaining their supplies from Northam and delivering their goods and produce to Northam for sale or transport elsewhere.

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Northam also serves as a higher order commercial centre servicing the smaller towns, such as Toodyay and York, due to the greater variety of retail outlets and businesses. For example Northam has the largest supermarket in the area and this attracts significant patronage.

The commercial centre to Northam not only serves these people but also the local town residents who work, shop and live within the town. The town also provides a particular function for passers by where people utilising the services and facilities in the town include day trippers and tourists from the Perth metropolitan area.

The continued access to the town centre for the broader community and passers by is of upmost importance so as to not impact on the viability of commercial facilities in the town and consequently the whole town's economic base.

Of particular concern is the impact of re-alignment of Great Eastern Highway on the business community in Northam. The areas economic base is centred on its rural activities and farming and therefore, a bypass may affect these economic components. Given the dependence on rural activities, minimal disruption to farming activities and accessibility to the town centre for delivery of produce is also important.

5.5.2 Community Attitudes

A majority of the Northam community is aware of the Northam Bypass proposal and the need for a bypass. The community can be broken down in to various sub-groups and the awareness and attitude towards the need for a bypass route differs between each group. The Northam Town and Shire Councils support the need for a Bypass.

As previously mentioned the business community in Northam and the local community are most affected by the current alignment of Great Eastern Highway through the town. It affects their daily lives and the operation of their businesses.

Apart from the local residents and business community within Northam town, there are the many residents, owners of farms and small rural properties and Aboriginal groups that have attachments to properties and the land. The lifestyle and community needs of each group needs to be fully considered as each group is affected differently and will have different attitudes.

There is a increased awareness towards environmental issues throughout the broader community. Environmental impacts and clearing of vegetation have become issues of community concern, with Northam being no exception. Any re-alignment of Great Eastern Highway will need to address these issues.

Of note also is the rural character of the area. Local residents in the area enjoy the rural amenity of the landscape and this feature will need to be preserved, particularly the rural and semi rural lifestyles enjoyed on farms and small rural holdings such as the Doctors Hill locality.

People are locating in these rural areas to escape from the City and it is expected there will be strong feelings towards retaining their lifestyles and investments.

Not only do landowners enjoy the rural amenity of Northam, but passers by, tourists or day trippers from Perth are attracted because of the character of the area. Again there will be an expectation to preserve the rural character of the area.

5.5.3 Cultural Significance

The long history and development of Northam means there are a number of places and buildings that are of cultural or heritage significance. These all need to be considered as part of assessment of impacts of new roads.

The Shire of Northam Town Planning Scheme lists:

· · · R Agricultural Hall - Irishtown 1 Bardeen Homestead & Farm Buildings С 2 С Buckland House & Farm Buildings 3 R 4 Former Church (RC) - Irishtown Ν Dempster Homestead 5 C Egoline Homestead 6 Katrine Homestead, including Avon Valley School, 7 С Cobblers Inn, Dairy Shed, Barn, Machinery Shed & Stables R Lockyer's Mill (on Hampton Vineyard) 8 С St Saviour's Church 9

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10Mokine HomesteadN11Spencers Brook TavernC12Springhill HomesteadN13Warranine Homestead GroupC14Glen Avon WeirN15Katrine CausewayN

* C - Classified by National Trust

R - Registered for Classification

N - Place identified by Shire of Northam

The Town of Northam proposed Town Planning Scheme N° 4 similarly contains a list of buildings and places, as follows:

CLASS A - CLASSIFIED BY THE NATIONAL TRUST

- 1. Morby Farm Homestead, Cemetery Road
- 2. Former Pensioner Cottage, cnr Colebatch Street and Newcastle Road
- 3. The Club Tavern and Stables (former Club Hotel/McCarthy's Hotel)
- 4. Former Northam Railway Station, Fitzgerald Street
- 5. Northam Post Office, Fitzgerald Street
- 6. The Avon Bridge Hotel (formerly Widling's Hotel/Railway Hotel), Fitzgerald Street
- 7. The Grant Hotel, Fitzgerald Street
- 8. Monument to Peter Chidlow and Edward Jones, Gillett Road
- 9. "Uralia" (excluding additions), Gordon Street
- 10. Byfield House, Gordon Street
- 11. Mitchell House, cnr Duke Street and Hawes Street
- 12. John Morrell's Grave, Quelquelling Road
- 13. Avon Valley Arts Centre (formerly Northam Post Office), Wellington Street
- 14. Avon Valley Arts Centre Workshop (formerly Northam Primary School)
- 15. Northam Court House, Wellington Street
- 16. Northam Town Hall and Adjacent Hall, Wellington Street
- 17. Police Station, Wellington Street
- 18. St John's Church, Wellington Street

CLASS B - REGISTERED ON THE NATIONAL ESTATE

- 19. The Old Methodist Church, Duke Street
- 20. The Bank of New South Wales, Fitzgerald Street
- 21. The Commonwealth Bank, Fitzgerald Street
- 22. St James' Church, Wellington Street

Apart from buildings and places associated with European settlement in the area, Aboriginal association with the area also needs to be considered.

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A survey for Aboriginal sites in the vicinity of the proposed Northam Town Bypass (Route 6) was carried out on behalf of the Main Roads Department in November 1988.

The Bypass Routes 6 and 6A cross the Northam Aboriginal Reserve 8313, which in the opinion of the authors is an Aboriginal Site within the meaning of the Aboriginal Heritage Act. Reserve 8313 is of some significance and is considered by the Aboriginal community as the last piece of Aboriginal land in Northam. The Northam Aboriginal Community Progress Association (NACPA) is currently seeking a 99 year lease for the reserve through the Aboriginal Lands Trust.

In addition, one newly recorded archaeological site, one previously recorded site and three solitary artefacts were located as a result of the archaeological survey.

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Reserve 8313 was gazetted in 1902 and it is apparent that there are local Aboriginal Community members with direct affiliation with the Reserve. It is likely that Aboriginal people are buried on the Reserve, although there are no records. The Northam Aboriginal Community has expressed strong opinions in regard to retaining Aboriginal Reserve 8313 and to date, a mutually agreed resolution is yet to be realised. Further details are outlined in Section 6.0.

5.5.4 Landscape and Amenity Values

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The Avon River and tributaries is a major landscape feature of Northam. Settlement has occurred around the river with the Town Centre built on the southern side.

Any impacts on the landscape quality of the river system is likely to meet community opposition and care will need to be taken with any river crossings.

Sections of the river are very much degraded and in these areas the impact on the environment and amenity of the river may be minimal due to its current state of condition. There is even an opportunity to upgrade these areas with the construction of any river crossings.

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In addition, opportunities may be created for recreation and tourist access to the river and these benefits should be maximised.

With any re-location of the highway, there will also be improved access from the town centre to the nearby river foreshore located adjacent to the main street. At present; the – Great Eastern Highway/Fitzgerald Street forms a barrier which restricts pedestrian and vehicle movements, thereby inhibiting the cross-functional link between people utilising the town centre facilities and the nearby river foreshore. This has been one of the major problems which has increasingly separated the town centre and the river as development based around the current route has progressed. Closer ties can be forged between these two areas if the highway is re-located, which could allow for redevelopment and improvement to the townscape of Northam.

Any new routes should seek to improve ties between the foreshore and the town centre and not further reduce them.

Another feature of Northam are the areas of remnant vegetation on private land, reserves and along the river. The loss of remnant vegetation, particularly along the river foreshore, is likely to meet community opposition, and methods to revegetate these areas will need to be investigated where removal of native vegetation is unavoidable.

5.5.5 Recreational Opportunities

Northam townsite has developed on either side of the Avon River, with the town centre on the southern side and residential areas surrounding the town centre on the southern side and stretching to the northern side of the river.

The river consequently is a major landscape feature of the town and a focal point for recreational activities. The foreshore area has been landscaped and upgraded and consequently provides a recreation function. Traditionally the foreshore has close ties with the town centre but the ties have weakened with reduced accessibility created by Great Eastern Highway.

Re-location of Great Eastern Highway would improve access to the foreshore area and enable closer ties with the town centre.

6.1 Introduction and Objectives

The Main Roads referred the Northam Bypass Route 6 proposal to the EPA and a formal level of assessment being a Consultative Environmental Review (CER) was set.

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In December, 1992, the EPA's CER Guidelines (see Appendix 1) were issued outlining the purpose, objectives, key issues and other relevant information to be considered during the preparation of the CER.

The CER Guidelines stipulated that an environmental impact assessment of all three bypass routes (ie Route 6, 6A and 9) would be required and that the CER assessment is to have regard for the future duplication of the carriageway.

This section of the CER Report outlines the potential environmental impacts associated with Northam Bypass Routes 6, 6A and 9 from pre-construction, construction and postconstruction perspectives The impacts are considered in terms of the physical, biological and human environments.

6.2 Potential Environmental Impacts of Route 6

6.2.1 Pre-Construction Impacts

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6.2.1.1 Scope and Objectives

Pre-construction impacts refers to the environmental impacts that occur before construction of the bypass road commences. Typical activities undertaken during this phase of a road construction project include detailed costings analysis, land acquisition along the proposed road reserve, environmental, biological, geotechnical and/or hydrogeological surveys (if required), amendment of preliminary design where appropriate and completion of final design drawings. The objective of this section is to assess the significance of the environmental impacts associated with the pre-construction phase of Route 6.

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6.2.1.2 Physical Environment

Apart from minor disturbance associated with the aforementioned surveys that may be undertaken during this period, the components of the physical environment are generally not impacted upon by pre-construction activities.

6.2.1.3 Biological Environment

The pre-construction activities may involve the removal of a small percentage of vegetation in order to successfully undertake surveys, however the impact to flora, fauna and habitat is considered negligible.

6.2.1.4 Human Environment

It is considered that pre-construction activities affects the human environment to the greatest degree through land resumption, impact on Aboriginal Sites and local community expectations.

Land Resumption

The construction of a new bypass road requires the resumption of land for the road reserve in which the bypass and associated infrastructure is contained within. Main Roads purchases available land when opportunities arise and negotiations with landowners regarding the acquisition of part or all of their properties are undertaken when appropriate.

This may cause adverse impacts to associated landowners through hardship, anxiety and the chance of losing affiliated land. Where possible, Main Roads attempts to minimise the impacts associated with land resumption, however, in some cases these are unavoidable.

To date, the Main Roads have acquired almost half of the 76 properties affected by the Route 6 alignment of the Northam Bypass. The land requirements and ownership details along the Route 6 alignment are provided in Appendix 6. Land owned by Main Roads represents over one third of the total land requirements for this alignment. It is relevant to note that almost 4 kilometres (over one third of the total Route 6 alignment) is Council Common and Foreshore Reserve, vested in the Town of Northam.
Further investigations by Main Roads with affected landowners whose properties have yet to be acquired will be necessary as part of the pre-construction activities of the Northam Bypass Route 6 project. It is likely that opposition to resume properties will be encountered indicating that land resumption potentially poses a significant impact to the Northam community.

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Aboriginal Sites

Prior to any construction work being initiated, the issue of Aboriginal Reserve 8313 (see Plan 11) will need to be resolved. As previously mentioned, the Reserve is considered an Aboriginal Site under the meaning of the Aboriginal Heritage Act (O'Connor et al, 1988).

In 1987, negotiations with Main Roads, the Aboriginal Lands Trust and the then Chairperson of the Northam Aboriginal Progress Association led to an agreement on a land swap for Aboriginal Reserve 8313. A land swap site was not finalised at the time, however, with the understanding that a suitable site would be selected, Main Roads pursued the Route 6 alignment based on the original agreement.

During the public participation and consultation program undertaken in preparation of this CER report, it has become apparent that the local Aboriginal people believe they were not adequately consulted during the 1987 land swap agreement and negotiations on their behalf at the time were undertaken by Aboriginal representatives with little or no affiliation with Aboriginal Reserve 8313. Accordingly, the land swap agreement is therefore considered invalid by the local Aboriginal Community and is subject to challenge.

The Northam Aboriginal Community Progress Association is currently chaired by a local Aboriginal with established ties to the Reserve. The local Aboriginal community is at present seeking a 99 year lease for Aboriginal Reserve 8313 and it is understood that Main Roads are negotiating with the Aboriginal Affairs Planning Authority with the aim to resolve the conflict between Aboriginal Reserve 8313 and the Route 6 alignment.

Local Community Expectations

There is general agreement by the local community that Northam needs a bypass. Some of the key issues raised by the Northam community include:

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the need to relocate through traffic (particularly heavy vehicles) away from Fitzgerald Street;

improving traffic flows and access around Northam's Central Business District;
 proposing an environmentally and socially acceptable bypass alternative that does not impact on the future planning and expansion of Northam;

□ maintaining a visual link with Northam;

□ retaining access to river foreshore; and

resolution of the Aboriginal Reserve 8313 issue.

The Route 6 alignment of the Northam Bypass relocates through traffic away from Fitzgerald Street and improves local traffic flows and access around Northam's Central Business District. In doing so, a visual link with Northam is maintained.

Access to the river foreshore alongside Katrine Road will be limited by the Route 6 alignment and, in order to achieve national highway standards, it is not possible to completely avoid Aboriginal Reserve 8313.

6.2.2 During Construction Impacts

6.2.2.1 Scope and Objectives

During construction impacts are those associated with constructing the Route 6 alignment of the Northam Bypass proposal. Typical activities undertaken during this phase of a major highway construction project include clearing vegetation, earthworking (ie cutting, filling, rock removal, blasting etc), re-contouring of embankments and batter slopes, stabilisation of proposed road surface, bridge and drainage construction and the laying down of the sealed road surface.

The objective of this section is to assess the significance of the environmental impacts associated during the construction phase of the Route 6 alignment.

6.2.2.2 Physical Environment

The components of the physical environment potentially impacted during construction of the Route 6 alignment relate mainly to landform/soils and surface water hydrology (ie Avon River, Mortlock River, streams and tributaries).



Landform and Soils

The main impacts on landform and soils associated with Route 6 are due to water and wind erosion.

Erosion - Around cuttings and embankments, water and wind erosion may cause the displacement and transport of soil material.

At locations where surface runoff and natural drainage are concentrated (eg. culverts) downstream erosion may occur as a result of larger flows along the drainage lines.

Clays and loams are most susceptible to water erosion, particularly around the steep valley sideslopes along the Avon River.

Erosion along the 2 kilometre section of the Avon River's north bank and the Mortlock River has the potential to increase turbidity and sediment loading in these waterways.

Erosional impacts associated with several locations along Route 6 are considered moderately significant and require careful management (see Section 7.3.1).

<u>Hydrology</u>

The Route 6 alignment has the potential to cause environmental impacts to the natural drainage features, the Avon River floodplain and the water quality of the Avon and Mortlock Rivers.

□ Drainage

The compacted earth embankments, cuttings and construction of an impermeable road surface may alter the natural drainage characteristics of the landscape as the construction of the road interferes with the transverse drainage paths.

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Embankments may intercept surface and sub-surface water flows, thereby decreasing recharge to rivers and streams.

Due to the high engineering standards applicable to major road design and construction, it is considered the impact associated with Route 6 on natural drainage is minor.

□ Floodplain

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The Route 6 alignment impinges significantly on the 1 in 100 year floodplain determined and mapped by the WAWA (see Plans 12 and 13).

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A Waterways Investigation Study undertaken by consulting engineers (Binnie and Partners, 1987) indicates that the potential impacts on the floodplain from the Route 6 alignment would be of minor significance. The study calculated a 25mm backwater effect upstream of the Route 6 alignment (ie, at the confluence of the Avon and Mortlock Rivers) during a 100 year ARI flood.

The Water Authority of Western Australia (WAWA) has reviewed the Waterway Investigation Study by Binnie and authority responsible for Partners and. as the development in the floodplain. recommendations on considers the impact on floodplain as acceptable and of minor significance.

Road surfaces and the surrounding environment collect pollutants associated with general road usage by vehicles (eg hydrocarbons, lead, litter etc).

There is the potential for these contaminants to be washed off surfaces by rain, incorporated into the roads' stormwater drainage system and possibly transported into receiving waterways, causing adverse water quality impacts.

This may have serious consequences in the case of an accidental spillage of toxic and/or hazardous chemicals, depending upon the location and magnitude of the spill.

Given the location of the Route 6 alignment, estimated traffic volumes and the slight but possible chance of a catastrophic chemical spillage, it is considered that potential water quality impacts on the Avon River from this route may be moderately significant and will require careful management (see Section 7.3.1).

6.2.2.3 Biological Environment

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Quality.

The components of the biological environment potentially impacted during the construction of the Northam Bypass Route 6 proposal are vegetation, fauna and ecosystem and habitat. A Biological Survey undertaken by consulting ecologists (Woodman and Associates) in August 1992 indicated that the majority of Route 6 passes through crop and pasture land. The remnant vegetation areas within the Route 6 road reserve are degraded and weed infested (including noxious weeds) as a result of heavy stock and human use.

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The fauna (mainly birds) were unlikely to be affected by the Route 6 alignment, although it has been brought to the consultants' attention that there may be a family of Echidna inhabiting the area around the Northam Cemetery.

The river habitats have the highest conservation value followed by the remnant woodlands, however, it is generally considered that the Route 6 alignment would not encounter or affect any areas of land with significant value for conservation of flora and fauna.

Vegetation

The clearing of vegetation along the Route 6 alignment has the potential to impact upon species composition and richness of vegetation types. Given the degraded condition and degree of weed invasion, it is considered that the environmental impacts of vegetation removal along the Route 6 alignment is of moderate significance and can be overcome by revegetation.

Although degraded, the 2 kilometre section along the north bank of the Avon River represents an area of relatively high conservation value and most likely performs some function (albeit limited) as a fauna corridor along the riverine environment. The Route 6 alignment will require the substantial removal of mature flooded gums and York gums along with other remnant native species such as swamp sheoak, jam and needle bush.

The opportunity to replace a vegetation corridor of similar size between the bypass and the Avon River is limited due to the loss of floodplain area associated with the Route 6 alignment. There is the opportunity however, to provide a reduced foreshore reserve (ie. 10-30 metres wide) to be revegetated and enhanced. In addition, it is proposed to upgrade and rehabilitate a large area of floodplain in the vicinity of the Island Farm Fauna Park for conservation and recreation purposes (see Section 7.3.2 for more details).

<u>Fauna</u>

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The disturbance of native fauna caused by the Route 6 alignment is minimal and unlikely to affect the continued utilisation of surrounding areas by dependent fauna. All native fauna species are protected, and steps to ensure that the Echidnas (and other species which may inhabit the area) are not threatened by the Route 6 alignment will be

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investigated prior to construction as previously discussed (see also Section 7.3.2 for more details).

The biological survey suggested that the degraded nature of proposed Route 6 alignment resulted in a low occurrence of native fauna species. The Avon River and Mortlock River banks have the highest conservation value for fauna due to the large number of bird species utilising these areas.

Currently, the river banks provide an almost continuous corridor of vegetation along the length of the rivers. This corridor is important for the movement of birds through the landscape. The foreshore reserve corridor is generally 40-80 metres wide along the 2 kilometre section of the Avon River bank. As mentioned in the previous section, the foreshore reserve will be reduced to 10-30 metres in width due to the construction of the Route 6 alignment and associated embankments.

During construction along the Route 6 alignment, the numerous bird species are likely to flee the construction area due to noise, vibration and machinery movements. It is expected that the majority of species will seek refuge in nearby areas removed from the disturbance.

Other fauna species likely to inhabit the river bank area (eg. mammals, amphibians, reptiles etc.) may be impacted upon, although given the low occurrence of these species, the impact is considered to be of minor significance.

Ecosystem and Habitat

Vegetation removal and modification of the landscape to accommodate the Route 6 alignment may alter or destroy habitat areas. Given that Route 6 would not encounter or affect areas of significant value for conservation of flora and fauna, it is considered that the environmental impacts on ecosystem and habitat from this alignment are generally of minor significance.

The Avon and Mortlock River banks and woodland areas near the Northam Scout Block provided the most valuable habitat areas along the Route 6 alignment, particularly in relation to nesting, roosting and perching sites for birds.

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As mentioned previously, these areas are likely to be vacated during construction of the bypass alignment and, where possible through revegetation, habitat areas will be recreated in an effort to re-establish a suitable environment for flora and fauna protection.

6.2.2.4 Human Environment

The potential impacts on the human environment during the construction of the Route 6 alignment are complex and varied and largely depend upon an individuals perception of what is acceptable or unacceptable. Aspects of the human environment likely to be impacted upon during construction include local business, noise and vibration, vehicle access, heritage values, landscape amenity, dust, farming operations, servicing infrastructure, local community expectations and recreation.

Local Business

The construction related impacts of the Route 6 alignment on local business is generally of a short term nature over the 2-3 year construction period. Given the limited opportunity to stage the Northam Bypass proposal, it is likely that local and through traffic will have to utilise the existing Great Eastern Highway/Fitzgerald Street route during the construction period. It is expected that local businesses would therefore experience minimal loss of trading during construction of the Route 6 alignment.

It is possible, however, that the increased workforce associated with a major road construction project of this type may benefit the local business houses through increased trading.

Noise and Vibration

The impacts of noise during bypass construction is an important issue in the Doctors Hill. locality where residents believe their quality of life will be adversely affected.

Construction related noise impacts associated with earthmoving equipment and blasting are the main concerns and these are considered significant enough to warrant management (see Section 7.3.3).

Vehicle Access

During the construction of Route 6, local and through traffic may experience disruption to vehicle access along certain sections of the alignment that cross over existing roads and tracks. This is particularly relevant where major construction works such as bridges, large cuttings and access roads are required. In this situation re-routing the road or providing alternative routes will be necessary.

Heritage Values

Construction of the Route 6 alignment has the potential to impact upon the heritage values of the area. Sites of particular concern include the following:

- Northam Cemetery
- Morby Farm Cottage
- Old Anglican Church Monument
- Old Northam Townsite
- Existing Tourist Drive (Katrine Road) and proposed heritage trails along the Avon River.

The above historical sites (see Plan 11) are generally not directly impacted upon by the Route 6 alignment, although concerns regarding indirect impacts (ie access and possible disturbance during construction) have been raised. The foreshore area along the north bank of the Avon River will experience restricted access during construction of the Route 6 alignment and this may result in some inconvenience to users.

The proposed heritage trails along the Avon River are not formally recognised in available Tourism Brochures, nor are details of their routes promoted by Northam's Tourist Centre. However, it is apparent that some sectors of the Northam Community are keen to formally establish heritage trails along the foreshore area and these may be affected by the Route 6 alignment. It is understood that the proposed heritage trails would traverse the foreshore reserve area, mainly within the floodplain, in close proximity to the Avon River banks.

Overall, it is considered that the impact on heritage values is minimal and mostly of a short term nature during the construction of the Route 6 alignment.

Landscape Amenity

The construction of a major road development involving large cut and fill areas may produce unsightly views affecting the landscape amenity and visual aesthetics of the land.

The earthworking associated with Route 6 involves maximum cuttings of 8 metres with embankments reaching 12 metres at some locations. This may adversely impact upon the landscape amenity of the environment.

It is possible to utilise the existing natural topography to minimise visual impacts, although in some cases this is not a viable option and alternative methods of reducing impacts (ie. landscaping, re-contouring, revegetation etc) will be employed (see Section 7.3.3).

<u>Dust</u>

Machinery movements associated with road construction and associated earthworks may cause dust problems, particularly under dry conditions. The worst effects of dust are usually in residential areas where airborne particulates may pose a nuisance problem, or in severe cases, a health problem.

The extent of dust related impacts depends largely upon seasonal considerations such as the condition of the ground surface (dry, damp, moist) and prevailing wind direction/ velocity, as well as the type and duration of earthworking. There is a range of dust management techniques available to mitigate dust impacts (see Section 7.3.3).

Farming Operations

The Avon Valley region is well known for its fertile, highly productive farmland which forms the economic backbone of the Northam area. Severance of large holdings has previously resulted from various servicing and infrastructure projects in and around Northam (eg. water supply pipeline, numerous railways, major roads etc). Further property severance/segregation is strongly opposed by the farming community and concerns over the potential impacts on productive farming land indicate that the economic viability of farming operations may be threatened by a major highway development affecting these properties. The construction of the Route 6 alignment does not impact on farming operations to the extent of jeopardising the livelihood of affected landowners, although certain farmers may experience some degree of hardship through loss of productive land and restricted access to water supplies.

Overall, the construction related impacts on farming operations from the Route 6 alignment is considered of negligible significance.

Servicing Infrastructure

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During the construction of the Route 6 alignment, the following services will be disrupted and require rectification (see Section 7.3.3):

Ð	lelecom	-	Trunk cables on Toodyay Road western connection, Withers Street and some individual houses.		
		-	Coaxial and fibre optic cables on Goomalling Road.		
	SECWA	-	Poles on Toodyay Road, Withers Street, Gillett Street, Goomalling Road (bypass on-ramp), at the crossing midway between Goomalling Road and Mortlock River and crossing east of eastern access.		
	Westrail	-	Standard and narrow gauge railway line crossings.		
	Water Authority	-	Route 6 passes over the Water Authority pipeline at western connection,		
		-	58mm diameter AC water main at Colebatch Road,		
		-	450mm diameter sewerage gravity main and Town Council pump main,		
		-	58mm or 100mm water main along Old York Road,		
		-	100mm or 150mm pipe along Goomalling Road,		
		-	150mm Water Authority pipe along narrow gauge railway.		
Local Community Expectations					
There	is general	agreemer	nt by the local community that Northam needs a bypass,		

however the majority of public input received during the CER's public participation and consultation exercises opposes the Route 6 alignment (see Section 9.2 on Public Participation and Consultation for more details).

