Stirling-Harvey redevelopment scheme including changes to the Harris Dam project

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Water Corporation

Report and recommendations
of the Environmental Protection Authority

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Summary and recommendations

This report is the Environmental Protection Authority's (EPA's) advice and recommendations to the Minister for the Environment on the relevant environmental factors for the Water Corporation's proposal to redevelop the Harvey and Stirling Reservoir system in order to utilise an additional quantity of water (approximately 34 Gigalitres per annum) from the Harvey River Basin for the Perth Metropolitan Water Supply Scheme (PMWSS). The proposal also involves construction of a new pipeline from Harris Dam to Stirling Reservoir to enable transfer of water from Harris Dam to the PMWSS via Stirling Reservoir.

The report also provides the EPA's assessment, under Section 46 of the *Environmental Protection Act 1986,* of the need to change existing conditions and procedures for the Harris Dam project, which was approved in 1987, in order to enable the transfer of water from the Harris Dam to the PMWSS via Stirling Reservoir.

Relevant environmental factors

Although a number of environmental factors were considered by the EPA in the assessment, it is the EPA's opinion that the following are the environmental factors relevant to the proposal, which require detailed evaluation in the report:

(a) Vegetation communities - clearing, inundation and disturbance for the new Harvey Reservoir, pipeline construction and other associated activities;

(b) Specially protected (threatened) fauna - clearing, inundation and disturbance of habitat for the new Harvey Reservoir, pipeline construction and other associated activities;

(c) Watercourses and surface water quantity - inundation, impoundment and diversion and changes to natural or existing water flow regimes;

(d) Landform and rehabilitation - disturbance for pipelines and a quarry;

(e) Noise and vibration - noise from construction activities;

(f) Particulates and dust - dust from construction activities;

(g) Post-development landuse - inundation and potential imposition of catchment management restrictions;

(h) Visual amenity - inundation, pipelines and a quarry; and

(i) Recreation - inundation of existing sites and potential imposition of catchment management restrictions

Conclusions

The EPA has considered the proposal by the Water Corporation to implement the Stirling-Harvey Redevelopment Scheme.

The EPA notes that the most significant impacts of the proposal will be the permanent loss, through clearing and inundation, of approximately 180 hectares of native vegetation and approximately 25 km of watercourses, of varying condition and conservation significance. One area of Forrestfield vegetation complex which will be inundated is considered to be of highest conservation significance. Other areas of Lowdon, Helena and Darling Scarp vegetation complexes are of varying levels of conservation significance. The proposal will also involve clearing and subsequent rehabilitation of up to 25 hectares of vegetation communities within Helena, Dwellingup and Hester, and Yarragil vegetation complexes for the Stirling-Harvey and Harris-Stirling pipelines.

The EPA also notes that the proponent has provided a comprehensive set of commitments to manage environmental impacts and a Land Acquisition and Rehabilitation Strategy in order to

offset the loss of conservation values which will occur as a result of the proposal. The proponent has also provided a preliminary outline of the objectives and strategies for rehabilitation of areas disturbed or provided to offset inundation, clearing or disturbance.

The EPA has concluded that the proposal is capable of being managed to meet the EPA's objectives provided there is satisfactory implementation by the proponent of the recommended conditions summarised in Section 4, including the proponent's commitments.

The EPA has also assessed the need to change existing conditions and procedures for the Harris Dam project, which was approved by the Minister for the Environment on 5 November 1987, to allow for supply of water from Harris Dam to the PMWSS (subject to its availability after allocation for other uses defined by the Water and Rivers Commission). This assessment is discussed in Section 6 of this report. The EPA's conclusion from this assessment is that the diversion of water from the Harris Dam for the PMWSS is environmentally acceptable, provided that the proponent continues to comply with the conditions and procedures of approval for the project, including the proponent's commitments. To ensure this the Water Corporation should be required to meet conditions set by the Water and Rivers Commission as part of the allocation process, which includes the requirement to undertake actions to offset any reduction in ability to manage the salinity in Wellington Reservoir caused by the diversion of water from the Harris Dam to the PMWSS.

Recommendations

The EPA submits the following recommendations to the Minister for the Environment:

1. That the Minister notes that the proposal being assessed is the redevelopment of the Harvey and Stirling Reservoir system in order to utilise an additional approximately 34 Gigalitres per annum from the Harvey Basin for the Perth Metropolitan Water Supply Scheme.
2. That the Minister considers the report on the relevant environmental factors for this proposal as set out in Section 3.
3. That the Minister notes that the EPA has concluded that the proposal can be managed to meet the EPA's objectives, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Appendix 3, and summarised in Section 4, including the proponent's commitments.
4. That the Minister imposes the conditions and procedures recommended in Appendix 3 of this report.
5. That the Minister notes that the EPA has concluded that diversion of water from the Harris Dam to the Perth Metropolitan Water Supply Scheme is environmentally acceptable, provided that the Water Corporation continues to comply with the existing conditions and procedures for the Harris Dam project. If at any time the Water Corporation seeks to change the existing conditions and procedures for the Harris Dam project as a result of an allocation to divert water to the Perth Metropolitan Water Supply Scheme, this would need to be subject to assessment and approval under Section 46 of the Environmental Protection Act.
6. That the Minister notes the other advice provided by the EPA in Section 5 of the report regarding the need for protection of vegetation provided as an offset for that lost due to the implementation of the Stirling-Harvey Redevelopment.

Conditions and Commitments

Having considered the proponent's commitments and information provided in this report, the EPA has developed a set of conditions which the EPA recommends be imposed if the proposal by the Water Corporation to redevelop the Harvey and Stirling Reservoir system is approved for implementation. These conditions are presented in Appendix 3. Matters addressed in the conditions include the following:

(a) that the proponent be required to fulfil the commitments in the Consolidated Commitments statement set out as an attachment to the recommended conditions in Appendix 3. These include:

- purchase of privately owned land for conservation;
- rehabilitation or restoration of disturbed and degraded areas;
- creation of fauna habitat;
- funding the investigation of environmental water requirements;
- contribution to restoration of waterways through the Harvey River Restoration Trust; and
- investigating and offsetting impacts on recreational opportunities.

Other advice

Yarloop Location 5322

The EPA advises that, in recognition of the very high conservation significance of the vegetation communities on Yarloop Location 5322, the land should be vested with the National Parks and Nature Conservation Authority as an A class Reserve for the conservation of flora and fauna. The EPA also advises that given the very high conservation value of the plant communities on the subject land, it would be unlikely to recommend in the future, that the area's disturbance for mining or other purposes could be carried out in such away as to meet the EPA's objectives and therefore be environmentally acceptable.

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1. Introduction

This report provides the Environmental Protection Authority's (EPA's) advice and recommendations to the Minister for the Environment on the relevant environmental factors for the Water Corporation's Stirling-Harvey Redevelopment Scheme proposal. This proposal is to redevelop the Harvey and Stirling Reservoir system in order to divert an additional quantity of water (approximately 34 Gigalitres per annum (GL/yr)) from the Harvey River Basin for the Perth Metropolitan Water Supply Scheme (PMWSS). The proposal also involves construction of a new pipeline from Harris Dam to Stirling Reservoir to enable transfer of water from the Harris Dam to the PMWSS via Stirling Reservoir.

Section 44 of the Environmental Protection Act 1986 requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the proposal and on the conditions and procedures to which the proposal should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

The report also provides the EPA's assessment, under Section 46 of Environmental Protection Act 1986, of the need to change the existing conditions and procedures for the approved Harris Dam project, assessed by the EPA in 1987, in order to enable the transfer of water from the Harris Dam to the PMWSS via the Stirling Reservoir.

The water resource contained within the Harvey-Waroona area was identified as a potential future water source for the Perth Metropolitan Water Supply Scheme (PMWSS) in the Perth's Water Future Strategy (WAWA, 1995) and was examined in more detail in the Harvey Basin Surface Water Allocation Plan (WRC, 1998) (hereafter referred to as 'the Allocation Plan'). The EPA provided advice to the Minister for the Environment under Section 16(e) of the Environmental Protection Act on both the Strategy (Bulletin 903, August 1998) and the Allocation Plan (Bulletin 910, November 1998).

In its advice on the Allocation Plan, the EPA recommended that (Recommendation 4):

"the Minister for the Environment note that the EPA has concluded that further water could be allocated from this resource for consumptive use without compromising EPA environmental objectives provided the environmental water provisions identified in the Harvey Basin Water Allocation Plan are maintained and the mitigation measures implemented. The acceptability of the source of the water will depend on the results of the recommended studies and assessment of the proposal under Part IV of the Environmental Protection Act 1986."

Following referral of the proposal, the level of assessment was set at Public Environmental Review (PER). Formal assessment at PER level was considered necessary because the EPA had concluded in its advice on the Allocation Plan that :-

- a dam with a full supply level of 78m or less may be able to comply with EPA environmental objectives (Recommendation 5);
- there may be environmental values that constrain development (eg vegetation) and that any proposal should clearly examine local and regional values (also Recommendation 5);
- a series of studies and further actions should be undertaken for environmental values identified in Section 3; and summarised in Section 4 of Bulletin 910 (Recommendation 3); and
- the construction of a pipeline to link the water resource to the PMWSS or the infrastructure required to treat and pump water had not been considered in the advice (Recommendation 6).

In compiling this report, the EPA has considered the relevant environmental factors associated with the proposal, issues raised in the public submissions, specialist advice from the Department of Environmental Protection (DEP) and other government agencies, the proponent's response to submissions and the EPA's own research and advice.

Further details of the Stirling-Harvey Redevelopment Scheme proposal are presented in Section 2 of this Report. Section 3 discusses environmental factors relevant to the proposal. The conditions and procedures to which the Stirling-Harvey Redevelopment should be subject, if the Minister determines that it may be implemented, are set out in Section 4. Section 5 provides Other Advice of the EPA relevant to the Stirling-Harvey Redevelopment Scheme.

During the assessment of the Stirling-Harvey Redevelopment proposal it became apparent that the transfer of water from Harris Dam to the PMWSS via the Harris-Stirling pipeline may be inconsistent with existing conditions and procedures, including the proponent's commitments for the Harris Dam project.

The EPA has considered the need for change to the existing conditions and procedures under Section 46 of the Environmental Protection Act. This assessment is set out in Section 6.

Section 7 of the report presents the EPA's Conclusions and Section 8, the EPA's Recommendations.

A list of people and organisations that made submissions on the proposal is included in Appendix 1. References are listed in Appendix 2, and recommended conditions and procedures and proponent's commitments are provided in Appendix 3.

Appendix 4 contains a summary of the public submissions and the proponent's response. The summary of public submissions and the proponent's response is included as a matter of information only and does not form part of the EPA's report and recommendations. The EPA has considered issues raised in public submissions when identifying and assessing relevant environmental factors.

Appendix 5 of the report contains a copy of the 1987 Minister's Statement that a proposal may be implemented and related environmental commitments for the Harris Dam project .

2. The proposal

The purpose of the Stirling-Harvey Redevelopment Scheme is :

a) to construct a new and larger Harvey Dam to divert water which currently flows over the existing Harvey Weir in winter; and

b) to construct pipelines from Harris Dam to Stirling Dam and from Stirling Dam to a new main line to be constructed on the swan coastal plain from Harvey to Perth.

The increase in the availability of water for irrigation purposes collected in the larger Harvey Dam will allow water which is currently released from Stirling Dam to Harvey Weir for irrigation, to be diverted to the PMWSS.

Additionally, water which is available from the Collie River Basin may, subject to the Water Corporation obtaining an allocation licence from the Water and Rivers Commission (WRC), be transferred to Stirling Reservoir and ultimately the PMWSS, via the Harris-Stirling Pipeline.

The major elements of the Stirling-Harvey Redevelopment Scheme (which are illustrated in Figures 1 and 2) are:

- construction of a new dam with a full supply level of 78m AHD on the Harvey River, 800m downstream from the existing weir (referred to in the PER as the New Harvey Dam);

- diversion of approximately 34 GL/y from the Stirling Reservoir for the PMWSS via a new 1.4m diameter pipeline to be constructed in the Harvey River Valley from Stirling Dam to Harvey (referred to in the PER as the Stirling-Harvey Pipeline);

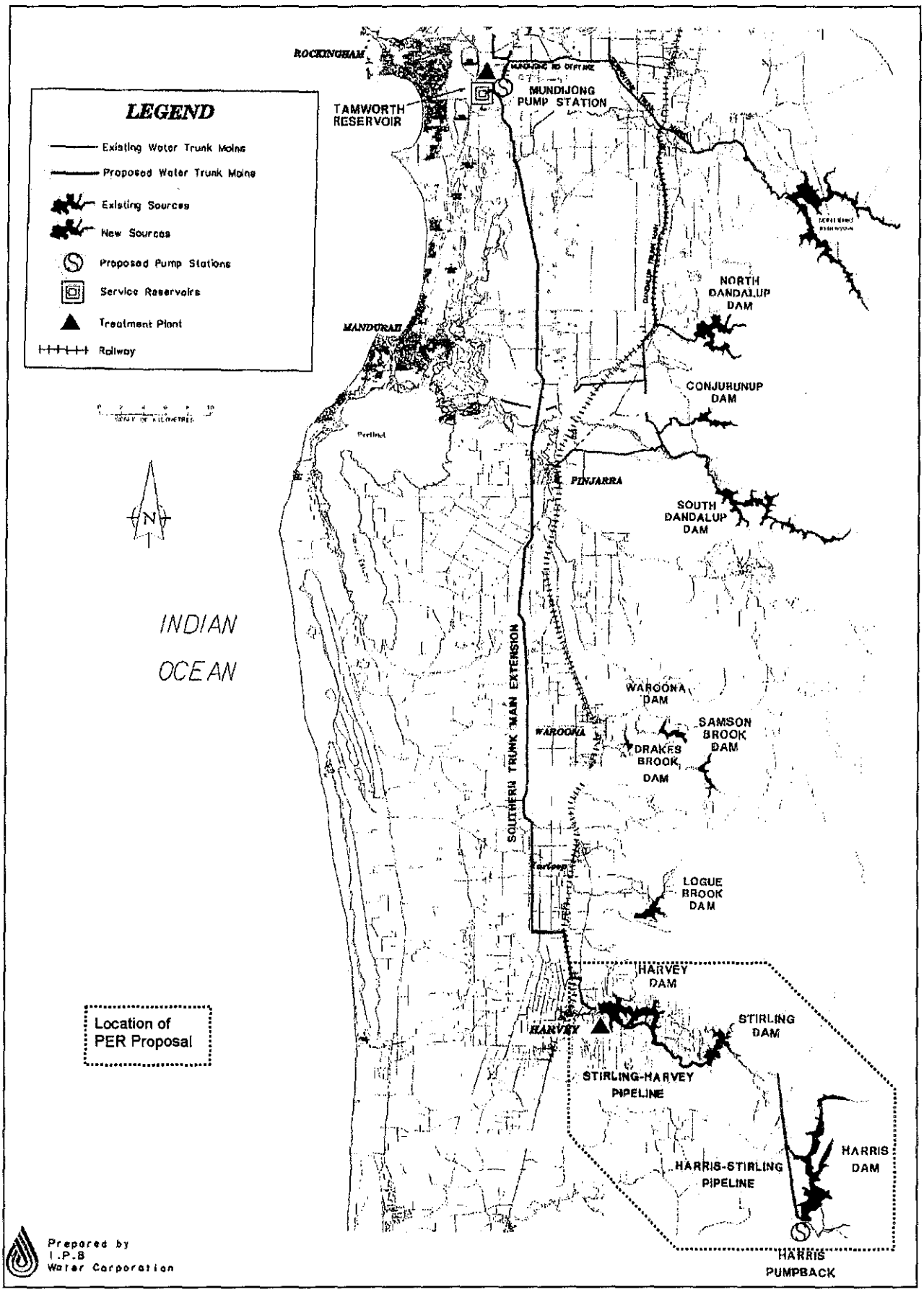

Figure 1. Location map (Source: Welker, 1999a).

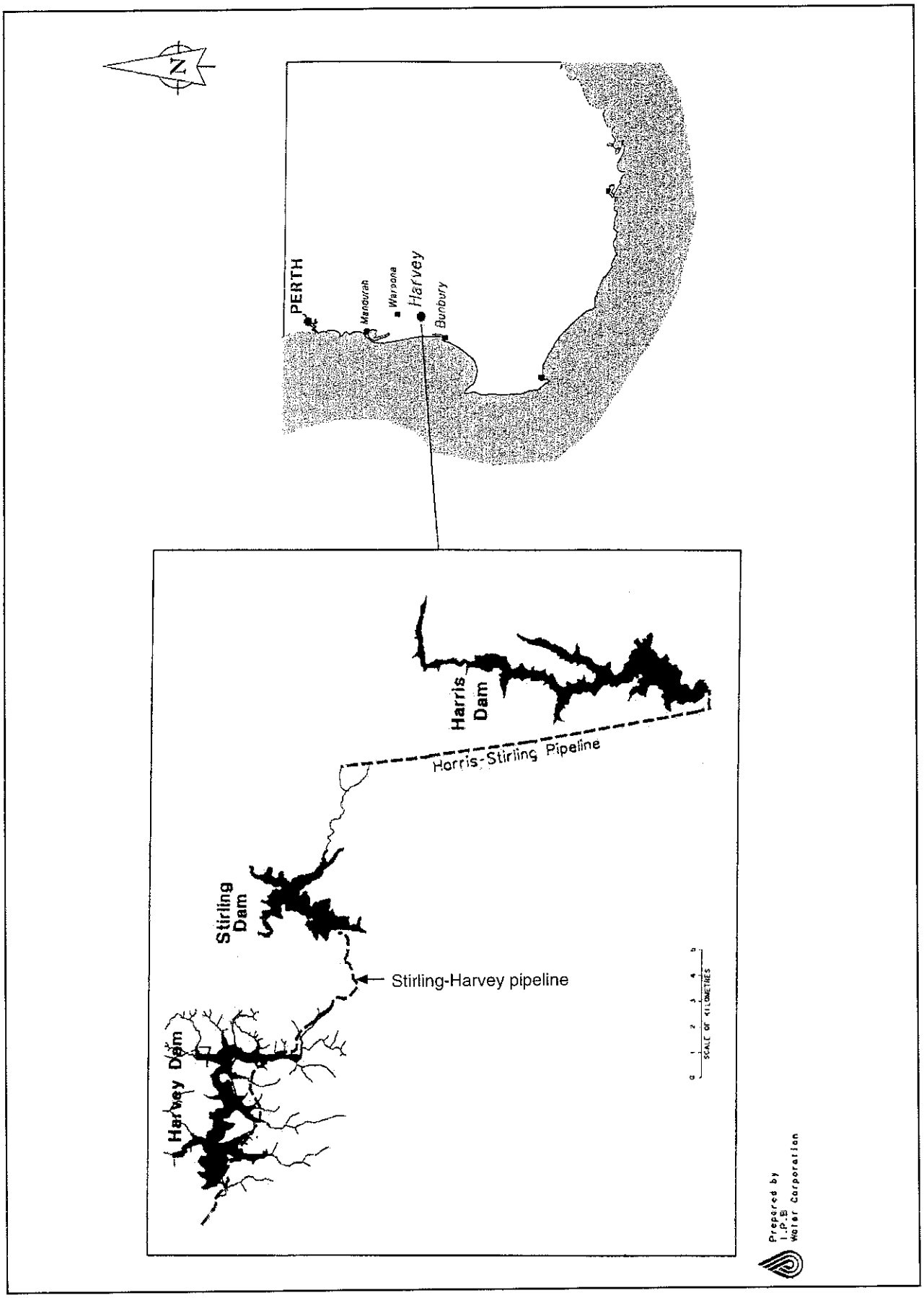

Figure 2. Key elements of the Stirling-Harvey Redevelopment proposal (Source: Welker, 1999a).

- construction of a pipeline (0.8m diam) from the Harris Dam to a stream tributary of the Stirling Reservoir (referred to in the PER as the Harris-Stirling Pipeline) ;
- upgrade of Stirling Dam by:
  - construction of a new concrete intake tower and modification to outlet works;
  - widening of the dam spillway and increasing the height difference between the spillway and the dam wall height by raising the embankment level;
  - installation of a new power supply to the dam using an on-site generator or overhead powerline; and
- realignment of the Harvey-Quindanning road to replace sections of the road to be inundated.

Good quality water from the Harris and Stirling dams is intended to be supplied to the PMWSS via a pipeline from the Stirling Dam to a new main supply pipeline on the swan coastal plain (referred to as the Southern Trunk Main) at Harvey. The Southern Trunk Main has been considered separately by the EPA at the level of Informal Review with Public Advice.

The poorer quality water from the new Harvey Dam will (in the short to medium term) be used for irrigation purposes but in the long term, water from the Harvey Dam may (with treatment) be used for the PMWSS.

A summary of the key characteristics of the proposal is presented in Table 1. A detailed description of the proposal is provided in Section 3 of the PER (Welker 1999a)

Since release of the PER, a number of modifications to the proposal have been made by the proponent. These include:

- change of location for the Chlorination and Fluoridation plant for water for the PMWSS from its original location as shown in Figure 6 of the PER to a new location as shown in Figure 3 of this Bulletin;
- minor changes to the realignment of the Harvey Quindanning Road and to the access road to properties on the North side of the new Harvey Dam (from Harvey -Quindanning Road rather than from Honeymoon Road as described in the PER);
- raising of the upper wall height at Stirling Dam as part of the planned upgrade foreshadowed in the PER to provide the necessary freeboard to prevent overtopping during the maximum probable flood event (The spillway height, and therefore the area inundated by Stirling Dam, will be unaltered);
- lowering of the water level in the Stirling Reservoir and release of water into the Harvey River from Stirling Reservoir during upgrade of Stirling Dam during the spring and summer of works to achieve the required lowering of water levels; and
- a reduction in the number of discharge points for the Harris-Stirling Pipeline from two to one, by removal of the northernmost discharge point.

3. Relevant environmental factors

- Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the proposal and the conditions and procedures, if any, to which the proposal should be subject. In addition, the EPA may make recommendations as it sees fit.

Table 1: Summary of key proposal characteristics

Element and key characteristic	Description
Harvey Reservoir	
New dam	35 m earth core and rockfill (above the river bank level)
Dam full supply level	78 m AHD
Storage	60 GL
Additional area inundated	370 ha
Native vegetation inundated (total)	183 ha approx.
Spillway width	30–60 m
Buffer area	30 m around reservoir at full supply level
Rockfill in dam	700,000 m^3
Earthfill in dam	400,000 m^3
Stirling–Harvey pipeline	Buried, alignment down the valley of Harvey River
Length	19 km
Diameter	1.42 m
Capacity	200 ML/d
Width of disturbance	Maximum 20 m
Width of clearing	Maximum 20 m
Vegetation cleared or disturbed	6 ha approx.
Harris–Stirling pipeline	Buried, alignment within transmission line easement
Length	16 km
Diameter	0.8 m
Capacity	Up to 70 ML/d ay
Width of disturbance	Maximum 12 m (within powerline easement)
Width of Clearing	Maximum 12 m (within powerline easement)
Vegetation cleared or disturbed	19 ha maximum (assumes proponent's preferred option to locate the pipe in the disturbed easement is not possible)
Road Re-alignment	
Length	7.5 km approx.
Width of disturbance	20 m approx. (predominantly cleared)
Area of disturbance	20 ha
Landowner access roads	2.8 km, low speed, unsealed

The identification process for the relevant factors is summarised in Table 2.

Having considered appropriate references, public and government submissions and the proponent's response to submissions, in the EPA's opinion, the following are the environmental factors relevant to the proposal:

(a) Vegetation communities - clearing, inundation and disturbance for the new Harvey Reservoir, pipeline construction and other associated activities;

(b) Specially protected (threatened) fauna - clearing, inundation and disturbance of habitat for the new Harvey Reservoir, pipeline construction and other associated activities;

(c) Watercourses and surface water quantity - inundation, impoundment and diversion and changes to natural or existing water flow regimes;

(d) Landform and rehabilitation - disturbance for pipelines and a quarry;

(e) Noise and vibration - noise from construction activities;

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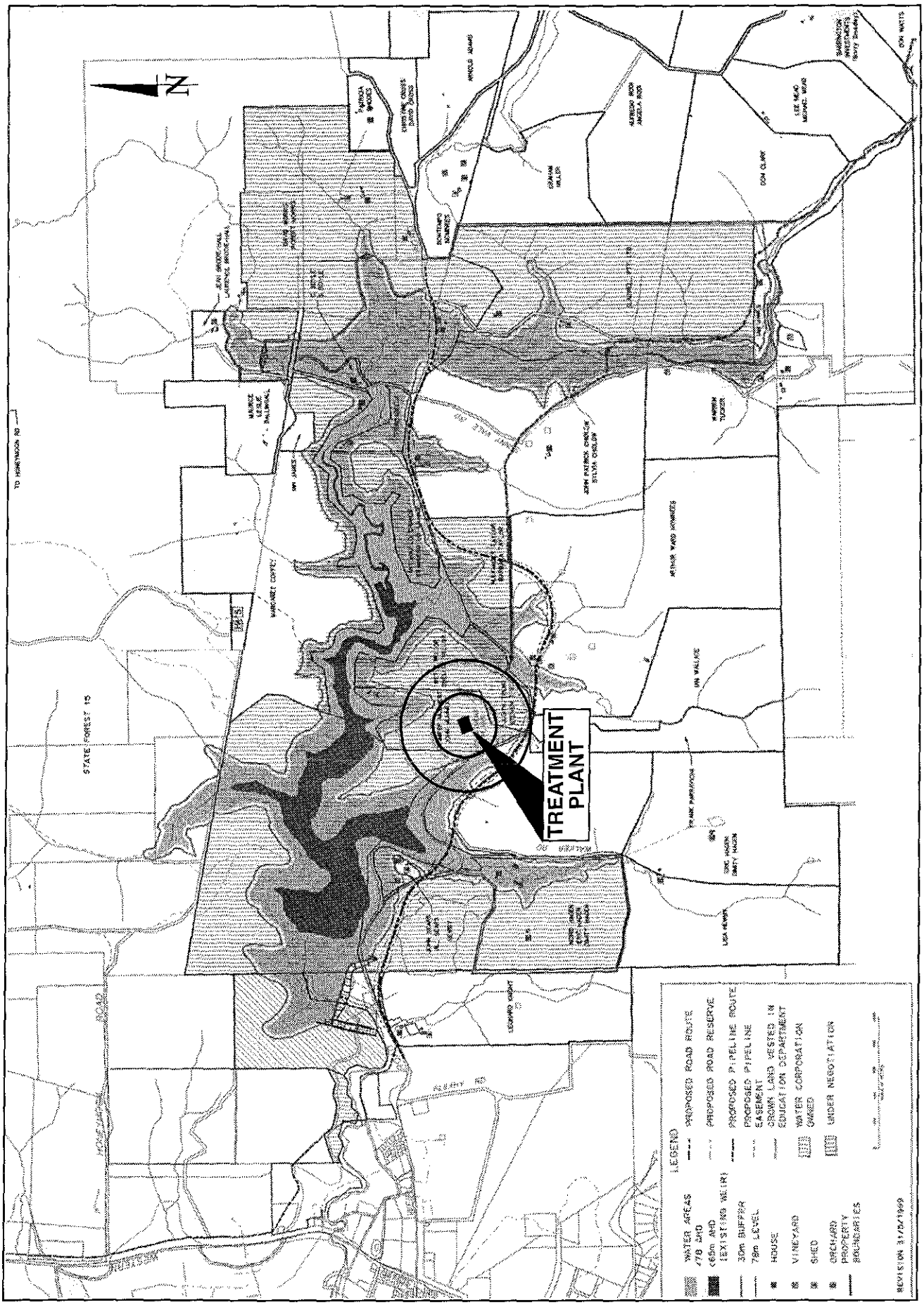

Figure 3. Map showing the area inundated by the proposed Harvey Dam and associated facilities (Source: Water Corporation, 1999).

Table 2: Identification of Relevant Environmental Factors

FACTOR	PROPOSAL COMPONENT WITH POSSIBLE IMPACT	GOVERNMENT AGENCY AND PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT ENVIRONMENTAL FACTORS
BIOPHYSICAL			
Vegetation communities	• Clearing and permanent inundation of 145 hectares of *Lowdon Complex*, 34 hectares of *Darling Scarp Complex*, 19 hectares of *Forrestfield Complex* and 14 hectares of *Helena Complex* vegetation for the **New Harvey Dam** • Clearing and rehabilitation of approximately 6 hectares of *Helena Complex* vegetation for the **Stirling-Harvey Pipeline** • Clearing and rehabilitation of up to 19 hectares of *Dwellingup and Hester*, *Murray* and *Yarragil* Complex forest for the **Harris-Stirling Pipeline.**	**Government** • The Water & Rivers Commission indicated in the Harvey Basin Surface Water Allocation Plan that where possible, pipeline routes should be located in already cleared areas to minimise the amount of clearing required. • The EPA provided advice in its report on the Harvey Basin Surface Water Allocation Plan advising that studies of the impacts of a new Harvey on plant communities would be required and that pipelines should be located outside sensitive riverine areas. **Public** • The cumulative impacts of biodiversity loss have not been adequately factored into the proposal. • The proposed alignment of the Harris-Stirling pipeline within Lot 11 is located within the upper slopes of the Harvey River watercourse ranging between 20m and 50m from the existing river channel. WRC (1998) has stated that '...construction of the pipeline along the riverine area downstream of the Stirling Dam is considered to be an unacceptable impact: it could be avoided by locating the pipeline outside riverine areas (page 59). • It is clear that the proposed route does not meet the WRC requirement of not being within the riverine vegetation and is likely to impact significantly on vegetation that is considered (PER page 68) to have the highest order of significance.	**Considered to be a relevant environmental factor**

FACTOR	PROPOSAL COMPONENT WITH POSSIBLE IMPACT	GOVERNMENT AGENCY AND PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT ENVIRONMENTAL FACTORS
Declared Rare and priority flora	Clearing or inundation has the potential to impact on Declared Rare or priority flora	**Government** CALM has indicated that it will need to be consulted as to where bridging would be undertaken for pipelines across gullies to avoid impacting on Declared Rare or priority flora. This could be detailed in the EMP.	No DRF have been identified to date which will be impacted by the new Harvey Dam component of the proposal. The proponent has committed to undertake additional spring surveys, where these have not been carried out previously to identify any populations of DRF and priority flora which may be present. Where these are detected, any impacts will be managed or mitigated through the procedures outlined in the PER and detailed in the vegetation protection plan which would be a component of EMS for the project. The conservation status of priority species *Hibbertia sylvestris* (P4) , which will be impacted by the proposal, is not expected to be significantly affected. **Factor does not require further EPA evaluation**
Terrestrial fauna	Clearing or inundation of native vegetation has the potential to impact on the habitat of native fauna	**Public** Lot 500 includes 200 acres of land registered with CALM as "Land for Wildlife" registration number 68. If the pipeline goes through Lot 500 it will cause considerable disturbance to habitat trees including those frequented by red tailed black cockatoos and rare river banksia. The Road pipeline option (p41) should be given further consideration as an alternative route to avoid these impacts.	The alignment of the Stirling-Harvey Pipeline through Lot 500 (as with the majority of the pipeline in forested areas) follows an existing track and the maximum disturbance width for the pipeline will be 20 metres, which will be rehabilitated soon after pipeline construction. The impacts of this disturbance on fauna are therefore unlikely to be significant and can be managed in the detailed design and implementation of the project. The proposed management is outlined in the proponent's PER and rehabilitation commitments and will be detailed in the proposed Fauna Management Plan which will be prepared in consultation with CALM and the DEP. **Factor does not require further EPA evaluation**

FACTOR	PROPOSAL COMPONENT WITH POSSIBLE IMPACT	GOVERNMENT AGENCY AND PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT ENVIRONMENTAL FACTORS
Specially Protected (Threatened) Fauna	Clearing and inundation associated with the new Harvey Dam and Stirling-Harvey pipeline has the potential to have a significant impact on the northernmost natural population of the Schedule 1 specially protected species the Western Ringtail Possum The general locality is also being used for reintroduction of the Woylie and the Noisy Scrub birds	**Government** • CALM has advised that it will need to be closely consulted in relation to a Management Strategy for the Western Ringtail Possums. **Public** • Approximately 1.2ha would be affected by the proposed Stirling-Harvey Pipeline on Lot 11 (based on 18m clearing width over 654m) resulting in a significant loss of habitat. The Water Corporation only intends to replace cleared vegetation along the pipeline with local understorey vegetation which would result in the permanent loss of habitat for the remaining populations of Western Ringtail Possum and other Priority species as listed in the PER. • The Carpet Python is also recognised as a rare species in the PER whose habitat includes granite outcrops. The proposed pipeline route could significantly impact on remnant populations of the Carpet Python which local residents have identified in granite outcrop areas within 500m of Lot 11, and by association is also likely to live within the granite outcrop areas of Lot 11.	**Considered to be a relevant environmental factor**
Aquatic fauna	• Construction of the new Harvey Dam has the potential to alter the aquatic fauna of watercourses which are inundated and prevent the migration of fauna species from the lower Harvey River on the coastal plain. • Emptying of Stirling Dam during the upgrade has the potential to adversely impact aquatic fauna	**Government** The Fisheries Department has indicated that : • monitoring of impacts on terrestrial and aquatic fauna should be continued and farm dams which will be inundated should be surveyed prior to construction to ensure that destructive introduced fish and crustacea to not infect the Harvey Dam; • Processes and practices to prevent the movement of animals of all life stages among dams (eg fish grates, separators and sterilisation processes) should be put in place between the three dams; and • A long term monitoring program should be established with Fisheries WA to monitor changes in the Harvey Weir and Stirling Dam.	The aquatic fauna of the Harvey River below Harvey Weir has been found to be generally depauperate. Coastal plain populations of migratory species have been found to be genetically distinct from those on the Darling Plateau. Forested upland streams are well represented in the Harvey River catchment and forested areas generally. The proponent has committed to investigate issues related to the inter catchment translocation of fish and to comply with the requirements of the Fisheries Department on the inter-catchment transfer of fish. **Factor does not require further EPA evaluation**

FACTOR	PROPOSAL COMPONENT WITH POSSIBLE IMPACT	GOVERNMENT AGENCY AND PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT ENVIRONMENTAL FACTORS
Watercourses and surface water quantity	The new Harvey Dam will potentially inundate about 25 km of streamlines. Streamlines may be disturbed when traversed by pipelines. Changes to the pattern of water releases from Stirling Dam or the amount of fringing vegetation in the lower reaches of the river may influence channel erosion rates Construction of a new Harvey Dam, use of water from the Harris and Stirling Dams for the PMWSS, and emptying of Stirling Reservoir during upgrade may have potential to adversely impact the ecology of downstream aquatic communities as a result of increased or decreased flows when compared to the natural regime	**Public** • Releases of water from the Stirling Dam over the last 50 years have resulted in elevated water levels in the river over the summer months which has allowed the river bank vegetation to thrive, and has created a natural barrier to stock, wildlife and feral animals. Releases of additional water over the summer months have resulted in severe erosion of those sections of the river bank not well protected by vegetation. The new pipeline from the Stirling Dam will greatly reduce the volume of water released to the river over the summer months. Reduced summer flow combined with the release of sufficient water to flood the white water course will result in severe degradation of the river. The wetting and drying cycle would cause the riverbanks to become very unstable and prone to erosion. • In the absence of comprehensive ecological understanding the initial in-stream flow recommendations should be regarded as estimates only. Provisions must be made for these estimates to be refined and adjusted with time. • Water is essential for the continued ecosystem of both the Harvey River and the Harvey Diversion Drain. Will the current volume of water entering these systems be maintained? • The in-stream water allocation for the Harvey River should be set at the current levels with only the volume of water pumped from the Harris Dam diverted down the pipeline. This would require a smaller pipeline, with a reduced environmental impact, and maintain the health of the vegetation on the riverbanks. The extra water running into the proposed Harvey Dam could then be diverted into the Perth pipeline at a point near the new dam wall	**Considered to be a relevant environmental factor**

FACTOR	PROPOSAL COMPONENT WITH POSSIBLE IMPACT	GOVERNMENT AGENCY AND PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT ENVIRONMENTAL FACTORS
Landform and Rehabilitation	Construction of the Stirling-Harvey pipeline through steep sections of the Harvey valley below Stirling Dam may have the potential to alter the natural landform in these areas. The hard rock quarry near the construction site for the new Harvey Dam will involve a change to the landform of the quarry site.	**Public** • The proposed access track adjacent to the Stirling-Harvey Pipeline would be particularly prone to erosion on the steep slopes of Lot 11. It is highly likely that localised destabilisation will result in minor earth slips and increased erosion over time, especially in the steeper areas where the width of disturbance will be greater (as stated in the PER). • To minimise impacts on the environment, the proposed pipeline should either be tunnelled, located in existing road reserves and cleared lands, or relocated out of riverine areas and areas of significant vegetation.	**Considered to be a relevant environmental factor**
Mosquitos	Inundation associated with the new Harvey Dam may have the potential to cause a health or nuisance mosquito problem	**Government** CALM has advised that it would like to be consulted with respect to the management plan for mosquito management.	The Health Department has advised the Water Corporation that any increases in mosquito breeding as a result of the proposal are likely to be minimal and can be managed through the proponent's amended commitment to prepare and implement a mosquito monitoring and management program (Commitment P18). **Factor does not require further EPA evaluation.**

POLLUTION			
FACTOR	**PROPOSAL COMPONENT WITH POSSIBLE IMPACT**	**GOVERNMENT AGENCY AND PUBLIC COMMENTS**	**IDENTIFICATION OF RELEVANT ENVIRONMENTAL FACTORS**
Noise & Vibration	Noise and vibration from construction activities associated with the new Harvey Dam may have the potential to have an adverse impact on residents of Harvey Weir Road and nearby residential areas Noise and vibration from vehicles using Harvey Weir Road to access the construction sites of the new Harvey Dam and the Stirling-Harvey and Harris-Stirling pipelines may have the potential to have an adverse impact on residents of Harvey Weir Road and nearby residential areas	**Government** • CALM advised that truck movements quoted in the Executive Summary (page ii) and section 10.5.1 are extreme maxima and should be put into context when used as comparisons to the proposed usage by this project. • The Department of Environmental Protection advised that the requirement for 4 truck movements per hour for 24 hours a day over a period of up to 6 days for a continuous concrete pour has the potential to result in substantial and unacceptable sleep disturbance. The DEP recommended that an on-site batching plant be used to reduce the number of concrete trucks entering and leaving the site and indicated that if this is not feasible, other mitigation measures will be required. **Public** • The PER acknowledges the 'noise level [is] likely to be more than operational assigned noise levels in residential areas on the east side of the South Western Highway for a significant amount of time.' How will the noise mitigation measures be negotiated with residents more than 500m from the proposed dam wall? • The PER references heavy truck movements but past experience suggests that movements of light vehicles such as 4WD and personal transport for the workers to and from the site are likely to be even greater. What increase in light vehicle movement is expected? Are any speed restrictions or other constraints pertaining to their activity being proposed? • The proposed hours of operation are of some concern considering the Hillside Road and surrounding area is a relatively tranquil place to live. It is requested that the hours of operation be restricted to 0700 to 1700.	**Considered to be a relevant environmental factor**
Particulates and Dust	Dust and particulates generated by activities associated with the construction of the new Harvey Dam may have the potential to cause a dust nuisance and may affect the productivity of table grape vineyards	**Public** • Have dust levels east and west of South Western Highway been monitored and recorded? If so, will monitoring continue during construction?	**Considered to be a relevant environmental factor**

FACTOR	PROPOSAL COMPONENT WITH POSSIBLE IMPACT	GOVERNMENT AGENCY AND PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT ENVIRONMENTAL FACTORS
Greenhouse gases	Clearing and inundation of vegetation and pumping of water from Harris Dam will result in emissions of greenhouse gases.		In assessing the various options for redevelopment of the Stirling-Harvey system in the Harvey Basin Surface Water Allocation Plan, opportunities for gravity supply were considered and the development option selected minimised greenhouse gas emissions. The selection of the valley option for the Stirling-Harvey Pipeline also avoids the need for pumping saving an estimated 13 000 tonnes of CO_2 per annum. The proponent has considered greenhouse impacts in the assessment of the proposal and has committed to ensuring that an equivalent amount of greenhouse gas carbon will be sequestered by the revegetation work associated with proposal over the life of the project as will be lost through clearing and inundation. (estimated to be approximately 30 000 tonnes). The proponent has also advised that it is committed to participation in the Commonwealth Greenhouse Challenge and that as part of the Challenge the Water Corporation will sign an agreement which will include an emissions inventory, an assessment of the opportunities for abating greenhouse gas emissions, a greenhouse gas emissions action plan, a process for regular monitoring and reporting of performance, and provision for independent verification of performance. **Factor does not require further EPA evaluation**
Surface Water Quality	Release of nutrients from inundation, and activities in the catchment have the potential, when combined with the depth of the impoundment, to adversely impact water quality in the new Harvey Dam. This in turn could affect quality in the Harvey River.	**Public** Effects on water quality from various activities and water quality requirements for the Stirling and Harvey Reservoirs should have been made clearer in the document.	Catchment management issues are addressed in the assessment of the factor 'Post-development land use'. The Water Corporation has advised that, in respect of reservoir water quality, the potential for stratification and deoxygenation will be reduced by the rapid turnover of the reservoir contents as a normal irrigation season could be expected to empty 80% of the reservoir each year. Additionally, from a water supply standpoint, a multi-level intake tower will enable water quality to be selected by drawing off from various depths within the reservoir, taking advantage of the stratification to select water of the appropriate quality generally from the "well mixed" zones. Water quality is unlikely to be a problem for recreational and aesthetic reasons, as in a situation of deteriorating water quality, water supply requirements would require remedial action well before these other considerations became an issue. This action would include recognised techniques for destratifying the reservoir such as the use of aeration techniques to generate vertical currents that result in increased rates of reservoir turn-over. However at this stage, these are considered unlikely to be required. **Factor does not require further EPA evaluation**

FACTOR	PROPOSAL COMPONENT WITH POSSIBLE IMPACT	GOVERNMENT AGENCY AND PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT ENVIRONMENTAL FACTORS
SOCIAL SURROUNDINGS			
Post-development landuse	The construction of the new Harvey Dam may have the potential to disrupt the social environment by fragmenting or isolating properties or residences, adversely impacting on landowners' properties or reducing the local population	**Government** CALM advised that in its view, Priority 1 classification for all Crown land within the Harvey-Stirling catchment is not appropriate and is of major concern if it means that existing CALM commercial investments such as pine plantations are not given fair treatment and consideration. There is inconsistency between the controls applying to softwood plantations and agricultural land uses and there seems to be an inequity with the classification and restrictions to land use between CALM-managed land and private land in the catchments. CALM's preferred option is for plantations to be zoned P2. **Public** Discouraging public access to private property from the proposed pipeline route will be a significant problem and access provisions are likely to exacerbate problems such as trespassing and vandalism.	**Considered to be a relevant environmental factor**
Visual amenity	The construction of the new Harvey Dam and the Harris-Stirling and Stirling-Harvey pipelines may have the potential to adversely impact on the visual amenity of particular areas within the Harvey River Basin.	**Public** A 1.4 metre permanently placed pipe and the associated vegetation clearing will result in major irreversible impacts on the landscape.	**Considered to be a relevant environmental factor**
European heritage	The Construction of the dam will lead to the inundation or relocation of a number of areas and buildings of European heritage significance	**Public** It appears that Jardup homestead will be inundated by the proposed redevelopment. The grave of Ephraim Mayo (Bunbury's first mayor and an MP) may be located nearby and perhaps he and other pioneers of the area should be commemorated in some way.	Factor can be effectively managed in accordance with relevant legislation such as the *Western Australian Heritage Act 1972* and the proponent's commitment to prepare a Heritage Management Plan to the requirements of the Heritage Council of WA (Commitment P 34) **Factor does not require further EPA evaluation**

FACTOR	PROPOSAL COMPONENT WITH POSSIBLE IMPACT	GOVERNMENT AGENCY AND PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT ENVIRONMENTAL FACTORS
Aboriginal heritage and culture	Inundation or clearing of land and native vegetation in the Harvey basin has the potential to impact on sites of Aboriginal heritage and / or cultural significance	**Public** The PER states that archaeological sites are most likely to be associated with water sources, rock outcrops, or breakaways containing rock shelters. This is significant as Lot 11 contains water courses and rock outcrops adjacent to the Harvey River which may mean that archaeological sites or ethnographic sites are present.	Factor can be effectively managed in accordance with relevant legislation and the proponent's commitments. **Factor does not require further EPA evaluation**
Recreation	• Recreation in the Harvey - Stirling Catchment has the potential to be restricted by the creation of Drinking Waters Source Protection Areas • Recreation in the vicinity of Harvey Weir has the potential to be adversely impacted by the inundation of areas used by recreationalists or the reduction in downstream 'aesthetic' water flows.	**Government** CALM advised that: • Recreation and other current land uses in the catchment need to be considered in an integrated way with water resource protection issues; • CALM needs to be consulted with respect to the planning of recreational facilities around the reservoirs; and • the statement in the PER indicating the '...proponent has agreed to provide funds towards the preparation of recreation plans and subsequent development and management of facilities on, around and below the Harvey Reservoir' should be included as a commitment.	**Considered to be a relevant environmental factor**

FACTOR	PROPOSAL COMPONENT WITH POSSIBLE IMPACT	GOVERNMENT AGENCY AND PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT ENVIRONMENTAL FACTORS
Traffic	Traffic may be disrupted by increased numbers of vehicles travelling to from and within the town of Harvey and along Weir Road	**Public** • During early spring and autumn, vehicles driving into the sun on Weir Road in early morning and evening will encounter a 'dead spot' approximately 100m west of the Weir Road/Hillside Road intersection. The road is quite narrow with deteriorating edges at this point. • It appears that impact of dam construction on the volume of traffic on Weir Road has been underplayed both in terms of direct impact on local residents and road safety. • There is a school bus run along Weir Road from 8:00am to 8:25 am and from 3:25pm to 4:00 pm picking up and setting down school children each weekday. The additional heavy vehicle traffic along Weir Road, the lack of vision around tight corners and the quality of the road raises significant safety concerns for the school children.	The proponent has committed to : • the preparation and implementation of a traffic management plan; • investigation of the competency of Weir Road to the Construction site; and • upgrade of Honeymoon Road in order to allow redirection of log trucks from Weir Road during the construction period. **Factor does not require further evaluation**
Public Safety	Public safety risk has the potential to be increased as a result of interaction between members of the public and construction and maintenance traffic or as a result of construction activities	**Public** • What safety practices will be in place should there be a major accident at the treatment plant just south east of the dam wall? • With both Agricultural College and Harvey High School being close by and the possibility of dangerous gases escaping from the treatment plant, what warning or alarm system for the schools and local community, including the town, will there be? • Have the local State Emergency Service been consulted and trained to control any emergency concerning chemicals that might be transported to the water treatment plant? • How safe will the dam wall be?	This factor can be managed in accordance with relevant legislation and engineering standards. Public liability considerations will self regulate management of risks. **Factor does not require further EPA evaluation**

(g) Post-development landuse - inundation and potential imposition of catchment management restrictions;

(h) Visual amenity - inundation, pipelines and a quarry; and

(i) Recreation - inundation of existing sites and potential imposition of catchment management restrictions

Details of the relevant environmental factors and their assessment are contained in Sections 3.1 - 3.9. The description of each factor shows why it is relevant to the proposal and how it will be affected by the proposal.

The assessment of each factor is where the EPA decides whether or not a proposal meets the environmental objective set for that factor.

A summary of the assessment of the environmental factors is presented in Table 4.

3.1 Vegetation communities - locally and regionally significant vegetation

Description

During the assessment of the proposal and following public submissions, the proponent was requested to provide its most up to date estimates of areas of native vegetation impacted by each component of the proposal and to subdivide the broad information provided in the PER according to vegetation complex, vegetation condition and conservation significance. A summary of this information, which has been adapted according to the EPA's view on the significance of impact, is provided in Table 3. A map showing the areas of vegetation to be inundated by the new Harvey Dam is provided as Figure 4.

New Harvey Dam

The proposed new Harvey Dam will inundate approximately 180 hectares of native vegetation, comprising a range of vegetation complexes in varying levels of condition. Table 12 of the PER provides an approximate summary of the areas of vegetation potentially affected by the Harvey Reservoir. In some cases these areas are slightly greater than predicted by the Water and Rivers Commission in the Harvey Basin Surface Water Allocation Plan (WRC, 1998).

The proposal will also involve the purchase of land of high conservation significance, rehabilitation of disturbed land and revegetation of areas of cleared agricultural land in order to protect and improve the quality of water in the new dam as well as to offset impacts of the proposal on vegetation communities . This is discussed later in this section under the heading 'Land Acquisition and Rehabilitation Strategy.'