During construction of the Northam Bypass project, it may be necessary to further consult with members of the community opposed to the Route 6 alignment in an effort to resolve outstanding issues that have previously been raised.

Recreation

Forms of passive and active recreation provide an important outlet for people living in Northam and surrounding areas. The main forms of recreation undertaken in and around Northam include:

- □ horse trail riding;
- □ jogging;
- □ canoeing;
- □ bushwalking and nature study;
- exploring historical sites;
- recreation centre activities (eg basketball, gymnastics etc);
- □ tennis;
- □ football; and
- \Box cricket.

During construction of the Route 6 alignment there may be some short term impacts on recreational activities such as horse trail riding, jogging, bushwalking and nature study where restricted access to the north bank of the Avon River will be required.

All other forms of recreation are not expected to be impacted upon during construction of the Route 6 alignment.

6.2.3 Post-Construction Impacts

6.2.3.1 Scope and Objectives

Post-construction impacts refer to those impacts that arise once the construction of the route alignment is complete. Typical activities undertaken during this phase of a major road development include minor re-contouring, revegetation, erection of appropriate signage and use of the bypass road by vehicles.

The objective of this section is to assess the significance of the environmental impacts associated with the post-construction phase of the Route 6 alignment. The impacts

associated with the post-construction phase are similar to during construction impacts, although in general, they may be longer term or permanent.

6.2.3.2 Physical Environment

The components of the physical environmental potentially impacted upon after the construction of the Route 6 alignment relate mainly to landform/soils and surface water hydrology (ie Avon River, Mortlock River, streams and tributaries). As mentioned previously, the impacts are similar to the construction impacts, although in most cases the post-construction impacts are long term or permanent.

Landform and Soils

The main impacts on landform and soils after the construction of a major highway development along Route 6 are wind and water erosion.

- Erosion Around cuttings and embankments, water and wind erosion may cause the displacement and transport of soil material.
 - At locations where surface runoff and natural drainage are concentrated (eg. culverts), downstream erosion may occur as a result of larger flows along drainage lines.
 - Clays and loams are most susceptible to water erosion, particularly around bridge structures and the steep valley sideslopes along the Avon River and Mortlock River.
 - Erosion along the 2 kilometre section of the Avon River's north bank and at the Avon and Mortlock River bridge structures has the potential to increase turbidity in the Avon River and Mortlock River resulting in sediment being transported downstream.
 - Erosional impacts associated with several locations along Route 6 are considered significant and require careful management (see Section 7.4.1).

Hydrology

After construction of the Route 6 alignment, there is the potential for long term environmental impacts to natural drainage features, the Avon River floodplain area and the water quality of the Avon and Mortlock Rivers. Drainage - Compacted earth embankments and the construction of an impermeable road surface may alter the natural drainage characteristics of the landscape as the construction of the road interferes with the transverse drainage paths.

- Embankments may intercept surface and subsurface water flows, thereby decreasing recharge to rivers and streams.

Alternatively, impermeable road surfaces collect stormwater runoff and may increase recharge.

Due to high engineering standards applicable to major road design and construction, it is considered that the impact significance on natural drainage is minimal.

The Route 6 alignment impinges significantly on the 1 in 100 year floodplain determined and mapped by the Water Authority of Western Australia (WAWA).

A Waterways Investigations Study undertaken by consulting engineers (Binnie and Partners 1987) using floodplain modelling indicated that the road embankments and bridge abutments along Route 6 would result in minimal upstream backwater effects (ie, approximately 25mm) during a 100 year ARI storm event.

WAWA has reviewed this information and considers the potential impacts are acceptable.

It is considered that the impact significance on floodplain is minimal.

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Road surfaces and the surrounding environment collect pollutants associated with general road usage by vehicles (eg hydrocarbons, lead, litter etc).

There is the potential for these contaminants to be washed off surfaces by rain, incorporated into the road's stormwater drainage system and possibly transported into receiving waterways causing adverse water quality impacts.

This may have serious consequences in the case of an accidental spillage of toxic and/or hazardous chemicals, depending upon the location and magnitude of the spill.

Given the location of the Route 6 alignment, estimated traffic volumes and the slight but possible chance of a catastrophic chemical spillage event, it is considered that potential water

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quality impacts on the Avon River from this route may be moderately significant and therefore will require careful management (see Section 7.4.1).

6.2.3.3 Biological Environment

The components of the biological environment which may potentially be impacted upon after the construction of the Route 6 alignment are vegetation, fauna and ecosystem and habitat.

Vegetation

The negative impacts to the vegetation mainly occur during the construction phase of the Northam Bypass Route 6 alignment. In general, the post-construction phase of the project would result in positive impacts due to rehabilitation and revegetation of affected land (see Section 7.4.2 for more details).

<u>Fauna</u>

The potential impacts on fauna after the construction of the Route 6 alignment are largely associated with the extent of modification to the existing environment and the degree to which this affects the fauna species dependent upon its resources.

In most cases along the alignment where crop and pasture land, roads, fences and other features of this already modified environment exist, it is expected that the impact on native fauna will be minimal due to the limited utilisation of these areas.

Along the Avon River, and to a lesser extent the Mortlock River, the riverine areas will no longer consist of a continuous corridor of the same magnitude. This will restrict fauna movements within these locations and, in regard to the 2 kilometre section along the north bank of the Avon River, will significantly modify this riverine environment causing long term impacts on fauna species which inhabit or are likely to utilise these areas.

To offset this loss, it is proposed to rehabilitate and revegetate the remaining 10-30 metre wide foreshore reserve and a large floodplain area around the Island Farm Fauna Park for the purpose of conservation and recreation (see Section 7.4.2 for more details).

Ecosystem and Habitat

Although it was concluded that the Route 6 alignment road reserve would not encounter or affect any areas of land with significant value for the conservation of flora and fauna, the biological survey identified the river habitats as having the highest conservation value with regard to fauna, followed by the areas of remnant woodland (ie. Northam Scout Block).

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The post-construction impact on the river habitat is significant and of a permanent nature as it involves the loss of approximately 15 hectares of floodplain and river bank area. This section of the river will therefore be unable to perform the function of a habitat corridor, however, it is proposed to rehabilitate and revegetate the remaining foreshore reserve and a large area of the floodplain around the Island Farm Fauna Park for the purpose of conservation and recreation (see Section 7.4.2. for more details).

6.2.3.4 Human Environment

The potential impacts on the human environment after the construction of the Route 6 alignment are complex and varied and largely depend on an individual's perception of what is acceptable or unacceptable. Aspects of the human environment likely to be impacted upon following construction of the Route 6 bypass include local business, noise and vibration, heritage values, landscape amenity, pollution, dust, farming operations, tourism and future town expansion.

Local Business

The impacts on local business houses following the construction of Route 6 in Northam may be of a positive nature, in that, this route is close to and maintains a visual link with the town, thereby increasing the probability that travellers that would otherwise have passed by, may be inclined to stop in Northam.

This is facilitated by entry and exit ramps conveniently located mid-way along the Route 6 bypass route at Northam-Pithara Road.

Although members of Northam's local business community have previously raised their concerns with regard to the Northam Bypass and declining business, it is understood through correspondence with Northam's Chamber of Commerce that the town's economy

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has improved in recent times and is therefore less reliant on attracting through traffic by way of visual contact.

Noise

The impacts of noise after bypass construction is an important issue in the Doctors Hill locality where residents believe their quality of life will be adversely affected.

Post-construction noise and vibration impacts attributable to heavy vehicle movements are the main concern particularly during evening and night.

A noise assessment of the highway alignment was undertaken by acoustic specialists where noise modelling and subsequent quantitative analysis was used to assess the significance of noise impacts on local residents. The noise assessment concluded that the Route 6 alignment would result in acceptable noise levels (within standards set by the EPA) in the Doctors Hill and other areas due to the large cuttings and the distance between the noise source and residences. The study therefore recommended that no special measures were required (see Appendix 5).

Heritage Values

Following construction, the Route 6 alignment has the potential to impact upon the heritage values of the area. Sites of particular concern include the following:

- Northam Cemetery
- Morby Farm Cottage
- Old Anglican Church Monument
- Old Northam Townsite
- Existing Tourist Drive (Katrine Road) and proposed heritage trails along the Avon River.

The above historical sites are generally not directly impacted upon by the Route 6 alignment, although concerns regarding indirect impacts (ie. access and possible disturbance) have been raised. This is applicable to the Cemetery where the access road (Katrine Road) will be retained during Stage 1 of the Route 6 proposal, but will need to be re-constructed as part of the future Stage 2 (ultimate proposal).

The proposed heritage trails along the Avon River are not formally recognised in available Tourism Brochures, nor are details of their routes promoted by Northam's Tourist Centre. However, it is apparent that some sectors of the Northam Community are keen to formally establish heritage trails along the foreshore area and these may be affected by the Route 6 alignment. It will still be possible to establish a walk trail along the remaining 10-30 metre wide foreshore reserve, and methods to achieve this are discussed in Section 7.4.3.

Landscape Amenity

After the construction of a major road development, large cut and fill areas may produce unsightly views affecting the landscape amenity and visual aesthetics of the land. In addition, the presence of a major road structure along the riverbank section of the Avon River may be perceived by some people as unnatural and aesthetically displeasing.

The earthworking associated with Route 6 involves maximum cuttings of 8 metres with embankments reaching 12 metres at some locations. Clearly, this may adversely impact upon the landscape amenity of the environment. There is also the visual impact associated with the numerous bridge structures and access roads which may be viewed as uncomplementary in a rural town setting.

It is possible to utilise the existing natural topography to minimise visual impacts, although in some cases this is not a viable option and alternative methods of reducing impacts (ie. landscaping, re-contouring, revegetation etc) may be employed (see Section 7.4.3).

Air Pollution

Following the construction of the Route 6 alignment it is estimated that an average of 700-800 vehicles per day are likely to travel along the bypass road.

The Northam community have previously raised concerns over the existing air pollution problems caused by vehicles moving through the town centre. It is perceived by some members of the community that the Route 6 alignment does not remove the existing traffic and pollution problems for the town centre, but simply shifts the problems to elsewhere within the town of Northam.

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It is considered that the air pollution associated with the Route 6 alignment would improve upon the existing situation substantially due to the continuous traffic movements and greater air pollution dispersion potential offered by the Route 6 bypass.

Farming Operations

The Route 6 alignment of the Northam Bypass does not impact on farming operations to the extent of jeopardising the livelihood of affected landowners, although certain farmers may experience some degree of hardship through loss of productive land and restricted access to water supplies. This could be largely overcome through negotiation and appropriate compensation to affected landowners.

Overall the impact on farming operations from the Route 6 alignment is considered of negligible significance.

Recreation

Forms of passive and active recreation provide an important outlet for people living in Northam and surrounding areas. The main forms of recreation undertaken in and around Northam include:

□ horse trail riding;

- □ jogging;
- □ canoeing;
- bushwalking and nature study;
- □ exploring historical sites;
- recreation centre activities (eg. basketball, gymnastics etc);
- □ tennis;
- □ football; and
- □ cricket.

Following the construction of the Route 6 alignment, there may be long term impacts on recreational activities such as horse trail riding, jogging, bushwalking and nature study. It is apparent that many of these recreational activities focus on the river bank area and it is likely that the loss of foreshore area and restricted access along the 2 kilometre section of the Avon River's north bank will adversely affect the extent of these pursuits at this location.

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However, it is proposed to rehabilitate and upgrade the remaining foreshore reserve area along the north bank of the Avon River and in the vicinity of the Island Farm Fauna Park, thereby improving the recreational attributes of this currently degraded location.

Tourism

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The location and design of the Northam Bypass alignment has implications in terms of a stracting tourists into the town.

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Northam is a popular destination for interstate travellers, day-trippers from Perth and tourists exploring the Avon Valley region. Tourism brings in valuable income to the local business community and it is imperative that a bypass route does not adversely affect future business opportunities.

The Route 6 alignment is close to Northam and maintains a visual link to the town. This is an important attribute as it encourages people to visit Northam who may otherwise have passed through, having not seen the township setting.

A disadvantage resulting from the Route 6 alignment's close proximity to town is that it affects a portion of a recognised tourist route known as Katrine Road. Given that access to Katrine Road will be maintained and only a 650m section of Katrine Road (out of approximately 13.8km) will be totally resumed by the ultimate development of the Route 6 alignment, it is considered that the impact to this small section of the tourist drive is minimal.

Future Town Expansion

The Route 6 alignment is close to Northam and may have some impact on areas identified or or earmarked for future urban expansion.

Planning around the Northam Bypass alignment has already taken place with the Doctors Hill Guided Development Scheme and subsequently the Town of Northam's Town Planning Scheme Maps showing the Route 6 alignment. It is logical to assume that the broader community has been aware of this route for some time. Northam is fairly restricted in terms of areas for future expansion, with limited expansion to the south only up to the Town boundary, constraints to the west due to the Army Camp and constraints to the east associated with industry. Other areas are constrained to urban development by natural landform and will involve significant costs associated with their development and servicing. The current special residential subdivision to the east of East Street prevents higher density urban expansion at that locality in the future.

One of the remaining options for townsite expansion is to the north-east around the Doctors Hill and Golf Course area.

The townsite expansion in this locality will need to take into account the impacts of the Route 6 alignment. Urban development can proceed in proximity to Route 6, however it is possible that the noise associated with a major highway may limit the extent and type of development in these locations.

6.3 Potential Environmental Impacts of Route 6A

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6.3.1 Preconstruction Impacts

6.3.1.1 Scope and Objectives

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Pre-construction impacts refers to the environmental impacts that occur before construction of the bypass road commences. Typical activities undertaken during this phase of a road construction project include detailed costings analysis, land acquisition along the proposed road reserve, environmental, biological, geotechnical and/or hydrogeological surveys (if required), amendment of preliminary design where appropriate, and completion of final design drawings. The objective of this section is to assess the significance of the environmental impacts associated with the pre-construction phase of Route 6A.

6.3.1.2 Physical Environment

Apart from minor disturbance associated with the aforementioned surveys that may be undertaken during this period, the components of the physical environment are generally not impacted upon by pre-construction activities.

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6.3.1.3 **Biological Environment**

and the second The pre-construction activities may involve the removal of a small percentage of vegetation in order to successfully undertake surveys, however the impact to flora, fauna and habitat is considered negligible. se de la facilita

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6.3.1.4 Human Environment

It is considered that pre-construction activities affect the human environment to the second greatest degree through land resumption, impact on Aboriginal Sites and local community expectations.

Land Resumption

The construction of a new bypass road requires the resumption of land for the road reserve within which the bypass and associated infrastructure are contained. Main Roads purchases available land when opportunities arise, and negotiations with landowners and regarding the acquisition of part or all of their properties are undertaken when appropriate. ÷. .

This may cause adverse impacts to associated landowners through hardship, anxiety and the chance of losing affiliated land. Where possible, Main Roads attempts to minimise the impacts associated with land resumption, however, in some cases these are unavoidable.

To date, the Main Roads have acquired almost half of the 76 properties affected by the Route 6A alignment of the Northam Bypass. As Route 6A only differs slightly from the Route 6 alignment, the land requirements and ownership details are very similar to those provided in Appendix 6. Main Roads land ownership represents over one third of the start total land requirements for this alignment. It is relevant to note that almost 4 kilometres (over one third of the total Route 6A alignment) is Council Common and Foreshore Reserve, vested in the Town of Northam.

Further negotiations by Main Roads with affected landowners whose properties have yet to be acquired will be necessary as part of the pre-construction activities of the Northam Bypass Route 6A project. It is likely that opposition to the resumption of properties will

be encountered, indicating that land resumption potentially imposes a significant impact upon the Northam community.

Aboriginal Sites

Prior to any construction work being initiated, the issue of Aboriginal Reserve 8313 will need to be resolved. As previously mentioned, the Reserve is considered an Aboriginal Site under the meaning of the Aboriginal Heritage Act (O'Connor et al, 1988).

In 1987, negotiations with Main Roads, the Aboriginal Lands Trust and the then Chairperson of the Northam Aboriginal Progress Association led to an agreement on a land swap for Aboriginal Reserve 8313. A land swap was not finalised at the time; however, with the understanding that a suitable site would be selected, Main Roads pursued the Route 6 alignment based on the original agreement. Route 6A affects Aboriginal Reserve 8313 to the same degree.

During the public participation and consultation programme undertaken in preparation of this CER report, it has become apparent that the local Aboriginal people believe they were not adequately consulted during the 1987 land swap agreement and negotiations on their behalf at the time were undertaken by Aboriginal representatives with little or no affiliation with Aboriginal Reserve 8313. Accordingly, the land swap agreement is therefore considered invalid by the local Aboriginal Community and is subject to challenge.

The Northam Aboriginal Progress Association is currently chaired by a local Aboriginal with established ties to the Reserve. The local Aboriginal community is at present seeking a 99 year lease for Aboriginal Reserve 8313 and it is understood that Main Roads are negotiating with the Aboriginal Affairs Planning Authority with the aim of resolving the conflict between Aboriginal Reserve 8313 and the bypass route alignments that affect the Reserve (ie. Route 6 and 6A).

Local Community Expectations

There is general agreement by the local community that Northam needs a bypass.

Some of the key issues raised by the Northam community include:

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- □ the need to relocate through traffic (particularly heavy vehicles) away from Fitzgerald Street;
- improving traffic flows and access around Northam's Central Business District;
- proposing an environmentally and socially acceptable bypass alternative that does enot impact on the future planning and expansion of Northam;

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- □ maintaining a visual link with Northam;
- □ retaining access to river foreshore; and
- □ resolution of the Aboriginal Reserve 8313 issue.

The Route 6A alignment of the Northam Bypass relocates through traffic away from Fitzgerald Street and improves local traffic flows and access around Northam's Central Business District. In doing so, a visual link with Northam will be maintained.

Access to the river foreshore will be limited to a small degree by the Route 6A alignment and, in order to achieve national highway standards, it is not possible to completely avoid Aboriginal Reserve 8313.

6.3.2 During Construction Impacts

6.3.2.1 Scope and Objectives

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During construction impacts are those associated with constructing the Route 6A alignment of the Northam Bypass proposal. Typical activities undertaken during this phase of a major highway construction project include clearing vegetation, earthworking (ie. cutting, filling, rock removal, blasting etc), re-contouring of embankments and batter slopes, stabilisation of the proposed road surface, bridge and drainage construction and the laying down of the sealed road surface.

The objective of this section is to assess the significance of the environmental impacts during the construction phase of the Route 6A alignment.

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6.3.2.2. Physical Environment

The components of the physical environment potentially impacted during construction of the Route 6A alignment relate mainly to landform/soils and surface water hydrology (ie. Avon River, Mortlock River, streams and tributaries).

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Landform and Soils

The main impacts on landform and soils associated with Route 6A are due to water and wind erosion.

- □ Erosion Around cuttings and embankments, water and wind erosion may cause the displacement and transport of soil material.
 - At locations where surface runoff and natural drainage are concentrated (eg. culverts) downstream erosion may occur as a result of larger flows along the drainage lines.
 - Clays and loams are most susceptible to water erosion, particularly around the steep valley sideslopes along the Avon River.
 - Erosion along the 600 metre section of the Avon River's north bank and the Mortlock River/Avon River bridge structures has the potential to increase turbidity and sediment loading in these waterways.
 - Erosional impacts associated with several locations along Route 6A are considered significant and will require careful management.

Hydrology

The Route 6A alignment has the potential to cause environmental impacts to the natural drainage features, the Avon River floodplain and the water quality of the Avon and Mortlock Rivers.

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Drainage

The compacted earth embankments, cuttings and construction of an impermeable road surface may alter the natural drainage characteristics of the landscape as the construction of a road interferes with the transverse drainage paths.

- Embankments may intercept surface and sub-surface water flows, thereby decreasing recharge to rivers and streams.
- Due to the high engineering standards applicable to major road design and construction, it is considered the impact significance associated with Route 6A on natural drainage is minimal.

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Floodplain

The Route 6A alignment impinges on the 1 in 100 year floodplain determined and mapped by the WAWA.

- Extrapolation from a Waterways Investigation Study undertaken by consulting engineers (Binnie and Partners, 1987) indicates that the potential impacts on the floodplain from the Route 6A alignment would be of minor significance.
- It is assumed that the backwater effects associated with Route 6A would be less than Route 6 and therefore also acceptable to WAWA.
- Water
 Quality
- Road surfaces and the surrounding environment collect pollutants associated with general road usage by vehicles (eg hydrocarbons, lead, litter etc).
- There is the potential for these contaminants to be washed off surfaces by rain, incorporated into the road's stormwater drainage system and possibly transported into receiving waterways, causing adverse water quality impacts.
- This may have serious consequences in the case of an accidental spillage of toxic and/or hazardous chemicals, depending on the location and magnitude of the spill.
- Given the location of the Route 6A alignment, estimated traffic volumes and the slight but possible chance of a catastrophic chemical spillage, it is considered that potential water quality impacts on the Avon River from this route may be significant and will require careful management.

6.3.2.3 Biological Environment

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The components of the biological environment potentially impacted during the construction of the Northam Bypass Route 6A proposal are vegetation, fauna and ecosystem and habitat. A Biological Survey undertaken by consulting ecologists (Woodman and Associates) in August 1992 indicated that the majority of Route 6A passes through crop and pasture land. Examination of the 2.5 kilometre section of this alignment not assessed during the survey (ie. behind the Cemetery) revealed very similar vegetation species composition to that of the survey area. It is therefore reasonable to assume that the remnant vegetation areas within the Route 6A road reserve are degraded and weed infested (including noxious weeds) as a result of heavy stock and human use.

The fauna (mainly birds) were unlikely to be affected by the Route 6A alignment, although it has been brought to the consultants' attention that there may be a family of Echidna inhabiting the area around the Northam Cemetery. The river habitats have the highest conservation value followed by the remnant woodlands, however, it is generally considered that the Route 6A alignment would not encounter or affect any areas of land with significant value for conservation of flora and fauna.

Vegetation

The clearing of vegetation along the Route 6A alignment has the potential to impact upon species composition and richness of vegetation types. Given the degraded condition and degree of weed invasion, it is considered that the environmental impacts of vegetation removal along the Route 6A alignment is of minor significance and can be overcome by revegetation.

Although degraded, the 40-80 metre wide foreshore reserve associated with the potentially affected 600 metre section along the north bank of the Avon River represents an area of relatively high conservation value and most likely performs some function (albeit limited) as a fauna corridor along the riverine environment.

The opportunity to replace a vegetation corridor of similar size between the bypass and the Avon River is somewhat reduced due to the loss of floodplain area associated with the Route 6A alignment. There is the opportunity however, to provide a reduced foreshore reserve (ie. 10-30 metres wide) along the 600 metre section of the Avon River affected by Route 6A. In addition, it would be possible to upgrade and rehabilitate a large area of floodplain in the vicinity of the Island Farm Fauna Park for conservation and recreation purposes.

<u>Fauna</u>

The biological survey suggested that the degraded nature of proposed Route 6 and Route 6A alignments resulted in a low occurrence of native fauna species. The Avon River and Mortlock River banks have the highest conservation value for fauna due to the large number of bird species utilising these areas.

Currently, the river banks provide an almost continuous corridor of vegetation along the length of the rivers. This corridor is important for the movement of birds through the landscape. The foreshore reserve corridor is generally 40-80 metres wide along the 600 metre section of the Avon River bank affected by the Route 6A alignment.

During construction of the Route 6A alignment, the numerous bird species are likely to flee the construction area due to noise, vibration and machinery movements. It is expected that the majority of species will seek refuge in nearby areas removed from the disturbance.

The disturbance of native fauna caused by the Route 6A alignment is minimal and unlikely to affect the continued utilisation of surrounding areas by dependent fauna. All native fauna species are protected, and steps to ensure that the Echidnas (and other species which may inhabit the area) are not threatened by the Route 6A alignment will be investigated if necessary.

Other fauna species likely to inhabit the river bank area (eg. mammals, amphibians, reptiles etc.) may be impacted upon, although given the low occurrence of these species, the impact is not expected to be significant.

Ecosystem and Habitat

Vegetation removal and modification of the landscape to accommodate the Route 6A alignment may alter or destroy habitat areas. Given that Route 6A would not encounter or affect areas of significant value for conservation of flora and fauna, it is considered that the environmental impacts on ecosystem and habitat from this alignment are generally of minor significance.

The Avon and Mortlock River banks and woodland areas near the Northam Scout Block provided the most valuable habitat areas along the Route 6A alignment, particularly in relation to nesting, roosting and perching sites for birds.

As mentioned previously, these areas are likely to be vacated during construction of the bypass alignment and, where possible through revegetation, habitat will be re-created in an effort to re-establish a suitable environment for flora and fauna protection.