Stirling-Harvey Pipeline

The proponent's preferred route for the Stirling-Harvey Pipeline will involve clearing and / or disturbance and subsequent rehabilitation of an estimated 6 hectares of Helena complex vegetation in good to very good condition in the Harvey River valley below Stirling Dam.

The EPA provided advice in its report on the Harvey Basin Surface Water Allocation Plan (EPA 1998b) advising that "pipelines should be located outside sensitive riverine areas".

As a result of this advice, the Water Corporation consulted with the Water and Rivers Commission (WRC), the Department of Conservation and Land Management (CALM) and other landowners during the design phase of the proposal, to determine the route for the Stirling-Harvey Pipeline within the river valley. The aim of this process was to ensure that the pipeline route was located so that it would not impact on sensitive riverine areas or other areas of high conservation significance, such as areas containing rare flora.

Table 3: Summary of impacts on vegetation communities

Project Component	Remnant vegetation complex	Area ha	Condition	Significance
Inundation by the new Harvey Dam	Lowdon	56	Native vegetation, relatively good condition, potential habitat for Western Ringtail Possum	**Very High** Lowdon vegetation complex is poorly represented (<2% of pre-European extent) in conservation reserves. This area represents the portion of this complex inundated which is in good condition
	Lowdon	77	Degraded by clearing and grazing, understorey almost absent	**Low** significance diminished by poor condition
	Lowdon	12	Degraded by clearing and grazing, understorey almost absent	**Low Medium** significance diminished by poor condition
	Helena	14	Native vegetation, good condition	**Medium** Helena vegetation complex is well represented (>25% of pre-European extent) in current and proposed reserves .
	Forrestfield (West Lot 1)	16	Native vegetation, very good condition in atypical location	**Very High** Forrestfield vegetation complex is poorly represented (<10% of pre-European extent) in reserves and the occurrence impacted is in good condition and an atypical geomorphological position
	Forrestfield (North Lot 2)	3	Degraded, high weed invasion and cleared understorey	**Low** Forrestfield vegetation complex is poorly represented (<10% of pre-European extent) in reserves but the significance is greatly diminished by its very poor condition
	Darling Scarp	5	Degraded as partly cleared and tracks present	**Medium** Darling Scarp vegetation complex is poorly represented (<10% of pre-European extent) in reserves but the significance is diminished by poor condition
Stirling-Harvey Pipeline	Helena	6	Native vegetation	**Low to medium** Helena vegetation complex is well represented (>25% of pre-European extent) in current and proposed reserves and sites disturbed will be rehabilitated during construction
Harris-Stirling Pipeline	Dwellingup, Yarragil and Murray	up to 19	Native vegetation, good condition, some dieback infection	**Low to medium** Dwellingup and Yarragil vegetation complexes are not well represented (both <15% of pre-European extent) in conservation reserves but there is an additional much greater area managed by CALM as multiple-use state forest. Murray vegetation complex is well represented (>15% % of pre-European extent) in reserves. Sites disturbed will be largely rehabilitated during construction.

Harris-Stirling Pipeline

The construction of the Harris-Stirling Pipeline will involve the clearing and subsequent rehabilitation of up to 19 hectares of jarrah forest vegetation along a narrow (maximum of 20 metres wide) strip. The vegetation along the pipeline route is described as Dwellingup, Murray and Yarragil vegetation complexes.

The proponent is in the process of negotiating with Western Power Corporation to allow construction of the pipeline within the already disturbed portion of the 'Muja Northern Terminal' powerline easement to minimise the requirement for clearing of vegetation. If this approach (which is dependent of the resolution of safety and other issues) can be successfully negotiated, the area of vegetation clearing is likely to be significantly reduced to an area of a few hectares.

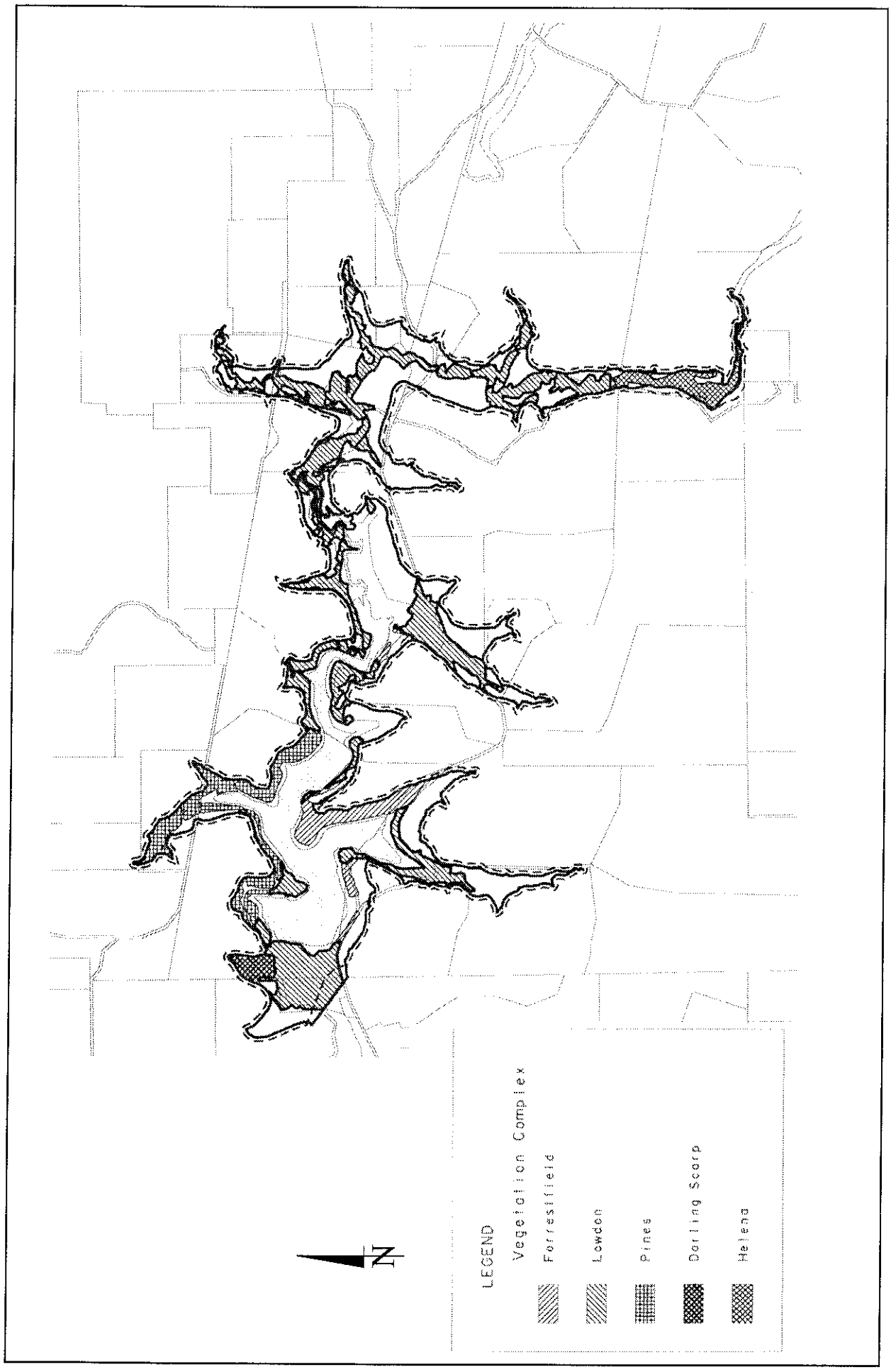

Figure 4. Vegetation complexes in the reservoir inundation area for the new Harvey Dam (Source: Water Corporation).

The Harris-Stirling Pipeline does not pass through riverine areas other than a highly disturbed area on the Harris River near Harris Dam. The proponent has designed the pipelines (page 79 of the PER) with the objective of ensuring that the long term impacts of pipeline stream crossings on riparian vegetation and fauna will be minimal.

Land Acquisition and Rehabilitation Strategy

In response to public submissions and issues raised by the EPA during its assessment, the proponent has prepared a Land Acquisition and Rehabilitation Strategy (LARS). This strategy, which is provided as an appendix to its response to public submissions (Appendix 4), outlines the specific actions which Water Corporation will undertake, to address or offset impacts of the proposal on vegetation communities and other environmental factors. The LARS is linked to specific commitments provided by the proponent in its list of consolidated commitments (Appendix 3). Examples include the commitment to acquire land for incorporation in the conservation estate (Commitment P 5) and the commitment to prepare a Rehabilitation Plan (Commitment P 17).

Agency and public comments

New Harvey Dam

A number of the public submissions raised issues relating to the specific or overall impacts of the dam on vegetation communities or on biodiversity. Some submitters indicated that in their view, the negative impacts of the new Harvey Dam on vegetation communities outweighed the public benefits of constructing the dam.

Stirling-Harvey Pipeline

Some submitters indicated that they believed that the Stirling-Harvey Pipeline should not be located within the river valley below Stirling Dam because of the potential impact of the pipeline on flora, fauna, landscape or other values of land in the valley.

Both the WRC and the CALM have recently advised (Water and Rivers Commission and CALM letters, July 1999) that the proposed route and management of impacts associated with the Stirling-Harvey Pipeline are acceptable, provided the proponent's commitments relating to consultation during detailed design and site rehabilitation, are implemented.

Assessment

The area considered for assessment of this factor is the new Harvey Reservoir, Stirling-Harvey Pipeline and Harris-Stirling Pipeline.

The EPA's environmental objective for this factor is to maintain the abundance, diversity, geographic distribution and productivity of vegetation communities.

New Harvey Dam

Table 3 indicates that some areas of Lowdon, and Forrestfield vegetation complexes affected by the inundation caused by the new Harvey Dam are likely to be of very high conservation significance.

Forrestfield Vegetation Complex

The area of Forrestfield vegetation complex which is in good condition (Lot 2) contains vegetation communities which reflect its atypical geomorphological position for Forrestfield vegetation complex and which are not similar to other vegetation communities in the Harvey

Hills or along the Ridge Hill Shelf (lower Darling escarpment) which were investigated within the Yarloop-Harvey area (Mattiske Consulting, 1999). The EPA therefore considers that the vegetation in this area is of very high conservation significance (equivalent in significance to a Threatened Ecological Community).

In order to offset the loss of the area of Forrestfield vegetation complex, the Water Corporation has committed to the purchase of an area of Forrestfield vegetation complex of similar conservation significance, for addition to the conservation reserve system. The area concerned is Yarloop Location 5322 near the town of Yarloop.

The Water Corporation has also undertaken within the Land Acquisition and Rehabilitation Strategy (LARS), to rehabilitate a 20 hectare gravel pit adjacent to the area to be inundated, with vegetation consistent with Forrestfield vegetation complex.

The proponent's objectives for the gravel pit area to be rehabilitated, as stated in the LARS, are as follows:

- *To reinstate self-sustaining vegetation communities that approach the form, cover, diversity and resilience of the original Forrestfield Vegetation complex found in the vicinity.*
- *All seed to be collected from local native species and applied in mixtures based on the recognised floristic composition of the site-vegetation types (as used in the rehabilitation planning) which occur within the Forrestfield Complex Area.*

The proponent has further committed to assist with the management planning for the proposed Korijekup Conservation Park near the town of Harvey and also with restoration of degraded areas within the proposed park.

Yarloop Location 5322, the area to be acquired for reservation, contains 5 hectares of intact Forrestfield vegetation complex which is described by Mattiske Consulting (1997) as containing Floristic Community Types 3b and 20b (Gibson, 1994). These vegetation communities are representative of Forrestfield vegetation complex, are very poorly represented in secure conservation reserves, and are regarded as locally and regionally significant.

The EPA estimates that, for the Forrestfield vegetation complex as a whole, 92-98% of the original bushland has been cleared. For Floristic Community Types 3b and 20b, between 2-8% of the original area in the Forrestfield complex remains. The largest remaining area of good quality Community Types 3b and 20b is located in the nearby Reserves 31900 and 31901 and A22307 (EPA, 1999). These reserves taken together have been recognised by the EPA as containing threatened or poorly reserved plant communities requiring interim protection (EPA, 1994).

Additionally a recent detailed assessment commissioned by Environment Australia and CALM (English and Blyth, 1997) identified Community Type 3b as "vulnerable"[1] and community type 20b as "endangered"[2].

As a result of detailed analysis undertaken by the proponent during the assessment process the vegetation communities in Yarloop Location 5322 were found to have some significant differences when compared to the communities in the area of Forrestfield complex which will be inundated. This is due in part, to the unique position of the latter area in an elevated position within the Harvey River valley and in part to the soil and landform characteristics of the area, which by their nature, support an unusual community of plant species associated with a Eucalyptus Wandoo overstorey.

In considering the acceptability of the acquisition and rehabilitation of land in order to offset the permanent loss of the Forrestfield complex vegetation, the EPA examined a range of alternative inundation scenarios for different levels of the proposed new Harvey Dam, provided by the

[1] An ecological community is classified as *vulnerable* if it is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community which is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range (English and Blyth 1997).

[2] An ecological community is classified as *endangered* if it is found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future (English and Blyth 1997).

Water Corporation. The EPA's conclusion from this examination was that a major reduction in the area of Forrestfield complex vegetation inundated could only be achieved with major impacts on the storage capacity of the proposed dam.

The EPA considers that acquisition and reservation of Yarloop Location 5322, as a supplementary addition to other contiguous or nearby reserves in Yarloop, would be a worthwhile and significant addition to the conservation reserve system. When considered in the context of the overall package of proposed offset measures as well as the management arrangements which will be put in place, the EPA believes the acquisition proposal adequately offsets the loss of the Forrestfield complex vegetation which would occur if the proposal was implemented.

Lowdon Vegetation Complex

The other area of vegetation to be inundated which is considered by the EPA to be of very high conservation significance is the 56 hectare total area of Lowdon complex vegetation in the Harvey River valley in good to very good condition (see Table 3).

Although the areas affected comprise disjunct remnants which in some cases are surrounded by cleared farmland, Lowdon vegetation complex has very low representation in current conservation reserves (<2% of pre-European extent) and the DEP has estimated that approximately, 8600 hectares remain uncleared.

Additionally, areas of lowland Lowdon vegetation complex in the Harvey River valley support stands of WA Peppermint (*Agonis flexuosa*) which are the preferred habitat of the rare (Schedule 1) fauna species, the Western Ringtail Possum.

To offset the loss of Lowdon vegetation complex, the proponent intends to purchase a similar area of land supporting uncleared Lowdon vegetation complex for incorporation in the conservation estate.

The LARS also incorporates rehabilitation of reservoir buffer areas (135 hectares) and the 'Peppermint Rehabilitation Areas (35 hectares) ' referred to in the PER according to the following preliminary objectives:

Buffer area (previously cleared areas)

- *To establish habitat for locally significant fauna and encourage the establishment of native vegetation with flora species that are consistent with vegetation complexes that occur in the local area* (predominantly Lowdon complex).
- *To reduce the risk of turbid runoff to the Harvey Reservoir and improve water quality.*

Peppermint woodland area (cleared grazing land)

- *To encourage the development of a peppermint woodland with habitat values for Western Ringtail possums and other significant fauna that may occur in the vicinity.*
- *To encourage peppermint woodlands, restoration work to be based on a mixture of seeding and plantings to enable both a range of native species to be re-introduced into these largely modified landscapes and also to provide a mosaic of different peppermint ages for assisting with fauna habitat restoration. Further investigative work, as well as trials, will be completed as part of the rehabilitation programme to assess the viability of transplanting.*

The EPA considers that the proposed offset measures as outlined in the Land Acquisition and Rehabilitation Strategy and the commitments provided by the proponent adequately mitigate the loss of areas of Lowdon vegetation complex which will occur as a result of the proposal.

Stirling-Harvey Pipeline

The 6 hectares of native vegetation which will be impacted by the Stirling-Harvey pipeline occurs predominantly on private property.

Some landowners whose properties will be impacted by the pipeline are concerned about the environmental impact of the pipeline, particularly with respect to the need for removal of old trees, blasting of shallow or outcropping granite and removal of mature peppermints. CALM and the WRC have advised that the route of the pipeline will not have an unacceptable impact on flora or fauna values, provided the commitments (listed in Appendix 3) are implemented.

With regard to the rehabilitation of disturbed areas along the pipeline, the EPA considers that the proponent's proposed objective for rehabilitation of areas disturbed by pipelines, viz:

- *To create a stable landscape with self-sustaining vegetation communities that are consistent with the current composition of vegetation complexes found in the area; and*
- *All seed to be collected from local native species and applied in mixtures based on the recognised floristic composition of the site-vegetation types (as used in the rehabilitation planning) which occur within this valley system;*

and the outline of the method and process of rehabilitation which have been provided in the LARS, will enable the EPA's objective for vegetation communities to be met.

The EPA therefore considers that as the proposed Stirling-Harvey Pipeline:

- has been located in consultation with CALM and the WRC;
- will be buried, with disturbed areas rehabilitated according to best practice soon after installation;
- follows an alignment which utilises existing tracks where possible;
- has been located so far as is reasonably practicable, away from the banks of the Harvey River;
- is located in an area of Helena vegetation complex which is well represented in conservation reserves; and
- will be subject to advice from CALM at the detailed design phase;

the impacts of the pipeline on the abundance, species diversity, geographic distribution and productivity of vegetation communities will not be environmentally significant provided the commitments, as listed in Appendix 3, are implemented.

Harris-Stirling Pipeline

Up to 19 hectares may require clearing if the Water Corporation and Western Power are unable to agree to the pipeline being located within the already cleared portion of the powerline easement. This would be the EPA's preferred alignment as it would significantly reduce the area of clearing required for this part of the proposal.

The 19 hectares of vegetation which may be impacted by the Harris-Stirling Pipeline is described in the PER and in Mattiske Consulting (1998a) as Dwellingup, Murray and Yarragil vegetation complexes. As these vegetation complexes are known to be well represented in reserves and multiple use State Forest, and vegetated areas disturbed will be rehabilitated according to the objectives and strategies referred to in the LARS (the same as for the Stirling-Harvey Pipeline), the significance of the impact of the Harris-Stirling Pipeline on vegetation communities is expected to be low.

Summary

Having particular regard to:

(a) the significance of the impacts of the proposal on vegetation communities as outlined in Table 3;

(b) the measures outlined in the proponent's Land Acquisition and Rehabilitation Strategy to offset the loss of values in areas impacted by the proposal (Appendix 1 of the proponent's response to public submissions), including:

- the proponent's commitment to acquire land for incorporation into the conservation estate, state forest or water reserve as described in the Land Acquisition and Rehabilitation Strategy; and
- the proponent's commitment to prepare a Rehabilitation Plan to the requirements of DEP which is to be based on the objectives identified in the Land Acquisition and Rehabilitation Strategy;

(c) the advice of CALM and the WRC regarding the alignment of the Stirling-Harvey Pipeline in the Harvey River valley; and

(d) the endeavours of the Water Corporation to locate the Harris-Stirling Pipeline in the Western Power easement;

it is the EPA's opinion that the proposal is capable of being managed to meet the EPA's environmental objective for vegetation communities.

3.2 Specially Protected (Threatened) Fauna

Description

The PER indicates that the proposed Harvey Dam will inundate areas of habitat for the local population of the Specially Protected (Threatened) Fauna species *Pseudocheirus peregrinus*, the Western Ringtail Possum. Areas of Lowden and Helena vegetation complex containing stands of WA Peppermint (*Agonis flexuosa*) appear to be favoured by Ringtail Possums.

The Stirling-Harvey Pipeline route also includes a portion of the habitat of the Ringtail Possum population, where it passes through privately owned forest east of the south eastern end of the new Harvey Dam.

Some elements of the proponent's Land Acquisition and Rehabilitation Strategy including the rehabilitation of the proposed 'peppermint rehabilitation areas' and 'reservoir buffer areas' will make provision for creation of new habitat for the species.

Agency and public comments

Government

CALM provided advice indicating that detailed consultation would be required in relation to the proponent's commitment to prepare a management strategy for the Western Ringtail Possum.

Public

Several submissions expressed concern about the possible impacts of increased inundation and the disturbance associated with the Stirling-Harvey Pipeline causing loss or disturbance to habitat for the Western Ringtail Possum, the Carpet Python or Carnaby's Black Cockatoo. Some submitters recommended that the road or tunnel pipeline options for the Stirling-Harvey Pipeline (page 41 of the PER) should be given further consideration as an alternative route to avoid these impacts.

One submission expressed concern that the proponent had not undertaken a survey of the alignment of the Stirling-Harvey Pipeline for the Western Ringtail Possum as part of the PER.

Assessment

The area considered for assessment of this factor is the new Harvey Reservoir and the Stirling-Harvey Pipeline.

The EPA's environmental objective for this factor is to protect Specially Protected (Threatened) Fauna species and their habitats, consistent with the provisions of the *Wildlife Conservation Act 1950.*

The key species requiring specific actions by the proponent to ensure that the proposal will meet the EPA's objective is the Western Ringtail Possum (Pseudocheirus peregrinus). Other species which need to be considered in the management of the proposal and in the objectives for rehabilitation or restoration of habitat are listed in Table 13 of the PER and include the Carpet Python and Carnaby's Black Cockatoo.

The WRC's Harvey Basin Surface Water Allocation Plan identified the management requirements for the Western Ringtail Possum (population) as a significant issue for a developer of a new Harvey Dam. This was because a CALM survey (during September–October 1997) of riverine areas that may be affected by inundation found the Western Ringtail Possum present in the area and that the population may be at a critically low density and therefore may not be viable (de Tores and Rosier 1998).

Furthermore the PER presented evidence that while the loss of habitat by inundation is unlikely to significantly affect overall population levels of the majority of species, the locally vulnerable species, Western Ringtail Possum, may be substantially affected by the removal of peppermint forest habitat without the creation of new habitat.

The Western Ringtail Possum is currently managed by CALM in accordance with a (draft) Interim Recovery Plan. Populations have been translocated to Leschenault Peninsula Conservation Park, Yalgorup National Park, the northern jarrah forest south-east of Dwellingup and the Karakamia Sanctuary, near Chidlow. However the success of translocation in these areas is still being investigated (Welker, 1999).

The proponent has committed to the preparation and implementation of a management strategy for the local Western Ringtail Possum population to the requirements of CALM, in order to attempt to mitigate impacts on the species and its habitat.

This strategy will incorporate:

- the preparation and implementation of a fauna protection plan for activities related to the construction and management of the elements of the project;
- the inclusion of faunal habitat in rehabilitation / restoration and buffer areas as discussed in the Land Acquisition and Rehabilitation Strategy; and
- cooperation with CALM in the control of foxes and feral cats (if required).

The PER indicates that the emphasis of the strategy will be to create new habitat (peppermint woodland) that will support the Western Ringtail Possum on the periphery of the Harvey Reservoir, with translocation only to be undertaken as a last resort.

CALM was requested to provide advice in relation to the ability of the proposal and the proponent's commitments to meet CALM requirements for the protection of threatened fauna, particularly with respect to the impacts of the Stirling-Harvey Pipeline.

CALM advised that:

"The impacts of the Stirling-Harvey Pipeline on threatened fauna and on landscape values in the valley would not be unacceptable, provided the appropriate management commitments are implemented by the proponent. The current commitments relating to the construction and management of the pipeline have been formulated in consultation with CALM."

Summary

Having particular regard to :

(a) the proponent's commitments to:

- prepare and implement a fauna management strategy to the requirements of CALM; and
- rehabilitate 104 hectares of Lowdon complex vegetation within reservoir buffer areas and provide for habitat within the 35 hectare peppermint rehabilitation area; and

(b) the additional advice of the Department of Conservation and Land Management;

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for Specially Protected (Threatened) Fauna.

3.3 Watercourses and surface water quantity

Description

New Harvey Dam

The allocation of water within the Harvey Basin for consumptive and other uses was examined in some detail by the WRC in the Harvey Basin Surface Water Allocation Plan (WRC, 1998). The Allocation Plan examined the environmental requirements of the Harvey River below Harvey Dam and the EPA provided advice to the Minister for the Environment on this matter in its advice to the Minister (Bulletin 910). Further consideration of the environmental water provisions for the Harvey River below Harvey Dam is therefore not necessary for this assessment.

The new Harvey Dam will however result in inundation of a significant length of watercourses in the Harvey River and tributaries above the dam wall. The WRC reports that approximately 25 km of the Harvey River and stream tributaries will be inundated by the Harvey Reservoir (WRC, 1999). This estimate is a revision of the 16 km figure referred to by the Water Corporation in the PER, which used a slightly different level of stream definition. However the Water Corporation has accepted the 25 km figure as the basis for providing commitments to offset impacts on the riparian values of watercourses.

The majority of the riparian areas which will be inundated are within cleared agricultural land and some of the affected watercourses have been heavily modified by the movement of domestic stock, roads and tracks, and other disturbances.