6.3.2.4 Human Environment

The potential impacts on the human environment during the construction of the Route 6A alignment are complex and varied, and largely depend upon an individual's perception of what is acceptable or unacceptable. Aspects of the human environment likely to be impacted upon during construction include local business, noise and vibration, vehicle access, heritage values, landscape amenity, dust, farming operations, servicing infrastructure, local community expectations and recreation.

Local Business

The construction related impacts of the Route 6A alignment on local business are generally of a short term nature over the 2-3 year construction period. Given the limited opportunity to stage the Northam Bypass proposal, it is likely that local and through traffic will have to utilise the existing Great Eastern Highway/Fitzgerald Street route during the construction period. It is expected that local businesses would therefore experience minimal loss of trading during construction of the Route 6A alignment.

It is possible, however, that the increased workforce associated with major road construction project of this type may benefit the local business houses through increased trading.

Noise and Vibration

The impact of noise during bypass construction is an important issue in the Doctors Hill locality where residents believe their quality of life will be adversely affected.

Construction related noise impacts associated with earthmoving equipment and blasting are the main concerns and these are considered significant enough to warrant management.

Vehicle Access

During the construction of Route 6A, local and through traffic may experience disruption to vehicle access along certain sections of the alignment that cross over existing roads and tracks. This is particularly relevant where major construction works such as bridges, large cuttings and access roads are required. In this situation re-routing the road or providing alternative routes will be necessary. Heritage Values and a state of meaning of the test of the second state of the second state of the second of the

Construction of the Route 6A alignment has the potential to impact upon the heritage disc values of the area. Sites of particular concern include the following:

- Northam Cemetery
- Morby Farm Cottage
- Old Anglican Church Monument
- Old Northam Townsite
- Existing Tourist Drive (Katrine Road) and proposed heritage trails along the Avon River.

The above historical sites are generally not directly impacted upon by the Route 6A alignment, although concerns regarding indirect impacts (ie. access and possible disturbance during construction) have been raised. The foreshore area along the north bank of the Avon River would experience restricted access during construction of the Route 6A alignment and this may result in some inconvenience to users.

The proposed heritage trails along the Avon River are not formally recognised in available Tourism Brochures, nor are details of their routes promoted by Northam's Tourist Centre. However, it is apparent that some sectors of the Northam Community are keen to formally establish heritage trails along the foreshore and these may be affected by the Route 6A alignment. Under this bypass proposal, it would also still be possible to establish a walk trail along the section of riverbank affected by the Route 6A alignment.

Overall, it is considered that the impact on heritage values is minimal and mostly of a short term nature during construction of the Route 6A alignment.

Landscape Amenity

The construction of a major road development involving large cut and fill areas may produce unsightly views affecting the landscape amenity and visual aesthetics of the land.

The earthworking associated with Route 6 involves maximum cuttings of 15 metres with embankments reaching 10 metres at some locations. Clearly, this may adversely impact upon the landscape amenity of the environment.

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It is possible to utilise the existing natural topography to minimise visual impacts, although in some cases this is not a viable option and alternative methods of reducing impacts (ie. landscaping, re-contouring, revegetation etc) may be employed.

<u>Dust</u>

Machinery movements associated with road construction and associated earthworks maycause dust problems, particularly under dry conditions. The worst effects of dust are usually in residential areas where airborne particulates may pose a nuisance problem, or in severe cases, a health problem.

The extent of dust related impacts depends largely upon seasonal considerations such as the condition of the ground surface (dry, damp, moist) and prevailing wind direction/ velocity, as well as the type and duration of earthworking. There is a range of dust management techniques available to mitigate dust impacts.

Farming Operations

The Avon Valley region is well known for its fertile, highly productive farmland which forms the economic backbone of the Northam area. Severance of large holdings has previously resulted from various servicing and infrastructure projects in and around Northam (eg. water supply pipeline, numerous railways, major roads etc). Further property severance/segregation is strongly opposed by the farming community and concerns over the potential impacts on productive farming land indicate that the economic viability of farming operations may be threatened by a major highway development.

The construction of the Route 6A alignment does not impact on farming operations to the extent of jeopardising the livelihood of affected landowners, although certain farmers may experience some degree of hardship through loss of productive land and restricted access to water supplies.

Overall, the construction related impacts on farming operations from the Route 6A alignment is considered of negligible significance.

Servicing Infrastructure

During construction of the Route 6A alignment, the following services will be disrupted and will require rectification.

	Telecom	-	Trunk cables on Toodyay Road western connection, Withers Street and some individual houses.
		-	Coaxial and fibre optic cables on Goomalling Road.
0	SECWA	-	Poles on Toodyay Road, Withers Street, Gillett Street, Goomalling Road (bypass on-ramp), at the crossing midway between Goomalling Road and Mortlock River and the crossing east of the eastern access.
	Westrail	-	Standard and narrow gauge railway line crossings.
0	Water		
	Authority	-	Bypass passes over Water Authority pipeline at western connection.
		-	58mm diameter AC water main at Colebatch Road.
		-	450mm diameter sewerage gravity main and Town Council pump main.
			58mm or 100mm water mains along Old York Road.
		-	100mm or 150mm pipe along Goomalling Road.
		-	150mm Water Authority pipe along narrow gauge railway line.

Local Community Expectations

There is general agreement by the local community that Northam needs a bypass, however the majority of public input received during the CER's public participation and consultation exercises opposes the Route 6A alignment (see Section 9.2 on Public Participation and Consultation for more details).

During construction of the Northam Bypass project, it may be necessary to further consult with members of the community opposed to the Route 6A alignment in an effort to resolve outstanding issues that have previously been raised.

Recreation

Forms of passive and active recreation provide an important outlet for people living in Northam and surrounding areas. The main forms of recreation undertaken in and around Northam include:

- \Box horse trail riding;
- \Box jogging;
- □ canoeing;
- bushwalking and nature study;
- exploring historical sites;
- recreation centre activities (eg basketball, gymnastics etc);
- tennis;
- \Box football; and
- □ cricket.

During construction of the Route 6A alignment there may be some short term impacts on recreational activities such as horse trail riding, jogging, bushwalking and nature study where restricted access to the north bank of the Avon River will be required.

All other forms of recreation are not expected to be impacted upon during construction of the Route 6A alignment.

6.3.3 Post-Construction Impacts

6.3.3.1 Scope and Objectives

Post-construction impacts refer to those impacts that arise once the construction of the route alignment is complete. Typical activities undertaken during this phase of a major road development include minor re-contouring, revegetation, erection of appropriate signage and use of the bypass road by vehicles.

The objective of this section is to assess the significance of the environmental impacts associated with the post-construction phase of the Route 6A alignment. The impacts associated with the post-construction phase are similar to during construction impacts, although in general, they may be longer term or permanent.

6.3.3.2 Physical Environment

The components of the physical environmental potentially impacted upon after the construction of the Route 6A alignment relate mainly to landform/soils and surface water

hydrology (ie. Avon River, Mortlock River, streams and tributaries). As mentioned previously, the impacts are similar to the construction impacts, although in most cases the post construction impacts are long term or permanent.

Landform and Soils

The main impacts on landform and soils after the construction of a major highway development along Route 6A are wind and water erosion.

- Erosion Around cuttings and embankments, water and wind erosion may cause the displacement and transport of soil material.
 - At locations where surface runoff and natural drainage are concentrated (eg. culverts), downstream erosion may occur as a result of larger flows around drainage lines.
 - Clays and loams are most susceptible to water erosion, particularly around bridge structures and the steep valley sideslopes along the Avon River and Mortlock River.
 - Erosion along the 600 metre section of the Avon River's north bank and at Avon River/Mortlock River bridge structures has the potential to increase turbidity in the Avon River resulting in sediment being transported downstream.
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Erosional impacts associated with several locations along Route 6A are considered significant and require careful management.

Hydrology

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After construction of the Route 6A alignment, there is the potential for long term environmental impacts to natural drainage features, the Avon River floodplain area and the water quality of the Avon and Mortlock Rivers.

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Drainage

Compacted earth embankments, cuttings and the construction of an impermeable road surface may alter the natural drainage characteristics of the landscape as the construction of a road interferes with the transverse drainage paths.

Embankments may intercept surface and subsurface water flows thereby decreasing recharge to rivers and streams.

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Due to high engineering standards applicable to major road design and construction, it is considered that the impact significance on natural drainage is minimal.

Floodplain

- The Route 6A alignment impinges significantly on the 1 in 100 year floodplain determined and mapped by the Water Authority of Western Australia (WAWA).
 - A Waterways Investigations Study undertaken by consulting engineers (Binnie and Partners 1987) using floodplain modelling indicated that the construction of Route 6 would result in minimal upstream backwater effects during a 100 year ARI storm event.
- WAWA has reviewed this information and considers the potential impacts are acceptable.
 - Given the reduced scale of impact associated within the Route 6A alignment of the floodplain, it is assumed that WAWA would also consider its impact on floodplain acceptable.
- WaterQuality
- Road surfaces and the surrounding environment collect pollutants associated with general road usage by vehicles (eg hydrocarbons, lead, litter etc).
- There is the potential for these contaminants to be washed off surfaces by rain, incorporated into the road's stormwater drainage system and possibly transported into receiving waterways, causing adverse water quality impacts.
- This may have serious consequences in the case of an accidental spillage of toxic and/or hazardous chemicals, depending upon the location and magnitude of the spill.
- Given the location of the Route 6A alignment, estimated traffic volumes and the slight but possible chance of a catastrophic chemical spillage event, it is considered that potential water quality impacts on the Avon River from this route may be significant and will require careful management.

6.3.3.3 Biological Environment

The components of the biological environment potentially impacted upon after the construction of the Route 6A alignment are vegetation, fauna and ecosystem and habitat.

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Vegetation

The negative impacts to the vegetation mainly occur during the construction phase of the Northam Bypass Route 6A alignment. In general, the post-construction phase of the project would result in positive impacts due to rehabilitation and revegetation of affected land.

<u>Fauna</u>

The potential impacts on fauna after the construction of the Route 6A alignment are largely associated with the extent of modification to the existing environment and the degree to which this affects the fauna species dependent upon its resources.

In most cases along the alignment where crop and pasture land, roads, fences and other features of this already modified environment exist, it is expected that the impact on native fauna will be minimal due to the limited utilisation of these areas.

Along the Avon River, and to a lesser extent the Mortlock River, the riverine areas will no longer consist of a continuos corridor of the same magnitude. This will restrict fauna movements within these locations and in regard to the 600 metre section along the north bank of the Avon River, may modify this riverine environment causing long term impacts on fauna species which inhabit or are likely to utilise these areas. Given the scope of impacts upon fauna, it is considered that the Route 6A alignment would have minimal impact on fauna apart from the loss of approximately 3ha. of foreshore area.

To offset this loss, it would be possible to rehabilitate and revegetate the remaining foreshore reserve and a large floodplain area around the Island Farm Fauna Park for the purpose of conservation and recreation.

Ecosystem and Habitat

Although it was concluded that the Route 6A alignment road reserve would not encounter or affect any areas of land with significant value for the conservation of flora and fauna, the biological survey identified the river habitats as having the highest conservation value with regard to fauna, followed by the areas of remnant woodland (ie. Northam Scout Block).

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The post-construction impact on the river habitat is significant and of a permanent nature as it involves the loss of approximately 3 hectares of floodplain and river bank area. This section of the river will therefore be unable to perform the function of a habitat corridor, however, it is proposed to rehabilitate and revegetate the remaining foreshore reserve and a large area of the floodplain around the Island Farm Fauna Park for the purpose of conservation and recreation.

6.3.3.4 Human Environment

The potential impacts on the human environment after the construction of the Route 6A alignment are complex and varied and largely depend on an individuals perception of what is acceptable or unacceptable. Aspects of the human environmental likely to be impacted upon following construction of the Route 6A bypass include local business, noise and vibration, heritage values, landscape amenity, pollution, dust, farming operations, tourism and future town expansion.

Local Business

The impacts on local business houses following the construction of Route 6A in Northam may be of a positive nature, in that this route is close to and maintains a visual link with the town, thereby increasing the probability that travellers who would otherwise have passed by, may be inclined to stop in Northam.

This is facilitated by entry and exit ramps conveniently located mid-way along the Route 6A bypass route at Northam-Pithara Road.

Although Northam's local business community have previously raised their concerns with regard to the Northam Bypass and declining business, it is understood that the town's economy has improved in recent times and is therefore less reliant on attracting through traffic by way of visual contact.

<u>Noise</u>

The impacts of noise after bypass construction is an important issue in the Doctors Hill locality where residents believe their quality of life will be adversely affected.

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Post-construction noise and vibration impacts attributable to heavy vehicle movements are the main concern particularly during evening and night.

A noise assessment of the highway alignment was undertaken by acoustic specialists where noise modelling and subsequent quantitative analysis was used to assess the significance of noise impacts on local residents. The noise assessment concluded that the Route 6A alignment would result in acceptable noise levels in the Doctors Hill and other areas due to the large cuttings and distance between the noise source and residences.

Heritage Values

Following construction, the Route 6A alignment has the potential to impact upon the heritage values of the area. Sites of particular concern include the following:

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- Northam Cemetery
- Morby Farm Cottage
- Old Anglican Church Monument
- Old Northam Townsite
- Existing Tourist Drive (Katrine Road) and proposed heritage trails along the Avon River.

The above historical sites are generally not directly impacted upon by the Route 6A alignment, although concerns regarding indirect impacts (ie. access and possible disturbance) have been raised. This is applicable where the Route 6A alignment extends behind the Cemetery and dissects the area earmarked for future Cemetery expansion.

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The proposed heritage trails along the Avon River and not formally recognised in available Tourism Brochures, nor are details of their routes promoted by Northam Tourist Centre. However, it is apparent that some sectors of the Northam Community are keen to formally establish heritage trails along the foreshore area and these may be affected to a minor degree by the Route 6A alignment.

Landscape Amenity

After the construction of a major road development, large cut and fill areas may produce unsightly views affecting the landscape amenity and visual aesthetics of the land. In addition, the presence of a major road structure along the riverbank section of the Avon River may be perceived by some people as unnatural and aesthetically displeasing.

The earthworking associated with Route 6 involves maximum cuttings of 15 metres with embankments reaching 10 metres at some locations. Clearly, this may adversely impact upon the landscape amenity of the environment. There is also the visual impact associated with the numerous bridge structures and access roads which may be viewed as uncomplementary in a rural town setting.

It is possible to utilise the existing natural topography to minimise visual impacts, although in some cases this is not a viable option and alternative methods of reducing impacts (ie. landscaping, re-contouring, revegetation etc) may be employed.

Pollution

Following the construction of the Route 6A alignment it is estimated that an average of 700-800 vehicles per day are likely to travel along the bypass road.

The Northam community have previously raised concerns over the existing air pollution problems caused by vehicles moving through the town centre. It is perceived by some members of the community that the Route 6A alignment does not remove the existing traffic and pollution problems for the town centre, but simply shifts the problems to elsewhere within the town of Northam.

It is considered that the air pollution associated with the Route 6A alignment would improve upon the existing situation substantially, due to the continuous traffic movements and greater air pollution dispersion potential offered by the Route 6A bypass.

Farming Operations

The Route 6A alignment of the Northam Bypass does not impact on farming operations to the extent of jeopardising the livelihood of affected landowners, although certain farmers may experience some degree of hardship through loss of productive land and restricted access to water supplies. This could be largely overcome through negotiation and appropriate compensation to affected landowners.

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Overall the impact on farming operations from the Route 6A alignment is considered of and the providence of the second s negligible significance. and the second an awar yangan ta

Recreation

Forms of passive and active recreation provide an important outlet for people living in Northam and surrounding areas. The main forms of recreation undertaken in and around the fallential and Northam include: entral and a second frequencies and the second s

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	canoeing;				
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	exploring historical sites;				
	recreation centre activities (eg. basketball,	gymnastics	etc);	· ·	
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	football; and				
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Following the construction of the Route 6A alignment, there may be long term impacts on recreational activities such as horse trail riding, jogging, bushwalking and nature study. It is apparent that many of these recreational activities focus on the river bank area and it is likely that the loss of foreshore area and restricted access along the 600 metre section of the Avon River's north bank will adversely affect the extent of these pursuits at this location.

However, it is possible to rehabilitate and upgrade the remaining and nearby foreshore areas in the vicinity of the Island Farm Fauna Park and thereby improve the recreational attributes of this currently degraded location. and the second second

Tourism

The location and design of the Northam Bypass alignment has implications in terms of attracting tourists into the town.

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Northam is a popular destination for interstate travellers, day-trippers from Perth and tourists exploring the Avon Valley region. Tourism brings in valuable income to the local business community and it is imperative that a bypass route does not adversely affect future business opportunities.

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The Route 6A alignment is close to Northam and maintains a visual link to the town. This is an important attribute as it encourages people to visit Northam, who may otherwise have passed through, having not seen the township setting.

The Route 6A alignment does not affect the recognised tourist route known as Katrine Road in a substantial manner, and overall the impacts on tourism from this route are primarily positive.

Future Town Expansion

The Route 6A alignment is close to Northam and may have some impact on areas identified or earmarked for future urban expansion.

Planning around the Northam Bypass alignment has already taken place with the Doctors Hill Guided Development Scheme and subsequently the Town of Northam's Town Planning Scheme Maps showing the Route 6 alignment, which is identical to Route 6A at these locations. It is logical to assume that the broader community has been aware of this route for some time.

Northam is fairly restricted in terms of areas for future expansion with limited expansion to the south only up to the Town boundary, constraints to the west due to the Army Camp and constraints to the east associated with industry. Other areas are constrained to urban development by natural landform and will involve significant costs associated with their development and servicing. The current special residential subdivision to the east of East Street prevents higher density urban expansion in that locality in the future.

One of the remaining options for townsite expansion is to the north east around the Doctors Hill and Golf Course areas.

The future townsite expansion in this locality will need to take into account the impacts of the Route 6A alignment. Urban development can proceed in proximity to Route 6A, however it is possible that the noise associated with a major highway may limit the extent and type of development in these locations.

6.4 Potential Environmental Impacts of Route 9 and and a set and a set and a set of the set of the set

6.4.1 **Pre-Construction Impacts**

6.4.1.1 Scope and Objectives

Pre-construction impacts refers to the environmental impacts that occur before construction of the bypass road commences. Typical activities undertaken during this phase of a road construction project include detailed costings analysis, land acquisition along the proposed road reserve, further biological, environmental, geotechnical and/or hydrogeological surveys (if required), amendment of preliminary design and completion of final design drawings.

6.4.1.2 Physical Environment

Apart from minor disturbance associated with the aforementioned surveys that may be undertaken during this period, the components of the physical environment are generally not impacted upon by pre-construction activities.

6.4.1.3 Biological Environment

The pre-construction activities associated with the Route 9 alignment may involve the removal of a small percentage of vegetation in order to successfully undertake required surveys. In general, however, the impact on flora, fauna and habitat is considered negligible.

6.4.1.4 Human Environment

It is considered that the pre-construction activities associated with the Route 9 alignment have the potential to impact on the human environment through land resumption and local community expectations.

Land Resumption

The construction of a new bypass road requires the resumption of land for the road reserve within which the bypass and associated infrastructure is contained. Main Roads purchases available land when opportunities arise, and negotiations with landowners regarding the acquisition of part or all of their properties is undertaken when appropriate.

This may cause adverse impacts to associated landowners through hardship, anxiety and the chance of losing affiliated land. Where possible, Main Roads attempts to minimise

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the impacts associated with land resumption, however, in some cases these are unavoidable.

There are a total of 16 landowners affected by the Route 9 alignment. To date, the Main Roads have acquired only 2 or 3 properties along the Route 9 alignment due to the previous commitment to investigate the Route 6 alignment.

The majority of landowners along the Route 9 alignment are farmers with holdings ranging from 200 to 500 hectares in area. It has been estimated that the Route 9 alignment involves the resumption of approximately 70 hectares of productive farming land. In some cases, the loss of production and inconvenience to farms seriously threatens the economic viability of these agricultural operations (see the following "during construction" and "post construction" impact assessment sections for Route 9).

Local Community Expectations

There is general agreement by the local community that Northam needs a bypass.

Some of the key issues raised by the Northam community include:

- the need to relocate through traffic (particularly heavy vehicles) away from Fitzgerald Street;
- improving traffic flows, safety and access around Northam's Central Business District;
- proposing an environmental and socially acceptable bypass alternative that does not impact upon the future expansion of Northam;
- □ maintaining a visual link with Northam;
- retaining access to the Avon River foreshore areas; and
- resolution of the Aboriginal Reserve 8313 issue.

Upon examination of the Route 9 alignment, it becomes apparent that most of the key issues above are adequately addressed under this proposal.

The support and community acceptance of the Route 9 alignment has been borne out during the public participation and consultation process (see Section 9.2), although the Shire of Northam and farming community are generally opposed to Route 9.

6.4.2 During Construction Impacts

6.4.2.1 Scope and Objectives

During construction impacts refer to the environmental impacts associated with constructing the Route 9 alignment of the Northam Bypass proposal. Typical activities undertaken during this phase of a major highway construction project include clearing vegetation, earthworking (ie. cutting, filling, rock removal, blasting etc), re-contouring of embankments and batter slopes, stabilisation of proposed road surface, bridge and drainage construction and the laying down of the sealed road surface.

6.4.2.2. Physical Environment

The components of the physical environment potentially impacted upon during the construction of the Route 9 alignment relate mainly to landform/soils and surface water hydrology.

Landform and Soils

The construction of a bypass alignment along Route 9 has the potential to cause water and wind erosion impacts on the landform and soils.

- Erosion Around cuttings and embankments, erosion may cause the displacement and transport of soil material.
 - Clays and loams are most susceptible to water erosion especially around bridge structures and along embankments near watercourses.
 - Care must be taken to ensure earthworking does not introduce increased sediment loads into the waterways.

Hydrology

The Route 9 alignment has the potential to cause environmental impacts to the natural drainage features, the Avon River floodplain and the water quality of the Avon and Mortlock Rivers.

- Drainage The compacted earth embankments and construction of an impermeable road surface may alter the natural drainage characteristics of the landscape as the construction of the road interferes with the transverse drainage paths.
 - At locations where surface runoff is concentrated (eg. culverts), downstream erosion may occur as a result of larger flows along the drainage lines.
 - Embankments may intercept surface and sub-surface water flows, thereby decreasing recharge to rivers and streams.
 - Due to the high engineering standards applicable to major road design and construction, it is considered that the impact significance associated with Route 9 on natural drainage is negligible.
- Floodplain Apart from floodplain intrusions associated with bridges over the Avon and Mortlock Rivers, it is considered that the Route 9 alignment does not significantly impact upon the 100 year floodplain associated with these watercourses. The Water Authority of Western Australia has assessed the impact of the proposed Avon River Bridge and embankments and considers the impacts are acceptable. Given the reduced scale of the Mortlock River bridge requirements, it is assumed that the impact on floodplain from this structure is also acceptable.

Water Quality

Road surfaces and the surrounding environment collect pollutants associated with general road usage by vehicles (eg. hydrocarbons, lead, litter etc).

There is the potential for these contaminants to be washed off surfaces by rain, incorporated into the road's stormwater drainage system and possibly transported into receiving waterways causing adverse water quality impacts.

This may have serious consequences in the case of an accidental spillage of toxic and/or hazardous chemicals, depending upon the location and magnitude of the spill.

The Route 9 alignment bridges across the Avon and Mortlock Rivers and drainage structures will be required for streams and rivers. Apart from the bridge crossings, the vast majority of the Route 9 alignment is quite removed from existing waterways. It is considered that the probability for water quality impacts on the Avon and Mortlock Rivers is extremely low for this alignment.

6.4.2.3 Biological Environment

The components of the biological environment potentially impacted upon during the construction of the Route 9 alignment of the Northam Bypass are vegetation, fauna and ecosystem and habitat. A Biological Survey undertaken by consulting ecologists (Woodman and Associates) in August 1992 indicated that the beginning and end of this alignment pass through crop and pasture land. Examination of aerial photography, supported by subsequent assessment of the central portion of the alignment, indicated very similar vegetation species composition to that of the survey area. The majority of Route 9 passes through farming land containing very limited native vegetation remnants.

Given the degree of disturbance and dominance of fenced pastures, it is considered that native fauna species are unlikely to be impacted upon the Route 9 alignment.

The river habitats have the highest conservation value followed by the remnant woodlands, however, it is generally considered that the Route 9 alignment would not encounter or affect any areas of land with significant value for conservation of flora and fauna.

Vegetation

The clearing of vegetation along the Route 9 alignment has the potential to impact upon the species composition of vegetation types. A large proportion of Route 9 passes through land which has been cleared of native vegetation and pastured. The remnant vegetation associated with the Northam Scout Block and the flooded gum vegetation along the Avon and Mortlock Rivers will generally not be adversely affected by Route 9 as clearing and road construction at these locations would be marginal.

<u>Fauna</u>

The disturbance of native fauna caused by the Route 9 alignment is minimal and unlikely to affect the continued utilisation of surrounding areas by dependent fauna. There will be a requirement to bridge the Avon and Mortlock rivers and this may result in severance of the continual river bank corridor which now exists. Given the extent of corridor area on either side of the Route 9 alignment at these locations, it is considered that fauna movements are unlikely to be significantly impacted upon.

Ecosystem and Habitat

Vegetation removal and modification of the landscape to accommodate the Route 9 alignment may alter or destroy habitat areas. Route 9 would not encounter or affect areas of significant value for conservation of flora and fauna. River and woodland habitat areas would only be marginally impacted upon by bridge crossings and access roads respectively. It is considered that the impacts of Route 9 on ecosystem and habitat are negligible.

6.4.2.4 Human Environment

The potential impacts on the human environment during the construction of the Route 9 alignment are varied and largely depend upon an individual's perception of what is acceptable or unacceptable.

Aspects of the human environment that may be impacted upon by Route 9 include local business, Aboriginal Sites, noise and vibration, heritage values, landscape amenity, dust, farming operations, servicing infrastructure, local community expectations, recreation, tourism and future town expansion.

Local Business

There are a range of social and economic based impacts that require consideration with respect to bypass alignments.

Route 9 is quite removed from the town and offers only limited views of Northam.

The local business community previously believed that maintaining a visual link with the town was an important economic attribute for a bypass alignment. However, Northam's Chamber of Commerce has recently assessed its position and now believe that Northam is a growing rural centre within an economically stable western wheatbelt district and is

therefore less reliant on attracting all potential passers-by through visual contact to the town.

Nevertheless, it is reasonable to assume that the Route 9 alignment offers a reduced incentive for travellers along the Great Eastern Highway to visit Northam and local businesses may lose trade as a result. During construction, the potential loss of business to the Northam community is considered of negligible significance. It is possible, however, that the increased workforce associated with a major road construction project of this type may benefit the local business houses through increased trading.

Aboriginal Sites

The impacts of Route 9 on Aboriginal Sites has not been determined accurately, although a search of recorded Aboriginal Sites in the vicinity was undertaken as part of an Aboriginal Survey for the Route 6 alignment in 1988.

Given that the proportion of this alignment not included in the Aboriginal Survey is presently cleared of native vegetation and pastured, it is unlikely that other Aboriginal Sites are located along the Route 9 alignment. This will require more specific evaluation prior to any construction work should Route 9 become the preferred alignment.

<u>Noise</u>

Noise associated with construction activities (ie. blasting, earthmoving equipment etc) and post-construction traffic movements has the potential to cause impacts to nearby residents.

Route 9 is expected to produce minimal noise impacts during construction as the alignment runs mainly through vacant government reserves and farmland having considerable distance separation from resident dwellings throughout these locations.

Heritage Values

The Route 9 alignment has little impact on the heritage values of Northam, the Avon River or the Avon Valley region in general.

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Landscape Amenity

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The construction of a bypass along the Route 9 alignment requires earthmoving activities involving large cut and fill areas. This may adversely impact upon the visual amenity of the environment.

<u>Dust</u>

Machinery movements associated with earthworks and road construction may cause dust related impacts. The worst effects are usually in residential areas where airborne particulates may pose a nuisance problem, or in severe cases, a health problem.

The extent of potential impacts depend largely upon the condition of the ground surface (dry, damp, moist), prevailing environmental factors (eg. wind direction and velocity) and the type and duration of earthworking.

The Route 9 alignment does not traverse through residential areas and therefore dust is not a major issue. Nevertheless, there is a range of dust management techniques available to mitigate dust related impacts.

Farming Operations

The Avon Valley region is well known for its fertile soils and productive farmland. Farming forms the economic backbone for the rural community and townspeople. Severance of large rural holdings has previously resulted from various servicing and infrastructure projects in and around Northam (eg. water supply pipeline, railway lines, major roads etc). Further property severance or segregation is strongly opposed by the farming community and concerns over further property resumption indicate that the economic viability of farming operations along the Route 9 alignment may be threatened.

Route 9 passes through several large holdings and, in some cases, segregates the farming infrastructure (ie. houses, sheds etc.) from the main area of productive farmland. The

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feasibility of some of the management strategies put forward to overcome lack of access to farmland (eg. underpasses) have been questioned by the farming community and at this stage, further negotiation by Main Roads would be required to resolve this matter.

The construction related impacts of Route 9 are generally of a short term nature, but affect farming operations over the 2-3 year construction period.

The main concerns put forward by affected farmers in relation to the Route 9 alignment include:

- Increased managerial problems associated with splitting the property with a controlled access highway;
- Possible adverse effects on water resources and drainage lines, particularly in relation to reduced dam recharge;
- Rearrangement of internal fencing to allow for more workable areas;
- Effects of weed invasion from the road; and
- Feasibility of working small, inaccessible areas.

It is considered that during the construction of Route 9, significant impacts on farming operations will result. Methods to address and manage these impacts will require careful investigation if this route is pursued.

Servicing Infrastructure

During construction of the Route 9 alignment, the following services will be disrupted and will require rectification.

Telecom	-	Trunk cables on Toodyay Road western connection, Withers Street and some individual houses.
	•	Coaxial and fibre optic cables on Goomalling Road.
SECWA	-	Poles on Toodyay Road, crossing east of eastern access and Goomalling Road.

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Standard and narrow gauge railway line crossings.

□ Water Authority

Westrail

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- Route 9 passes over Water Authority pipeline at western connection.
- 58mm diameter AC water main at Colebatch Road.
- 450mm diameter sewerage gravity main and Town Council pump main.
- Water Authority land adjacent to sewerage ponds may be required for nutrient removal system.
- 100mm or 150mm pipe along Goomalling Road.
 - 150mm Water Authority pipe along narrow gauge railway line.

Local Community Expectations

As discussed in under the pre-construction impacts of Route 9 (Section 6.4.1.4), this alignment largely achieves the desired expectations of most local community members in terms of a bypass alternative for Northam. Apart from the inconvenience associated with limited access to some of the roads crossed and the aforementioned farming community concerns, it is considered that the impact on the local community during the construction of Route 9 is minimal.

<u>Recreation</u>

Forms of passive and active recreation provide an important outlet for people living in Northam and surrounding areas.

The main forms of recreation undertaken in and around Northam include:

- □ horse trail riding;
- □ jogging;
- □ canoeing;
- bushwalking and nature study;
- □ exploring historical sites;
- recreation centre activities (eg basketball, gymnastics etc);
- □ tennis;
- \Box football; and
- □ cricket.

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Apart from the short term disturbance and/or inconvenience that bridge structures may cause to some recreation activities during construction (eg. horse trail riding, bushwalking), it is considered that Route 9 alignment does not significantly impact upon the abovementioned recreational activities.

Tourism

The location and design of the Northam Bypass alignment has implications for attracting tourists to the town.

Northam is a popular destination for interstate travellers, day-trippers from Perth and tourists exploring the Avon Valley region. Tourism brings in valuable income to local businesses and it is important that the bypass does not affect tourist related business opportunities.

The Route 9 alignment is quite removed from the town, possibly resulting in less people being inclined to travel the extra distance to inspect what Northam has to offer.

It is considered that the impacts on tourism during construction of the Route 9 alignment are negligible and may only cause short term inconvenience of a minor nature. These can largely be overcome by appropriate signage.

Future Town Expansion

The construction area for the Route 9 alignment is located some distance from Northam and therefore is unlikely to impact on any known development proposals aimed at urban expansion.

Comments received during the public participation and consultation exercises indicated that some people believe this route alignment forms a logical northern boundary for future residential development. The effects during the construction of the Route 9 alignment on the future town expansion of Northam are considered negligible.

6.4.3 Post-Construction Impacts

6.4.3.1 Scope and Objectives

Post-construction impacts refer to those impacts that arise once the construction of a route alignment is complete. Typical activities undertaken during this phase of a major road development include minor re-contouring, revegetation, erection of appropriate signage and use of the bypass by vehicles.

The objective of this section is to assess the significance of the environmental impacts associated with the post-construction phase of the Route 9 alignment. The impacts associated with the post-construction phase are similar to during construction impacts, although in general, they may be longer term or permanent.

6.4.3.2 Physical Environment

The components of the physical environment potentially impacted upon after the construction of the Northam Bypass Route 9 alignment relate mainly to landform/soils and surface water hydrology.

Landform and Soils

Erosion

Following the construction of a bypass alignment along Route 9, there is the potential for water and wind erosion impacts on the landform and soils.

- Around cuttings and embankments, erosion may cause the displacement and transport of soil material.
- Clays and loams are most susceptible to water erosion especially around bridge structures and along embankments near watercourses.
- Erosional impacts are greatest along the Route 9 bridge structures at the Avon and Mortlock Rivers. Sediments dislodged from the bridge embankments may increase the turbidity within these watercourses.
- Erosional impacts associated with of Route 9 are considered of minor significance and can be overcome using standard batter and scour protection techniques.

Hydrology

Following the construction of the Route 9 alignment, there is the potential for long term environmental impacts to the natural drainage features, the Avon River floodplain and the water quality of the Avon and Mortlock Rivers.

□ Drainage

The compacted earth embankments and construction of an impermeable road surface may alter the natural drainage characteristics of the landscape, as the construction of the road interferes with the transverse drainage paths.

Embankments may intercept surface and sub-surface water flows, thereby decreasing recharge to rivers and streams.

Due to the high engineering standards applicable to major road design and construction, it is considered that the impact significance associated with Route 9 on natural drainage is negligible.

Floodplain - Apart from the floodplain intrusions associated with bridges over the Avon and Mortlock rivers, it is considered that the Route 9 alignment does not significantly impact upon the 100 year floodplain associated with this watercourses. The Water Authority of Western Australia has assessed the impact of the Avon River bridge and considers the impacts are acceptable. Given the reduced scale of Mortlock River bridge requirements, it is assumed that the long term impact on floodplain from this structure is also acceptable.

Water Quality

Road surfaces and the surrounding environment collect pollutants associated with general road usage by vehicles (eg. hydrocarbons, lead, litter etc).

There is the potential for these contaminants to be washed off surfaces by rain, incorporated into the road's stormwater drainage system and possibly transported into receiving waterways, causing adverse water quality impacts.

This may have serious consequences in the case of an accidental spillage of toxic and/or hazardous chemicals, depending upon the location and magnitude of the spill.

The Route 9 alignment bridges across the Avon and Mortlock Rivers and drainage structures will be required for streams and rivers. Apart from bridge crossings, the vast majority of the Route 9 alignment is quite removed from existing waterways. It is considered that the probability for water quality impacts on the Avon and Mortlock Rivers is extremely low for this alignment and therefore is of negligible significance.

6.4.3.3 Biological Environment

The components of the biological environment potentially impacted following construction of the Route 9 alignment are vegetation, fauna and ecosystem and habitat. A Biological Survey undertaken by consulting ecologists (Woodman and Associates) in August 1992 indicated that the beginning and end of this alignment pass through crop and pasture land. Examination of aerial photography, supported by subsequent assessment of the central portion of the alignment, indicated very similar vegetation species composition to that of the survey area. The majority of Route 9 passes through farming land containing very limited native vegetation remnants.

Given the degree of disturbance and dominance of fenced pastures, it is considered that native fauna species are unlikely to be impacted upon by the Route 9 alignment.

The river habitats have the highest conservation value followed by the remnant woodlands, however, it is generally considered that the Route 9 alignment would not encounter or affect any areas of land with significant value for conservation of flora and fauna.

Vegetation

The clearing of vegetation along the Route 9 alignment has the potential to impact upon the species composition of vegetation types. A large proportion of Route 9 passes through land which has been cleared of native vegetation and pastured. The remnant vegetation associated with the Northam Scout Block and the flooded gum vegetation along the Avon and Mortlock Rivers will generally not be adversely affected by Route 9 alignment, as clearing and road construction at these locations would be marginal.

<u>Fauna</u>

The disturbance to native fauna following the construction of the Route 9 alignment is minimal and unlikely to affect the continued utilisation of surrounding areas by dependent fauna.

The Avon and Mortlock rivers will be bridged and this may sever the continual river bank corridor that now exists, however there are expanses of vegetation corridors either side of each river at these locations and it is expected that fauna movements would not be significantly inhibited.

Ecosystem and Habitat

Vegetation removal and modification of the landscape to accommodate the Route 9 alignment may alter or destroy habitat areas. Route 9 would not encounter or affect areas of significant value for conservation of flora and fauna. River and woodland habitat areas would only be marginally impacted upon by bridge crossings and access roads respectively. It is considered that the impacts following the construction of Route 9 on ecosystem and habitat are negligible.

6.4.3.4 Human Environment

The potential impacts on the human environment from the Route 9 alignment of the Northam Bypass are varied and largely depend upon an individual's perception of what is acceptable or unacceptable.

Aspects of the human environment that may be impacted upon by Route 9 include local business, noise, heritage values, landscape amenity, dust, farming operations, local community expectations, recreation, tourism and future town expansion.

Local Business

There is a range of social and economic based impacts requiring consideration with respect to bypass alignments.

Route 9 is quite removed from the town and offers only limited views of Northam from the Council Common to the west.

The local business community previously believed that maintaining a visual link with the town town was an important economic attribute for a bypass alignment. However, more recently it has become evident that Northam is a growing rural centre within an economically stable western wheatbelt district and therefore less reliant on attracting all potential passers-by through visual contact to the town.

Nevertheless, it is reasonable to assume that the Route 9 alignment offers a reduced incentive for travellers along the Great Eastern Highway to visit Northam and local businesses may lose trade as a result.

<u>Noise</u>

Post-construction traffic movements have the potential to cause impacts to nearby residents.

Route 9 has minimal noise impacts as the alignment runs mainly through vacant government reserves and farmland having considerable distance separation from residences throughout these locations.

Heritage Values

The construction of a highway along the Route 9 alignment has little impact on the heritage values of Northam, the Avon River or the Avon Valley region in general.

Landscape Amenity

Following the construction of a bypass along the Route 9 alignment large cut and fill areas may adversely impact upon the visual amenity of the environment.

Cuttings of up to 15 metres deep, with some sections through granite parent material will be required along this alignment and these may cause a significant visual contrast to the surrounding environment. Where possible it may be appropriate to blend in the alignment with the landscape through re-contouring and revegetation, although in the case of large cuttings through rock,(eg. behind the Cemetery), this would be difficult.

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Farming Operations

As previously discussed, Route 9 passes through several large holdings and, in some cases, segregates the farming infrastructure (ie. houses, sheds etc.) from the main area of productive farmland. The feasibility of some of the management strategies put forward to overcome access to farmland (eg. underpasses) have been questioned and at this stage remains unresolved.

The post-construction impacts of Route 9 are generally of a long term or permanent nature.

The main concerns put forward by affected farmers in relation to the Route 9 alignment include:

- □ Increased managerial problems associated with splitting the property with a controlled access highway;
- Possible adverse effects on water resources and drainage lines, particularly in relation to reduced dam recharge;
- Rearrangement of internal fencing to allow for more workable areas;

□ Effects of weed invasion from the road; and

□ Feasibility of working small, inaccessible areas.

It is considered that following the construction of the Route 9 alignment, significant impacts on farming operations will result. Methods to address and manage these impacts will require careful investigation if this route is pursued.

Local Community Expectations

As discussed under the pre-construction and during construction phase of Route 9 (Sections 6.4.1.4 and 6.4.2.4 respectively), this alignment largely achieves the desired expectations of most local community members in terms of a bypass alternative for Northam.

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Recreation

Forms of passive and active recreation provide an important outlet for people living in Northam and surrounding areas.

The main forms of recreation undertaken in and around Northam include:

- □ horse trail riding;
- □ canoeing;
- bushwalking and nature study;
- exploring historical sites;
- recreation centre activities (eg. basketball, gymnastics etc);
- □ tennis;
- \Box football; and
- □ cricket.

The Route 9 alignment does not significantly impact upon the abovementioned recreational activities apart from minor inconvenience to horse trail riding and bushwalking.

<u>Tourism</u>

The location and design of the Northam Bypass alignment has implications for attracting tourists to the town.

Northam is a popular destination for interstate travellers, day-trippers from Perth and tourists exploring the Avon Valley region. Tourism brings in valuable income to local businesses and it is important that the bypass does not affect tourist related business opportunities.

The Route 9 alignment is quite removed from the town, possibly resulting in less people being inclined to travel the extra distance to inspect what Northam has to offer.

It is considered that the long term impacts on tourism from the Route 9 alignment would be of minor significance and may result in benefits to the tourist attractions through the provision of a more user friendly town environment.

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There are also numerous methods of attracting tourists into the town (ie. information bays, signage, alternative access points).

Future Town Expansion

The Route 9 alignment is located some distance from Northam and therefore is unlikely to impact on development proposals aimed at urban expansion.

Some people believe this route alignment forms a logical northern boundary for future residential development.

From a planning point of view, the Route 9 alignment would not jeopardise future planning initiatives in the short or long term.

7.0 ENVIRONMENTAL MANAGEMENT

7.1 Introduction and Objectives

The environmental management of the Northam Bypass proposal focuses on the preferred route alignment. The environmental impacts associated with Route 6 have the greatest significance and therefore require a greater degree of management. Although the management techniques have been formulated to address the environmental impacts identified for the Route 6 alignment, they are also applicable to the environmental components affected by the Routes 6A and 9 (eg management of impacts on Avon River, Doctors Hill and others as appropriate). In addition, there are some impacts that are not specifically applicable to Route 6 (eg, property severance and disruption to farming operations caused by Route 9) and have been highlighted accordingly where necessary.

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The management strategies presented in the CER are consistent with those outlined in the Main Roads Environmental Management Manual (Main Roads, 1992) and have been expanded upon where appropriate.

The objective of this section is to present a range of environmental management strategies that avoid, mitigate and/or ameliorate the environmental impacts of the Northam Bypass Route 6 alignment as identified in Section 6.2 of this report. The management of the physical, biological and human environments are considered from pre-construction, during construction and post-construction perspectives.

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7.2 Management of Pre-Construction Impacts

7.2.1 Physical Environment

The pre-construction activities associated with the Route 6 alignment have negligible impact on the physical environment and therefore do not require specific management outside the usual field survey procedures.

7.2.2 Biological Environment

The pre-construction activities may involve the removal of a small percentage of vegetation in order to achieve necessary surveys. The impact on flora, fauna and habitat is considered negligible and as such, does not require special management outside normal field survey procedures.

It is recommended that a fauna survey be undertaken as part of the pre-construction activities to determine the existence and population size of a group of Echidna believed to inhabit the Cemetery area.

7.2.3 Human Environment

The impact of pre-construction activities, such as resuming land for a bypass road reserve, may have a significant impact on affected landowners. This in turn may cause an adverse reaction amongst the local community.

7.2.3.1 Land Resumption

Impact

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Acquisition of land affected by the Route 6 bypass alignment.

Management

- □ The management of impacts associated with land resumption, no matter how involved, may not always result in a satisfactory outcome for both affected landowners and Main Roads.
- Acquisition of land and compensation for affected landowners will need to be negotiated at a level aimed at achieving the best result for parties concerned.
- □ Main Roads will endeavour to minimise the impacts associated with land resumption through negotiations and be aware of the hardship this may cause affected landowners.

7.2.3.2 Aboriginal Sites

Impact

The impact of Route 6 on Aboriginal Reserve 8313 prior to the construction of the Route 6 alignment.

Management

Negotiations are still proceeding, but at this stage there appears to be 3 main options.

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- (i) Further negotiate with the Aboriginal people regarding a land swap for Aboriginal Reserve 8313 based on the existing alignment of Route 6 and the previous land swap agreement;
- (ii) Shift the Route 6 alignment so that it has less impact on Aboriginal Reserve 8313 and negotiate ceding to the Aboriginal Lands Trust land owned by Main Roads adjacent to Aboriginal Reserve 8313 for the purposes of the local Aboriginal Community;
- (iii) Select a bypass route alignment that completely avoids Aboriginal Reserve 8313.
- Options (i) and (ii) are currently being investigated and depending upon the final outcome, option (iii) may have to be pursued.

7.2.3.3 Local Community Expectations

Impact

Adverse community reaction to Route 6 bypass alignment.

Management

- The majority of public input received during the CER's public participation and consultation exercises appears opposed to the Route 6 alignment and believe the impacts on the Avon River, Doctors Hill, Cemetery and future town expansion are unacceptable.
- Given that the Northam Bypass proposal has been in the planning stages for many years and, through various public consultation activities, the Northam community has had the opportunity to form their opinions, it is likely that such opposition to the Route 6 alignment will not diminish substantially in the near future.
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There is limited opportunity to manage the Route 6 proposal in terms of local community expectations and it is considered the community perceived impacts will remain significant for some time.

7.3 Management of During Construction Impacts

7.3.1 Physical Environment

There are a range of potential environmental impacts on the physical environment during the construction of the Route 6 alignment that require management.

7.3.1.1 Landform and Soils

Impact

Erosion in areas cleared of vegetation and ground embankments and batters where substantial cut or fill is necessary.

Management

The management of erosion will be achieved by implementing the following strategies.

- Re-contouring all batter slopes to acceptable gradients. Provide stabilisation mulch with seed to all embankments adjacent to the Avon River to prevent siltation and turbidity to the Avon River caused by dislodgment of silts. Consideration should be given to constructing these embankments outside of winter.
- Revegetate cleared areas of road reserve not required by Stage 1 construction of the bypass alignment.
- □ At locations where surface runoff and natural drainage are concentrated (eg. culverts) adequate scour protection (eg. rock reinforcement or similar) shall be provided to minimise erosion.
- Scour protection (eg. rock reinforcement or similar) shall be provided to minimise erosion of the river banks along embankments and at bridges where the abutments intrude into the 100 year floodplain.
- □ After significant storm events, Main Roads will inspect scour protection structures and if necessary, report to relevant authorities (eg. EPA, WAWA, ARMA).

7.3.1.2 Hydrology

Impact

Possible short term interference with natural drainage lines.

Management

- Ensure all major structures will be designed to accommodate a 100 year flood event and comply with the backwater constraints set by the Water Authority of Western Australia (WAWA).
- Transverse drainage structures will be designed to cater for 50 year storm event in accordance with Main Roads standards and Local Authority requirements.
- The effects of increased water levels both upstream and downstream of the transverse structure shall be minimised.

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Should the drainage flow need to be dammed temporarily during the construction of Route 6, Main Roads will ensure that the ponded water is treated appropriately before it is pumped downstream.

Impact

Loss of floodplain area due to fill associated with road and bridge embankments.

Management

- Adherence to WAWA approved road alignment and compliance with WAWA's backwater constraints associated with the assessed Route 6 alignment.
- The backwater effect and associated increase in water level caused by the Avon River bridge abutments and piers and the road embankment's intrusion on the floodplain shall comply with the Water Authority's requirement of an afflux not greater than 25mm of the confluence of the Mortlock and Avon Rivers for the 100 year ARI flood event.

Bridges across both the Avon and Mortlock Rivers shall be designed so that there is 300mm freeboard between the underside of the bridge deck and the 100 year ARI flood level.

The 100-year flood lines are subject of a current study by the Water Authority of WA. Upon completion of this study, the proposed alignment and structures of Route 6 should be reviewed to ensure compliance with the Water Authority's maximum backwater effect requirements.

<u>Impact</u>

Siltation and pollution of the Avon and Mortlock rivers (and associated streams and tributaries) from earthworking activities during construction.

Management

Employ erosion control measures outlined in Section 7.3.1.1.

- During construction, pollution and siltation of water courses will be guided or minimised by means of careful planning of operations and the use of temporary trapping and sandbagging where appropriate.
- The section of the bypass along the Avon River and on the bridges over both the Avon and Mortlock Rivers will require special drainage structures which limit

potentially polluted road runoff and silt entering the river.

Compensating basins with "dead" storage below the outlet shall be constructed to collect potentially polluted runoff and provide a reduction in the pollutant/sediment level prior to discharging into the river. The basins shall be designed to accommodate a 10 year ARI storm event. A number of smaller basins in lieu of only two larger basins should be utilised to minimise visual impacts and maximise soakage ability and to provide sufficient freeboard even shortly after rainfall events to accommodate unlikely, yet possible, chemical spills.

It is recommended that runoff from uphill catchments be separated by the use of catch drains where necessary which intercept runoff and then discharge directly into the river. This will reduce the size required for the compensating basins.

Kerbing or an appropriate lateral drain on the Avon River side of the southern carriageway (where its crossfall is towards the River) be employed to direct stormwater to the compensating basins (refer Figure 4).

The drainage system which collects road pavement runoff in the section of the bypass along the Avon River and on the bridges over the Avon and Mortlock Rivers shall be designed to trap and contain the accidental spillage of chemicals and permit their recovery/treatment.

Consideration should be given to providing the above protective drainage measures to sections of the bypass within the immediate vicinity of the Avon and Mortlock Rivers, should they directly discharge into these watercourses.

A guard rail shall be installed on the Avon River side of the road to reduce the risk of vehicles running into the river, and therefore retain any spills onto the pavement carriageway.

□ A contingency plan has been prepared outlining procedures to be undertaken in the event of a major chemical spillage following construction of the Bypass (see Section 7.4.1.2). It is considered that these management procedures should also apply to the during construction phase of the proposal



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7.3.2 Biological Environment

The potential impacts to components of the biological environment during the construction of the Northam Bypass Route 6 alignment require management.