Natural riparian areas are important as they support vegetation which has a crucial role in providing habitat and supporting ecological processes, and are often noted for their relatively high faunal biodiversity (Welker, 1999a).

About 35% of the catchment of the Harvey Reservoir has been cleared. The Falls Brook tributary of the Harvey River (within the catchment of the Harvey Reservoir) rises in State Forest and passes through the Falls Brook Nature Reserve before entering cleared agricultural land.

The Harvey Basin Surface Water Allocation Plan indicated that a dam with a full supply level of 80 metres AHD would have had a significant impact on the riparian values of watercourses in the Falls Brook Nature Reserve. However given the short period, low frequency and likely minor extent (if any) of inundation of Falls Brook Reserve by the Harvey Reservoir under the

present proposal (with a full supply level of 78 metres AHD), the impacts on the ecological values of the Falls Brook Reserve are expected to be negligible.

Harvey River Restoration Trust

The WRC indicated in the Allocation Plan that, in order to offset the loss of riparian functions resulting from a new and larger dam in the Harvey River valley, any developer of the Harvey Hills resource would be required to make a major contribution to a Harvey River Restoration Trust and that the Trust would promote the rehabilitation of the Harvey River system. (WRC, 1998a).

Accordingly, the Water Corporation has committed to the provision of a major contribution ($750 000 over 5 years) to the Trust to offset the loss of riverine environments which will occur as a result of inundation by the new Harvey Dam. Although presented as a component of the Land Acquisition and Rehabilitation Strategy, the Restoration Trust, which is to be administered by the WRC, can be viewed as a major initiative in its own right.

The Harvey River Restoration Trust aims to provide resources for the restoration of significant environmental values over a notional riparian area of 188 hectares (the approximate area of riverine areas inundated by the new Harvey Dam). As the Trust will principally provide supplementary funding for community initiatives, funding or in-kind contributions from community organisations may result in the length of river restored being greater than this.

Restoration of the riverine zone is proposed to include weed control, revegetation, and placement of large woody debris as stream habitat. Cattle crossings and fencing are also proposed to limit livestock access to enable regrowth of the understorey. Engineering works to modify existing channel dimensions to improve bank stability and reduce the amount of water required for riverine and wetland inundation may be appropriate in certain situations, subject to available resources.

Harvey River below Stirling Dam

The section of the Harvey River between Stirling Dam and the new Harvey Reservoir (approximately 10 km) has been extensively modified by releases of water for irrigation and whitewater canoeing. Releases of water over the summer months for whitewater canoeing since the early 1980s have resulted in accelerated erosion of the banks of the Harvey River between Stirling Dam and the Harvey Dam (particularly in the section between 4 and 8 km from Stirling Dam). This erosion has been exacerbated by the local soil type and past farming practices which have reduced the level of bank protection provided by riparian vegetation (WRC 1998a).

The proposal to divert water from Stirling Dam for the PMWSS will reduce the volume of water released to the river throughout the year.

Additionally the release of water from Stirling Reservoir when it is lowered during the upgrade of Stirling Dam has the potential to cause further erosion if not carefully managed. The intensity of, and management of the rate of commencement and cessation of releases are likely to be important factors in minimising erosion potential (Welker et al 1997).

Harris-Stirling Pipeline discharge

Subject to obtaining a water allocation licence from the WRC, the Water Corporation proposes to transfer water from Harris Dam to Stirling Reservoir for supply to the PMWSS (refer to Section 6). Water from the pipeline would be discharged into a stream tributary of Stirling Reservoir. Although the PER referred to two discharge points, the proponent has subsequently indicated that one discharge point is now proposed.

The proposed discharge point for the Harris-Stirling Pipeline is a typical upland, jarrah forest stream which are generally characterised by high loads of large woody debris (LWD) in the channel. The high LWD load decreases the capacity of the channel to convey substantial flood

flows (Streamtec, 1998a). The discharge site is unregulated and has an intact riparian zone. In places, the stream is bedrock-controlled and consequently is not erodable (Welker, 1999a). However there may be a requirement to time operation of the pumpback according to weather conditions and / or water levels in the receiving streams and to monitor and respond to erosion or adverse changes in water quality.

The natural flow regime at the discharge site was determined by the proponent using the historic flow records for other streams in the nearby Harvey area (Streamtec, 1998).

The pumpback may discharge up to approximately 70 ML/d (average of 0.7 m^3/s) for extended periods in the first years following commissioning. In the longer term the pumpback will operate for a limited period following winter in accordance to the amount of water that is available from the Harris Dam. The pumpback will discharge at a constant rate but will add to any natural flows from the catchment (Welker 1998a).

Agency and public comments

Harvey River below Stirling Dam.

A number of submitters expressed the view that releases for white water canoeing had created erosion in the Harvey River below Stirling Dam. One submitter from a member of a canoeing association expressed a recognition of the need to protect the environmental values of the River while preserving opportunities for whitewater events.

A number of submissions expressed the view that the release regime for irrigation requirements has had some beneficial effects on riparian communities of the Harvey River below Stirling Dam. Some of these submissions also took the view that a reduction in flow may have an adverse impact on the riparian communities along the river, which they think may have adapted to some degree to the longer period and unnatural pattern of annual flows.

The Water Corporation has responded to this view by indicating that

"the current release regime from the Stirling Dam to the Harvey Dam is highly modified. Large volumes of water are released to the Harvey River downstream from the Stirling Dam during the summer months when, under a normal hydrological regime, flows would be very small. The proposed change in release volume (from a current maximum of about 45 GL to the proposed 16 GL) will not impact the environmental values of the Harvey River Downstream from the Stirling Dam."

Assessment

The area considered for assessment of this factor is the new Harvey Reservoir, the Harvey River downstream from Stirling Dam, and the tributary of the Stirling Reservoir into which the Harris-Stirling Pipeline will discharge.

The EPA's environmental objectives for this factor are:

- to maintain the integrity, functions and environmental values of watercourses; and
- to maintain surface water quantity so that existing and potential uses including ecosystem maintenance, are protected.

New Harvey Dam and Harvey River Restoration Trust

In its advice on the Harvey Basin Surface Water Allocation Plan (EPA, 1998b), the EPA noted that the WRC recommended that the full supply level of the new Harvey Dam be no greater than 78 metres AHD so as not to impact on the nature conservation values of the Falls Brook Nature Reserve.

The EPA considers that the impacts of the present proposal (with a full supply level of 78 metres AHD) on the ecological values of the Falls Brook Reserve are expected to be negligible and therefore are not environmentally significant.

The EPA also considers that the Water Corporation's commitment (P14) to contribute $750 000 to the Trust, in addition to subsidiary benefits of other elements of its Land Acquisition and Rehabilitation Strategy, provides the opportunity to offset the loss of riparian function which will occur as a result of inundation of watercourses by the New Harvey Dam.

Harvey River below Stirling Dam

In response to concerns raised regarding downstream releases from Stirling Dam, the Water Corporation has provided an additional commitment (P16) to prepare and implement an investigations program in order to determine the environmental water requirements of the section of Harvey River between the new Harvey Reservoir and the Stirling Dam, taking into account the long period over which this section of the river has been subject to an altered flow regime. On the basis of these investigations, the WRC will determine the Environmental Water Provisions (EWPs) required for releases to minimise the erosive effect and protect the environmental values of the river. This will provide the baseline information to enable the WRC to more effectively regulate allocated releases from Stirling Dam to meet environmental as well as recreational or aesthetic functions.

The EPA considers that the reduction in releases for irrigation which will occur as a result of the Stirling-Harvey Redevelopment may provide an opportunity to examine the potential for managing future releases from Stirling Dam (particularly with respect to their frequency, timing, intensity, and duration) to improve the ecological function of this section of the river within the expected volume of release from Stirling Dam (approximately 16 GL per year). Maintenance and protection of river channel integrity should be a primary consideration in determining the environmental water requirements of the river.

The proponent has also provided an additional commitment (Commitment P45) to prepare and implement a Stirling Reservoir draining and water release management plan to the requirements of WRC. This commitment has the objective of preventing channel erosion below the Stirling Dam from releases during the upgrade and new intake tower construction planned as a component of the proposal.

The release of water for whitewater canoeing is not part of the Water Corporation's proposal for the Harvey-Stirling Redevelopment Scheme. The matter of releases for whitewater canoeing is still being considered by the WRC, and will only be permitted to recommence with the approval of the WRC.

The EPA considers that the proponent's commitments and the future actions of the WRC in determining required environmental water provisions and downstream release rates will enable the project to be managed to meet the EPA's objective.

Harris-Stirling Pipeline discharge

The PER indicated that the discharge from the Harris-Stirling Pipeline (up to 0.7 m^3/s) was to be partitioned between two streams (A and B) with a combined bankfull capacity of approximately 6 m^3/s (see PER Figure 13) . However during the assessment process, the Water Corporation further investigated the requirement for clearing of vegetation for the pipeline discharges. After receiving further technical advice from its consultant (Streamtec letter, June 1999), the proponent advised that it considers that the reduction in impact on the receiving streams resulting from using two discharge outlets would be less significant than the additional clearing required to locate discharge point B in a suitable location along the receiving watercourse. This was estimated to be an area 300 metres long by 8 metres wide. The receiving stream for the single discharge point now proposed for the Harris-Stirling Pipeline has a channel capacity of 3.65 m^3/s which although less than 6 m^3/s, is approximately 5 times the maximum discharge rate of the pumpback.

During the assessment, the proponent responded to discussion of the risk of possible erosion associated with the discharge site by modifying its original commitment (now Commitment P12) so as to allow for monitoring of possible changes to water quality and channel morphology at the discharge site for the Harris-Stirling Pipeline (as well as below the new Harvey Dam). The proponent has also provided an additional commitment to prepare and implement a channel erosion contingency plan as a component of the project EMS, which includes trigger levels for action in the case of erosion being identified (Commitment P13).

Summary

Having regard to:

a) the aim and objectives of the Harvey River Restoration Trust, which is to be administered by the WRC, and the Water Corporation's commitment to provide funds to the Trust; and

b) the proponent's commitments to:

- prepare and implement an investigations program to provide information in relation to the adequacy of environmental water provisions downstream from the proposed new Harvey Dam;

- prepare and implement an investigations program to determine environmental water requirements on the Harvey River between the new Harvey Reservoir and the Stirling Dam (new Commitment P16); and

c) the requirement for approximately 16 GL/yr of water to be released from the Stirling Dam;

it is the EPA's opinion that the proposal is capable of being managed to meet the EPA's objectives for watercourses and surface water quantity.

3.4 Landform and rehabilitation

Description

Construction of the Stirling-Harvey pipeline through steep sections of the Harvey valley below Stirling Dam has the potential to alter the natural landform and vegetation. The rehabilitation of these areas will need to be carried out in consultation with landowners, including CALM, in order to ensure that erosion and visual impacts are minimal in the medium and long term and that rehabilitation is consistent with areas adjacent to the pipeline.

The hard rock quarry to be established near the construction site for the new Harvey Dam will involve a change to the landform of the quarry site. The quarry site, part of which will be submerged by the new Harvey Dam, and part of which may be exposed as sheer rock faces, will require particular management of potential aesthetic and risk-related issues. The quarry will require an approved Project Management Plan from the Department of Minerals and Energy (DME) which includes provision for rehabilitation of quarry faces.

In addition, the proponent has committed to an extensive programme of rehabilitation or restoration of gravel and earth borrow pits, farmland areas and degraded areas of remnant vegetation as components of the Land Acquisition and Rehabilitation Strategy in order to offset impacts of the proposal on vegetation communities and other environmental factors.

Agency and public comments

One submission maintained that the access track proposed adjacent to the Stirling-Harvey Pipeline would be particularly prone to erosion on the steep slopes adding that *"It is highly likely that localised destabilisation will result in minor earth slips and increased erosion over time, especially in the steeper areas where the width of disturbance will be greater."*

A few submissions recommended that to minimise impacts on the environment, the proposed pipeline should either be tunnelled, located in existing road reserves and cleared lands, or relocated away from the river valley route.

One submitter asked if the regeneration work associated with the proposal will be carried out using professional assistance or left to volunteer groups. The Water Corporation responded to this submission by providing the following advice:

"The planning of the revegetation work has already commenced and includes a team with extensive experience in rehabilitation in the Jarrah forest (J Quilty and E Mattiske combined have a minimum of 40 years of experience working in this area). Rehabilitation planning has already addressed current site needs, site remedial needs, selection of appropriate local native species by vegetation complex and site-vegetation type.

Regeneration work will be carried out using professional assistance if the nature of the work is specialised or special equipment is required. Volunteer groups may be utilised under supervision."

Assessment

The area considered for assessment of this factor is the Stirling-Harvey and Harris-Stirling Pipelines and the quarry areas near the construction site for the new Harvey Dam.

The EPA's environmental objective for this factor is to establish stable, sustainable landforms consistent with surroundings and to ensure that the areas affected by the proposal or the proponent's Land Acquisition and Rehabilitation Strategy are rehabilitated to a standard consistent with the values of the areas disturbed or permanently lost.

Harvey-Stirling and Harris-Stirling Pipelines.

The proponent's outline of the proposed rehabilitation strategy which is within the Land Acquisition and Rehabilitation Strategy (Appendix 1 of the proponent's response to public submissions) provides the following preliminary objectives for rehabilitation of the Harris-Stirling and Stirling-Harvey pipelines and other areas disturbed by the proposal:

- *To create a stable landscape with self-sustaining vegetation communities that are consistent with the current composition of vegetation complexes found in the area.*
- *All seed to be collected from local native species and applied in mixtures based on the recognised floristic composition of the site-vegetation types (as used in the rehabilitation planning) which occur within this valley system.*

The proponent has also provided a description of the parameters for which completion and rehabilitation performance criteria will be developed and applied for the project overall which include the following:

- Soil stability;
- Recruitment of fauna into rehabilitation areas;
- Diversity and abundance of native flora species;
- Development of a diversity of structure (height and plant cover) and composition of local plant communities;
- Presence of weeds and dieback disease;
- Establishment of ecological processes; and
- Resilience to fire.

Preliminary performance targets and criteria will be established for each rehabilitation stage which will be reviewed annually following monitoring.

The EPA is aware that, with respect to the rehabilitation of the pipeline areas, it is not proposed to fully rehabilitate the pipeline areas to the extent that large trees will not be planted or permitted to grow within close proximity (a few metres of) the pipeline. However the EPA considers that the limited maximum clearing widths (20 and 12 metres respectively) for the Stirling-Harvey and Harris-Stirling Pipelines will mean that ecological impacts of the pipeline will be limited. The EPA has provided further advice on this matter in Section 3.10 of this report in relation to visual impacts of the pipelines.

Quarry areas

The objective for rehabilitation of the hard rock quarry and borrow pit areas associated with the proposal is also stated in the Land Acquisition and Rehabilitation Strategy as follows:

- *Create a safe, stable, landscape with visual amenity and a cover of native vegetation based on local native flora species.*

The EPA considers that this is an acceptable rehabilitation objective for these areas and believes that the specific issues relating to rehabilitation of these areas can be adequately managed through the proponent's Rehabilitation Plan (new commitment P17), and through the requirements of the Department of Minerals and Energy as part of that Department's approval of a quarry Project Management Plan.

Land Acquisition and Rehabilitation Strategy

Prior to accepting the proponent's commitments to rehabilitate or restore degraded lands to offset impacts on intact vegetation, the EPA sought an undertaking from the proponent that rehabilitation or restoration would be to the highest possible standard (in other words industry best practice). The Water Corporation responded to this undertaking by providing an outline of the rehabilitation objectives, rehabilitation process and completion criteria to be developed for each type of area nominated for rehabilitation or restoration works.

The Corporation also provided a new commitment (P17) to prepare and implement to DEP requirements, a rehabilitation plan for areas disturbed by the proposal, the buffer zone and peppermint woodland and Forrestfield Complex vegetation rehabilitation areas as described in Appendix 1 of the proponent response to submissions (Appendix 4 of this report). This commitment resulted from the amalgamation and amendment of commitments P21 and P57 which were listed in Section 11 of the PER.

Summary

Having particular regard to the proponent's commitments to:

(a) restrict the clearing zone for the Stirling-Harvey Pipeline to a maximum of 18 metres; and

(b) prepare and implement to DEP requirements, a rehabilitation plan for areas disturbed by the proposal, the buffer zone and peppermint woodland and Forrestfield complex vegetation rehabilitation areas as described in Appendix 1 of the proponent response to submissions (commitment P17);

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for landform and rehabilitation.

3.5 Noise and vibration

Description

As described in the PER, the construction site is set primarily within a rural area about 1.5-2 km east of the South West Highway. Between the highway and the construction site and upstream from the site are a number of residences, the nearest of which is located adjoining the earthfill excavation and the next nearest, about 0.5-0.8 km to the south and south west of the construction site. The closest residential area (containing about 40 residences) is located near Aachen Way, approximately 1.2 km from the site (see Figure 5).

In addition, there are a number of offices and residences belonging to Government agencies on the south side of Weir Road, and the Agricultural School residential and administrative facilities to the north west of the site.

The construction phase of the proposal will result in emissions of noise and vibration. The three main sources of noise and vibration from construction would be:

- noise from machinery, vehicles and activities associated with the construction of the embankment, spillway, rockfill quarry and earthfill borrow areas;
- air blast over-pressure noise and vibration from blasting; and
- noise from truck traffic movements to and from the construction sites.

Construction noise and vibration

Dam construction activities will be primarily confined to October to May over a period of two years. Construction activities (spillway and foundations) in the first year will normally take place between 0700 and 1900 hours excluding Sunday and public holidays. Continuous concrete pours may occur outside these times. In the second year, construction of the embankment is expected to be for a longer period during the day (0700 - 2000 hours).

Maps showing the proponent's prediction of noise level contours under worst case conditions are shown in Figures 24 and 25 of the PER for the first and second seasons of construction.

Noise levels during the first season (during spillway and dam foundation construction) at the nearest residence in Aachen Way are likely to be up to 14 dB(A) above the assigned daytime (0700-1900 hours) noise level of 45 dB(A) under downwind conditions of 4m/s. In the second season (embankment construction), daytime noise levels may be up to 9 dB(A) above the assigned level. Noise levels may be up to 12 dB(A) above the assigned noise level of 40 dB(A) between 1900-2200 hours under 3 m/s downwind conditions and 20°C/100m temperature inversion in the second season. These predicted noise levels may be adjusted by +5 dB(A) to allow for the likely annoying (tonal) characteristics of noise emissions from the construction site.

These predictions are based on wind blowing directly from the construction site to residences at nominated wind speeds for daytime and evenings. The noise impact will be less for lower wind speeds, when winds are not blowing directly towards residences, and at higher wind speeds when ambient noise levels are higher.

Table 23 of the PER indicates that calm and light easterly wind conditions are likely to be experienced for about 20-25% of the construction period.

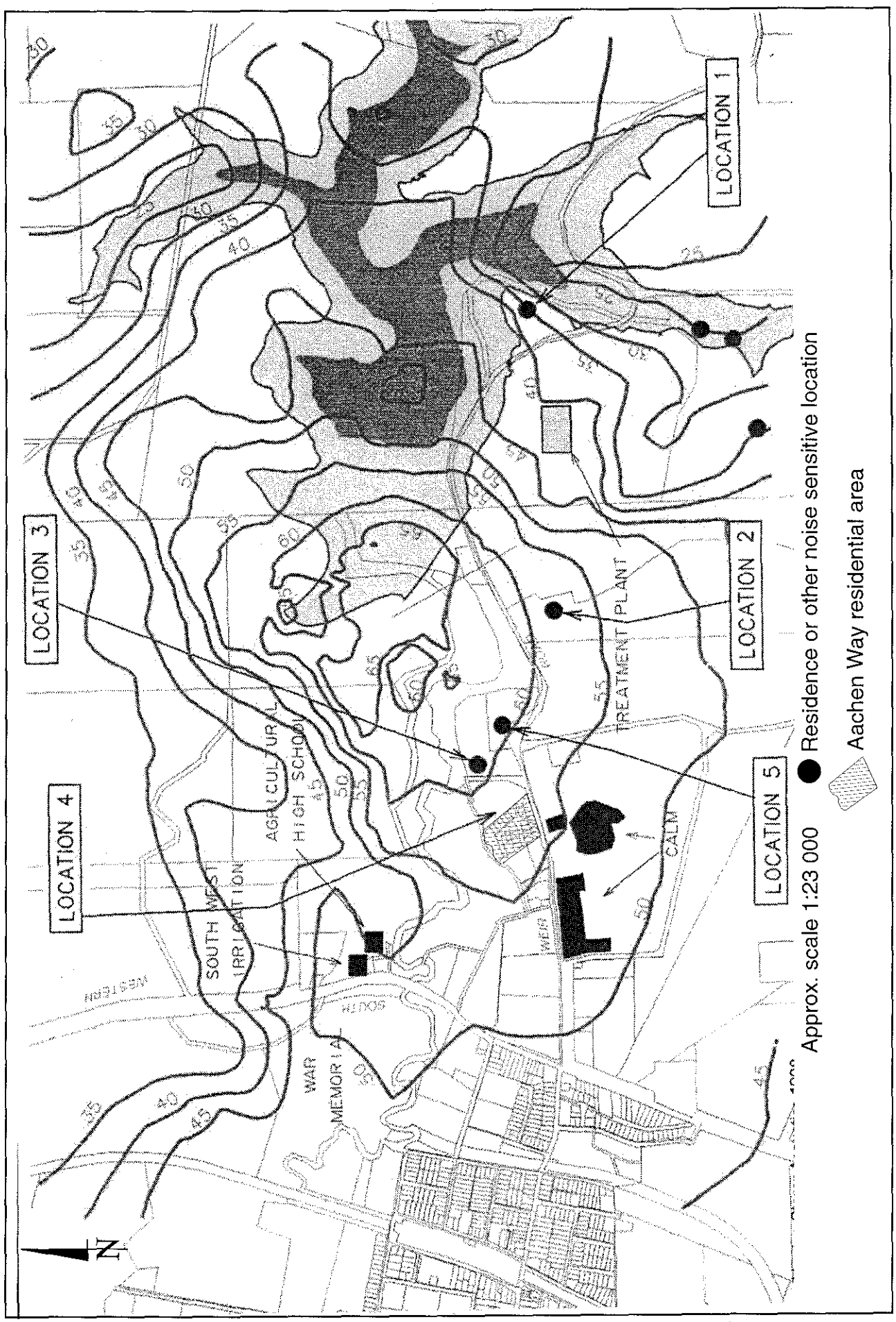

Figure 5. Noise prediction contour map for the first season of construction of the new Harvey Dam (worst case conditions) (Source: Welker, 1999a).

Blasting noise & vibration

Blasting will be required during construction to obtain rockfill materials from a site located about 500 metres to the north-east of the dam wall. In addition, construction of the spillway, dam foundation and outlet conduit preparation, will require some blasting.

The PER indicates that blasting will be restricted to Mondays to Saturdays excluding public holidays between the hours of 0900–1700 hours and that, as far as possible, blasting will be carried out at the same time each day, following consultation with nearby residents, to reduce potential annoyance.

Blast over-pressure levels will be required to be kept in compliance with the Noise Regulations and the PER indicates that vibration will be kept below criteria prescribed by the Australian Standard by managing charge size and time delay between individual blasts.

A survey will be conducted of the condition of residences (the presence of any cracks etc) within about 1.5 km of the construction site prior to the commencement of any blasting.

Measures listed in the PER to minimise the noise and vibration impacts from blasting include:

- designing for each blast, specific initiation, charge weight per delay and overall blast size characteristics to meet the noise and vibration criteria at all residences;
- carrying out blasting at approximately the same time each day, determined in consultation with the local community; and
- monitoring noise and vibration at a reference site for every blast, and making the results available to residents.

Transport noise and vibration

Construction will involve the transport of aggregate and pipes by trucks (with trailers) along Weir Road to the construction sites. At the peak of the construction stage, up to 100 truck movements a day are anticipated.

Truck movements may give rise to increased noise at residences along the transport route. However the PER indicates that the movement of these trucks to the construction site will be restricted to daylight hours (0700–1900) and will avoid the picking up and setting down times at the Harvey Senior High School. The proponent has also committed to preparing and implementing a construction traffic management plan in consultation with the Shire of Harvey.

The PER also predicted that up to 40–50 log truck movements may occur each day during the harvesting of softwood logs from CALM pine plantations.

The preliminary draft EIA Guidance No.14 - "Road and Rail Transportation Noise" prepared by the EPA recommends external noise levels of 75 dB(A) as a maximum level and 55 dB(A) as an average (LAeq) level. The recommended internal maximum level in living spaces, for the existing traffic of about 10 trucks per hour, would be 55 dB(A).