7.3.2.1 Vegetation

Impact

Clearing of important vegetation types such as the flooded gums along the north bank of the Avon River and the woodland vegetation in the Northam Scout Block.

<u>Management</u>

- □ Restrict vegetation clearing and machinery movements to the proposed road reserve area.
- □ Re-contour ground surface to facilitate revegetation.
- Revegetate disturbed areas of the road reserve not required for road construction purposes with suitable native species (see Appendix 3) in order to minimise erosion and provide fauna habitat.
- In areas where noxious weed proliferation is obvious, remove topsoil and dispose of infested material by burying in borrow pits.
- □ Fire exclusion measures and weed control should be employed in areas where post-construction activities are unlikely to be implemented within 1-2 years (see Section 7.4.2.1 for more details).

7.3.2.2 Fauna

<u>Impact</u>

Loss and disturbance of native fauna species in river and woodland habitats.

Management

- Limit disturbance in these important habitat areas by restricting vegetation removal and machinery movements to the proposed road reserve.
- Revegetate disturbed areas of road reserve not required for road construction purposes with suitable native species (see Appendix 3) in order to re-establish fauna corridors.
- □ Revegetation should concentrate on one side of the bypass road to minimise native fauna road kills.

7.3.2.3 Ecosystem and Habitat

Impact

Loss of riverine habitat along Avon River/Mortlock River foreshore, further alteration of habitat areas and the disturbance to ecosystem.

Management

- Revegetate with indigenous plant species and provide fauna habitat areas to encourage native fauna movements between remnant vegetation blocks.
- Prepare vegetation plan showing:

key areas to be revegetated

- selected species and preferred revegetation method
- revegetation timetable.
- Monitor the establishment of endemic vegetation species in revegetation areas on an annual basis for a 2 year period and implement appropriate remedial measures if appropriate. Results of monitoring to be submitted annually to relevant authorities (eg. EPA, CALM, ARMA).

7.3.3. Human Environment

7.3.3.1 Noise and Vibration

Impact

 Adverse effects of blasting and machinery movements on residents in the Doctors Hill area.

Management

- To mitigate noise impacts in residential areas (eg. Doctors Hill), blasting and construction works will be limited to reasonable daytime hours.
- Noise and vibration levels associated with blasting activities will comply with standards set by the EPA's Pollution Control Division.
- Before and after inspections of houses in the vicinity, which may be potentially affected by vibrations associated with blasting, will be undertaken by Main Roads.

7.3.3.2 Vehicle Access

Impact

Construction related inconvenience to road users where bypass alignment crosses roads and tracks.

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<u>Management</u>

- Re-route affected roads in order to minimise disturbance to road users.
- Provide alternative routes if re-routing traffic along busy roads causes congestion.
- □ Erect appropriate signage giving clear directions of road route alterations.

7.3.3.3 Heritage Values

<u>Impact</u>

Disturbance to Heritage Sites during construction.

<u>Management</u>

- Restrict machinery movements around Morby Farm Cottage in an effort to minimise noise impacts.
- Notify relevant agencies (eg Northam Tourist Centre, Local Authorities, interest groups) regarding the restricted access to the foreshore area along the north bank of the Avon River during construction.
- Access to the Cemetery via Katrine Road will be maintained during Stage 1 of the Bypass. Upon future duplication of this alignment, an alternative access road will be constructed to the Cemetery.
- □ Impacts to the old Northam townsite and Old Anglican Church Monument will be minimised through the careful location of access roads.

7.3.3.4 Landscape Amenity

<u>Impact</u>

Visual impact on landscape amenity associated with bridges, embankments, large cut areas and the road structure itself.
- Reduce visual impacts through re-contouring landscaping and revegetation with indigenous plant species. (see Appendix 3)
- □ Bridge and culvert structures will be designed to compliment surrounding environment and associated embankments will be re-contoured to appropriate gradients and revegetated.

7.3.3.5 Dust

Impact -

Dust impacts during construction caused by earthworking and ground disturbance.

Management

Earthworking to be undertaken during suitable ground conditions where possible.

Dust suppression measures such as the use of water carts will be employed throughout the construction phase.

7.3.3.6 Farming Operations

Impact

Minor loss of productive farmland and restricted access to water supply during construction (Route 6).

Management

- □ Main Roads will negotiate an amicable agreement with the landowner whose access to water supply will be impacted upon during construction of the Route 6 alignment.
- Compensation for loss of productive farmland will also need to be negotiated with affected landowner.

Impact

Loss of prime farm land, restricted access, effects on water resources, spread of weeds and segregation of property during construction (Route 9).

Management

□ Loss of farm land - compensate for reduced viability.

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- Restricted access provide suitable underpasses or overpasses where appropriates and the
- Effects on water resources control flows by way of culverts, maintain existing
 drainage lines and monitor where necessary.
- Spread of weeds undertake weed control programme and plant trees where appropriate.
- Segregation and severance of property pay for refencing as required, purchase small unmanageable areas and plant trees if necessary.

7.3.3.7 Local Community Expectations

Impacts

Opposition and adverse feelings toward the Route 6 alignment.

Management

Main Roads to make personnel available to liaise with concerned groups and individuals in order to resolve adverse community feelings and opposition to the Route 6 alignment.

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7.3.3.8 Recreation

Impact

Loss of recreational amenity along the foreshore on the north bank of the Avon River.

<u>Management</u>

- Negotiate with Pony Club regarding suitable alternative horse riding trails, given that trails along the river may be affected in the short term during the construction of the bypass.
- Seek input and involve the local community with regard to upgrading and enhancing the currently degraded foreshore area along the north bank of the Avon River.

Impact

Disruption to servicing infrastructure.

Liaise with relevant government authorities (ie. WAWA, Telecom, SECWA, Westrail) in order to determine the logistics and costs associated with negotiating affected services. Specific impacts for the Route 6 alignment known to date and proposed management strategies are detailed below.

Impact

Disruption to Telecom services.

Management

- Relocation of trunk cables as required on Toodyay Road, western connection,
 Withers Street and individual houses.
- Provide temporary coaxial and fibre optic cables at Goomalling Road and reinstate these cables under bridge structure.

Impact

Disruption to SECWA services.

Management

Relocate poles as required on Toodyay Road, Withers Street, Gillett Street, Goomalling Road (bypass on-ramp), crossing midway between Goomalling Road and Mortlock River and crossing east of eastern access.

Impact

Possible interference to railway lines.

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Management

Bridge to span railway lines with clearances to satisfy Westrail requirements.

Impact

Disruption to Water Authority services.

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- Enclose Water Authority pipeline in a box culvert along the section where the bypass passes over the pipeline. A section of pipeline may require replacement.
- □ Replace 58mm diameter AC water main at Colebatch Road.
- Sleeve 450mm diameter sewerage gravity main and Town Council pump main.
 Provide access road under Avon Bridge.
- Relocate and upgrade 58mm or 100mm pipe along Old York Road.
- Attach 100mm or 150mm pipe along Goomalling Road to the underside of the bridge.

Relocation of 150mm pipe along narrow gauge railway if required.

7.4 Management of Post-Construction Impacts

7.4.1 Physical Environment

There are components of the physical environment which may be potentially impacted upon by the post-construction phase of the Route 6 alignment and therefore requirement management.

7.4.1.1. Landform and Soils

Impact

Erosion around the re-contoured embankments and batters not included for management during the construction phase.

Management

Revegetate batters and embankments with indigenous shrub and groundcover species (see Appendix 3). Stepping may be required to facilitate revegetation along batters and embankments with steep gradients.

7.4.1.2 Hydrology

Impact

Possible interference with natural drainage lines.

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- Employ drainage management strategies listed in the during construction phase (ie.
 Section 7.3.1.2).
- Ensure minor transverse drainage structures such as culverts are periodically checked for possible obstructions. Should it be demonstrated that flooding has been exacerbated following the bypass-road construction, ensure-appropriate remedial----measures are implemented.

Impact

Water quality impacts associated with stormwater runoff from the bypass road surface.

Management

- □ The section of the bypass along the Avon River will employ drainage structures such as retention basins in order to limit potentially polluted road runoff and silt entering the Avon River.
- The drainage structures will be designed to trap and contain the accidental spillage of chemicals in order to facilitate recovery of material and minimise the potential for contamination of the Avon River.
- □ See also details of stormwater management strategies proposed to be employed during the construction phase (Section 7.3.1.2).

Impact

Contamination of Avon and Mortlock Rivers by chemical/hazardous material spillage.

Management

- □ Contingency Plan
 - The following Contingency Plan has been adapted from the Leschenault Waterways Management Programme (Waterways Commission, 1992) and is designed to assist the Avon River Management Authority combat pollution of the waterways in the region of chemical spillage.
 - Phases of operation:
 - 1. First Notice
 - First notice to be directed or reported to the Police Department.
 - The Police to then notify all other parties.

• It is most important for all groups to be notified of the event.

The decision to become involved or not must be made by them, and not some other party.

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Police

Western Australian Fire Brigade

Conservation and Land Management

Avon River Management Authority

Northam Town Council

Northam Shire Council

State Emergency Services

Water Authority of Western Australia

Ambulance

Environmental Protection Authority.

2. Identification

Police or Fire Brigade

- Hazchem codes/Transport manifests

3. Containment

- Police set up a command post and be co-ordinators

- Western Australian Fire Brigade to be the Combat Authority

Methodology of containment to be determined according to the circumstances of the event with all concerned group representatives on site.

4. Recovery

To be determined according to circumstances of the event.

5. Disposal

- Liaise with Local Councils and Health Department.

6. Associated Costs

- Each group to determine individual costs to be presented to those responsible.

7.4.2 Biological Environment

The potential for impacts to components of the biological environment following construction of the Route 6 bypass alignment require management.

7.4.2.1 Vegetation

<u>Impact</u>

Loss of vegetative cover to those areas along the bypass alignment not revegetated during construction.

Management

- Revegetation of remaining road reserve and future median strip with indigenous plant species of trees, shrubs and groundcovers (see Appendix 3), including the road reserve areas proposed for future duplication of the carriageway (ie. Ultimate Stage 2).
- Embankments and batters to be also revegetated with suitable shrub and groundcover species. Areas with steep gradients may require stepping to facilitate the establishment of appropriate species.
- Provide fire protection for newly established revegetation areas with the employment of strategic firebreaks. Fire protection should be designed and maintained to exclude fire from revegetated areas for five (5) years.
- Control of noxious weeds by manual, mechanical or chemical means may be required prior to revegetation. Care must be taken to ensure runoff associated with the application of chemical herbicides is minimised in order to avoid water quality impacts to nearby waterways.
- Periodically monitor establishment of revegetation areas and implement remedial techniques if necessary (eg. re-seeding, container planting). Monitoring results to be submitted annually to the relevant authorities (EPA, CALM, ARMA).

7.4.2.2 Fauna

Impact

Loss of habitat and potential for road kills along bypass alignment.

- Re-establishment and/or enhancement of habitat areas to reflect or improve upon existing habitats by careful selection of indigenous plant species (see Appendix 3).
- Provision of wildlife corridors to assist in the safe movement of fauna along its length.
- Emphasise revegetation/habitat creation to one side of the bypass alignment as a method to reduce the cross-road movements and subsequent road kills of native fauna.
- Standard road design characteristics associated with the construction of National Highways (eg, vehicle recovery area where there is no vegetation within 7 metres of the road edge) provide clearance and visibility for both vehicles and fauna.

7.4.2.3 **Ecosystem and Habitat**

Impact

Loss of riverine habitat along the Avon River/Mortlock River, alteration of previous habitat areas and disturbance to ecosystem patterns.

Management

- Adopt post-construction management strategies outlined in the vegetation and fauna components (ie Sections 7.4.2.1 and 7.4.2.2 respectively).
- - Where possible, revegetate with the intent of linking together remnant vegetation blocks.

7.4.3 Human Environment

The components of the human environment potentially impacted upon following the construction of the Route 6 bypass alignment require management.

7.4.3.1 Local Business

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Impact

Loss of income for local business due to Route 6 bypass alignment.

- Provide information bays showing important tourist, local business and shopping information. Information bays located just before turn off points into Northam.
- Ensure appropriate signage is erected to encourage people to visit Northam (eg Historical Tourist Drive through Northam). Signage to be included at access points along bypass alignment (eg Northam- Pithara Road).

7.4.3.2 Noise and Vibration

Impacts

Perceived noise impacts to residential area (ie Doctors Hill).

Management

- □ Noise assessment for the Route 6 alignment indicates cutting at this location would reduce the noise levels associated with estimated traffic flows to acceptable standards (see Appendix 5).
- Landscaping and revegetation will also reduce vehicle generated noise.
- □ No additional noise management techniques required.

7.4.3.3 Heritage Values

Impacts

Disruption to heritage sites in the vicinity of bypass alignment, modification to Cemetery access road following duplication of the Route 6 carriageway and restricted access/size reduction to foreshore areas.

Management

- □ Maintain access to Morby Farm Cottage and erect appropriate signage regarding its location.
- Access to the Cemetery via Katrine Road will be maintained during Stage 1 of the Bypass. Upon future duplication of this alignment, an alternative access road will be constructed to the Cemetery. Funeral processions shall not be required to travel along bypass road.
- □ Area of foreshore along the north bank of the Avon River will be reduced (ie. from the existing 40-80 metres wide to the proposed 10-30 metres wide) due to bypass embankments, however, there will still be provision for informal walk

trails/heritage trails along the remaining foreshore reserve (see Plan 14).

- The remaining foreshore area is above the 1 and 2 year ARI flood level and therefore will not generally be subject to inundation (see also Plan 14).
- Access to the foreshore will be possible through land currently acquired by Main Roads near the Moore Street/York Road intersection.
- □ Foreshore areas will be upgraded and revegetated with indigenous plant species such as Eucalyptus rudis, Melaleuca rhaphiophylla, Hakea preissii, Acacia acuminata, Allocasuarina obesa, Juncus pallidus and Juncus pauciflorus for the purpose of conservation and recreation.

7.4.3.4 Landscape Amenity

Impact

Visual impact of embankments, cuttings, bridge structures and the bypass road.

Management

- Reduce visual impacts through re-contouring landscaping and revegetation with indigenous plant species (see Appendix 3).
- □ Bridge and culvert structures will be designed to compliment surrounding environment and associated embankments will be re-contoured to appropriate gradient and revegetated.
- □ Special care will be taken along the affected Avon River foreshore area where rehabilitation and revegetation has the potential to significantly enhance this currently degraded area.

7.4.3.5 Air Pollution

Impact

Community concerns over air pollution caused by traffic movements through residential areas and in close proximity to town centre.

Management

- □ The Route 6 bypass alignment will allow steady traffic flows for vehicles bypassing Northam and reduce traffic movements within the town centre.
- This situation will improve local air quality around the town centre.

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- Estimated traffic volumes through the Doctors Hill area (ie 727 vehicles per day) are of a relatively low magnitude and is therefore unlikely to produce any noticeable increase in air pollution at this location.
- It is therefore considered that it is not necessary to implement any specific management strategies for perceived air quality impacts associated with the Route 6 alignment.

7.4.3.6 Farming Operations

Impact

Minor loss to productive farmland and restricted access to water supplies following construction (Route 6).

Management

Negotiate with affect landowner regarding compensation for loss of productive farmland and restricted access to water supply.

Impact

Loss of prime farm land, restricted access, effects on water resources, spread of weeds and segregation of property following construction (Route 9).

<u>Management</u>

- □ Loss of farm land compensate for reduced viability.
- Restricted access provide suitable underpasses or overpasses where appropriate.
- □ Effects on water resources control flows by way of culverts, maintain existing drainage lines and monitor where necessary.
- □ Spread of weeds undertake weed control programme and plant trees where appropriate.
- Segregation and severance of property pay for refencing as required, purchase small unmanageable areas and plant trees if necessary.



RIVERBANK AREA BETWEEN HOCKEY FIELD AND TROTTING TRACK

1 YEAR ARI FLOOD LEVEL (143.75m above AHD)

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7.4.3.7 Recreation

Impact

Restricted access for horse trail riding along the north bank of the Avon River and reduction of foreshore area which may inhibit passive recreational activities such as bushwalking and nature study.

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Management

- Negotiate with Pony Club regarding alternative riding trails not affected by the Route 6 bypass alignment.
- Establish informal waking trails along the remaining foreshore area between the bypass and the Avon River.
- □ Revegetate foreshore area with suitable indigenous tree, shrub and groundcover species for the purpose of conservation and recreation.□
- Upgrading foreshore area and provide a range of picnic and barbecue facilities.

7.4.3.8 Tourism

Impact

Loss of 600m section of Katrine Road (an established Tourist Drive) associated with the future duplication of the carriageway (i.e. Ultimate - Stage 2).

Management

Erect appropriate signage along bypass and nearby roads to facilitate directions and the continued use of Katrine Road as a Tourist Drive.

7.4.3.9 Future Town Expansion

Impact

Dissection of established rural-residential area (Doctors Hill) and constraint of bypass route on the future expansion of Northam.

Management

□ The Route 6 Bypass alignment has several access points along its length that ensure cross town movements are accommodated. In addition, all existing access roads crossed by the Route 6 alignment will be retained.

- The bridge overpass along Northam-Pithara Road will also cater for pedestrians and cyclists by way of dual use pathways.

It is possible to take into account the bypass route and the future expansion of Northam through appropriately designed developments that take advantage of proposed access routes and minimise impacts on amenity.

8.0 ENVIRONMENTAL COMMITMENTS

8.1 Objective

The objective for the preparation of environmental commitments for the proposed Route 6 alignment of the Northam Bypass is to provide necessary guidance on the management of potential environmental impacts. The environment commitments ascertain what management strategy is required, who will implement the strategy and the timing of implementation. Where appropriate, commitments which are required to be undertaken to the satisfaction of a regulatory authority, will have the abbreviation of the approval body shown in brackets after the commitment eg (EPA), Environmental Protection Authority. A list of regulatory authorities and their abbreviations is provided at the end of this section.

The environmental commitments have been categorised into:

- Pre-construction commitments;
- During construction commitments;
- Post-construction commitments.

8.2 **Pre-Construction Commitments**

(1) Main Roads to commission a fauna study to ascertain the existence and population of a group of Echidna reported to inhabit the Cemetery area prior to any construction works being undertaken (EPA, CALM).

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- (2) Main Roads to negotiate with affected landowners, where land resumption is required, in order to arrange an equitable agreement and compensation for loss of property.
- (3) Main Roads to liaise with WAWA regarding the outcome of the Avon River Floodway Study and the implications of study findings with respect to the Route 6 alignment and compliance with WAWA's maximum backwater surcharge constraints (WAWA, EPA).

(4) Main Roads are to continue to liaise with the Northam Aboriginal Community Northam Bypass Consultative Environmental Review 130 Progress Association in order to resolve the issue of Aboriginal Reserve 8313 prior to any construction work being undertaken (ALT, AAPA).

(5) Main Roads to undertake public education and consultation should Route 6 be approved by all relevant authorities and pursued by Main Roads prior to the implementation of this alignment:

8.3 During Construction Commitments

- (6) Main Roads to make all contractors, associated with the construction of the Route alignment, aware of environmental commitments aimed at protecting the environment during construction and built these commitments into their work contracts.
- (7) Main Roads to ensure all re-contouring of embankments and batter slopes to be achieved to acceptable gradients in order to minimise erosion and subsequent siltation of watercourses (EPA, ARMA).
- (8) Main Roads to revegetate cleared areas of road reserve not required for Stage 1 road purposes (EPA, CALM, ARMA).
- (9) Main Roads to revegetate embankments and batter slopes susceptible to short term erosion impacts during the construction phase of the project (EPA, CALM, ARMA).
- (10) Main Roads to provide scour protection (eg. rock reinforcement or similar) to all bridge and road embankments within the 100 year floodplain (EPA, ARMA, WAWA).
- (11) Scour protection structures to be monitored by Main Roads to examine their stability and durability with the results to be reported as appropriate.
- (12) Main Roads to ensure all major road structures are constructed to accommodate a 100 year ARI flood event and comply with backwater constraints set by the Water Authority (WAWA).

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- (13) Main Roads to ensure all minor transverse structures such as culverts will be constructed to cater for a 50 year ARI storm event (WAWA).
- (14) Should drainage flows need to be dammed temporarily, Main Roads will ensure that the ponded water is treated appropriately before it is pumped downstream (WAWA, ARMA, EPA).
- (15) Main Roads to ensure stormwater drainage structures are constructed to design specifications to achieve necessary retention times and storage capacities to collect sediments and compensate stormwater runoff (ARMA, WAWA, EPA).
- (16) Main Roads to carefully plan and manage all earthworking and construction related activities in order to minimise loss of soil material and subsequent siltation along the Avon and Mortlock rivers (WAWA, EPA, ARMA).
- (17) Main Roads to restrict vegetation clearing and machinery movements to the road reserve area along important areas such as the Northam Scout Block and Avon River bank (EPA).

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- (18) Main Roads to re-contour and prepare the ground surfaces of revegetation areas to appropriate standards in order to facilitate the successful establishment of indigenous plant species (EPA, CALM, ARMA).
- (19) In road reserve areas of the Route 6 alignment where noxious weed proliferation is obvious, Main Roads are to arrange the removal and burial of affected topsoils to borrow pits.
- (20) Main Roads shall prepare a revegetation program outlining key areas to be revegetated, selected species and timetable for revegetation.
- (21) Main Roads will monitor the establishment of revegetation annually for a period of 2 years after practical completion of the bypass proposal. Results of monitoring will be included in the Annual Monitoring Report (EPA, ARMA, CALM).

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- (22) If revegetation is not progressing to the satisfaction of approval authorities, Main Roads will implement appropriate measures to remedy revegetation establishment (EPA, ARMA, CALM).
- (23) Main Roads to ensure noise and vibration levels associated with blasting activities comply with standards set by the EPA's Pollution Control Division (EPA).
- (24) Main Roads are to undertake before and after inspections of houses in the vicinity of blasting in order to assess potential vibration disturbance (EPA).
- (25) Main Roads will ensure inconvenience caused by re-routing cross roads affected during construction of the bypass alignment will be kept to a minimum and provide appropriate signage to achieve this.
- (26) During construction, Main Roads shall notify relevant agencies such as the Northam Tourist Centre, Shire of Northam and Town of Northam regarding restricted access to the foreshore areas along the Avon River.
- (27) Main Roads to ensure earthworking is undertaken during suitable ground conditions or employ dust suppression measures, such as water carts, when dust levels become problematic (EPA).
- (28) Main Roads to implement approved contingency plan during the construction of the Bypass project in order to contain and/or recover chemical or fuel spillages.
- (29) Main Roads to seek input from the local community in regard to planning and rehabilitating the foreshore areas in an effort to incorporate community needs for this important recreation/conservation area (EPA, ARMA).

8.4 **Post-Construction Commitments**

(30) Main Roads to ensure the revegetation of all road reserve, embankments and batter slopes, including those areas revegetated during construction, are revegetated with appropriate indigenous plant species (EPA, ARMA).

- (31) Main Roads to periodically check all minor transverse drainage structures for possible obstructions and if it is demonstrated that road construction has exacerbated local flooding, Main Roads are to investigate remedial measures.
- (32) Main Roads to periodically maintain stormwater drainage structures and remove material that may inhibit their function (ARMA, EPA).
- (33) If the chemical control of weeds is necessary prior, during or after revegetation, Main Roads shall take care to avoid contaminated runoff entering waterways (EPA, ARMA).
- (34) Main Roads shall revegetate road reserves with the intention of creating suitable habitat areas and providing wildlife corridors that minimise fauna road kills.
- (35) Main Roads to construct the infrastructure for information bays and enlist the support of local authorities, local businesses and the Northam Tourist Centre regarding the content of accompanying signage.
- (36) Following community involvement, Main Roads will upgrade the foreshore areas along the north bank of the Avon River and on the floodplain area in the vicinity of the Moore Street/York Road intersection. This will involve revegetation with indigenous riverine species and the provision of passive recreational facilities (eg informal walk trail, picnic seating and tables and barbeques).
- (37) Main Roads to implement approved contingency plan during the construction phase of the project. During the post-construction phase of the project, the implementation of the contingency plan will be the responsibility of the relevant authorities (eg, Police Department, Fire Brigade, Town of Northam, Shire of Northam, EPA, ARMA, State Emergency Service, etc).
- (38) Main Roads shall undertake annual monitoring of:
 - revegetation areas;
 - scour protection structures within 100 year flood plain

for a 2 year period following practical construction of the Route 6 alignment.

Results of the monitoring shall be submitted to relevant agencies as appropriate (EPA, ARMA, WAWA, CALM).

Commitment Abbreviations

AAPA	Aboriginal Affairs Planning Authority
ALT	Aboriginal Lands Trust
ARMA	Avon River Management Authority
CALM	Department of Conservation and Land Management
EPA	Environmental Protection Authority
WAWA	Water Authority of Western Australia

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9.0 ENVIRONMENTAL ASSESSMENT PROCESS

9.1 Environmental Protection Act 1986

Environmental impact assessment of development proposals in Western Australia is undertaken by the EPA under the provisions of the Environmental Protection Act 1986. Development proposals that may have a significant effect on the environment are referred to the EPA who make a decision on the level of assessment. Environmental impact assessment may be conducted on either a formal or informal basis.

Under the formal process there are three levels of assessment (Consultative Environmental Review (CER), Public Environmental Review (PER) or Environmental Review and Management Plan (ERMP). These documents differ in terms of the length of the public review period and the scope of the proposal (ie a CER usually relates to local scale projects while an ERMP usually relates to regional or state-wide scale projects). The proponent is required to prepare the required assessment document according to EPA prepared guidelines. This document is subsequently reviewed by the EPA who determine whether the proposal as described is considered environmentally acceptable, and accordingly make recommendations for the approval and management of the project by the Minister. The Minister for the Environment then sets conditions and procedures for implementation of the project which are legally binding and are usually based on EPA recommendations.

Under the informal environmental impact assessment process, the EPA advises other decision making authorities of its environmental concerns. Appropriate development controls and conditions can be then established by relevant authorities.

Having regard to this process, the EPA has determined a level of assessment of CER for the Northam Bypass proposal and has issued guidelines which are included in Appendix 1.

9.2 Public Participation and Consultation

9.2.1 Introduction

An effective public participation and consultation program has many benefits, particularly if implemented during the planning process. Using this approach, public concerns,

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alternatives and methods of resolution can be discussed prior to project approvals being sought. This helps to reduce misconceptions, misinformation and opposition to a project whilst improving proponent credibility and providing the public with the opportunity to impart community based information and knowledge.

As discussed in the "Background" and-"Evaluation of Alternatives"-sections of this report (ie, Sections 1.2 and 3.5 respectively), extensive public consultation had previously been undertaken for the Northam Bypass proposal during 1989 and 1990.

The purpose of the Northam Bypass (CER) public participation and consultation program is to fully inform the local community of the project and to allow for community concerns to be voiced such that they may be adequately addressed in the CER.

The main components of the public participation and consultation program are:

- Newsletters;
- Group Presentations; and an
- Open Day.

Each component is detailed in the following sections.

9.2.2 Community Newsletters

A total of 3 separate Community Newsletters are:

- distributed to the general community as an insert to the Northam Advocate;
- posted to affected landowners, interested parties and community groups; and
- made available at the local library and the Main Roads office in Northam.

The Community Newsletters are designed to inform the public on the progress of the Bypass proposal to date, outline important up-coming dates, highlight issues and resolutions brought about during the public participation and consultation program and define contact names and addresses for any queries or additional information.

Community Newsletter Nº 1

Community Newsletter N² 1 was distributed to the Northam community on June 9, 1993 (see Appendix 4A) and discussed the following:

- Main Roads appointment of BSD Consultants to prepare CER for Northam Bypass proposall;
- Objective of the Northam Bypass proposal;
- History of route selection process and the determination of the preferred route alignment (ie, Route 6);
- Objective of CER;
- Public participation and consultation program components and opportunities for public to voice their concerns; and
- Contact names of BSD Consultants personnel involved in the CER study.

Community Newsletter Nº 2

Community Newsletter N^o 2 (see Appendix 4B) was distributed to the Northam community on July 21, 1993 and contained the following:

- progress of the CER study to date;
- main issues and concerns raised during the public participation and consultation programme;
- important upcoming dates (e.g. completion of CER report, lodgement to EPA, Public Review period, response to public submissions etc).

Community Newsletter Nº 3

Community Newsletter N° 3 is proposed to be distributed to the Northam community on September 28, 1993 and contain the following:

- update on the progress of the CER study;
- summary of issues raised during the public participation and consultation program and the CER Public Review period;
- Upcoming important dates (e.g. EPA Report and Recommendations, Ministerial Conditions, anticipated bypass construction timeframe etc);
- Acknowledgment of public participation from the Northam community.

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9.2.3 Group Presentations

A number of Group Presentations where undertaken in order to gain feedback from a range of community and interest groups.

The groups involved in the Group Presentation exercise included the following:

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- Town of Northam;
- Shire of Northam;
- Northam Chamber of Commerce;
- Northam Environmental Society; and
- Northam Aboriginal Progress Association.

To establish contacts, an introductory meeting with representatives from each of the groups was arranged on May 27, 1993 where initial concerns were raised and documented (See Appendix 4C).

This was followed by Group Presentations conducted on June 23, 1993 to each of the groups at various venues (See Appendix 4D). It was stressed at the Group Presentations that concerns relating to any of the three Northam Bypass route alignments (ie, 6, 6A and 9) should be voiced in order to facilitate the environmental impact assessment of each bypass alignment.

9.2.4 Open Day

The Northam Bypass Open Day provided the opportunity for members of the public to inspect a range of display material relevant to the Northam Bypass CER.

The Open Day was advertised in the Northam Advocate on June 30, 1993 and held on July 8, 1993 at the Northam Boulevard Shopping Centre from 2.30pm to 8.15pm to coincide with late night trading.

Display material will include the following:

- 1:5000 aerial photograph showing the three bypass route alignments (ie, 6, 6A and 9);
- Separate plan views of each bypass alignment;

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- Cross sections of the preferred route alignment (ie, Route 6) at key locations (eg, along the Avon River and Doctors Hill area);
- Summary of the proposal including information on why the preferred alignment (ie, Route 6) was chosen, an outline of the environmental impacts of each route (ie, Route 6, 6A and 9) and general environmental management strategies applicable to Route 6.
- The CER timeframe and opportunities for public submissions.

There was also copies of a "hand in" comments sheet available (see Appendix 4E) for members of the public to either fill out and place in a box provided at the Open Day or mail in to BSD Consultants at a later date.

A total of 102 completed comments sheets were submitted to the consultants for analysis. The replies are summarised below:

- a) Routes 6 and 6A: 95% of all comments expressed concerns towards both options.
 Major concerns were (in descending order of concern):
- Routes do not function as bypasses, sever township and restrict growth.
- Impact on Avon River.
- Residential disturbance.

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- Environmentally unacceptable options.
- Impact on Cemetery.

In terms of benefits, a small percentage supported Routes 6/6A because of the need to keep traffic near to town for business and tourism.

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b) Route 9: a small percentage of comments received stated this option would impinge on town business trade and would affect the viability of farms severed by the alignment.

However 90% of all comments supported this option for the following reasons:

- Functions as an effective bypass.
- Would be cheaper to construct.
- Minimal residential impact.
- Less environmental impact.
- More heritage conscious.

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Appendix 4F provides a more detailed breakdown of concerns with respect to each of the three bypass alignments.

9.2.5 Program Summary

The Program Summary outlines the principal dates associated with each of the public participation and consultation exercises for the Northam Bypass CER.

27/05/93	Introductory Meetings
09/06/93	Community Newsletter Nº 1
23/06/93	Group Presentations
08/07/93	Open Day
21/07/93	Community Newsletter Nº 2
23/07/93 to 20/08/93	4 week Public Review period for CER
22/09/93	Community Newsletter Nº 3

9.2.6 Conclusion

The public participation and consultation program for the Northam Bypass CER proposal provided ample opportunity for community/interest groups and members of the public to voice their concerns.

Submissions and comments sheets received during the preparation of the CER were filed accordingly for easy reference. Where appropriate, solutions to legitimate concerns were investigated and incorporated into the CER document. Using this approach it is possible to take into account community issues and concerns during the preparation of the CER, thereby streamlining the Public Review phase of the EIA process.

At the time Route 6 was selected as the preferred alignment by the Northam Bypass Steering Committee in 1989, the Northam community appeared evenly divided between support for Routes 6 and 9. Since this decision was made, it is apparent that community attitudes toward the Route 6 alignment have changed, and the large majority of public input received during the CER's public participation and consultation exercises expressed concerns over the potential environmental, social and future planning problems the Route 6 alignment may create.

Clearly, those members of the community who provided input during this public participation and consultation process preferred the Route 9 alignment.

Northam Bypass Consultative Environmental Review

10.0 CONCLUSION

The Northam Bypass CER has incorporated the environmental impact assessment of Routes 6, 6A and 9 and the environmental management of Route 6.

It is apparent from the impact assessment that Route 6 has the greatest environmental impacts on the physical, biological and human environments of the three route alignments. However, it is also considered that environmental management strategies and environmental commitments put forward in this CER Report to protect these environmental components will result in an environmentally acceptable proposal.

The CER's public participation and consultation program clearly demonstrated that the majority of people who took part in the consultation process are opposed to the Route 6 alignment. There is also the issue of Aboriginal Reserve 8313 which needs to be resolved to the satisfaction of the Northam Aboriginal Community prior to the Route 6 (or Route 6A) alignment being constructed.

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APPENDIX 1

EPA GUIDLINES FOR CER

PROPOSED GREAT EASTERN HIGHWAY NORTHAM BYPASS

CONSULTATIVE ENVIRONMENTAL REVIEW GUIDELINES

Overview

In Western Australia all environmental reviews are about protecting the environment. The fundamental requirement is for the proponent to describe what they propose to do, to discuss the potential environmental impacts of the proposal, and then to describe how those environmental impacts are going to be managed so that the environment is protected.

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If the proponent can demonstrate that the environment will be protected then the proposal will be found environmentally acceptable; if the proponent cannot show that the environment would be protected then the Environmental Protection Authority (EPA) would recommend against the proposal.

Throughout the process it is the aim of the EPA to advise and assist the proponent to improve or modify the proposal in such a way that the environment is protected. Nonetheless, the environmental review in Western Australia is proponent driven, and it is up to the proponent to identify the potential environmental impacts and design and implement proposals which protect the environment.

For this proposal, protecting the environment means that the natural and social values associated with the Avon River and associated flora and fauna are protected. Where they cannot be protected, proposals to mitigate the impacts are required.

Purpose of an CER

The primary function of an CER is to provide the basis for the EPA to provide advice to Government on protecting the environment. An additional function is to communicate clearly with the public so that EPA can obtain informed public comment. As such, environmental impact assessment is quite deliberately a public process. The CER should set out the series of decisions taken to develop this proposal at this place and time and why.

Objectives of the review

The Consultative Environmental Review should have the following objectives:

- to place this project in the context of the regional environment;
- to explain the issues and decisions which led to the choice of this project at this place at this time;
- to set out the environmental impacts that the project may have; and
- for each impact, to describe any environmental management steps the proponent believes would avoid, mitigate or ameliorate that impact.

The CER should focus on the major issues for the area and anticipate and answer the questions that members of the public will raise. Data describing the environment should be directly related to the discussion of the potential impacts of the proposal. Both should then relate directly to the actions proposed to manage those impacts.

Key issues

The critical environmental issue for the proposal is likely to be the impact on the Avon River and the associated flora and fauna. It is critical therefore that the CER shows a detailed understanding of conservation, landscape and social values in the area, and whether they are represented elsewhere. The conservation values of areas to be disturbed should be examined in detail. The regional environmental and social values of the affected environment should be discussed, in particular, the importance of the Avon River.

The original referral document indicated that three options for the bypass were considered in detail by the Steering Committee, being alignments 6, 6A and 9. There is also the "do nothing" option. Alignment 6 became the preferred option. This option is likely, however, to have the most significant impacts on the environment, particularly the Avon River. The CER should, therefore, not focus solely on alignment 6 but consider and discuss the likely environmental impacts of each alignment.

The CER should present the impacts of each alignment, in terms of the issues listed below, in a manner that would allow the public and the Authority to assess the environmental merits of each alignment. In particular, the public and the Authority should be able to:

- assess whether the preferred alignment (or as modified during the assessment process) is environmentally acceptable; and
- make recommendations regarding the environmental acceptability of the other alignments.

The CER should also discuss the reasons for selection of the preferred alignment, including why the alternatives were not selected.

The key issues for this project should be clearly identified in the CER, and the content of succeeding sections of the report determined by their relevance to these issues.

In this case the key issues should include:

- construction impacts on the Avon River, including
 - likely changes to the hydrology of the river and and tributaries crossed:
 - the extent of any fill into the valley and floodplain:
 - the potential for increased sediment transport due to destabilisation of the river bank(s); and
 - significance of the vegetation to be removed:
- management and impacts of the river crossings for both the Avon the Mortlock Rivers:
- flora, fauna and ecosystems along each alignment:
 - major vegetation communities
 - land units:
 - rare and poorly known flora, fauna and communities, shown on distribution maps:
 - inter-relationships of the biota and environment:
- feral fauna, weed, access and fire control:
- landscape and recreation values, including:
 - loss of recreational amenity where the bypass crosses, or runs adjacent to, the Avon and Mortlock Rivers,
 - landscape and visual impacts of any large cuts or fill required for the bypass:

- social impact on:
 - individual landowners along the proposed routes, including land resumption requirements, impacts on farming operations and access to properties;
 - recreational and tourist users; and
 - local communities, particularly local businesses in Northam
- cultural impact on Aboriginal people with traditional affiliation to the land:
- - water management issues:
 - maintenance of surface water drainage patterns;
 - off-road stormwater treatment
- contingency plans for accidents such as fuel spills, etc;
- noise;
- construction phase management issues:
 - dust and noise control;
 - overburden and topsoil management
 - rehabilitation of easement and spoil pits; and
 - contingency plans for accidents such as fuel spills.etc.

plus any other key issues raised during the preparation of the report.

NOTE: The CER should not only address the environmental impacts for the first carriageway, but it should provide sufficient information for the public and the Authority to judge the environmental acceptability of any future duplication of the carriageway.

Public participation and consultation

A description should be provided of the public participation and consultation activities undertaken by the proponent in preparing the CER. It should describe the activities undertaken, the dates, the groups and individuals involved and the objectives of the activities. Cross reference should be made with the description of environmental management for the proposal which should clearly indicate how community concerns have been addressed. Where these concerns are dealt with via other departments or procedures, outside the EPA process, these can be noted and referenced here.

Detailed list of environmental commitments

The commitments being made by the proponent to protect the environment should be clearly defined and separately listed. Where an environmental problem has the potential to occur, there should be a commitment to rectify it. They should be numbered and take the form of:

- a who will do the work:
- b what the work is:
- c when the work will be carried out; and
- d to whose satisfaction the work will be carried out.
- All actionable and auditable commitments made in the body of the document should be numbered and summarised in this list.

APPENDIX 2

RESULTS OF BIOLOGICAL SURVEY

4.1 Eucalyptus loxophleba woodland with Acacia acuminata - Allocasuarina huegeliana understorey on Moderate brown Sandy-gravel.

Site 1

BROAD DESCRIPTION

Site 1 was situated along the existing Great Eastern Highway. The plant community present commenced opposite the entrance to the Northam Army Camp and extended adjacent to the highway for 400m. The majority of the site consisted of planted road verge with some open pasture.

In general the site was healthy although weed invasion was high and therefore very little native groundcover was present. Part of the site extended into a rifle range which contained a small stand of *Jacksonia furcellata* and a small seasonal wet area. *Juncus pallidus, Juncus pauciflorus, Wurmbea pygmaea* and *Drosera platystigma* were the only native plant species present in this wet area but not in the remainder of Site 1.

Soil in this vegetation community consisted of Moderate brown (5YR 4/4) Sandy-gravel.

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A total of 40 vascular plant species were recorded, 16 of which were introduced species. All three declared noxious weeds previously mentioned were present at this site. 7

TABLE 1: VASCULAR PLANT SPECIES RECORDED AT SITE 1

* denotes introduced species

Acacia acuminata Acacia insolita *Acaena echinata Allocasuarina huegeliana Amyema preissii *Anagallis arvensis Arthropodium capillipes *Avena fatua *Briza maxima Cheilanthes austrotenuifolia Cynodon dactylon *Dittrichia graveolens Drosera platystigma Drvandra sessilis *Echium plantagineum *Ehrharta calvcina Eragrostis elongata Eucalyptus calophylla Eucalyptus loxophieba Eucalyptus rudis Grevillea vestita Hakea auriculata var. spathulata Hakea preissii Hibbertia huegelii *Homeria miniata *Hypochaeris glabra Jacksonia furcellata Juncus pallidus Juncus pauciflorus Neurachne alopecuroidea *Oxalis cernua Pimelea argentea *Pseudognaphalium luteo-album Ptilotus polystachyus *Romulea rosea *Solanum nigrum *Sonchus sp. *Taraxacum officinale *Trifolium subterraneum Wurmbea pygmaea

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4.2 Granite outcrop with Acacia acuminata -Allocasuarina huegeliana overstorey on Dusky brown Loamy-sand

Site 2

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BROAD DESCRIPTION

Site 2 consisted of a small area of *Eucalyptus calophylla* woodland bordering a medium granite outcrop, situated within the boundaries of the shooting range. The entire area was 100m in length.

Overall this vegetation community was degraded due to heavy grazing in the past, with weed invasion very high. The larger *Acacia acuminata* present were healthy but old and scenescing.

Pockets of a Dusky brown (5YR 2/2) Loamy-sand were present on the outcrop.

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A total of 23 vascular plant species were recorded in this community with 7 of these being introduced species. The only noxious weed present was *Echium plantagineum*.

TABLE 2: VASCULAR PLANT SPECIES RECORDED AT SITE 2

*denotes introduced species

Acacia acuminata Allocasuarina huegeliana ____ *Asparagus asparagoides *Avena fatua Borya nitida *Brassica tournefortii Cheilanthes austrotenuifolia Cynodon dactylon *Cytisus proliferus Drosera pallida Dryandra sessilis *Echium plantagineum Eucalyptus calophylla Hakea preissii Hibbertia huegelii Lobelia tenuior Pimelea argentea *Romula rosea Stipa elegantissima Stypandra glauca Thysanotus patersonii *Ursinia anthemoides Waitzia acuminata

4.3 Eucalyptus calophylla woodland with Acacia acuminata understorey on Moderate brown Sandygravel.

Site 3

BROAD DESCRIPTION

Site 3 was situated in the Northam Scout Block. The northern side of the centre-line consisted of pasture with scattered *E. loxophleba* and *A. acuminata* while the southern side of the centre-line consisted of a large area of healthy native vegetation. This area was very similar to Site 1 with the exception of an *E. calophylla* overstorey. A greater diversity of understorey species was also present.

Overall the site was very healthy with little disturbance. Weed invasion was still high due to the close proximity of pasture, however many native groundcover and understorey species are still present. The site also contained some very small granite outcrops covered by a shallow soil layer. Overall soil type was the same as Site 1.

Due to the time of year that the field survey took place many annuals and other smaller species were not flowering, making collection and identification difficult. Mr Eric Fox of Northam kindly loaned a photograph album of wildflowers that have been seen in the area although not recorded during this survey. These include;

Orchids- Caladenia hirta

Caladenia flava Diuris longifolia Thelymitra antennifera Everlastings- Helipterum manglesii Podolepis sp. Approximately 12 other species of wildflower have also been recorded by Mr Fox, including *Burchardia multiflora*, *Stackhousia huegelii* and *Petrophile biloba*.

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A total of 44 vascular plant species were recorded, 13 of which were introduced. The noxious weeds *Homeria miniata* and *Oxalis cernua* were present.

TABLE 3: VASCULAR PLANT SPECIES RECORDED AT SITE 3

*denotes introduced species

Acacia acuminata Acacia insolita *Acaena echinata Allocasuarina huegeliana Amyema preissii *Anagallis arvensis Arthropodium capillipes *Avena fatua *Brassica tournefortii *Briza maxima Cheilanthes austrotenuifolia Cynodon dactylon Dioscorea hastifolia *Dittrichia graveolens Dryandra sessilis *Ehrharta calycina Eucalyptus calophylla Eucalyptus camaldulensis Eucalyptus loxophleba *Fumaria muralis Gastrolobium spinosum Grevillea vestita Hibbertia huegelii Hibbertia rhadinopoda *Homeria miniata *Hypochaeris glabra Jacksonia furcellata Kennedia prostrata Muehlenbeckia adpressa Neurachne alopecuroidea *Oxalis cernua Phyllanthus calycinus *Pseudognaphalium luteo-album Ptilotus polystachyus Ptychosema pusillum

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*Romulea rosea *Solanum nigrum *Sonchus sp. Sowerbaea laxiflora Stypandra glauca *Taraxacum officinale *Trifolium subterraneum *Ursinia anthemoides Wurmbea pygmaea Xanthorrhoea preissii

<u>.</u>

4.4 Granite outcrop with Eucalyptus calophylla -Eucalyptus loxophleba overstorey on Dusky brown Loamy-sand.

Site 4

BROAD DESCRIPTION

The small granite outcrop at site 4 was approximately 80m in length and situated in a pasture area. It has been heavily grazed and as a result the site is in a very degraded condition with almost no native understorey remaining.

Soil at Site 4 was similar to soil collected from pockets in the granite outcrop at Site 2.

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A total of 14 species of vascular plant were collected from this vegetation community. Five of these were introduced with no noxious weeds present.

TABLE 4: VASCULAR PLANT SPECIES PRESENT AT SITE 4 *denotes introduced species

Acacia acuminata *Aira caryophyllea *Avena fatua Borya initida *Briza maxima Cheilanthes austrotenuifolia Drosera pulchella Eucalyptus calophylla Eucalyptus loxophleba Hibbertia huegelii Poaceae sp. 1 *Pseudognaphalium luteo-album Ptychosema pusillum

*Rumex sp.

4.5 Open Eucalyptus loxophleba woodland with Acacia acuminata understorey.

Site 5 and Site 11 BROAD DESCRIPTION

Sites 5 and 11 were both situated in or adjacent to pasture. This has resulted in areas that been grazed in the past, and as in Site 4 very little native groundcover or understorey is present. In both areas weed invasion is very high. The remaining trees are relatively tall and healthy.

The soil types were different between the two sites due to their different positions in the landscape. Site 5 was located on a mid to upper slope position while Site 11 was situated on a gentle lower slope plain east of the Mortlock River. Site 5 occurred on blackish red (5R 2/2) Sandy-gravel. Site 11 was situated on grayish brown (5YR 3/2) Sandy-loam.

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A total of 22 vascular plant species were recorded in this vegetation community. Seven of these were introduced species. The noxious weeds *Echium plantagineum* and *Oxalis cernua* were present.

TABLE 5: VASCULAR PLANT SPECIES PRESENT AT SITES 5 AND 11 *denotes introduced species

Acacia acuminată *Avena fatua *Briza maxima Caesia parviflora Chamaexeros serra Dianella revoluta Drosera pallida *Echium plantagineum *Erodium cicutarium Eucalyptus loxophleba Hakea preissii *Hypochaeris glabra Lomandra micrantha *Oxalis cernua Oxalis corniculata Pimelea argentea Poaceae sp. 2 Ptilotus drummondii *Romulea rosea Thysanotus patersonii *Trifolium subterraneum Unknown creeper

4.6 Acacia acuminata shrubland on Moderate reddish brown Sandy-clay.

Site 6

BROAD DESCRIPTION

Site 6 was a very degraded area situated adjacent to the railway line and sewage farm. Site condition was very poor indicating high levels of disturbance either through grazing or human impact. The area was a very open woodland with few understorey or groundcover species. Weed invasion was also high although percentage cover was only 60%, with large areas of bare earth present.

This community was situated on Moderate reddish brown (10R 4/6) Sandy-clay.

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A total of 14 vascular plant species were recorded, 7 of which are introduced species. The noxious weeds *Echium plantagineum* and *Homeria miniata* were present.

TABLE 6: VASCULAR PLANT SPECIES PRESENT AT SITE 6 *denotes introduced species

Acacia acuminata Amyema preissii *Arctotheca calendula *Avena fatua *Briza maxima Caesia parviflora Dryandra sessilis *Echium plantagineum Eucalyptus loxophleba Hakea preissii *Homeria miniata *Romulea rosea Senecio sp. *Trifolium angustifolium

4.7 River bank with *Melaleuca* rhaphiophylla-Casuarina obesa overstorey on Dark yellowish brown Sandy-clay.

Site 7

BROAD DESCRIPTION

Situated on the banks of the Avon River this vegetation community extended approximately 20m from the waters edge on either side of the river. Heavy stock use in the past has disturbed the area resulting in very high levels of weed invasion.

Very few understorey or shrub species were evident during the survey although small orchids and annuals are often present in these wet areas. None were evident during the survey and past grazing may have removed them from the area.

The river bank was composed of Dark yellowish brown (10YR 4/2) Sandy-clay.

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A total of only 8 vascular plant species were recorded with 6 species of introduced plants present. The only noxious weed present was *Oxalis cernua*.

TABLE 7: VASCULAR PLANT SPECIES PRESENT AT SITE 7 *denotes introduced species

*Arctotheca calendula *Avena fatua Casuarina obesa *Hypochaeris glabra *Isolepis prolifera Melaleuca rhaphiophylla *Oxalis cernua

*Romulea rosea

4.8 Low plain with *Eucalyptus rudis* - *Eucalyptus loxophleba* overstorey over pasture on Moderate reddish brown Clayey-sand.

Site 8 and Site 10

BROAD DESCRIPTION

This vegetation community was present along the Avon River inland from Site 7. It consists of a low-lying area which probably floods during heavy rains. Both stock and human use have degraded this area. Weed invasion is very high due to this disturbance in the past. Few native understorey species were present.

The proximity of this area to the river has resulted in the soil having a high clay content. This is of a Moderate reddish brown colour (10R 4/6).