The PER indicates that the maximum noise level of a typical truck passing along Weir Road would be approximately 73 dB(A) at a distance of 30 m from the road. The corresponding internal noise level in a house with windows open, would be 63 dB(A). Thus the recommended internal noise level is exceeded by the existing traffic on Weir Road.

In this case the draft Guidance would recommend limiting the overall increase in average (L_{Aeq}) level to 3 dB(A).

Agency and public comments

Construction noise (including blasting)

One submission maintained that the noise level in residential areas on the east side of the South West Highway is likely to be more than operational assigned noise levels for a significant amount of time and asked how the noise mitigation measures will be negotiated with residents more than 500m from the proposed dam wall?

One submission suggested that the proposed hours of operation are of some concern considering the Hillside Road and surrounding area is a relatively tranquil place to live and requested that the hours of operation be restricted to 0700 to 1700.

Transport related noise and vibration

CALM advised that the level of heavy vehicle movements quoted in the Executive Summary of the PER (page ii) and section 10.5.1 are extreme maximums and should be put into context when used as comparisons to the proposed usage by this project. Harvesting activities would not cover the same period. Recent operations in Tallanalla Plantation produced a maximum of 16-18 trips per day (32-36 truck movements).

A number of submissions expressed concern over the predicted increase in the volume of heavy truck and light vehicle movements on Weir Road associated with construction and the management of this increase in terms of noise and traffic safety.

The DEP expressed a view that the 4 truck movements per hour required for 24 hours a day over a period of up to 6 days for continuous concrete pours would be likely to result in substantial and unacceptable sleep disturbance for some residents. The submission strongly recommended that an on site concrete making (batching) plant be used (the possibility of this was identified in the PER) and indicated that other mitigation measures will need to be identified if an on-site batching plant is not used.

Assessment

The area considered for assessment of this factor is the construction site for the new Harvey Dam and residences located on Harvey Weir and Harvey-Quindanning Roads.

The EPA's environmental objective for this factor is to protect the amenity of nearby residents from noise and vibration impacts resulting from activities associated with the proposal by ensuring that noise levels meet statutory requirements and acceptable standards.

Construction noise (including blasting)

The proponent's modelling predictions of noise from construction as discussed in the PER, have identified the possibility that noise levels during the first construction season (during spillway and dam foundation construction) at the nearest residence in Aachen Way could be up to 14 dB(A) above the assigned daytime (0700-1900 hours) noise level of 45 dB(A) under downwind conditions of 4m/s.

The PER also predicts that in the second season (embankment construction) daytime noise levels at Aachen Way may be up to 9 dB(A) above the assigned level and between 1900-2200 noise levels may be up to 12 dB(A) above the assigned noise level of 40 dB(A). These predicted noise levels may be adjusted by +5 dB(A) to allow for the likely annoying (tonal) characteristics of noise emissions from the construction site.

The *Environmental Protection (Noise) Regulations 1997* do not require adherence to assigned noise levels for construction activities carried out between 0700 and 1900 hours on any day except Sunday and public holidays provided:

- the construction work is carried out in accordance with section 6 of the Australian Standard 2436–1981 "Guide to Noise Control on Construction, Maintenance and Demolition Sites";
- the equipment used is the quietest reasonably available; and
- a noise management plan is submitted at the request of the DEP.

This is because the Regulations recognise both the transient nature of construction noise and the general lack of flexibility in siting construction activities.

Additionally, construction may occur outside these hours or on Sundays or public holidays provided the above conditions are met and:

- all nearby residents are advised of the work to be done at least 24 hours before it commences;
- the proponent demonstrates that it is reasonably necessary for the work to be done out of hours; and
- the proponent submits a noise management plan to the DEP for approval, at least seven days before the work starts. The noise management plan would be required to include details of the need for the work, type of work, predicted noise levels, control measures, noise and vibration monitoring and complaint response procedures.

The proponent has provided a number of commitments in the PER with the objective of ensuring that residents near the construction site do not suffer significant impacts from noise associated with construction. These commitments are as follows :

P21. *Prepare and implement a construction noise and vibration management plan in consultation with nearby residences, the Shire of Harvey and according to the requirements of DEP* (with the objective of minimising noise impacts and meeting appropriate standards including AS 2436-1981).

P22. Conduct noise monitoring in the residential area on Weir Road for the dam construction period.

P23. Make available the results of any noise audit and noise and vibration monitoring to the local community.

P24. Comply with regulatory standards and take all reasonable measures to minimise impacts at the nearest noise sensitive premises for air blast noise and overpressure. These measures will include:-

- designing for each blast, specific initiation, charge weight per delay and overall blast size characteristics to meet the noise and vibration criteria at all residences;
- carrying out blasting at approximately the same time each day, determined in consultation with the local community; and
- monitoring noise and vibration at a reference site for every blast, and making the results available to residents.

P25. Negotiate with the occupiers of residences within 500 m of the dam construction site to mitigate the impact of noise levels.

P26. Conduct a survey of residences within about 1.5 km of the dam construction site, at no cost to the owner, to determine the baseline condition of the residences.

P27. Conduct trial blasting to determine a procedure to protect nearby residential dwellings.

The proponent also provided guidance on detailed aspects of the proposed management of noise impacts in its response to public submissions (Appendix 4, Section 4.2.3).

The EPA considers that given the proponent's commitments and the ability for aspects of the proposal to be further refined to minimise noise impact to the requirements of the DEP through the approval process for the proponent's Noise Management Plan, the aspects of the proposal associated with construction are capable of being managed to meet the EPA's environmental objective for noise and vibration.

Transport noise

The key concerns expressed in public submissions on the impacts of traffic noise were related to:

a) increased levels of traffic generally leading to higher noise levels; and

b) noise from heavy vehicle traffic during the proposed continuous concrete pours taking place over 24 hours for up to six days.

Following discussion of the matter of the general increase in levels of traffic during the EPA's assessment of the proposal, the proponent has provided an additional commitment (P46) to upgrade sections of Honeymoon Road to improve safety and reduce dust generation in order to remove the current restriction on the use of Honeymoon Road by logging traffic. This is expected to reduce the maximum predicted peak heavy vehicle traffic levels during the summer construction period to around 140 rather than 190 movements per day. The current maximum levels are estimated in the PER to be around 115 movements (including log trucks).

The preliminary draft EIA Guidance No.14 - "Road and Rail Transportation Noise" prepared by the EPA recommends external noise levels of 75 dB(A) as a maximum level and 55 dB(A) as an average (L_{Aeq}) level. The recommended internal maximum level in living spaces, for the existing traffic of about 10 trucks per hour, would be 55 dB(A).

Based on the information presented in the PER, the recommended internal noise level is already exceeded by the existing traffic on Weir Road. In this case the draft Guidance would recommend limiting the overall increase in average (L_{Aeq}) level to 3 dB(A).
The DEP has advised that this limitation on the level of noise level increase could be achieved by a combination of measures including limiting the noise levels of trucks through the contract process, limiting truck speeds past sensitive areas, prohibition of engine braking and upgrading of road edges where appropriate. The proponent has advised in its response to public submissions (Appendix 4, Section 4.2.3) that these measures will be implemented as part of the Noise and Vibration Management Plan for the proposal.

The EPA therefore considers that limitation of increase in average (L_{Aeq}) level to no more than 3 dB(A) to be achievable on the basis that :

a) the increase in truck numbers will be from about 115 to about 140, with the proposed opening of Honeymoon Road to log trucks. This increase in truck numbers (of the same noise level) would cause a 1 dB(A) increase in the average (L_{Aeq}) noise level; and

b) the maximum noise levels of the trucks associated with construction works would be limited to the same or lower levels than the log trucks which use Harvey Weir Road through the contract process and through the Construction Noise and Vibration Management Plan.

The EPA notes the long term benefit of removing log trucks from Weir Road after the completion of dam construction. However the EPA also notes that there is one residence on Honeymoon Road which is set back from the road, but for which the possible need for ameliorative measures should be assessed in the Construction Noise and Vibration Management Plan.

In regard to the likely noise impacts associated with continuous concrete pours taking place over 24 hours, the DEP considers that the Water Corporation should be required to undertake further mitigation measures for residents along Weir Road who are adversely affected by truck movements during the proposed continuous concrete pours. This should be incorporated during the DEP's approval process for the Construction Noise and Vibration Management Plan and be based on DEP agreed sleep disturbance criteria.

In view of the proponent's commitments and the ability for further adaptation of management and mitigation measures through the Noise and Vibration Management Plan to be developed to the requirements of DEP, it is expected that impacts from transport noise will be manageable to meet the EPA's objectives.

Summary

Having particular regard to:

- the predicted noise levels associated with the proposal from construction activities and heavy vehicle movements;
- the proponent's commitments to minimise noise impacts and meet appropriate standards and to prepare a Construction Noise and Vibration Management Plan to DEP requirements, which will make provision for heavy vehicle traffic noise (including further mitigation for residences affected by 24 hour continuous concrete pours); and
- the proponent's commitment to upgrade Honeymoon Road to allow diversion of log truck traffic during the construction period;

it is the EPA's opinion that the proposal can be managed to meet the EPA's objective for noise and vibration.

3.6 Particulates and dust

Description

Figure 6 of the PER shows that the construction site is set primarily within a rural area about 2 km east of the South West Highway. Between the highway and the construction site, and upstream from the site are a number of residences the nearest of which is located adjoining the earthfill excavation.

The next nearest are about 500-800 metres to the south and south west of the construction site. The closest residential area (containing about 40 residences) is approximately 1.2 km from the site and there are also a number of offices and residences belonging to Government agencies on the south side of Weir Road. The Harvey Agricultural School residential and administrative facilities lie to the north west of the site.

To the west and south east of the construction site are vineyards that grow table grape varieties. The productivity and marketability of these grapes is very sensitive to contamination by airborne dust. Strong easterly winds have the potential to convey dust from the construction site to these areas (Welker, 1999).

The main potential sources of airborne dust are:

- heavy vehicle movements over unpaved roads or tracks;
- earth-moving by bulldozers, front-end loaders and haulpacks;
- lift-off from exposed, dry surfaces such as cleared areas and stockpiles;
- drilling to place explosive charges and subsequent blasting; and
- the handling of imported granular materials associated with dam construction.

The PER states that the potential for airborne dust will be minimised by:

- the distance of the site from the majority of residences;
- keeping exposed surfaces such as stockpiles and cleared areas to a minimum;
- implementing good housekeeping practices to ensure that waste materials do not accumulate and lead to the generation of dust;
- applying water sprays during potentially dusty activities such as loading and unloading quarry material; and
- the use of the Nonel blasting system which avoids ground surface disturbance associated with detonation thereby reducing dust generation.

The PER also provides a commitment to the preparation and implementation of a dust management and monitoring plan in consultation with local residents, the Shire of Harvey and DEP, detailing measures to minimise on site dust emissions in accordance with best practice, including:

- adoption of wet drilling procedures or provision of dust collectors on drilling equipment to minimise dust generation by this activity;
- the scheduling of blasting as far as practicable when winds will not carry dust towards residences;
- imposing an appropriate speed limit on trucks using haul roads, and watering these roads and the quarry and borrow pit floors to reduce dust generation;
- if warranted, employing mobile sprinklers in operational areas to maintain surfaces in a moist state; and
- keeping dust prone areas wet, including overnight.

The dust management plan will also describe an ambient dust monitoring program. The program will be designed to:

- provide feedback information to assist dust management practices;
- verify that dust levels meet ambient criteria; and
- determine dust levels near table grape growing vineyards to the east of the construction site.

Agency and public comments

One submission asked whether dust levels east and west of South Western Highway have been monitored and recorded and whether monitoring will continue during construction.

The EPA visited the site of the Stirling-Harvey Redevelopment in May 1999 and spoke to owners of table grape growing enterprises who expressed concern about the potential effects of contamination of grape crops by airborne dust on their marketability. The persons concerned expressed the view that management of the construction site will be required on summer nights after construction activities have finished for the day as well as during the daytime operational period. The view that a compensation claim mechanism will be required in the event of damage being sustained to grape crops was also expressed.

Assessment

The area considered for assessment of this factor is residential areas and sensitive rural activities (such as table grape growing areas) on the east side of South West highway within close proximity to the new Harvey Dam construction site.

The EPA's environmental objective for this factor is to ensure that the dust levels generated by the proposal do not adversely impact upon welfare and amenity or cause health problems by meeting statutory requirements and acceptable standards.

The criteria for acceptable dust levels have been prescribed in the Environmental Protection (Kwinana) (Atmospheric Waste) Policy 1992 and Environmental Protection (Kwinana) (Atmospheric Waste) Regulations 1992, collectively known as the "Kwinana EPP".

The residential criteria for total suspended particulates (TSP) in the Kwinana EPP are:

- 1000 $\mu g/m^3$ (15-minute average);
- 90 $\mu g/m^3$ (24-hour average) which it is desirable not to be exceeded; and
- 150 $\mu g/m^3$ (24-hour average) which shall not be exceeded.

The main intent of these criteria is to protect visual amenity and prevent dust nuisance.

A National Environment Protection Measure (NEPM) for Ambient Air was endorsed by the National Environment Protection Council in June 1998. This measure contains a standard for particulate matter with an equivalent aerodynamic diameter of 10 microns or less, referred to as PM_{10}, which is shown in Table 17 of the PER.

The PER states that control of dust to meet the TSP criteria should ensure that the PM10 criterion specified in the NEPM are also met. The PER also states that the need to keep materials used in constructing the dam wall above a specific moisture content and the separation of the site from residences will mean that movement of dust from the site at levels which are likely to create a nuisance should be insignificant. However, the PER adds that contingency measures will be developed and described in the dust management plan to ensure dust emissions are minimised.

The EPA considers that, on the basis of the information provided in the PER and the proponent's response to public submissions, that the proposal can be managed through the implementation of the dust management plan to meet the EPA's objective for particulates and dust. However during the assessment process, the view was expressed that as a contingency, grape growers should be able to have reasonable confidence that they would be compensated if they suffer significant economic impacts which can be attributed to the construction of the new Harvey Dam.

As a result of discussion of this matter with the proponent, an additional commitment (P20) has been provided by the proponent to prepare a compensation claim procedure prior to construction, for any alleged adverse impacts on the marketability of table grapes jointly with vineyards owners operators east of the South Western Highway.

Summary

Having particular regard to the proponent's commitments it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for particulates and dust.

3.7 Post-development land use

Description

Current land uses

The PER states that private landowners in the Harvey Hills engage in a variety of land use activities primarily of an agricultural nature including grazing of dairy cattle, sheep farming, citrus orchards, pecan nuts, marron farming, table grapes, passion fruit vines, beef cattle, animal agistment, hay production, silviculture (blue gums), deer, and farm stay chalets.

Private landowners in the Harvey Hills fall into the following generalised groups:

- full-time Hills residents who operate farms;
- dairy farmers based in Harvey and nearby areas who have run-off blocks in the Harvey Hills; and
- landowners who reside in Perth and have lifestyle blocks or farms in the Hills.

Public sector land uses in the catchment include the Falls Brook Nature Reserve, a CALM pine plantation, Water Corporation reserves and State Forest. The Harvey Hills, with the exception of CALM managed State Forest and pine plantations, is zoned "General Farming" in the Shire of Harvey District Planning Scheme No 1. The Shire supports the continued use of the area for viable large scale farming activity, with some limited tourist and recreational activity possibly permitted where no adverse effect to the primary agricultural purpose of the zone would result. The minimum lot size for land zoned 'general farming' is 40 ha.

Predicted impacts

The social impact analysis conducted as part of the Harvey Basin Surface Water Allocation Plan identified three major sources of social impact associated with the Stirling–Harvey Scheme:

- inundation of public and private property;
- construction of the new dam wall, relocation of the Harvey–Quindanning Road and new access roads; and
- the imposition of source protection measures to control activities and land use within the Harvey Reservoir catchment.

These impact sources could result in two types of impact on social surrounds:

1) **Direct impacts on landowners as a result of construction, inundation of land or pipeline easements.**

   These impacts include:

   - displacement of the landowners or residents;
   - reduction in productive land area;
   - impacts on European or Aboriginal heritage values due to inundation;
   - fragmentation of properties due to roads or inundation; and
   - construction related impacts such as noise, dust, visual amenity or disruption of access.

   A 78 m AHD full supply level Harvey Reservoir would result in the displacement of four part time or full time residences on properties which are not owned by the proponent. A number of additional properties abutting the Harvey Reservoir would be affected by inundation (Welker, 1999a).

2) **Indirect effects on landowners and other groups due to requirements for change to existing and / or future land use activities (catchment management).**

   These changes would result from source protection requirements brought about by the use of the catchments of Stirling and Harvey Dams as drinking water catchment areas. Impacts include

   - potential reduction in the range of current or future land use activities or developments permitted;
   - additional management requirements for current agricultural land use activities; and
   - changes to the level and type of recreational activity and usage on and around the Harvey and Stirling Reservoirs.

Land acquisition policy

In order to address impacts on properties which are either partly or completely inundated by the Harvey Dam, the proponent has developed a land acquisition policy for the project which is outlined in Section 10-1-3 of the PER. The policy involves negotiation, purchase of parts of or whole properties and other arrangements. Where agreement cannot be reached through negotiation, resolution may be progressed in accordance with the *Land Administration Act* which makes provision for the role of the compensation court and an appeals process.

The implementation of the Stirling–Harvey Redevelopment Scheme involves the proponent acquiring some privately owned land in the Harvey Hills. The PER indicates that if the proposal is approved, the proponent would acquire privately owned property situated within the area of inundation for the new Harvey Dam and in the right of way for the realigned Harvey–Quindanning Road. In addition, a 30-metre wide buffer strip of land adjacent to the area of inundation would also be acquired. This would form the buffer area around the reservoir as required by the WRC.

In cases where the area of inundation and the reservoir buffer zone constitute only a small proportion of a particular private property, the PER states that the proponent would likely acquire only that small portion. Where the area of inundation and the buffer zone cover a substantial portion of a property, the proponent may purchase all or part of such properties, depending upon the desires of the landowner.

The proponent intends to seek easements over land required for the pipeline route from Stirling Reservoir to the Southern Trunk Main extension.

Agency and public comments

Dam construction, inundation and pipeline construction

A number of public submissions expressed concern about the impacts of inundation by the new Harvey Dam and the Stirling-Harvey Pipeline on their properties.

One public submission expressed the view that discouraging public access to private property from the proposed pipeline route will be a significant problem and that unauthorised access along the pipeline is likely to exacerbate problems such as trespassing and vandalism.

Catchment management

CALM advised that in its view, Priority 1 classification for all Crown land within the Harvey-Stirling catchment is not appropriate and is of major concern if it means that existing CALM commercial investments such as pine plantations are not given fair treatment and consideration. CALM's submission argues that there are sometimes inconsistencies in water catchment areas between the controls applying to softwood plantations and those agricultural land uses and that CALM's preferred option is for plantations to be zoned P2.

The Department of Agriculture expressed the view that the proponent should have provided a more detailed analysis in the PER of the impact of the proposal on agricultural enterprises and landowners in and around the area inundated by the new Harvey Dam.

Assessment

The area considered for assessment of this factor is the Harvey River Basin above the town of Harvey (referred to in the PER as the Harvey Hills).

The EPA's environmental objective for this factor is to ensure that changes to social surroundings resulting from the impacts of the proposal are identified and that appropriate mitigation actions are implemented.

Dam construction, inundation and pipeline construction

The impacts of the proposal relating to noise and dust are discussed in sections 3-5 and 3-6 of this report.

Impacts on European or Aboriginal heritage values due to inundation have been addressed in the PER and are referred to in Table 2 of this report.

The proponent has consulted with landowners in relation to the matter of disruption to access and has relocated the road access to properties on the north side of the dam wall so that it originates from Harvey Weir Road rather than from Honeymoon Road as referred to in the PER (see Appendix 4, Section 1).

The PER indicates that the negotiation process is in progress for properties affected by the project and that in some instances, a mutually acceptable arrangement has been agreed in accordance with the Land Acquisition Policy.

The EPA considers that proponent's Land Acquisition Policy and other statutory processes for the acquisition of land for public purposes can be applied so as to ensure that landowners are not affected in a significantly adverse way by the direct impacts of the proposal on their properties.

Section 8.7.2 of the PER and the proponent's Land Acquisition and Rehabilitation Strategy (Appendix 4) outlines the rehabilitation objectives for the Stirling-Harvey Pipeline which include the restoration of pre-existing agricultural land uses and the creation of a stable landscape with self-sustaining vegetation communities that are consistent with the current composition of vegetation complexes found in the area.

The proponent has indicated that fences and other structures currently limiting access to properties crossed by to the Stirling -Harvey Pipeline will be reinstated after construction and vegetation which is cleared will be reinstated except for large trees in close proximity to the pipe.

The EPA therefore considers that there are unlikely to be significant adverse impacts on social surroundings on properties affected by the Stirling-Harvey Pipeline.

Catchment Management

A policy to determine acceptability of private and public land uses for the purposes of water quality protection within the catchment area had not been developed when the EPA provided strategic advice on the Harvey Basin Surface Water Allocation Plan. However, at that time, the WRC proposed a water quality protection plan to ensure no increased risk of pollution results to the Harvey and Stirling reservoirs from inappropriate land use in the area. In developing the plan, the WRC expected to accommodate the majority of large scale land uses that presently operate in the Harvey Dam catchment. It was envisaged that intensive farming practices may be curtailed or modified to comply with the protection plan.

In the EPA's Report to the Minister for the Environment (Bulletin 910), the EPA noted that:

"WRC proposes an approach to developing catchment management plan in consultation with affected landowners"

The EPA also proposed that WRC or a water service provider involved in developing water supply infrastructure in the Harvey Basin, develop a policy for protection of water quality in consultation with affected landowners.

The EPA is aware that since it provided advice on the Allocation Plan, the WRC has engaged in a consultative process to develop the Stirling Catchment Area and Harvey Catchment Area Water Source Protection Plans. The WRC has also convened a Stakeholder Reference Group to assist directly in the preparation of these plans comprising "key stakeholder representatives" including;

- catchment and local representatives;
- Water and Rivers Commission;
- Water Corporation;
- Department of Conservation and Land Management;
- Health Department of WA;
- Local government;
- Fisheries WA; and
- Recreation interest groups including fishing, canoeing and rally driving.

The draft Water Source Protection Plans are due to be released for public consultation by the end of September 1999 with the finalisation of the plans scheduled for December 1999.

The EPA considers that the waters source protection planning process is appropriate for the resolution of issues relating to the promulgation of Water Source Protection areas and for developing policies for land use activities and best practice catchment management.

Summary

Having particular regard to :

(a) the issues raised in submissions by land owners affected by the proposed new Harvey Dam and Stirling Harvey pipeline;

(b) the Water and Rivers Commission's Water Source Protection planning process for the Harvey Basin;

(c) the proponent's land acquisition policy; and

(d) the proponent's commitments to address and mitigate the issues raised;

the EPA is of the view that the proposal can be managed to meet the EPA's objective for post-development land use.

3.8 Visual amenity

Description

The PER (Section 10.7.3) identified the components of the proposal with significant potential to impact on visual amenity as follows:

"A 35-metre high (above the river bank level) embankment, a spillway ranging from 30 to 60 metres in width cut through the hillside north of this wall, and the quarried face of a hillside immediately upstream of the dam will impact on the landscape of the valley of the Harvey River. On the upstream side of the dam, an extensive lake formed by the embankment will affect the landscape.

The pipeline between the Stirling and Harvey reservoirs will lead to a temporary disturbance of a small corridor of vegetation in native forest in the valley of the Harvey River."

As it is proposed to leave the area of land between the 75 metre AHD and 78 metre AHD inundation levels uncleared there is also a possibility that vegetation which is not cleared will die and that dead trees and other vegetation will adversely impact on landscape quality in the vicinity of these areas.

The proponent has undertaken to provide plantings of trees in the vicinity of the embankment and by agreement near residences within 1 km of the proposed dam to screen residences if requested by the residents, and to incorporate consideration of visual amenity in the proponent's rehabilitation plan (Commitment P17).

Agency and public comments

Only one submission commented directly on matters relating to visual amenity. This submission presented the view that a 1.4 metre permanently placed pipe (the Stirling-Harvey Pipeline) and the associated vegetation clearing will result in major irreversible impacts on the landscape.

However one submission relating to impacts on vegetation communities also has relevance to visual amenity. This submission contained the following statement

"The PER states that the areas affected by occasional inundation 'will result in the mortality of species which are susceptible to waterlogging'. All species of flora in the mid to upper slopes will be susceptible to waterlogging resulting in extensive tree deaths and loss of habitat. The assessment of environmental impacts should take this into consideration".