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A total of 23 vascular plant species were recorded, 15 of which are introduced species. The noxious weeds *Echium* plantagineum and Oxalis cernua were present.

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TABLE 8: VASCULAR PLANT SPECIES PRESENT AT

SITES 8 AND 10

*denotes introduced species

Acacia acuminata *Acaena echinata Amyema preissii *Anagallis arvensis *Avena fatua *Briza maxima Casuarina obesa *Echium plantagineum *Ehrharta calycina Eucalyptus loxophieba Eucalyptus rudis Hakea preissii *Hypochaeris glabra Lycium australe *Oxalis cernua *Oxalis variabilis *Plantago major *Romulea rosea *Rumex acetosella *Sonchus sp. Stipa elegantissima *Taraxacum officinale *Trifolium angustifolium

4.9 River bank with *Eucalyptus rudis* over *Casuarina obesa* on Dark reddish brown Loam.

Site 9

BROAD DESCRIPTION

Site 9 was situated on the banks of the Mortlock River and extended approximately 15m from the waters edge on either side of the river. Like the Avon River, the banks of the Mortlock have been grazed, resulting in weed invasion. Again few native shrub species were present. The primary difference between the banks of the two rivers is the absence of *Melaleuca rhaphiophylla* along this section of the Mortlock River probably due to the seasonality of water levels in the river.

Soil at this vegetation community was composed of Dark reddish brown (10R 3/4) Loam.

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Fourteen vascular plant species were recorded along this section of the river. The majority of these (9 species) were introduced. The noxious weeds *Echium plantagineum* and *Oxalis cernua* were present.

TABLE 9: VASCULAR PLANT SPECIES PRESENT AT SITE 9 *denotes introduced species

Acacia acuminata *Arctotheca calendula *Avena fatua Casuarina obesa *Echium plantagineum Eucalyptus rudis Hakea preissii *Hypochaeris glabra *Isolepis prolifera Juncus pallidus *Oxalis cernua *Oxalis variabilis *Romulea rosea *Ursinia anthemoides 4.10 Planted road verge with Eucalyptus loxophleba - Eucalyptus camaldulensis on Dark reddish brown Sandy-clay.

Site 12

BROAD DESCRIPTION

This community was situated close to where the proposed Bypass rejoins the existing Great Eastern Highway. The area has been planted in a 5m wide strip following road construction. The understorey consists largely of grasses and weed invasion is very high due to the close proximity of pasture.

The road verge soil consists of Dark reddish brown (10R 3/4) Sandy-clay.

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A total of 12 vascular plant species were recorded, 7 of which were introduced. The only noxious weed present was *Echium plantagineum*.

TABLE 10: VASCULAR PLANT SPECIES PRESENT AT SITE 12 *denotes introduced species

Acacia acuminata

Acacia colletioides

*Avena fatua

*Briza maxima

Daviesia hakeoides subsp. subnuda

*Echium plantaginuem

Eucalyptus camaldulensis

Eucalyptus loxophleba

*Hypochaeris glabra

*Oxalis cernua

*Romulea rosea

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*Ursinia anthemoides

RESULT OF FAUNA SURVEY

All areas likely to be affected by construction of the Northam Bypass (Route 6) were surveyed to determine the impact of construction on fauna. During the course of this survey three broad fauna habitat types were identified:

River - Avon and Mortlock Rivers including fringing vegetation.

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Woodland - Eucalyptus loxophleba (York Gum) / Acacia acuminata (Jam) woodland including small granite outcrops.

Paddock - Paddocks including small groups of remnant trees.

Overall, 24 species of bird, 1 species of gecko and 1 species of introduced mammal were recorded during the assessment. Appendix F lists all fauna species recorded and those expected to occur within and around the proposed road reserve.

All habitats were found to be very degraded with little native understorey present, restricting the number of predicted species, particularly birds, significantly. No rare or endangered fauna were recorded with the only gazetted species likely to occur being the Peregrine Falcon (*Falco peregrinus*). As this is a cosmopolitan species the project is unlikely to have any impact on this bird.

LIST OF VERTEBRATE FAUNA SPECIES RECORDED AND THOSE EXPECTED TO OCCUR WITHIN THE ROAD RESERVE OF THE PROPOSED GREAT EASTERN HIGHWAY NORTHAM BYPASS ROUTE

KEY: * Species Recorded + Species expected_to_occur. ^ Gazetted species I Introduced species	an a	
Fauna Habitats River - Avon and Mortlock Rivers inclu W/L - York gum/Acacia woodland incl outcrops PDK - Paddock including remnant sma	ding fringing veget uding small granite Il groups of trees	ation •
FAUNA HABITATS	RIVER W/L P	DK
-BIRDS		
PODICIPEDIDAE Poliocephalus poliocephalus, Hoany booded Grobo		
Tachybaptus novaehollandiae,	+ _	
PHALACROCORACIDAE Phalacrocorax sulcirostris, Little Black Cormorant	+ +	
P. melanoleucos, Little Pied Cormorant		
ARDEIDAE Ardea pacifica, Pacific Heron A. novaehollandiae, White-faced Heron	+	+
Egretta alba, Great Egret Nycticorax caledonicus, Rufous Night Horon	+	
PLATALEIDAE	+	
Threskiornis aethiopica, Sacred Ibis T. spinicollis, Straw-necked Ibis Platalea flavipes,	++	+ +
Yellow-billed Spoonbill ANATIDAE	•	
Cygnus atratus, Black Swan Tadorna tadornoides,	· +	
Australian Shelduck	+	

Anas superciliosa, Pacific Black Duck A. gibberfrons, Grey Teal A. castanea, Chestnut Teal A. rhynchotis, Australasian Shoveler Malacorhynchus membranaceus, Pink-eared Duck Aythya australis, Hardhead Chenonetta jubata, Maned Duck Oxyura australis, Blue-billed Duck Biziura lobata, Musk Duck ACCIPITRIDAE	+ + + + + + + +		i β - i a ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹
Elanus notatus, Black-shouldered Kite Lophoictinia isura,	+	+	÷
Square-tailed Kite Haliastur sphenurus, Whistling Kite Accipiter fasciatus, Brown Goshawk A cirrhoceobalus	+ + +	+ + +	+ + +
Collared Sparrowhawk Aquila audax, Wedge-tailed Eagle Hieraaetus morphnoides, Little Eagle Circus aeruginosus, Marsh Harrier FAI CONIDAE	+ + + +	+ + +	+ + + +
Falco peregrinus,Peregrine Falcon^F. longipennis,Australian HobbyF. berigora,Brown FalconF. cenchroides,Australian KestrelPHASIANIDAEAustralian Kestrel	 + + + +	+ + +	+ + +
Coturnix novaezealandiae, Stubble Quail			+
RALLIDAE Gallinula ventralis, Black-tailed Native-hen G. tenebrosa, Dusky Moorhen Porphyrio porphyrio, Purple Swamphen Fulica atra, Eurasian Coot CHARADBIIDAE	+ + + +	v	•
Vanellus tricolor, Banded Lapwing Charadrius ruficapillus, Red-capped Plover C. melanops, Black-fronted Plover	+ + +		+

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RECURVIROSTRIDAE

Himantopus himantopus, Black-winged Stilt Recurvirostra novaehollandiae, **Red-necked** Avocet + SCOLOPACIDAE Tringa glareola, Wood Sandpiper + :-Common Sandpiper T. hypoleucos, + Greenshank T. nebularia. + Calidris ruficollis. **Red-necked Stint** + COLUMBIDAE Columba livia, Feral Pigeon 1 + Streptopelia senegalensis, Laughing Turtle-Dove I Phaps chalcoptera, Common Bronzewing Ocvphaps lophotes. Crested Pigeon CACATUIDAE Cacatua roseicapilla. Galah PLATYCERCIDAE Purpureicephalus spurius, Red-capped Parrot Barnardius zonarius. Port Lincoln Ringneck CUCULIDAE Cuculus pallidus, Pallid Cuckoo + Chrysococcyx basalis, Horsfield's Bronze-Cuckoo C. lucidus. Shining Bronze-Cuckoo STRIGIDAE Ninox novaeseelandiae. Southern Boobook + TYTONIDAE Tvto alba. Barn Owl PODARGIDAE Podargus strigoides, Tawny Frogmouth AEGOTHELIDAE Aegotheles cristatus, Australian Owlet-nightjar ALCEDINIDAE Dacelo novaeguineae, Laughing Kookaburra Halcyon sancta, Sacred Kingfisher

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Merops ornatus,	Rainbow Bee-eater
HIRUNDINIDAE	
Hirundo neoxena,	Welcome Swallow
Cecropis nigricans,	Tree Martin
C. ariel,	Fairy Martin
MOTACILLIDAE	-
Anthus novaeseelan	diae,

Richard's Pipit

CAMPEPHAGIDAE

Coracina novaehollandiae

Black-faced Cuckoo-shrike Lalage sueurii, White-winged Triller MUSCICAPIDAE Petroica multicolor, Scarlet Robin P. goodenovii, Red-capped Robin Pachycephala rufiventris,

Rufous Whistler Colluricincla harmonica,

Grey Shrike-thrush Myiagra inquieta, Restless Flycatcher Rhipidura fuliginosa, Grey Fantail R. leucophrys, Willie Wagtail SYLVIIDAE

Cinclorhamphus mathewsi,

Rufous Songlark C. cruralis, Brown Songlark ACANTHIZIDAE Smicrornis brevirostris, Weebill Gerygone fusca, Western Gerygone Acanthiza apicalis, Inland Thornbill A. inornata, Western Thornbill A. chrysorrhoa,

Yellow-rumped Thornbill NEOSITTIDAE

Daphoenositta chrysoptera,

Varied Sittella

MELIPHAGIDAE

Anthochaera carunculata,

Red Wattlebird Manorina flavigula, Yellow-throated Miner Lichenostomus virescens, Singing Honeyeater Melithreptus brevirostris, **Brown-headed Honeveater** White-naped Honeyeater M. lunatus. Lichmera indistincta, **Brown Honeyeater EPHTHIANURIDAE** Ephthianura albifrons, White-fronted Chat DICAEIDAE Dicaeum hirundinaceum. Mistletoebird PARDALOTIDAE Pardalotus punctatus. Spotted Pardalote P. striatus. Striated Pardalote ZOSTEROPIDAE Zosterops lateralis, Silvereye GRALLINIDAE Grallina cvanoleuca. Australian Magpie-lark ARTAMIDAE Artamus cinereus. Black-faced Woodswallow A. cyanopterus, **Dusky Woodswallow** CRACTICIDAE Cracticus torquatus, Grey Butcherbird C. nigrogularis, Pied Butcherbird

Gymnorhina tibicen, Australian Magpie CORVIDAE Australian Raven

Corvus coronoides.

MAMMALS

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TACHYGLOSSIDAE Tachyglossus aculeatus, Short-beaked Echidna

DASYURIDAE Sminthopsis griseoventer,

Common Dunnart S. crassicaudata. Fat-tailed Dunnart

BURRAMYIDAE

Cercartetus concinnus.

Western Pygmy-possum

MACROPODIDAE

Macropus fuliginosus,		
Western	Grev Kangaroo	* + +
M. robustus, Cor	nmon Wallaroo	en e
MOLOSSIDAE		
Tadarida australis		
White-striped	Mactiff_hat	
Mormonterus planicopo	Mastin-Dat	* * *
	Montiff bot	
	Mastin-Dat	* + *
VESPER ILIONIDAE		
Nyctopnilus major,		
Greater Li	ong-eared Bat	* + +
N. gouldi, Gould's L	ong-eared Bat	+ + +
N. geoffroyi, Lesser L	ong-eared Bat	, + . + . +
Chalinolobus gouldii,	i di seco	
Gould's	s Wattled Bat	* * *
C. morio, Chocolate	e Wattled Bat	+ + +
Falsistrellus mackenziei,		
Gre	at Pipistrelle	+ +
Eptesicus regulus,	····	· · · ·
King Ri	ver Eptesicus	* + *
MURIDAE	• .	
Hydromys chrysogaster,	Water-rat I	••••••••••••••••••••••••••••••••••••••
Rattus rattus,	Black Rat I	+ + +
Mus musculus,	louse Mouse I	• • • •
LEPORIDAE		
Orvctolagus cuniculus	Rabbit I	
CANIDAE		
Vulpes Vulpes	For 1	
Felie catue	Earol Cat I	
rens calus,	relat Gali	
AMPHIBIANS		
LEPTODACTYLIDAE		
Crinia georgiana	.2 ⁴	+ · · · ·
C. pseudinsignifera		÷ •
Heleioporus albopunctatus		
l imnodvnastes dorsalie		

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Myobatrachus gouldii Pseudophryne guentheri HYLIDAE

Litoria adelaidensis L. moorei F6

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CHELUIDAE Side-necked Tortoises				
Chelodina oblonga	+			
GEKKONIDAE Geckos				
Crenadactylus o. ocellatus		+		
		•		
Diplodactylus granariensis		· .		
granariensis		+		
D. polyophthalmus				
D. spinigerus inornatus		Ŧ		. "
Gehvra varienata		- T - +		
Phyllodactylus marmoratus	·			
Inderwoodisaurus milii	+	+		13
PVGOPODIDAE	с.,	+		
Aprasia puloballa	2			
Delma fraceri		+		
		≁		
Lialis Durtonis		+		
Pygopus lepidopodus		+		
AGAMIDAE Dragon Lizards			•	
Ctenophorus ornatus		+		
C. reticulatus		+		la/
Pogona m. minor		+		
SCINCIDAE Skinks	•			
Bassiana trilineata	+			÷ .
Cryptoblepharus plagiocephalus	+	+ '	+ ·	
Ctenotus labillardieri		+	•	-1 - 1
C. schomburgkii				
Egernia napoleonis	+	+		
Hemiergis i. initialis	•	, 		зłź
H. peronii	<u>н</u>	г -		,
Lerista distinguenda	.	т 1		
Menetia grevii	. +	т ,		e di
Morethia obscura	+	+•	×.	17
Tiliqua r rugosa		+		
VARANIDAE	4	÷	+	· •
Varanus gouldii				
Varanus goulun V t trictic	, +	+		
	+	+		
Remation Blind Snakes			-	•
Ramphotyphiops australis	+	+		
n. pinguis	+	+		
H. Waltii	+	+		
BOIDAE Pythons				
Liasis stimsoni stimsoni	+			

ELAPIDAE Elapid Snakes	
Demansia psammophis reticulata	+
Neelaps bimaculatus	+
Notechis scutatus occidentalis	+
Pseudechis australis	+
Pseudonaja affinis affinis	+
P. nuchalis	+
Rhinoplocephalus gouldii	+
R. nigriceps	+
Simoselaps bertholdi	
S. s. semifasciatus	+

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APPENDIX 3

VEGETATION SPECIES SUITABLE FOR REVEGETATION

VASCULAR PLANT SPECIES SUITABLE FOR REVEGETATION OF AREAS DISTURBED DURING CONSTRUCTION OF THE PROPOSED NORTHAM BYPASS

Species	Description	Flowering
Acacia acuminata	Tall shrub/tree	Jul-Oct
Acacia insolita	Shrub to 1m	Sep-Mar
Allocasuarina huegeliana	Tree to 8m	May-Jan
Casuarina obesa	Tree to 10m	All year
Calothamnus quadrifidus	Shrub 1-2m	Aug-Dec
Daviesia hakeoides	Shrub to 1m	May-Jul
Dianella revoluta	Herb up to 0.85m	Oct-Nov
Dioscorea hastifolia	Climbing shrub	May-Jul
Eucalyptus calophylla	Tree 30-40m	Jan-May
Eucalyptus loxophleba	Tree to 10m	May-Oct
Eucalyptus rudis	Tree 9-15m	Apr-Nov
Gastrolobium spinosum	Shrub 1-2m	Aug-Nov
Grevillea vestita	Shrub 1-2m	Jun-Sep
Hakea auriculata	Shrub to 1m	Aug-Nov
Hibbertia huegelii	Low shrub to 0.5m	Aug-Nov
Hibbertia rhadinopoda	Prostrate shrub	Sep-Dec
Juncus pallidus	Reed to 2m	Oct-Nov
Juncus pauciflorus	Reed to 1.5m	Oct-Nov
Kennedia prostrata	Groundcover	Jul-Nov
Melaleuca rhaphiophylla	Tree to 10m	Sep-Jan
Phyllanthus calycinus	Shrub to 1m	Jun-Nov
Pimelea argentea	Shrub to 2m	Jul-Oct
Xanthorrhoea preissii	Shrub to 3m	Jan-Nov

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APPENDIX 4

RESULTS OF PUBLIC PARTICIPATION AND CONSULTATION PROGRAMME



MAIN ROADS Western Australia



NORTHAM BYPASS CER

COMMUNITY NEWSLETTER NO 1

BSD Consultants have been appointed by Main Roads Western Australia to prepare a Consultative Environmental Review (CER) for the Northam Bypass proposal.

As the majority of the Northam community is aware, the Northam Bypass proposal involves the re-alignment of the Great Eastern Highway to the north of the Northam townsite, in order to reduce the adverse community impact of the highway's present alignment through the Northam town centre, whilst retaining the accessibility and convenience to Northam's business district.

Following numerous joint Council meetings, a public meeting and careful examination of the three alignment alternatives (Route 6, 6A and 9 - see plan overleaf), the Northam Bypass Steering Committee (comprising of representatives from the Shire of Northam, Town of Northam, Environmental Protection Authority (EPA) Department of Planning and Urban Development and Main Roads recommended to the Minister of Transport that Route 6 be the selected alignment. This was subsequently accepted by the Minister and publicly announced on October 11, 1990.

As part of the pre-construction activities, it is necessary that an environmental impact assessment for the Northam Bypass be undertaken to the satisfaction of the EPA. Upon referral of the project, the EPA decided that the appropriate level of assessment was a Consultative Environmental Review (CER) and in December 1992 issued guidelines accordingly.

The EPA's CER Guidelines stipulate that the environmental impacts of each alignment (i.e. 6, 6A and 9) should be presented in a manner that allows the public and the Authority to:

- assess whether the preferred alignment (or as modified during the assessment process) is environmentally acceptable, and
- make recommendations regarding the environmental acceptability of the other alignments.

However, the environmental management for the proposal will focus on the preferred Bypass alignment (ie, Route 6) in order that route specific management strategies can be investigated and detailed. To facilitate public involvement during the preparation of the CER and to seek public comment on the Northam Bypass proposal, it is proposed to implement a public participation and consultation program consisting of the following:

Newsletters:

3 separate newsletters (this being Newsletter No 1) to be posted to affected landowners and community/interest groups and circulated to the general public of Northam as an insert to the local paper (Northam Advocate). Newsletters will contain information on the progress of proposal to date, important upcoming dates (eg. Open Day, public review period etc) and highlight issues and resolutions of community concerns.

Group Presentations:

Presentations supported with take home written material to local interest and community groups such as Chamber of Commerce, Northam Environmental Society, Northam Aboriginal Progress Association, farming groups and other relevant bodies are proposed to be undertaken in mid to late June.

Open Day:

Is to be held at the Boulevard Shopping Centre on Thursday, July 8, 1993 between 2pm and 8pm and will consist of displays (route option alignments, aerial photography, revegetation areas, bridge locations etc) and include take home written information and a "hand in" comments sheet. Personnel from BSD Consultants and Main Roads will be available to answer any queries and take note of concerns with respect to any of the alignments.

Clearly there will be ample opportunity for interest groups and the wider Northam community to voice their concerns on the acceptability or otherwise of the Northam Bypass, proposal in a manner that will directly input to the preparation of the CER.

See ...

BSD Consultants are committed to keeping people well informed on the progress and findings of the CER study and outcomes of the public participation and consultation program. If you have any queries or would like additional information regarding the Northam Bypass CER Study, please do not hesitate to contact Mick McCarthy or Tony Van Den Dries at BSD Consultants on (09) 316 2988.



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MAIN ROADS

Western Australia

NORTHAM BYPASS CER

COMMUNITY NEWSLETTER NO. 2

Since the release of Community Newsletter No. 1, BSD Consultants have undertaken significant progress towards preparing a draft Consultative Environmental Review (CER) Report. This newsletter outlines progress made thus far and all relevant results.

The first newsletter indicated the CER Guidelines issued by the Environmental Protection Authority (EPA) required the Consultants to assess the environmental impacts of the three bypass alignments (ie Routes 6, 6A and 9 shown overleaf) in a manner allowing the public and EPA to:

• assess whether the initial preferred alignment -Route 6 - (or as modified during the assessment process) is environmentally acceptable; and

• make recommendations regarding the environmental acceptability of the other alignments.

Accordingly, to date a series of Group Presentations and an Open Day have been conducted.

Group Presentations

On June 23, 1993, BSD representatives met with a number of local interest and community groups, in order to discuss issues and concerns relating to the bypass alignments. Main points raised by each group are summarised below.

a) Shire of Northam: expressed concerns in relation to Route 9 with respect to loss of prime farm land and property severance and the effect that a distant bypass would have on the Town's economy.

b) Northam Aboriginal Community Progress Association (NACPA): concerned that both Routes 6 and 6A would significantly impact upon Aboriginal Reserve 8313.

c) Northam Chamber of Commerce: concerned about the social and environmental aspects of a bypass close to the Town. Visibility of the Town from the bypass not now considered so important.

d) Northam Environmental Society (NES): expressed environmental and social concerns with respect to Routes 6 and 6A primarily in relation to impacts on the Avon River, Doctors Hill, heritage sites and the Cemetery.

e) Town of Northam: concerned about severance problems to the Town by Routes 6 and 6A plus the potential impacts on the Avon River and in the Doctors Hill area.

Open Day

The Open Day was held at the Boulevard Shopping Centre Northam on Thursday, July 8, 1993 (2.30 p.m.- 8.15 p.m.) Aerial photography, plan views of each alignment, typical cross sections and general information on route selection and the CER time frame were presented. Officers from BSD and Main Roads were present to answer any queries. CONSULTANTS

APPENDIX 4B

CONSULTING ENGINEERS - TOWN PLANNERS - PROJECT MANAGERS

A total of 85 Comment Sheets inviting expressions of concern regarding the bypass proposals were completed and submitted to the Consultants for analysis. Specific public replies are summarised below.

a) Routes 6 and 6A: 95% of all comments expressed concerns towards both options. Major concerns were (in descending order of concern):

- Routes do not function as bypasses, sever
- township and restrict growth.
- Impact on Avon River.

(B)

- Residential disturbance.
- Environmentally unacceptable options.,
- Impact on Cemetery.

In terms of benefits, a small percentage supported Routes 6/6A because of the need to keep traffic near to town for business and tourism.

b) Route 9: a small percentage of comments received stated this option would impinge on town business trade and would affect the viability of farms severed by the alignment.

However 90% of all comments supported this option for the following reasons:

- Functions as an effective bypass.
- Would be cheaper to construct.
- Minimal residential impact.
- Less environmental impact.
- More heritage conscious.

The preceding group(s) and community comments and concerns will be taken on board and discussed with Main Roads prior to finalising environmental management plans and completion of the CER document.

Important Upcoming Dates

The remaining weeks of this CER study involve undertaking the following activities.

- Lodgement of CER Report with EPA (23/7/93).
- Four week public review period for CER (26/7/93 to 20/8/93).
- Response to public submissions (6/9/93 to 24/9/93).
- Issuing of Community Newsletter No. 3 (28/9/93).

Every effort will be made to adhere to this time frame.

Details on where the CER documents are available for purchase or review will be given in the 28/7/93 edition of the "Advocate" newspaper.

Should you have any further queries or would like additional information regarding the Northam Bypass CER study, feel free to personally contact Mick McCarthy or Tony Van Den Dries at BSD Consultants on (09) 316 2988.


NORTHAM BYPASS CER

PPENDIX 4C

SUMMARY OF CONCERNS HIGHLIGHTED DURING INTRODUCTION MEETINGS (27/5/93)

Town of Northam

- Peter Kata (Town Engineer), Don Burnett (Manager, Financial Services).
- Appears to be division in Council.
- Council endorsed Route 6, but informally prefers Route 9.
- Primarily concerned with issues such as:
 - Impact on Avon River
 - Flooding
 - Degradation of land
 - Cemetery (Managed by Shire of Northam)
 - Route in town area
 - Noise (particularly Doctors Hill)
 - Risks and hazards (chemical spills, river contamination etc).
- Public also seem divided between Route 6 and 9 which was evident throughout previous Display and Public Meeting.
- Route 6 is easily accessible and retains contact with town.
- Route 9 is cheapest.
- Council support need for Bypass.
- Town of Northam's Town Planning Scheme Review shows the Route 6 Bypass Road Reserve.

Shire of Northam

- Alan Middleton (Shire Clerk), Doug Morgan.
- Shire of Northam favours Route 6.

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- The Shire's Town Planning Scheme charters to protect broad acre land and is opposed to productive landuse being adversely affected under Route 9.
- Route 6 provides some financial benefits for local businesses and Main Roads has acquired most of the properties along the Route 6 alignment.
- Route along the Avon River would enhance the river.

Doug Morgan has long established family history in Northam and is aware that the Route 6 alignment traverses part of an "artificially created" floodplain as a result of previous sand mining and extensive excavation at this location.

1872 - last 100 year flood.

- In 1937 (Depression) to mitigate flooding of town, people were employed to cut flooded gums. Buildozers followed causing considerable damage to floodplain area near Cemetery.
- Revegetation and tree planting in flood plain not recommended as this will increase risk of flooding in Northam town.
- Council supports protection of the river and believes there will be little impacts on the river during construction of Route 6.
- Work associated with Route 6 will provide opportunity to beautify river.
- Route 9 affects properties (eg hay merchant) to such an extent that devastates livelihood.
- Many complaints for Route 6 from the Doctors Hill area unjustified as prospective residents were notified and aware of the possibility of the Bypass going through at this location.
- Route 6 is not reflected in Shires Town Planning Scheme as the alignment is largely within the Town of Northam's municipality.
- Route 6 should not be portrayed as a bypass, but an alternative route.

Chamber of Commerce

- Murray Smith (Chamber representative).
- Whole town is divided on Route 6 and 9.
- Originally people wanted close access, business contact (ie Route 6) but since then Northam has grown considerably and there is less reliance on bypass being so close.
- Chamber of Commerce and business houses appear more concerned about exposure to Northam from exit ramps to the town (ie appropriate signage, easy access/exit).
- Public meeting showed about a 50/50 split in vote for Route 6 and 9.
- Town and Shire supported Route 6 with little community input at the time decision was made.

- Avon River Scenic Drive affected by Route 6.
- Heavy industrial traffic increase risk and hazards to the Avon River through spillage and contamination.
- The Cemetery has recently been listed on the National Trust and therefore Route 6A may be a better alternative to Route 6 as it preserves both the Avon River and Cemetery.
- Aboriginal Reserve along Route 6 and 6A likely to be a major problem.
- People do not want to stop progress, but believe Route 6A or 9 are better alternatives.
- Eight (8) bridges along Route 6 and 6A will have adverse effects on the floodplain by raising water level by 40 50 cms in the town.
- The only people vehemently opposed to Route 9 are the Shire of Northam and 3 of their ratepayers.
- There are a total of 200 businesses in the Northam area with only 80 90 being members of the Chamber of Commerce.

Northam Environmental Society

- Don Stephenson, Peter Weatherly, Cherrie Risby.
- Route 9 is favoured, NES has problems with Route 6 and 6A.
- Along the river where Route 6 is proposed will cause unacceptable impacts to the river (ie flooding, bank erosion) and remnant flooded gum vegetation.
- Other areas impacted by Route 6 include:
 - Aboriginal Reserve
 - Old townsite
 - Pioneer Cemetery
 - Access roads
 - Church of England monument
 - Katrine area
 - Residential expansion to the north
 - Wildlife habitat.
 - It is considered completely unacceptable to construct a 110 km/hr highway through a residential area (Doctors Hill).
- Route 6 closes all options for future developments.

- The Route 6 alignment is an outdated planning proposal that does not recognise the existing and future growth of Northam.
- Route 9 could form a logical boundary for the Northam town and only affects 3 farmers.

Northam Aboriginal Progress Association

- Rod Garlett (President of NAPA), Helen Doye (Secretary, NAPA), Jan Goodacre (Historian, Cemetery Curator).
- The Aboriginal Reserve is the last piece of Aboriginal land in Northam.
- NAPA is currently seeking a 99 year lease for the Reserve through the Aboriginal Lands Trust.
- 1902 Reserve gazetted.
- 1934 Births on the reserved dated back to this period.
- 3 major families on the land
 - Stack (Rob, Neville, May, Alf)
 - Egan (John, Frederick)
 - Inditch (Henry).
- Suggested Norm Fox made the comment that Route 9 is the Main Roads preferred option.
- Land swap negotiated previously by NAPA (Paul Parfitt) is null and void as Parfitt is a newcomer, has no connection with Reserve families, did not consult with elders and therefore is in no position to act on behalf of Aboriginal community with traditional ties to Reserve.
- It is likely that dead people are buried on the Reserve (no records) particularly still-born children.
- Currently only verbal submissions opposing Route 6 have been made.
- The existing Reserve has been defined as an archaeological site although it is not known about the extent of ethnographical significance.

APPENDIX 4D

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NORTHAM BYPASS CER GROUP PRESENTATION

SHIRE OF NORTHAM

1.30 P.M. Wednesday June 23, 1993

VENUE: Shire of Northam Offices, Fitzgerald Street, Northam

MINUTES

1. <u>PARTICIPANTS</u>

David Antonio Allan Middleton Doug Morgan Frank Martinelli John Wilmot Gordon Ashman Jenny Sheehan Peter Martin Ron Posselt Geoffrey Martin John Morgan David Mudge Tony Van Den Dries Mick McCarthy (Shire President) (Shire Clerk) (Shire Councillor) (Shire Councillor) (Shire Councillor) (Shire Councillor) (Shire Councillor) (Kunine Farm) (Shire Councillor) (Kunine Farm) (Mirrothorpe Farm) (Main Roads) (BSD Consultants) (BSD Consultants)

2. ISSUES AND CONCERNS RAISED

- (i) Old church and old goal may experience some restricted access but no direct impact from bypass.
- (ii) Councillor Morgan questions the extent of true floodplain area of Avon River due to previous sand mining/vegetation clearing activities.
- (iii) Station Bridge/Taylor Bridge area has been filled with no apparent increase in flooding.
- (iv) Main Roads already owns a lot of land along this route.
- (v) The area affected is badly managed and of little environmental significance.
- (vi) Route better related to town which is visible along route.

- (vii) Route 6 is an alternative route for trucks and not a bypass of the town.
- (viii) Concerns of people living in Doctors Hill are based on vested interests.
- (ix) Landowner affected by all three routes, but considers Route 6 the best alternative as it leaves farming property and his income source largely intact apart from some affects on stock water supplies.
- (x) Does not affect productive farm land.

ROUTE 6A

- (i) Shire would not oppose Route 6A, but is concerned over the long term extension of the Cemetery.
- (ii) Involves another major hill to traverse with associated costs.
- (iii) Concerns of people living in Doctors Hill are based on vested interest.

ROUTE 9

- (i) Landowner in hay business, employs 18 seasonal workers and believes Route 9 will destroy business.
- (ii) Underpasses proposed:
 - not enough width/height clearance for header and trucks;
 - one underpass for property not feasible;
 - alternative to cross bypass road causes problems for continuity of business schedule, licensing of vehicles;
 - sheep may not used boxed culvert type underpass given that these may need to be considerable length.
- (iii) Affects highly productive land.
- (iv) Could cost more because of property severance, compensation, underpasses etc.
- (v) There is a poor relationship of route to town.
- (vi) Requires more earthworks and greater cuts.
- (vii) Has major impact on the economy of the town.

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NORTHAM BYPASS CER GROUP PRESENTATION

NORTHAM ABORIGINAL PROGRESS ASSOCIATION

2.45 p.m. Wednesday June 23, 1993

VENUE: Northam Recreation Centre

MINUTES

1. <u>PARTICIPANTS</u>

Rod Garlett(Chairperson NAPA)Jan Goodacre(Historian)Joseph Wallam(Aboriginal Affairs Planning Authority)25 representatives from Northam Nyoongah CommunityDavid Mudge(Main Roads)Tony Van Den Dries(BSD Consultants)Mick McCarthy(BSD Consultants)

2. ISSUES AND CONCERNS RAISED

- <u>General</u>
- (i) Clackline route should be considered as an alternative to the 3 routes proposed.
 - (ii) Aboriginal Reserve 8313 has significance to the local people.

(iii) The land exchanged previously agreed to by the Aboriginal Lands Trust did no involve consultation with local Aboriginal people and therefore is invalid.

(iv) Information contained in the Aboriginal Study undertaken in 1988 by Quatermain, Bodney and O'Connor is false.

- (v) Chairperson of the Northam Aboriginal Progress Association declared there would no land swap and no compensation sought for Reserve 8313.
- (vi) Main Roads believed consultation with Aboriginal families living in the area had been undertaken and a satisfactory outcome regarding a land swap for Reserve 8313 had been negotiated and resolved with the Aboriginal Lands Trust.
- (vii) Main Roads could adjust alignment to have minimal impact on Reserve 8313. Aboriginal community opposed to any impact.

- (viii) A lot of memories exist for the Aboriginal community with respect to Reserve 8313.
- (ix) Money does not mean anything to the Aboriginal community, the Reserve does.
- (x) Aboriginal people holiday, live and die in Northam.
- (xi) Aboriginal people are strongly committed to keeping Reserve 8313 and love the land.
- (xii) The group meeting is the first time the local Aboriginal community has been collectively consulted with regard to the Northam Bypass proposal.
- (xiii) Main Roads refuted the perceived lack of Aboriginal consultation and referred to 1987 agreement with Aboriginal Lands Trust on land swap for Reserve 8313.
- (xiv) The land swap resolution was not endorsed by the Minister for Aboriginal Affairs and is therefore not legally binding.
- (xv) In the past 4 years since the land swap agreement has taken place, there has been many changes for Aboriginal people.
- (xvi) Aboriginal people have the right and ability to express their concerns.
- (xvii) Paul Parfitt (previously Chairperson of NAPA) and Milton Thorne had no right to negotiate land swap as they did not property consult with local Aboriginal people.
- (xviii) Aboriginal people want the Main Roads to respect their feelings.
- (xix) Joseph Wallam (Aboriginal Affairs Planning Authority) will be the focus for future consultation between Main Roads and the local Aboriginal community.
- (xx) The Aboriginal community was encouraged to write and submit their views.

- (i) Will significantly affect Aboriginal Reserve 8313.
- (ii) Affect on Moreby Cottage.
- (iii) Aboriginal people oppose Route 6.

NORTHAM BYPASS CER GROUP PRESENTATION

NORTHAM CHAMBER OF COMMERCE

3.45 p.m. Wednesday June 23, 1993

VENUE: Avon Valley Arts Centre, Wellington Street, Northam

MINUTES

1. <u>PARTICIPANTS</u>

Murray Smith Les Norrish Stan Malinowski David Mudge Tony Van Den Dries Mick McCarthy (Member - Chamber of Commerce) (Member - Chamber of Commerce) (Member - Chamber of Commerce) (Main Roads) (BSD Consultants) (BSD Consultants)

2 ISSUES AND CONCERNS RAISED

<u>General</u>

- (i) Personal views should be put aside and the Chamber of Commerce should deal with real issues which support what is best for the town.
- (ii) Entry statements and information bays are required to promote tourism at Northam.
- (iii) Goomalling Road has a lot of traffic.
- (iv) Northam community split 50/50 between Route 6 and Route 9.
- (v) Future weir could provide more water for the town.
- (vi) Chamber requested formal presentation before decision can be made. Proposed 'Open Day' considered good opportunity to gain further information.
- (vii) As funding becomes available for project, it is expected that mid-1996 is the earliest starting time for construction (Main Roads).

- (i) People believe if they did not support Route 6, the community would lose the bypass.
- (ii) Route 6 is not a bypass, but an alternative route.

ROUTE 6A

(i) Aboriginal people oppose Route 6A.

ROUTE 9

(i) Affects productive land but Aboriginal people not employed on farmland.

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(ii) Aboriginal community prefer Route 9.

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NORTHAM BYPASS CER GROUP PRESENTATION

NORTHAM ENVIRONMENTAL SOCIETY

5.00 p.m. Wednesday June 23, 1993

VENUE: Avon Valley Arts Centre, Wellington Street, Northam

MINUTES

1. <u>PARTICIPANTS</u>

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Don Stephenson Peter Weatherly Pat Stephenson Cherrie Risby 25 community members David Mudge Tony Van Den Dries Mick McCarthy (President - NES) (Member - NES) (Member - NES) (Member - NES) (60-70% residents of Doctors Hill) (Main Roads) (BSD Consultants) (BSD Consultants)

2. ISSUES AND CONCERNS RAISED

General

- (i) The Consultants should do an environmental impact assessment and environmental management for all three routes.
- (ii) EPA Guidelines for CER suggest that a complete analysis of all three routes would save time.
- (iii) Environmental management will be focused on Route 6, however, all three options will be fully assessed from an impact viewpoint (Main Roads).
- (iv) Will the 'do nothing' approach be examined.
- (v) Why aren't the Consultants being asked to make a recommendation on the best option.
- (vi) Will the social impacts on existing residences be examined (eg depreciation in land values, lifestyle issues, access etc).
- (vii) When will the CER be complete the CER will be complete by the end of July (BSD Consultants).

- (iii) The Northam Bypass proposal could be held up depending on the outcomes negotiated for Aboriginal Reserve 8313.
- (iv) Major developments impacted on by Route 6 which appears to affect the only developable area left in Northam.
- (v) The impact on floodplain could lead to river scouring. The Waterways Commission will need to be consulted.
- (vi) Currently 7,000 people in Northam and as the town grows the reduced area of foreshore resulting from Route 6 would provide insufficient area for recreation along the foreshore.
- (vii) Runs over old Northam townsite where soldiers were trained.

ROUTE 6A

(i) What are the benefits of Route 6A.

ROUTE 9

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- (i) If people cannot see the town, they will not visit.
- (ii) This option would not delay Main Roads programming and the need for ramps, entry statements and sign posting could be stipulated on Main Roads conditions for development.
- (iii) Is an extra 1 kilometre in length, but is unlikely to pose problems from an Aboriginal sites point of view (Main Roads).

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ROUTE 6

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- (i) Opposition of Route 6 because of effects on:
 - Doctors Hill
 - Avon River
 - Heritage
 - Cemetery
 - (ii) Doctors Hill would have 100km/hr highway going through a residential area which is considered would have unacceptable environmental and social impacts.

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- (iii) Avon River will be impacted upon by earthworks with associated interference with floodplain and restricted access to foreshore.
- (iv) River will have to bank up or flow faster to compensate loss of floodplain area.
- (v) Major impacts on heritage sites such as old townsite, old goal site, Anglican Church monument, heritage trails.
- (vi) Affects last piece of river in this condition throughout Northam.
- (vii) Six million dollars more expensive than other options.
- (viii) Cemetery will be affected once dual carriageway is required.
- (ix) Route 6 has the most environmental impacts.
- (x) Business people supported Route 6 because it was close to town.
- (xi) Old Anglican Church monument may be affected by access roads.
- (xii) Views from Route 6 to Northam may be good, but what about views of the road from the residences.
- (xiii) Rural outlook present from Doctors Hill will be destroyed by Route 6.

ROUTE 6A

- (i) Opposed to Route 6A
- (ii) Solves Avon River, Heritage and Cemetary problems, but still left with impacts on Doctors Hill.

ROUTE 9

(i) Not the preferred location for bypass alignment, but solves most environmental problems.

(ii) Northam Environmental Society supports Route 9.

(iii) Why wasn't Route 9 selected.

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NORTHAM BYPASS CER **GROUP PRESENTATIONS**

TOWN OF NORTHAM

7.00 p.m. Wednesday June 23, 1993

VENUE: Town of Northam Offices, Fitzgerald Street Northam

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MINUTES

PARTICIPANTS 1.

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Mayor Ottaway Bruce Wittber Peter Kata 1999 1 1 1 Don Burnett John Bridgeham 8 Councillors David Mudge Tony Van Den Dries Mick McCarthy 4 members of the public

(Mayor of Northam) (Town Clerk) (Manager, Works and Services) (Manager, Financial Services) (Manager, Health and Urban Dev)

(Main Roads) (BSD Consultants) (BSD Consultants)

2. **ISSUES AND CONCERNS RAISED**

- What is BSD's preferred option (pre-emptive question). (i)
- (ii) Council originally preferred Route 9, then Shire and Town Council had to make joint decision, pecuniary interests declared, Shire would only support Route 6, some of the Town Councillors would have gone for Route 9 had they been allowed to vote.
- (iii) Town area cut in half by Route 6 and 6A causing severance problems and dividing the town.
- (iv) Cemetery
 - concerned about potential damage to old gravestones
 - loss of heritage value
 - if the Cemetary was Aboriginal burial ground, there would be no chance of road going through
- **Doctors Hill** (v)
 - many people owned land prior to 1987/88 Report
 - very valuable properties .
 - potential traffic noise impacts on quality of life -
 - traffic noise may be manageable

- (vi) Transport of Dangerous Goods
 - Liaison Committee formed to investigate transport of dangerous goods
 - high cost of rail transport resulting in increased occurrence of dangerous goods being transported by road
 - should contamination of Avon River occur, potential downstream affects at Perth could eventuate
 - tonnes of hazardous material is constantly being transported by road and rail along the Avon Valley with no contamination problems
- (vii) If the bypass route is brought through Northam, it is just shifting the existing problems.
- (viii) Council has changed, Government has changed and community attitude's have changed.
- (ix) Council more environmentally sensitive and may no longer support Route 6.
- (x) Potential environmental impacts more important than cost or effects on Cemetary.
- (xi) There have been 25 years of bypass discussion and people have not taken the previous public consultation process very seriously.
- (xii) People now seeing things developing and are taking notice.
- (xiii) Council does not have to make a decision immediately and will wait to review the environmental document before considering the matter further.

- (i) Encroaches on Avon River and flood plain area.
- (ii) Has impact on Cemetary.
- (iii) Not a true bypass route.
- (iv) Greater disturbance to people.
- (v) Closer proximity to town.
- (vi) Better than the existing route.

ROUTE 6A

- (i) Cemetery
 - has long term effect on Cemetary expansion
 - has minimal short term direct effects on Cemetary
- (ii) Closer proximity to town.

- (i) Shire is concerned Route 9 has a major disturbance on farmland.
- (ii) The effect on people by Route 6 should have a greater significance (does 3 farms equal 50 people?).
- (iii) Town of Northam now appear to favour Route 9.

APPENDIX 4E

NORTHAM BYPASS CONSULTATIVE ENVIRONMENTAL REVIEW COMMENTS SHEET

Are there any issues or concerns with respect to any of the three Northam Bypass route alignments (ie, Route 6, 6A and 9) which you would like to bring to the Consultants attention? You may also wish to include ways you believe may overcome your concerns.

Route 6:_____

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Route 6A:	:		
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Route 9:			
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The "Comments Sheet" may be placed in the box provided at the Open Day or mailed to reach BSD Consultants, PO Box 446, Applecross WA 6153 by July 16, 1993.

APPENDIX 4F

MAIN CONCERNS RAISED IN OPEN DAY "COMMENTS SHEETS" SUBMITTED TO THE CONSULTANTS DURING PREPARATION OF THE CER [Nº (% of total "Comments Sheets" and submissions received)]

ROUTE 6

1.	Does not function as bypass/severs township/restricts expansion	38 (37%)
2.	Impact on Avon River scenically/spillages/wildlife etc.	29 (28%)
3.	General residential inconvenience	23 (22%)
4.	Cemetery impact	16 (16%)
5.	Environmentally unacceptable	14 (14%)
6.	Noise pollution	7 (7%)
7.	Heritage impact	6 (6%)
8.	Need to keep traffic near town for businesses/tourism	2 (2%)

ROUTE 6A

1.	Does not function as bypass/severs township/restricts expansion	28 (27%)
2.	General residential inconvenience	14 (14%)
3.	Environmentally unacceptable	12 (12%)
4.	Impact on Avon River scenically/spillages/wildlife etc	11 (11%)
5.	Cemetery impact	5 (5%)

1.	Functions as an effective bypass	37 (36%)
2.	Cheaper to construct	19 (19%)
3.	Minimal residential impact	16 (16%)
4.	Less impact on the environment	11 (11%)
5.	More heritage conscious option	8 (8%)
6.	Preserves future residential land	7 (7%)
7.	Diverts heavy/dangerous goods vehicles around Northam	5 (5%)
8.	Would impinge on town business	4 (4%)
9.	Would affect farming activities	3 (3%)

APPENDIX 5

NORTHAM BYPASS NOISE LEVEL IMPACT ASSESSMENT

HERRING STORER ACOUSTICS

Suite 34, 11 Preston Street, Como, Western Australia, 6152.

A C N (679 049 067

Telephone: (09) 367 6200 Facsimile: (09) 474 2579



GREAT EASTERN HIGHWAY

NORTHERN BYPASS STAGE ONE

NOISE LEVEL IMPACT ASSESSMENT

JULY 1993

BY

T.C. REYNOLDS HERRING STORER ACOUSTICS

Ref: 1013-93065

14 JULY 1993

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1.0 PREFACE

An acoustic study has been made of the proposed Northern Bypass of the Great Eastern Highway.

This report sets out the findings and conclusions of this study with respect to noise level impacts to surrounding residential areas.

Assessment of impact has been based on Main Roads' guidelines.

2.0 CONCLUSION

It is the conclusion of this study that noise levels to existing residences, due to the proposed deviation arc unlikely to cause any adverse impact. For future residences along this route, a minimum setback of 50 metres should be observed (from the centre of the road).

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No noise control measures are recommended.

3.0 METHOD

In order to calculate the noise levels at various locations along the proposed bypass route, the traffic sound power level was required.

The L10 sound pressure level was firstly calculated using the data contained in the Welsh Method for calculating the Road Traffic Noise. This method gave an L10 level (refer to Appendix 1 - Terminology for Definition) of 67 dB(A) at 10 metres. This level was compared to highway traffic previously measured, which after corrections for flow rates speed and percentage heavy vehicles gave an L10 level of 68 dB(A) at 10 metres. The measured noise level was then converted to a sound power level which was used to calculate the noise level at five locations along the by-pass to obtain representative noise levels at various distances from the highway.

Information input into the computer model included ground contours, ground type, temperature, humidity, wind strength and wind direction.

4.0 CRITERIA OF ASSESSMENT AND DESIGN

The Mains Roads' policy for noise level impact criteria is as follows:

"(a) Main Roads' design goal for new road projects is to limit traffic noise at residences to less than 68 dB(A) $L_{10}(18 \text{ hour})$. To achieve this it may be necessary to include in the design, noise reduction features such as barriers.

- (b) In cases where a significant increase in noise is predicted to occur (such as in an existing quiet area), Main Roads will consider inclusion of noise reduction features even though predicted levels may be less than 68 dB(A). In this instance a design guide of 63 dB(A) is to be adopted for investigating these features in this noise study."
- Due to the relatively low ambient levels of the existing residential area the $L_{10}(18 \text{ hour})$ value of 63 dB(A) has been used as the prime criteria of impact assessment.

Design criteria used, is as defined from the existing parameters;

- Road type bitumen chip scal
- Flow rate -Year 2017 AADT - 1530
- Heavy vehicles 17%
- Average speed 110 Kph
- Gradient 10% Uphill

5.0 RESULTS

The L10 values are those commonly used to assess the intrusive effect of traffic noise and is the level of noise that is exceeded for 10% of the time. The L10 (18hr) values are the arithmetic average of the hourly values between 0600 and 2400 hrs.

A summary of the calculated sound pressure levels L10 (18 hour) values are shown in Table 1.

LOCATION	DISTANCE FROM BYPASS	L10 (18 hour)
1-94400	50m 100m	53 48
2-95000	50m 120m	46 50
3-95560	30m 50m 90m (building)	61 46 35
4-96000	50m 120m (building)	58 46
5-99400	50m 140m (building)	50 43

The above locations generally represent the noise at the various distances for typical situations.

6.0 DISCUSSION

Using the predicted 20 year AADT flow rate of 1500 the L10 (18 hr) values at various typical section were calculated at various distances from the bypass.

The analysis of the bypass show that the existing residence should not be adversely affected. Any future residence should be at least in general terms, 50 metres away from the centre of the road.

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Yours faithfully for HERRING STORER ACOUSTICS

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APPENDIX 1 - TERMINOLOGY

The following is a brief explanation of some of the terminology used in the study of noise. AS1633 Glossary of Acoustic Terms may be used for more detailed information.

- dB Decibel, the unit used to measure sound pressure levels. It is based on a logarithmic scale hence simple addition and subtraction does not apply.
- dB(A) Decidel measurement according to the "A" weighted scale. The human ear does not respond equally to the same sound pressure at different frequencies. The "A" weighting has predetermined adjustments made at certain frequencies to make the measured sound level approximate to the response of the ear.
- dB(lin) Decibel measurement without any adjustment.
- Leq Equivalent Continuous Sound Level. The Leq measurement integrates these fluctuations to give the equivalent continuous level containing an equal amount of energy over the time of measurement.
- LAcq A-weighted continuous equivalent noise level (or average) for the measurement time.
- Slow This term refers to electronic dampening of the meters response to enable needle movement to be more readily observed. This is the normal mode for sound level measurement.
- SPL Sound pressure level, the physical property measured with a sound level meter expressed as dB. Commonly referred to as noise level and sound level.
- L_n The maximum noise level recorded in the measurement period.
- L₁₀ Equivalent continuous sound level over the measurement period for the loudest 10 percent of the noise levels.
- L₁₀₀ The minimum noise level recorded in the measurement period.
- $L_{10}(18 \text{ hr})$ The arithmetic average of the hourly L_{10} values between 0600 and 2400 hours.

APPENDIX 6

LAND REQUIREMENTS AND OWNERSHIP DETAILS ALONG THE ROUTE 6 ALIGNMENT

















LIBRARY DEPARTMENT OF ENVIRONMENTAL PROTECTION WESTRALIA SQUARE 141 ST. GEORGE'S TERRACE, PERTH

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