The Water Corporation responded to this submission by stating that *"There is no doubt that there will be some mortality in the inundation areas, however the type and extent depends on the species present and the length of inundation. In other studies of a similar nature in the western Darling Ranges there has been a shift in plant communities as a result of shifting levels of inundation and soil moisture regimes. The latter in part occurs in response to climatic conditions and there is evidence in other catchments within the northern Jarrah forest for this shift. The latter then becomes related to the degree of change and what species and communities are affected in aerial extent by such shifts. Historically many species are able to adjust to these changes, however this may take some time."*

Assessment

The area considered for assessment of this factor is the new Harvey Reservoir and the Stirling-Harvey pipeline.

The EPA's environmental objective for this factor is to ensure that the visual amenity of the area adjacent to the project is not unduly affected by the proposal.

The EPA notes the description of the low visual impact of the embankment and spillway for the new Harvey Dam. The EPA also notes the proponents undertaking in the PER to provide screening from the dam and hard rock quarry site in the event that particular residences find the visual impact unacceptable.

The EPA notes that the disturbance zone for the Stirling-Harvey Pipeline may be permanently visible as a minor change in landform and vegetation along its length because of the need for the pipeline to be reasonably navigable by suitable four wheel drive vehicles for pipeline repair or maintenance purposes and because trees will not be permitted to grow in close proximity to the pipe. However the EPA considers that given the proponent's rehabilitation commitments provided in the PER and in the response to public and agency submissions, and the location of the pipeline (which is to be fully buried along its length) low in the landscape, the impact on visual amenity should be minimal.

During the EPA's assessment, the view was expressed that there is some potential for adverse visual impacts around the edge of the new Harvey Dam if vegetation within the 75-78 metre AHD inundation zone, which will not be cleared during construction, dies as a result of waterlogging. These impacts, though not reflecting an additional environmental impact (the proponent included this area in its estimate of areas to be inundated), have some potential to diminish scenic values of the Harvey River valley. The EPA considers that the proponent should closely monitor changes in vegetation condition in areas of uncleared vegetation between in the 75 and 78 metre AHD inundation level,s and should prepare a contingency strategy to mitigate impacts on visual amenity in the event that these become unacceptable.

In response to the discussion of this matter, the proponent has agreed to manage potential visual impacts of inundation between the 75 and 78 metre AHD inundation levels, should these become unacceptable, through provisions of its proposed rehabilitation plan (Commitment P17).

Summary

Having particular regard to the proponent's commitments, it is the EPA's opinion that the proposal can be managed to met the EPA's objective for visual amenity.

3.9 Recreation

Description

The PER identified the following recreation activities in the Harvey River Catchment east of the Harvey town site which were documented during the preparation of the Harvey Basin Surface Water Allocation Plan:

- trout fishing (during most times of the year);
- marroning (which brings the greatest numbers of people to the existing reservoirs, but with some negative social impacts due to littering and some trespassing);
- picnicking (there are public BBQs and picnic tables near the Weir and a 1 km walk through natural surroundings follows the Harvey River to little Harvey Weir);
- swimming (not permitted in Gibbs Pool or the Harvey Reservoir); and
- abseiling (by schools and outdoor recreation clubs in the old quarry near the Harvey Weir).

The PER also identifies Rally Australia and white water canoe slalom events as the major public recreational events occurring n the valley. Rally Australia is the largest recreational event in the Harvey Hills and, as with the white water canoeing events of national and international standard, is an economic benefit to the Harvey district.

The proponent and the Shire of Harvey have completed a Memorandum of Understanding which provides for the preparation of recreation plans and the development of recreation facilities. The proponent has agreed to provide funds towards the preparation of recreation plans and the subsequent development and management of facilities on, around and below the Harvey Reservoir. These plans will be prepared in consultation with the local community and will result in some improvement to recreational facilities.

Agency and public comments

CALM provided advice on the PER, indicating that in its view:

- recreation and other current land uses in the catchment need to be considered in an integrated way with water resource protection issues;
- CALM needs to be consulted with respect to the planning of recreational facilities around the reservoirs; and
- the statement in the PER indicating the '...proponent has agreed to provide funds towards the preparation of recreation plans and subsequent development and management of facilities on, around and below the Harvey Reservoir' should be included as a commitment.

Assessment

The area considered for assessment of this factor is the Harvey River Basin, particularly the catchment of Stirling Dam.

The EPA's environmental objective for this factor is to ensure that recreational uses of the area affected by the proposal, as developed by planning agencies, are not unduly compromised.

The EPA notes the advice of CALM that recreation needs to be addressed regionally to deal with the impacts of any possible displacement of recreational activities from the Stirling catchment to other areas of CALM estate.

The EPA also notes that since the publication of the PER, the proponent has provided an additional commitment (Commitment P48) to fund the preparation of a Regional Recreational Opportunities Spectrum Study and to facilitate the necessary changes to existing recreation facilities (or development of new facilities) to compensate for the displacement of recreation facilities resulting from the proposal.

Summary

Having particular regard to:

(a) the advice of CALM and the WRC; and

(b) the proponent's commitments;

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for recreation.

Table 4: Summary of Assessment of Relevant Environmental Factors

RELEVANT FACTOR	RELEVANT AREA	EPA OBJECTIVES	EPA ASSESSMENT	EPA ADVICE
BIOPHYSICAL				
Vegetation communities	• Harvey Reservoir • Stirling-Harvey Pipeline • Harris-Stirling Pipeline	Maintain the abundance, diversity, geographic distribution and productivity of vegetation communities.	The proponent has recognised the likely high level of significance of Forrestfield vegetation complex impacted, based on its atypical geomorphological position and on the comparison of species present on the site to be impacted, with other sites in the Harvey area. The Corporation has also recognised the low representation of Lowdon and Darling Scarp vegetation complexes in conservation reserves. The Corporation has committed to a Land Acquisition and Rehabilitation Strategy and the preparation of a rehabilitation plan for areas disturbed by the proposal or rehabilitated to offset losses caused by inundation. The Rehabilitation Plan is to be prepared and implemented to the requirements of the Department of Environmental Protection. The package of measures proposed as part of the land acquisition and rehabilitation strategy include: • site rehabilitation of areas temporarily disturbed; • purchase and donation of land for reservation for the purpose of flora and fauna conservation; • financial assistance with reserve management • site restoration of degraded land with local native plant species present in Lowdon and Forrestfield vegetation complexes and suitable as habitat for the Western Ringtail Possum; and • major contribution to funding for the Harvey River Restoration Trust.	Having particular regard to: • the significance of the impacts of the proposal on vegetation complexes; • the Land Acquisition and Rehabilitation Strategy proposed by the proponent to offset the loss of values in areas which will be impacted by the proposal (appendix 1 of the proponent's response to public submissions); and • the proponent's commitments to acquire land for conservation, contribute $750 000 to the Harvey River Restoration Trust and prepare a rehabilitation plan to the requirements of DEP; It is the EPA's opinion that the proposal can be managed to meet the EPA's objective.

RELEVANT FACTOR	RELEVANT AREA	EPA OBJECTIVES	EPA ASSESSMENT	EPA ADVICE
Specially Protected (Threatened) Fauna	Harvey Reservoir Stirling-Harvey Pipeline	Protect Specially Protected (Threatened) Fauna species and their habitats, consistent with the provisions of the Wildlife Conservation Act 1950.	Advice from CALM indicates that it considers that the proposal will not have an unacceptable impact on the conservation status of the Western Ringtail Possum provided the proponent's commitments are implemented. The proponent has committed to restoration of 35 hectares of peppermint forest including transplantation of mature peppermint trees as potential habitat for the Western Ringtail Possum. The proponent has also committed to establishing habitat for the species in the 104 hectare buffer revegetation area surrounding the new Harvey Dam.	Having regard to the proponent's commitments to: • prepare and implement a fauna management plan to the requirements of CALM; and • rehabilitate 35 hectares of Lowdon complex vegetation within peppermint rehabilitation areas and provide for habitat within the 104 hectare reservoir buffer revegetation areas; and the advice of the CALM, it is the EPA's opinion that the proposal can be managed to meet the EPA's objective for this factor.
Landform and Rehabilitation	Stirling - Harvey and Harris-Stirling pipelines Hard rock quarry at the construction site for the new Harvey Dam	• Establish stable, sustainable landforms consistent with surroundings • Ensure that the areas affected by the proposal and the proponent's Land Acquisition and Rehabilitation Strategy are rehabilitated to a standard consistent with the values of the areas disturbed or permanently lost.	The EPA notes that: • all pipelines will be buried along their entire length; • pipeline installation will be designed to reduce clearing and disturbance zones to a maximum width of 20 metres; and • the proponent has committed to preparing and implementing a rehabilitation plan for areas disturbed by the pipelines which is to be to the requirements of DEP on advice from CALM.	Having regard to the proponent's commitments to: • restrict the disturbance zone for the pipeline to a maximum of 20 metres; • prepare and implement a rehabilitation plan (to DEP requirements) for all areas disturbed by the pipeline as a component of the EMS for the project, it is the EPA's opinion that the proposal can be managed to meet the EPA's objective for this factor.

RELEVANT FACTOR	RELEVANT AREA	EPA OBJECTIVES	EPA ASSESSMENT	EPA ADVICE
Watercourses and surface water quantity	New Harvey Reservoir Harvey River downstream from Stirling Dam Tributaries of Stirling Reservoir	To maintain the integrity, functions and environmental values of watercourses. To maintain surface water so that existing and potential uses, including ecosystem maintenance are protected	The EPA notes that the aim of the Harvey River Restoration Trust is to provide a source of funding which will assist in the replacement of riparian functional and ecological values of the vegetation and in-stream habitat that will be lost through the proposed dam development. The EPA also notes that the proponent has committed to: • providing a $750 000 contribution to the Harvey River Restoration Trust which is approximately equal to the approximate cost of materials and labour required to restore 24.6 km of streamlines; • establishing environmental water requirements for the Harvey River below Stirling dam; • developing and implementing a water quality and channel morphology monitoring program to determine impacts of the new dam and discharges from the Harris-Stirling pipeline; and preparing and implementing a channel erosion contingency plan. The EPA also notes that: • the Water Corporation has made additional commitments to commission research to assist in the determination and verification of the environmental water requirements of the Harvey River below Stirling Dam, by the WRC; and • the WRC has authority to progressively vary water allocation to allow for environmental water provisions as environmental water requirements are established.	Having regard to: a) the aim and objectives of the Harvey Rivers Restoration Trust, which is to be administered by the WRC and the Water Corporation's commitment to provide funds to the Trust; and b) the proponent's commitments to: • prepare and implement an investigations program to verify the adequacy of environmental water provisions downstream from the proposed new Harvey Dam; • prepare and implement an investigations program to determine environmental water requirements on the Harvey River between the new Harvey Reservoir and the Stirling Dam (new commitment); and c) the requirement for approximately 16 GL/yr of water to be released from the Stirling Dam; it is the EPA's opinion that the proposal is capable of being managed to meet the EPA's objectives for watercourses and surface water quantity.

RELEVANT FACTOR	RELEVANT AREA	EPA OBJECTIVES	EPA ASSESSMENT	EPA ADVICE
POLLUTION				
Noise and vibration	The construction site for the new Harvey Dam Residences located on Harvey Weir and Harvey-Quindanning Roads.	Protect the amenity of nearby residents from noise and vibration impacts resulting from activities associated with the proposal by ensuring that noise levels meet statutory requirements and acceptable standards.	The EPA notes the commitments by the proponent to : • prepare a construction and blasting noise and vibration management plan to the requirements of DEP; • conduct noise monitoring; • determine baseline housing integrity; and • conduct trial blasting to protect nearby residences. The EPA also notes that: • the construction and blasting noise and vibration management plan, which is to be prepared by the proponent to DEP requirements, will make provision for the management of heavy vehicle traffic noise; • the proponent has undertaken to apply a number of mitigation measures to ensure that the increase in heavy vehicle noise at sensitive locations is limited to a maximum of 3dB (A). • the proponent has provided an additional commitment to upgrade Honeymoon road to redirect log trucks from forest areas east of Harvey and thereby reduce the peak increase in truck movements.	Having particular regard to • the predicted noise levels associated with the proposal from construction activities and heavy vehicle movements; • the proponent's commitments to minimise noise impacts and meet appropriate standards and to prepare a Construction Noise and Vibration Management Plan to DEP requirements, which will make provision for heavy vehicle traffic noise (including further mitigation for residences affected by 24 hour continuous concrete pours); and • the proponent's commitment to upgrade Honeymoon Road to allow diversion of log truck traffic during the construction period; it is the EPA's opinion that the proposal can be managed to meet the EPA's objective for noise and vibration.
Dust and particulates	Areas within close proximity to the New Harvey Dam construction site	Ensure that the dust levels generated by the proposal do not adversely impact upon welfare and amenity or cause health problems by meeting statutory requirements and acceptable standards.	The EPA notes that: • The proponent has provided a new pre-construction commitment to prepare (jointly with landholders east of South West Highway) an agreed process for resolving compensation claims relating to economic losses caused by dust impacts on table grape crops. • The proponent has committed to the preparation and implementation of a construction dust management plan in consultation with local residents, the Shire of Harvey and DEP; and	Having particular regard to the proponent's commitments, it is the EPA's opinion that the proposal can be managed to meet the EPA's objective for this factor.

SOCIAL SURROUNDINGS				
RELEVANT FACTOR	**RELEVANT AREA**	**EPA OBJECTIVES**	**EPA ASSESSMENT**	**EPA ADVICE**
Visual amenity	• Harvey Dam • Stirling-Harvey Pipeline	Ensure that the visual amenity of the area adjacent to the project should not be unduly affected by the proposal.	The EPA notes that: • the disturbance zone for the Stirling-Harvey pipeline will be permanently visible along its length because of the need for the line to be navigable by suitable off road vehicles for pipeline repair or maintenance purposes; • There is some potential for adverse visual impacts around the edge of the new Harvey Dam if vegetation within the 75-78 metre AHD inundation zone is killed by waterlogging; and • the proponent has committed to visual screening of the dam wall for land owner's 'close to the dam if this is requested by the landowner.	Having regard to the proponent's commitments, it is the EPA's opinion that the proposal can be managed to meet the EPA's objective for this factor.
Post-development landuse	Harvey River Basin above the town of Harvey	Ensure that changes to social surroundings resulting from the impacts of the proposal are identified and that appropriate mitigation actions are implemented.	The EPA notes that some land owners whose properties will be impacted by the proposal are concerned about the potential reduction in environmental and other values.	Having particular regard to : (a) the views expressed in submissions by land owners affected by the proposed new Harvey dam and Stirling Harvey pipeline; (b) the Water and Rivers Commission's Water Source Protection planning process for the Harvey Basin; (c) the proponent's land acquisition policy; and (d) the proponent's commitments; the EPA is of the view that the proposal can be managed to meet the EPA's objective for post-development land use.

RELEVANT FACTOR	RELEVANT AREA	EPA OBJECTIVES	EPA ASSESSMENT	EPA ADVICE
Recreation		Ensure that recreational uses of the area, as developed by planning agencies are not unduly compromised.	The EPA notes the advice of CALM that recreation needs to be addressed regionally to deal with the impacts of any possible displacement of recreational activities from the Stirling catchment to other areas of CALM estate The EPA also notes the additional commitment provided by the proponent to fund the preparation of a recreational opportunities spectrum study to address recreational displacement that may result from the proposal and to fund replacement facilities.	Having particular regard to: • the advice of CALM; and • the proponent's commitments, it is the EPA's opinion that the proposal can be managed to meet the EPA's objectives.

4. Conditions and commitments

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the proposal and on the conditions and procedures to which the proposal should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

In developing recommended conditions for each project, the EPA's preferred course of action is to have the proponent provide an array of commitments to ameliorate the impacts of the proposal on the environment. The commitments are considered by the EPA as part of its assessment of the proposal and, following discussion with the proponent, the EPA may seek additional commitments.

The EPA recognises that not all of the commitments are written in a form which makes them readily enforceable, but they do provide a clear statement of the action to be taken as part of the proponent's responsibility for, and commitment to, continuous improvement in environmental performance. The commitments, modified if necessary to ensure they are enforceable, then form part of the conditions to which the proposal should be subject if it is to be implemented.

The EPA may, of course, also recommend conditions additional to those relating to the proponent's commitments.

4.1 Proponent's commitments

The proponent's commitments as set in the PER and subsequently modified, as shown in Appendix 3, should be made enforceable conditions. These include;

- purchase of privately owned land for conservation purposes;
- rehabilitation or restoration of disturbed and degraded areas;
- creation of fauna habitat;
- funding the investigation of environmental water requirements;
- contribution to restoration of waterways through the Harvey River Restoration Trust; and
- investigating and offsetting impacts on recreational opportunities.

4.2 Recommended conditions

Having considered the proponent's commitments and the information provided in this report, the EPA has developed a set of conditions which the EPA recommends be imposed if the proposal by the Water Corporation to implement the Stirling-Harvey Redevelopment Scheme, is approved for implementation. These conditions are presented in Appendix 3. Matters addressed in the conditions include:

(a) that the proponent be required to fulfil the commitments in the Consolidated Commitments statement set out as an attachment to the recommended conditions in Appendix 3.

5. Other Advice

Yarloop Location 5322

The Water Corporation has indicated that Yarloop Location 5322, which is to be provided as part of the Land Acquisition and Rehabilitation Strategy as an offset for the loss of the Forrestfield vegetation resulting from the proposal, is subject to a mining tenement (Retention Licence).

Although the land is potentially prospective for titanium minerals, the EPA is not aware of the degree to which the land could be subject to mining. However the EPA is aware that the vegetation communities on the land are of very high conservation significance as discussed in Section 3.1 of this report.

The EPA notes that the Mining Act in Western Australia provides for the owner of land to determine whether a mining operation is permitted on their land. However mining is not precluded from any Crown lands.

The Water Corporation has provided an undertaking within its Land Acquisition and Rehabilitation Strategy that Yarloop Location 5322 will be purchased from its current owner and then (subject to government processes) converted to Crown land to be vested with the National Parks and Nature Conservation Authority as an A Class Reserve for the conservation of flora and fauna. The EPA believes that this is the preferred action for land with very high conservation value, provided resources are available to secure the relevant land area. However, given the power of the freehold land owner to withhold permission for mining on its own land, retention of the land in freehold title (perhaps with a conservation covenant) could lead to greater security of protection from mining, despite this resulting in a less certain conservation outcome.

The EPA therefore advises that, in recognition of the very high conservation significance of the vegetation communities on Yarloop Location 5322, and despite the possibility that the area may be subject to proposals for mining, the land should be vested with the National Parks and Nature Conservation Authority as an A Class Reserve for the conservation of flora and fauna. The EPA also advises that, given the very high conservation significance of the plant communities on the subject land, it would be unlikely to recommend that its disturbance for mining or other purposes could be carried out in such away as to meet the EPA's objectives and therefore be environmentally acceptable.

6. Changes to the 1987 Harris Dam project

Description

The Harris Dam project, which was identified as the most suitable means of providing an improved secure source of low salinity water for the Great Southern Towns Water Supply (GSTWS) was approved for implementation by the Minister for the Environment in November 1987 after assessment by the EPA (EPA, 1987).

The stated objectives of the proposal for the supply (to the GSTWS and Collie Irrigation District) which were provided in the ERMP for the Harris dam project (Dames & Moore, 1985) were:

- *"To determine the optimum quality of water which should be supplied to domestic services;*
- *To supply water of this quality, in a cost effective manner as soon as possible;*
- *To ensure adequate water is available to meet the projected demand for domestic supplies served by the GSTWS beyond the year 2000; and*

- *To facilitate the management of freshwater inflows onto Wellington Reservoir so that the average quality of irrigation water can be maintained."*

The Stirling-Harvey Redevelopment Scheme includes a pipeline from the Harris Dam to a stream tributary of the Stirling Reservoir to enable water to be transferred from Harris Dam to the PMWSS via Stirling Reservoir. The Water Corporation will require an allocation licence from the WRC for any water to be pumped from Harris Dam to Stirling Reservoir.

The Harris Dam project is subject to environmental conditions of approval under the Environmental Protection Act, including implementation of the proponent's commitments. The proponent of the Harris Dam project following the 1995 split of the former Water Authority of Western Australia, is the Water Corporation. Therefore the Corporation is responsible for ensuring that the conditions and commitments for Harris Dam are fulfilled.

As part of its assessment of the Stirling-Harvey Redevelopment Scheme, the EPA has therefore considered the need to change any of the existing conditions and procedures for the Harris Dam project, under Section 46 of the Environmental Protection Act 1986, in order to enable transfer of water from the Harris Dam to the PMWSS.

Agency comment

In its submission on the Stirling-Harvey Redevelopment project, Agriculture WA advised that it considers that the proposal to divert water from Harris Dam to the Stirling-Harvey system may have significant impacts on the productivity of local agricultural systems reliant upon irrigation water from Wellington Dam. The Department added that this could result in salinity increases in soils irrigated from that reservoir, and or lower productivity levels that should be expected. The Department also advised that the an analysis should be made of the impact of the proposal on the Wellington Dam Recovery Catchment plan, irrigation water quality and associated impacts on the productivity of the region's agriculture.

The Water Corporation responded to this by providing the following advice:

"The volume of water available from the Harris Dam for supply to Perth has been determined by the Water and Rivers Commission. In allocating the water, the Commission has stipulated that, inter alia, the needs of South West Irrigation (including salinity management at Wellington Reservoir) must not be adversely impacted. Furthermore, the Commission has stated that local needs for the environment, Great Southern Towns Water Supply, power generation and Wellington salinity management have precedence over water supply to Perth. The Corporation understands these conditions on the allocation of water from Harris Dam.

The Corporation has completed salinity modelling for the two dam system under various water supply and demand scenarios and has determined that taking water for supply to Perth has a very small impact on the ability of Harris Dam to manage salinity levels in the Wellington reservoir."

The WRC has confirmed that any allocation licence to the Water Corporation to allow diversion of water from Harris Dam to Perth would be subject to conditions regarding environmental water requirements and salinity management in Wellington Reservoir (WRC letter 23 July 1999). These conditions are :

1. *Local need for the environment, GSTWS, power generation and Wellington salinity management have precedence over water supply to Perth. In particular the operating rules for releases from Harris Dam to mitigate salinity levels in the Wellington Reservoir will continue and have priority over supply to Perth.*
2. *Further environmental water requirement work using the holistic methodology, be carried out between the Harris and Wellington Dams in conjunction with EWR work to be carried out by the Commission downstream of Wellington Reservoir. This will identify any needs for environmental flow releases from Harris Dam. If environmental water provisions are required, they will have priority over supply to Perth; and*

3. *Of the total allocations, sufficient water, as determined by the CWAG, is set aside for power generation purposes.*

4. *Develop and implement a Wellington Catchment salinity action contribution to compensate for any reduction in ability to manage the salinity in Wellington Reservoir. The contribution should be developed in conjunction with the Commission and South West Irrigation to satisfy both agencies. Implementation within 3 to 7 years of commencement. of the Harris pumpback scheme or as agreed by the Commission . If the Corporation was not prepared to carry out or fund the implementation of a satisfactory salinity action contribution, the allocation would be reduced accordingly.*

5. *Complete a new operating strategy for the Harris-Wellington system to the satisfaction of the Commission within a year of the issue of the licence.*

EPA assessment

The EPA notes that the conditions of approval for the Harris Dam project require that ;

"The Harris Dam will be operated and managed to achieve .....a small improvement on average in quality of Wellington Dam water....."

The Water Corporation has advised that in seeking to divert water from Harris Dam, it intends to comply with the existing conditions and commitments provided by the Water Authority in relation to the Harris Dam project and the additional requirements of conditions imposed by the WRC under the allocation licence. The Water Corporation has indicated that it will offset any impacts of increased Harris abstraction on salinity in Wellington Reservoir through catchmentt management and reservoir operation measures. The EPA understands the WRC and Water Corporation are defining operating rules for when water could be diverted from Harris Dam to Stirling Reservoir while meeting the WRC's conditions.

The EPA therefore concludes that the diversion of water from the Harris Dam to the PMWSS is environmentally acceptable, provided that the Water Corporation continues to comply with the existing conditions and procedures of approval for the project, including the proponent's commitments. To ensure this, the Water Corporation should be required to meet conditions set by the WRC as part of the licence allocation process for diversion of water from the Harris Dam.

If at any time the Water Corporation seeks to change the existing conditions and procedures for the Harris Dam project as a result of an allocation to divert water to the PMWSS, this would need to be subject to assessment and approval under Section 46 of the Environmental Protection Act.

7. Conclusions

The EPA has considered the proposal by the Water Corporation to implement the Stirling-Harvey Redevelopment Scheme.

The EPA notes that the most significant impacts of the proposal will be the permanent loss, through clearing and inundation, of approximately 180 hectares of native vegetation and approximately 25 km of watercourses, of varying condition and conservation significance. One area of Forrestfield vegetation complex which will be inundated is considered to be of highest conservation significance. Other areas of Lowdon, Helena and Darling Scarp vegetation complexes are of varying levels of conservation significance. The proposal will also involve clearing and subsequent rehabilitation of up to 25 hectares of vegetation communities within Helena, Dwellingup and Hester, and Yarragil vegetation complexes for the Stirling-Harvey and Harris-Stirling pipelines.

The EPA also notes that the proponent has provided a comprehensive set of commitments to manage environmental impacts and a Land Acquisition and Rehabilitation Strategy in order to offset the loss of conservation values which will occur as a result of the proposal. The

proponent has also provided a preliminary outline of the objectives and strategies for rehabilitation of areas disturbed or provided to offset inundation, clearing or disturbance.

The EPA has concluded that the proposal is capable of being managed to meet the EPA's objectives provided there is satisfactory implementation by the proponent of the recommended conditions summarised in Section 4, including the proponent's commitments.

The EPA has also assessed the need to change conditions and procedures for the approved Harris Dam project, which was approved by the Minister on 5 November 1987, to allow for supply of water from Harris Dam to the PMWSS (subject to its availability after allocation for other uses defined by the Water and Rivers Commission). This assessment is discussed in Section 6 of this report.

The EPA's conclusion from this assessment is that the diversion of water from the dam for the PMWSS is environmentally acceptable, provided that the proponent continues to comply with the conditions and procedures of approval for the project, including the proponent's commitments. To ensure this, the Water Corporation should be required to meet conditions set by the Water and Rivers Commission as part of the allocation process for the diversion of water from the Harris Dam.

8. Recommendations

The EPA submits the following recommendations to the Minister for the Environment:

1. That the Minister notes that the proposal being assessed is the redevelopment of the Harvey and Stirling Reservoir system in order to utilise an additional approximately 34 Gigalitres per annum from the Harvey Basin for the Perth Metropolitan Water Supply Scheme.
2. That the Minister considers the report on the relevant environmental factors for this proposal as set out in Section 3.
3. That the Minister notes that the EPA has concluded that the proposal can be managed to meet the EPA's objectives, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Appendix 3, and summarised in Section 4, including the proponent's commitments.
4. That the Minister imposes the conditions and procedures recommended in Appendix 3 of this report.
5. That the Minister notes that the EPA has concluded that diversion of water from the Harris Dam to the Perth Metropolitan Water Supply Scheme is environmentally acceptable, provided that the Water Corporation continues to comply with the existing conditions and procedures for the Harris Dam project. If at any time the Water Corporation seeks to change the existing conditions and procedures for the Harris Dam project as a result of an allocation to divert water to the Perth Metropolitan Water Supply Scheme, this would need to be subject to assessment and approval under Section 46 of the Environmental Protection Act.
6. That the Minister notes the other advice provided by the EPA in Section 5 of the report regarding the need for protection of vegetation provided as an offset for that lost due to the implementation of the Stirling-Harvey Redevelopment.

Appendix 1

List of Submitters

Organisations:

- Agriculture WA
- Amateur Canoe Association of Western Australia
- Australian Junior Canoeing Team
- Canoe Kayak Education Australia
- Department of Conservation and Land Management
- Conservation Council of WA
- Darling Range Canoe Club
- Fisheries WA
- German Canoeing Federation
- Shire of Harvey
- RecfishWest
- Shire of Murray
- South West Public Health Unit : Physical Activity Program
- Team Dagger Australia
- University of Western Australia Outdoor Club
- Water and Rivers Commission
- J & SJ Whitehouse School Bus Contractors

Individuals:

- Mr B Arielli
- Dr S Bennett
- Mr J Bradshaw
- Mr & Mrs M & A Brindley
- Mrs M Campbell
- Mr & Mrs D Clark
- Mr J Clarke
- Mr M Collister
- Ms K Collister
- Mr J Cottrell
- Ms A Coulson
- Ms M Dashwood
- Mr B Dashwood
- Mr A Farrance
- Mr R Farrance
- Mr A Farrance
- Mr M Farrington
- Mr G Higham
- Mr & Mrs M & P Kelly
- Ms R Khorshid
- Ms E Lefroy
- Ms E Lewis
- Mr M Lowe and Ms P Lewis
- Ms S Maley
- Mr W Over
- Mr & Mrs K & C Potter
- Mr K Potter
- Mr H Roberts
- Ms H Roberts
- Mr T Roberts
- Mr G Ryder
- Mr S Sinclair
- Mr S Snowball
- Messrs J & A Sprengel
- Mr P Tucker
- Mr D Watts
- Ms A William
- Mr M Williams
- Mr D Williams
- Ms P Williams
- Mr S Wiltshire

Appendix 2

References

References

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Water and Rivers Commission (1999). *Harvey River Restoration Trust: A Proposal for Funding Restoration Works Within the Harvey Basin.* (Unpublished Draft WRP 14)

Appendix 3

Recommended Environmental Conditions and Proponent's Consolidated Commitments

RECOMMENDED ENVIRONMENTAL CONDITIONS

STATEMENT THAT A PROPOSAL MAY BE IMPLEMENTED (PURSUANT TO THE PROVISIONS OF THE ENVIRONMENTAL PROTECTION ACT 1986)

STIRLING-HARVEY REDEVELOPMENT SCHEME

Proposal: The redevelopment of the Harvey and Stirling Reservoir System by constructing a new dam on the Harvey River near the town of Harvey and new pipelines from the Harris Dam to the Stirling Dam and from the Stirling Dam to the Southern Trunk Main at Harvey, in order to utilise water from the Harvey and Collie basins for the Perth Metropolitan Water Supply Scheme, as documented in schedule 1 of this statement.

The proposal also involves the implementation of a Land Acquisition and Rehabilitation Strategy to offset the environmental impacts of the proposal.

Proponent: Water Corporation

Proponent Address: 629 Newcastle Street LEEDERVILLE WA 6007

Assessment Number: 1249

Report of the Environmental Protection Authority: Bulletin 950

The proposal to which the above report of the Environmental Protection Authority relates may be implemented subject to the following conditions and procedures:

1 Implementation

1-1 Subject to these conditions and procedures, the proponent shall implement the proposal as documented in schedule 1 of this statement.

1-2 Where the proponent seeks to change any aspect of the proposal as documented in schedule 1 of this statement in any way that the Minister for the Environment determines, on advice of the Environmental Protection Authority, is substantial, the proponent shall refer the matter to the Environmental Protection Authority.

1-3 Where the proponent seeks to change any aspect of the proposal as documented in schedule 1 of this statement in any way that the Minister for the Environment determines, on advice of the Environmental Protection Authority, is not substantial, those changes may be effected.

2 Proponent Commitments

2-1 The proponent shall implement the consolidated environmental management commitments documented in schedule 2 of this statement.

2-2 The proponent shall implement subsequent environmental management commitments which the proponent makes as part of the fulfilment of conditions and procedures in this statement.

3 Proponent

3-1 The proponent for the time being nominated by the Minister for the Environment under section 38(6) or (7) of the Environmental Protection Act 1986 is responsible for the implementation of the proposal until such time as the Minister for the Environment has exercised the Minister's power under section 38(7) of the Act to revoke the nomination of that proponent and nominate another person in respect of the proposal.

3-2 Any request for the exercise of that power of the Minister referred to in condition 3-1 shall be accompanied by a copy of this statement endorsed with an undertaking by the proposed replacement proponent to carry out the proposal in accordance with the conditions and procedures set out in the statement.

3-3 The proponent shall notify the Department of Environmental Protection of any change of proponent contact name and address within 30 days of such change.

4 Commencement

4-1 The proponent shall provide evidence to the Minister for the Environment within five years of the date of this statement that the proposal has been substantially commenced.

4-2 Where the proposal has not been substantially commenced within five years of the date of this statement, the approval to implement the proposal as granted in this statement shall lapse and be void. The Minister for the Environment will determine any question as to whether the proposal has been substantially commenced.

4-3 The proponent shall make application to the Minister for the Environment for any extension of approval for the substantial commencement of the proposal beyond five years from the date of this statement at least six months prior to the expiration of the five year period referred to in conditions 4-1 and 4-2.

4-4 Where the proponent demonstrates to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority that the environmental parameters of the proposal have not changed significantly, then the Minister may grant an extension not exceeding five years for the substantial commencement of the proposal.

5 Compliance Auditing

5-1 The proponent shall submit periodic Performance and Compliance Reports, in accordance with an audit program prepared in consultation between the proponent and the Department of Environmental Protection.

5-2 Unless otherwise specified, the Chief Executive Officer of the Department of Environmental Protection is responsible for assessing compliance with the conditions, procedures and commitments contained in this statement and for issuing formal, written advice that the requirements have been met.

5-3 Where compliance with any condition, procedure or commitment is in dispute, the matter will be determined by the Minister for the Environment.

Note

1 The proponent is required to apply for a Works Approval and Licence for this project under the provisions of Part V of the Environmental Protection Act.

Schedule 1

The Proposal (1249)

1. The proposal consists of the following elements:

- construction of a new dam with a full supply level of 78 metres Above Height Datum on the Harvey River, 800m downstream from the existing weir (referred to as the New Harvey Dam);
- construction of a pipeline (referred to as the Stirling-Harvey Pipeline) in the Harvey River Valley from Stirling Dam to the Water Corporation's Southern Trunk Main pipeline in the town of Harvey.
- diversion of water (approximately 34 Gigalitres per annum) from the Stirling Reservoir for the Perth Metropolitan Water Supply Scheme;
- construction of a pipeline from the Harris Dam to the Stirling Reservoir (the Harris-Stirling Pipeline).
- upgrade of Stirling Dam by :
    * construction of a new concrete intake tower and modification to outlet works;
    * widening of the dam spillway and increasing the height difference between the spillway and the dam wall, by raising the embankment level; and;
    * installation of a new power supply to the dam using an on-site generator or overhead powerline,
- realignment of the Harvey-Quindanning road to replace sections of the road to be inundated; and
- purchase and / or rehabilitation of land for the purpose of offsetting impacts of inundation by the new Harvey Dam and disturbance for the installation of pipelines and other infrastructure.

The major characteristics of the proposal are summarised in Table 1.

Table 1: Key Characteristics Table

Element and key characteristic	Description
Harvey Reservoir	
New dam	35 m earth core and rockfill (above the river bank level)
Dam full supply level	78 metres Above Height Datum
Storage	60 Gigalitres
Additional area inundated	370 hectares
Native vegetation inundated (total)	183 hectares approximately.
Spillway width	30–60 metres
Buffer area	30 metres around reservoir
Rockfill in dam	700,000 cubic metres
Earthfill in dam	400,000 cubic metres
Stirling–Harvey pipeline	Buried, alignment down the valley of Harvey River
Length	19 kilometres
Diameter	1.42 metres
Capacity	200 Megalitres per day
Width of disturbance	Maximum 20 metres
Width of clearing	Maximum 20 metres
Vegetation cleared or disturbed	6 hectares approximately .
Harris–Stirling pipeline	Buried, alignment within transmission line easement
Length	16 kilometres
Diameter	0.8 metres
Capacity	Up to 70 Megalitres per day
Width of disturbance	Maximum 12 metres (within powerline easement)
Width of Clearing	Maximum 12 metres (within powerline easement)
Vegetation cleared or disturbed	19 hectares maximum (assumes proponent's preferred option to locate the pipe in the disturbed easement is not possible)
Road Re-alignment	
Length	7.5 kilometres approximately
Width of disturbance	20 metres approximately. (predominantly cleared)
Area of disturbance	20 hectares
Landowner access roads	2.8 kilometres, low speed, unsealed

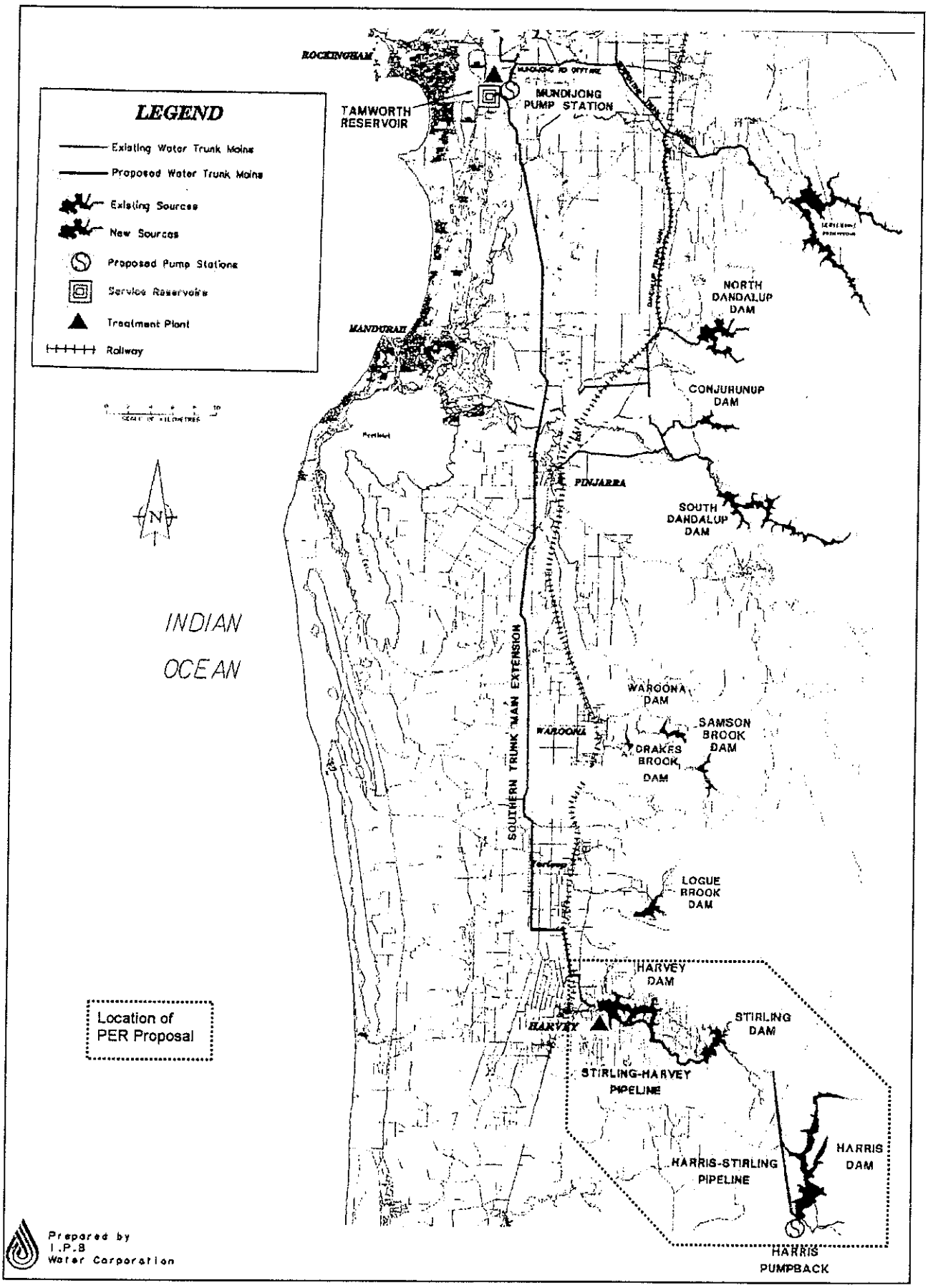

Figure 1. Location map (Source: Welker, 1999a).

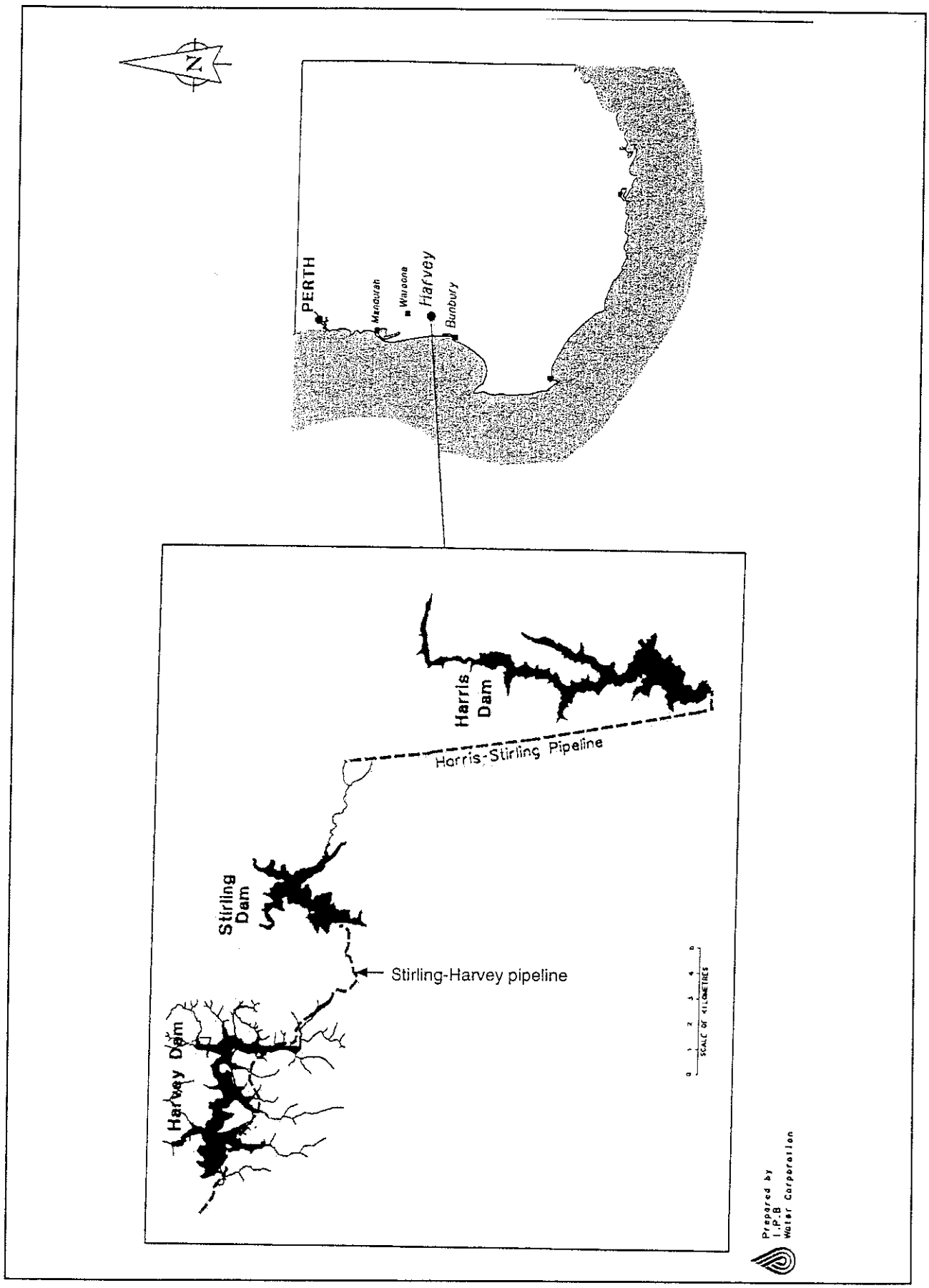

Figure 2. Key elements of the Stirling-Harvey Redevelopment proposal (Source: Welker, 1999a).

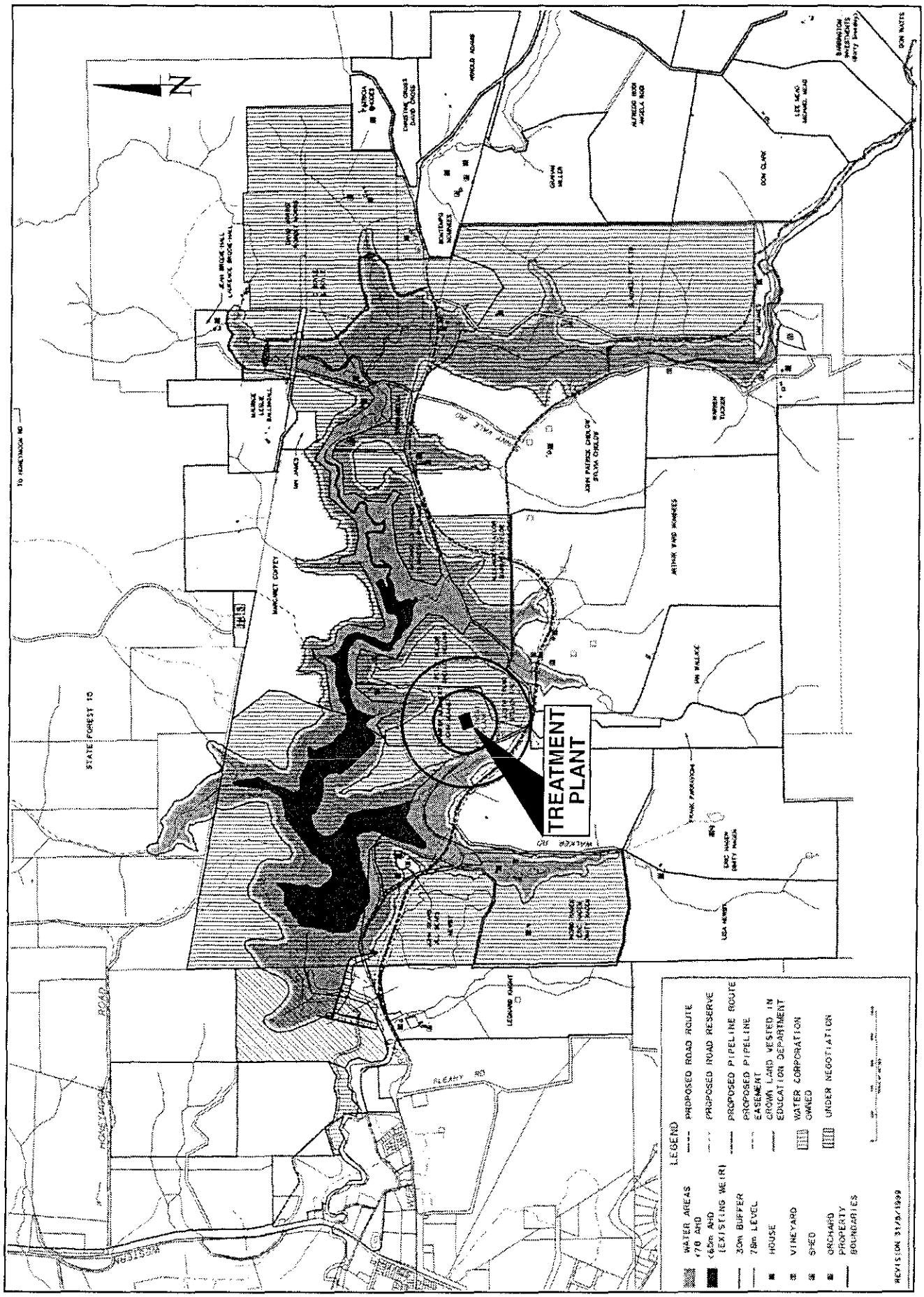

Figure 3. Map showing the area inundated by the proposed Harvey Dam and associated facilities (Source: Water Corporation, 1999).

Schedule 2

Proponent's Consolidated Environmental Management Commitments

28 August 1999

STIRLING-HARVEY REDEVELOPMENT SCHEME (1249)

WATER CORPORATION

Auditable Commitments

Commitment (Who/What)	Objective (Why)	Action (How/where)	Timing (When)	Whose Advice	Measurement Compliance Criteria
P1 In order to manage the environmental impacts of the proposal, an environmental management system will be developed and implemented which includes the following elements: 1. An environmental policy and corporate commitments; 2. Mechanisms and processes to ensure: •Planning to meet environmental requirements; •Implementation of actions to meet environmental requirements; •Measurement and evaluation of environmental performance. 3. Review and improvement of environmental outcomes (Formerly P1)	To manage the environmental impacts of the proposal.	Incorporate into project into the Proponent's environmental management system.	Prepare prior to and implement during and following construction.	DEP/ CALM *	Submission of EMS document
P2 Prepare and implement a vegetation protection plan which includes forest hygiene procedures and is accordance with the EMS (Formerly P4 and P7)	To minimise impacts on vegetation.	Within the proposal area.	Prepare prior to and implement prior to, during and following construction.	CALM	Submission of EMS document
P3 Develop and implement a weed and fire control strategy for the construction of the pipeline. (Formerly P5)	To protect vegetation values along pipeline routes.	Along pipeline routes.	Prior to pipeline construction.	CALM	Submission of EMS document
P4 Conduct a dieback survey and detailed survey for Declared Rare Flora and Priority Flora along pipeline routes prior to construction. (Formerly P6)	To protect vegetation values along pipeline routes.	Along pipeline routes.	Prior to pipeline construction.	CALM	Submission of EMS document
P5 Acquire land for incorporation into the conservation estate, State Forest or water reserve system as described in Appendix 1 of the response to submissions. (Formerly P8)	To increase security and protection of native vegetation complexes that have been extensively cleared by previous land use activities.	By acquisition of available land with substantial conservation value.	Prior to dam construction.	DEP CALM	Advice from proponent advising of DEP and CALM approval.
P6 Facilitate the preparation of interim management guidelines for the proposed Korijikup Conservation Park and Falls Brook Nature Reserve (including additions proposed as part of this proposal) to the requirements of CALM and assist with the rehabilitation of degraded areas in accordance with P17. (New commitment)	To protect nature conservation values in the proposed Korijikup Conservation Park and the Falls Brook Nature Reserve	By provision of financial resources to CALM	Prior to and during construction of the dam.	CALM	Advice from CALM

Commitment (Who/What)	Objective (Why)	Action (How/where)	Timing (When)	Whose Advice	Measurement Compliance Criteria
P7 Prepare and implement a fauna protection plan. (Formerly P9)	To minimise impacts on fauna.	Within proposal area.	Prepare prior to and implement prior to, during and following construction of the proposal.	CALM	Submission of EMS document
P8 Prepare and implement a management strategy for Western Ringtail Possum to the requirements of CALM. (Formerly P11)	To protect rare fauna.	Within and around inundation area of reservoir.	Prepare prior to and implement during and following dam construction.	CALM	Advice from CALM
P9 Include in the rehabilitation/restoration and buffer areas (refer P 17), habitat and native plant species suitable for rare and vulnerable fauna known or likely to occur in the general area. (Formerly P12)	To enhance the amount of faunal habitat.	Within rehabilitation areas.	Prior to, during and following dam construction.	CALM	Advice from CALM
P10 Complete investigations into the inter-catchment transfer of fish species. (Formerly P14)	To protect faunal diversity.	In the Stirling catchment.	Prior to construction of the Harris-Stirling pipeline.	Fisheries Dept	Submission of report
P11 Comply with the requirements of the Fisheries Department on the inter-catchment transfer of fish. (Formerly P15)	To protect faunal diversity.	In the Stirling catchment.	Prior to construction of the Harris-Stirling pipeline.	Fisheries Dept	Letter from Fisheries Dept
P12 Develop and implement a water quality and channel morphology monitoring program (Formerly P16)	To determine impacts of the new dam and discharges from the Harris-Stirling pipeline.	Below the Harvey Dam and discharges from the Harris-Stirling pipeline.	Develop prior to and implement during and following construction.	WRC	Submission of EMS
P13 Prepare and implement a channel erosion contingency plan which includes trigger levels for action in the case of erosion being identified. (New commitment)	To mitigate any channel erosion impacts if they occur.	Below the Harvey Dam and discharges from the Harris-Stirling pipeline.	Develop prior to construction. Implement following detection of channel erosion.	WRC	Submission of EMS document
P14 Contribute $750,000 to the Harvey River Restoration Trust for river restoration projects and preparation of a river restoration program. (Formerly P18)	To facilitate the regeneration of riverine areas.	By supporting the Harvey River Restoration Trust.	Prior to dam construction.	WRC	Advice from WRC
P15 Prepare and implement an investigations program to verify the adequacy of environmental water provisions downstream from the proposed new dam wall. (Formerly P20)	To verify the adequacy of environmental water provisions.	Downstream from new dam.	During and following dam construction.	WRC	Advice from WRC

Commitment (Who/What)	Objective (Why)	Action (How/where)	Timing (When)	Whose Advice	Measurement Compliance Criteria
P16 Prepare and implement an investigations program to determine environmental water requirements on the Harvey River between the new Harvey Reservoir and the Stirling Dam (New commitment)	To determine environmental water requirements of the existing hydrological regime on the Harvey River between the dams	The Harvey River between the new Harvey Reservoir and the Stirling Dam.	Prior to the completion of construction of the Harvey Dam	WRC	Advice from WRC
P17 Prepare and implement to DEP requirements a rehabilitation plan (which includes consideration of visual amenity) for areas disturbed by the proposal, vegetation between the 75m and 78m inundation level, the buffer zone and peppermint woodland and Forrestfield Complex vegetation rehabilitation areas as described in Appendix 1 of the proponent response to submissions. (Formerly P21 and P57)	To establish a self-sustaining vegetation communities that are consistent with the current composition of vegetation complexes found in the area.	Areas disturbed by the proposal, reservoir buffer area and peppermint woodland and Forrestfield rehabilitation areas.	Prepare prior to and implement during and following dam construction.	DEP/ CALM	Submission of and compliance with relevant EMS documents
P18 Prepare and implement a mosquito monitoring and management program. (Formerly P22)	To determine any change in the mosquito breeding from the new Harvey Reservoir and manage impacts to the requirements of the Health Dept of WA..	On and around the Harvey Reservoir	Prepare prior to dam construction. Implement during and following dam construction.	CALM / Health Dept*	Submission of Plan & Written Advice from Health Dept
P19 Prepare and implement a construction dust monitoring and management plan. (Formerly P23)	To ensure dust level external to construction site area are acceptable.	Within the dam construction site.	Prepare prior to and implement during dam construction.	DEP	Submission of EMS document.
P20 Prepare a compensation claim procedure for any alleged adverse impacts on the marketability of table grapes jointly with vineyards owners operators east of the South Western Highway (New commitment)	To compensate for any reduced economic returns caused by dust from construction of the dam.	West of the dam construction site to the South Western Highway.	Prepare prior to construction of the dam	DEP	Letter from table grape growers east of the South Western Highway
P21 Prepare and implement a construction noise and vibration management plan in consultation with nearby residences, the Shire of Harvey and according to the requirements of DEP. (Formerly P24)	To minimise noise impacts and meet appropriate standards including AS 2436-1981.	Within and external to dam construction site.	Prepare prior to dam construction. Implement during construction.	DEP	Submission of EMS document
P22 Conduct noise monitoring in the residential area on Weir Road for the dam construction period. (Formerly P25)	To establish noise levels from construction.	External to dam construction site.	Prior to and during dam construction.	DEP	Submission of EMS document
P23 Make available the results of any noise audit and noise and vibration monitoring to the local community. (Formerly P26)	To inform residents of noise levels and actions to control noise.	External to dam construction site.	During dam construction.	Shire of Harvey	Advice from the Shire of Harvey
P24 Comply with regulatory standards and take all reasonable measures to minimise impacts at the nearest noise sensitive premises for air blast noise and overpressure. (Formerly P27).	To minimise impacts and comply with noise regulations.	External to dam construction site.	During dam construction.	DEP	Submission of noise monitoring report.

Commitment (Who/What)	Objective (Why)	Action (How/where)	Timing (When)	Whose Advice	Measurement Compliance Criteria
P25 Negotiate with the occupiers of residences within 500 m of the dam construction site to mitigate the impact of noise levels. (Formerly P28)	To reduce noise effects on nearest resident.	External to construction site.	Prior to dam construction.	DEP	Advice from residents
P26 Conduct a survey of residences within about 1.5 km of the dam construction site, at no cost to the owner, to determine the baseline condition of the residences. (Formerly P29)	To determine baseline housing integrity.	External to construction site.	Prior to dam construction.	DEP	Submission of survey report.
P27 Conduct trial blasting to determine a procedure to protect nearby residential dwellings. (Formerly P30)	To protect dwellings from vibration impacts.	External to construction site.	Prior to dam construction.	DEP	Submission trial report.
P28 Prepare and implement a program of aesthetic water quality monitoring in the Tourist Precinct, around Stirling's Cottage to the requirements of WRC. (Formerly P31)	To ensure the maintenance of appropriate aesthetic water quality near Stirling's cottage.	Downstream of the new dam.	Implement prior to construction Implement following completion of the dam.	WRC	Advice from WRC.
P29 Prepare and implement a water quality monitoring program for the construction period downstream of the new dam to the requirements of WRC. (Formerly P32)	To determine any impact from construction on water quality.	Downstream of the new dam.	Prior to, during and following dam construction.	WRC	Advice from WRC.
P30 Develop and implement a community consultation and information program. (Formerly P35)	To inform landowners of consequences of the proposal.	Within the community	Prior to, during and following dam construction.	DEP/WRC	Submission of EMS document.
P31 Provide fire management access for CALM to the Harvey Weir pine plantation. (Formerly P37)	To ensure fire CALM fire management is not adversely affected.	Downstream of the new dam.	During and following dam construction.	CALM	Advice from CALM
P32 Support the development of facilities in the Tourism Precinct in accordance with the Memorandum of Understanding between the Shire of Harvey and the proponent. (Formerly P39)	To alleviate social impacts on the Shire of Harvey.	Within the Shire of Harvey.	During and following dam construction.	Shire of Harvey	Advice from the Shire of Harvey
P33 Ensure the release of aesthetic flows to the Tourism Precinct are in accordance with the requirements of the WRC. (Formerly P40)	To maintain amenity within Tourism precinct.	Within Tourism Precinct.	Following dam construction.	WRC	Advice from WRC
P34 Prepare a heritage management plan in accordance with the requirements of the Heritage Council of WA and in consultation with the Shire of Harvey. (Formerly P42)	To protect significant heritage places.	In inundation area.	Prior to dam construction.	Heritage Council	Advice from Heritage Council

Commitment (Who/What)	Objective (Why)	Action (How/where)	Timing (When)	Whose Advice	Measurement Compliance Criteria
P35 Conduct a further Aboriginal site survey of creek line crossings (which were previously unsurveyed) along the Harris-Stirling pipeline route. (Formerly P44)	To survey for further Aboriginal sites on creek lines.	On Harris-Stirling pipeline route.	Prior to construction of Harris–Stirling pipeline.	Proponent	Submission of Report
P36 Consult with the Aboriginal community prior to submitting an application to disturb two Aboriginal sites pursuant to section 18 of the Aboriginal Heritage Act 1972. (Formerly P45)	To ensure the significance of Aboriginal heritage sites are understood.	In the area of the proposal.	Prior to dam construction.	DAA	Advice from DAA
P37 Consult with Aboriginal people and organisations on construction of the pipelines. (Formerly P46)	To ensure that the proposal minimises impact on significant Aboriginal sites.	In the area of the proposal.	Prior to pipeline construction.	DAA	Advice from DAA
P38 Conform with any requirements relating to recreational flow releases from the Harvey or Stirling reservoirs imposed through an allocation licence issued by the WRC. (Formerly P48)	To provide for releases for whitewater in accordance with allocation licence.	Downstream of Stirling Reservoir.	Prior to, during and following dam construction.	WRC	Advice from WRC
P39 Restore recreational use around Gibbs Pool following the construction phase of the proposal. (Formerly P49)	To develop recreation facilities below the new dam.	Downstream of the new dam.	Following dam construction.	Shire of Harvey	Advice from the Shire of Harvey
P40 Conduct an investigation of the competency of the section of Weir Road to the construction site. (Formerly P50)	To determine road condition.	Sealed section of Weir Road.	Prior to dam construction.	Proponent	Submission of report
P40 Prepare and implement a construction traffic management plan in consultation with the Shire of Harvey and the local community. (Formerly P51)	To ensure road safety and protect amenity of residents.	Traffic routes to the construction site.	Prepare prior to and Implement during dam construction.	Proponent/ Shire of Harvey	Submission of EMS document
P42 Prepare and implement a safety monitoring and surveillance program for the Harvey Dam which supplements the existing program for the Stirling Dam. (Formerly P52)	To ensure dam safety.	Within the area of the proposal.	Following dam construction.	Proponent	Submission of EMS document
P43 Prepare a dam safety emergency plan for the Harvey and Stirling dams. (Formerly P53)	To ensure dam safety.	Within the area of the proposal.	Prior to completion of dam construction.	Proponent	Submission of EMS document
P44 Conduct a quantitative risk assessment of chlorination facility prior to construction. (Formerly P54)	To ensure the location and design of facility is acceptable.	Surrounds of the chlorination facility.	Prior to construction of disinfection plant.	DEP/DME	Submission of assessment report

Commitment (Who/What)	Objective (Why)	Action (How/where)	Timing (When)	Whose Advice	Measurement Compliance Criteria
P45 Prepare and implement a Stirling Reservoir draining and water release management plan to the requirements of WRC. (New commitment)	To prevent channel erosion below the Stirling Dam from releases during the construction of the Stirling intake tower.	Harvey River between the Stirling Dam and Harvey Reservoir.	Prepare prior to intake tower construction. Implement during intake tower construction.	WRC	Advice from WRC
P46 Upgrade sections of Honeymoon Road	To remove the current restriction on the use of Honeymoon Road by logging traffic	Honeymoon Road	By September 2000	Shire of Harvey/ CALM *	Advice from the Shire of Harvey
P47 Prepare and implement a recreation site redevelopment plan for recreational facilities below the Stirling Dam	To ensure that the reinstatement of facilities at the site is undertaken to provide a similar level of amenity to the existing recreation area	Downstream from Stirling Dam	Prior to pipeline construction	CALM	Advice from CALM
P48 Fund the preparation of a Regional Recreational Opportunities Spectrum Study (to the level agreed with CALM) and facilitate the necessary changes to existing recreation facilities (or development of new facilities) to compensate for the displacement of recreation facilities resulting from the proposal.	To address recreational displacement that may result from the proposal and identify offsets	By provision of financial resources to CALM	Prior to dam completion	CALM	Advice from CALM
P49 Provide details of pipeline construction methods and final site configurations	To address minimal disturbance and adequate site restoration	Stirling - Harvey and Harris - Stirling pipelines	Prior to pipeline construction	CALM	Advice from CALM

Note * For those issues affecting CALM

Other Commitments to be implemented by the Proponent

1	Establish a management presence in the proposal area. (Formerly P2)
2	Cooperate with CALM on fox and feral cat control programs in the area. (Formerly P13)
3	To ensure that the restoration program achieves at least 30,000 tonnes of carbon dioxide sequestration within 10 years. (Formerly P33)
4	Implement the proponent's land acquisition policy. (Formerly P34)
5	Inform landowners affected by the proposal of the land acquisition policy. (Formerly P36)
6	Assist the WRC in resourcing the preparation of a catchment management plan. (Formerly P38)
7	Initiate the Government Heritage Disposal Process. (Formerly P41)
8	Liaise with Rally Australia, the Shire of Harvey, WRC and CALM to facilitate the selection of an alternative route for Rally Australia, or management measures to protect water quality. (Formerly P47)
9	Undertake screen plantings of trees in the vicinity of the embankment and by agreement near residences within 1 km of the proposed dam. (Formerly P58)

Appendix 4

Summary of Submissions

and Proponent's Response to Submissions

1. Refinements to the Proposal

Several refinements to the proposal have been made through completion of more detailed design work since the Corporation submitted the PER for the Stirling Harvey Redevelopment Scheme to the EPA. The refinements are relatively minor changes and are outlined below.

1.1 Modifications to Stirling dam

The need and scope of works for modifications to the Stirling Dam were identified in the PER for the Stirling-Harvey Redevelopment Scheme. The extent of modifications was outlined in section 3.8 of the document as:

- Widening of the spillway to enable passage of the revised Probable Maximum Flood (including the need for blasting);
- Construction of a new concrete intake tower in the Stirling reservoir and modification to outlet works; and,
- Upgrading of the access track from the top to the toe of the dam.

The most significant environmental factor associated with the above work was identified in the PER as the impact of clearing vegetation for the new access track and the widening of the spillway. The factors and impacts relating to vegetation clearing were identified within the constraints of the project definition at that time and have not changed significantly since then.

Construction impacts, such as blasting, noise and dust were not raised explicitly for the Stirling Dam modifications as the site is isolated from residences The nearest residence is located in an adjoining valley about 1.5 kilometres away, and is separated from the site of the works at Stirling Dam by an intervening ridge.

Construction impacts and vegetation clearing will be addressed in the Environmental Management Plan for the project and incorporated into contractual documentation for the works.

Since the submission of the PER further definition of the modifications to Stirling Dam has occurred. This process has identified three activities that were not specifically described in the Corporation's PER which, in the interests of completeness, we would like to bring to the attention of the EPA. The activities are:

- The need to substantially lower the water level in the Stirling reservoir during the construction of the new intake tower and the impact of this on the in-reservoir aquatic fauna;
- The rate at which water will be released from the reservoir to achieve the required lowering of water levels and the impact that this will have on the downstream river channel; and,
- The need to raise the Stirling Dam to provide the necessary freeboard to prevent dam wall overtopping during the Probable Maximum Flood event.

In terms of the general definition of the works required for the Stirling Dam Modifications and the impact arising from these works, there are no additional social issues that have come to light since the submission of the PER.

Power supply to the Stirling Dam site will be undertaken as part of this project (refer to PER page 32). Power is required at the site for lighting within the new intake tower and for the operation of control valves and the gantry crane. Three power supply options are currently under evaluation:

- Three phase power installed below ground with the Stirling to Harvey trunk main;
- Single phase power installed above ground from the existing reticulated power network (an extension of approximately 1.5 km). The extension to the power supply would be entirely contained within the exiting cleared road reserve and would not require any additional clearing of vegetation;
- Power provided on site by a small independent generator set.

Selection of the preferred power supply option is expected by mid June. None of the above options impose any additional environmental impacts on the project.

1.1.1 Lowering Stirling Reservoir Water Level

Water levels in Stirling reservoir will need to be lowered to provide dry access to areas required for the construction of the works. A cofferdam will be constructed to control water flow during the construction period and this will provide a temporary refuge for aquatic fauna. The cofferdam will be constructed immediately upstream from the existing Stirling Dam and will maintain a storage capacity of at least 100,000 to 200,000 m^3.

A survey of aquatic species in the reservoir (Streamtec 1999) indicates that the fauna is depauperate and consistent with other public water supply reservoirs. The buffer volume provided by the cofferdam will ensure that the water body will remain fully oxygenated even with a concentration of fauna (pers comm Dr Peter Davies, Streamtec).

The cofferdam will be removed when the remedial works are complete. It is expected that the cofferdam will be in place for a period of up to 6 months from January to June. Present planning is for this work to be completed in 2003.

1.1.2 Rate of Release

Under the current planning scenario, the lowering of Stirling reservoir water levels to allow commencement of works is expected to be required by January, 2003. Lowering the reservoir by release of water will commence as soon as practicable after the winter inflow season of 2002. This provides a period of around 3-4 months to drain the reservoir by a combination of the transfer of water to Perth and the release of water to the new reservoir of the Harvey Dam (expected completion by June, 2002). Under this scenario, a release rate of 6-7 cumecs (18GL/month) will be adequate to achieve the desired storage position by January 2003. This rate of release is well below bank full flow and is consistent with the current release from the Stirling Reservoir for irrigation purposes.

In the event that the winter of 2002 is wetter than average and the new Harvey Dam is full, the release program may be shortened to minimise spill from the lower reservoir. A maximum release rate of around 10 cumecs (26GL/month) will be used in this instance. A 10 cumecs release rate is still within the bank full flow of around 14 cumecs.

If a shortened program of reservoir draining is required, care will be taken to slowly increase release rate to the full 10 cumecs to minimise the impact on the downstream channel. Similarly, when the release program ceases, the rate of release will be gradually reduced to avoid slumping of saturated banks.

Under both reservoir draining options, the release will be maintained at a constant rate over the period of draining to avoid the impact of surging on channel stability.

The Water Corporation will work with the Water and Rivers Commission, Fisheries WA and Recfishwest in managing the release of water from the Stirling reservoir. Informal contact has already been made with the Commission and no significant management issues are foreseen at this time.

The Corporation will undertake regular surveillance of the downstream river channel during the release program. Temporary protection measures such as, rock armouring and/or placement of geotextile material will be undertaken in the unlikely event that unnatural erosion of the channel occurs.

1.1.3 Raising Stirling Dam Embankment

Raising the Stirling Dam is required to provide adequate freeboard during extreme flood events (return period in excess of 100,000 years). Raising the embankment will not result in a change to the current maximum full supply level (158.46mAHD) and, hence, there will be no additional impact on the environment on completion of these works.

There are no environmental impacts associated with these works that are outside the normal construction issues addressed in the PER and included in the Corporation's Environmental Management Plan.

1.1.4 Conclusion

The Corporation believes that the refinements to the Stirling Dam modifications identified since the submission of the PER can be adequately and appropriately managed through our existing PER and Environmental Management Planning process and that a separate referral for Stirling Dam Modifications is unnecessary.

The Corporation proposes to incorporate an additional commitment to those identified in the PER to cover the management of draining Stirling reservoir and the associated water release.

Commitment

To prepare a reservoir draining and water release management plan for the Stirling reservoir in consultation with the Water and Rivers Commission.

Objective	To ensure that reservoir draining and water release from Stirling reservoir are managed in accordance with the requirements of the Water and Rivers Commission.
Action	Within the Stirling reservoir and downstream of the Stirling Dam.
Timing	Prior to and during Stirling reservoir draining.
Whose Advice	Water and Rivers Commission
Compliance Criteria	Submission of EMP

1.2 Chlorination and Fluoridation Plant

The Chlorination and Fluoridation plant outlined in section 3.3 of the PER has been relocated to a new site as shown on figure 1. This site and buffer zone are predominantly within Water Corporation owned land with only a small proportion of the buffer extending to Crown land and private property.

The site is on the top of a hill surrounding woodland and is concealed from all directions. The site is an ex gravel pit, considerably degraded, apart from one area that is still being worked. A gravel track exists to the site and would be suitable for upgrading to an access road.

The general fall of the land is such that a major chlorine discharge would flow towards the Harvey reservoir. Chemical deliveries will be unchanged from the original site.

1.3 Roads and Tracks

Some minor changes to the realignment of the Harvey Quindanning road have occurred since the submission of the PER (see figure 1). The changes have no impact on the statement of impacts and commitments made in the PER.

In terms of access track routes, the Corporation is continuing to work with local landowners to determine the best mutual solution for access track alignments. From discussions held to date, it is likely that the access to the north side of the reservoir will now be provided from the Harvey Quindanning road rather than from Honeymoon road as detailed in the PER. This change will reduce area of vegetation clearing required. While the access track alignments are still under discussion, the net impact of the final configuration on the environment will be similar (or less than) that outlined in the PER.

2. General Comments in Submissions

1. CALM has a number of statutory responsibilities that need to be reflected in deliberations on the following issues:

    - provision of areas of similar conservation value to the conservation estate;
    - preparation of fauna management plans;
    - re-establishment of significant fauna habitat in rehabilitation areas;
    - determination of bridge locations on significant streamlines to avoid impacts on stream conservation and habitat values; and
    - screen planting to protect visual amenity.

Response

The proponent recognises and understands the statutory role, expertise and knowledge of CALM relating to the proposal. Extensive consultations have been held with CALM (and are continuing) to facilitate the preparation of the environmental management plan (EMP) and selection of an area of similar conservation value to incorporate into the conservation estate. The need to consult with CALM was acknowledged throughout the PER and is being incorporated into the EMP.

2. The Executive Summary should have reflected the cooperative approach needed which relies to a large extent on CALM's knowledge of the area and ongoing management role.

Response

Refer to response to comment 1

3. CALM would like to be given some assurance of a more integrated approach to further planning and implementation of the scheme. Preparing an EMP which includes individual management plans (eg: vegetation protection, rehabilitation, etc) may be pre-empting the preparation of a more integrated and balanced catchment management plan approach involving full public consultation. If an EMP is prepared it should involve thorough consultation with CALM and approval by the EPA followed by the preparation of an Area Management Plan involving full public consultation.

Response

The Water and Rivers Commission (WRC) will direct the preparation of a source protection plan for the catchments of the Harvey and Stirling reservoirs. The proponent believes that this plan will involve extensive community consultation and is likely to promote land use activities (including recreation) that are consistent with the anticipated usage of the water resource. The proponent's vegetation protection, rehabilitation and river restoration commitments will be implemented to facilitate the protection of the water resource and consequently will be consistent with any source protection plan prepared.

The proponent understands that its commitment to prepare an EMP will be a condition of any environmental approval given to the project. This plan is being prepared in consultation with all relevant Government agencies (including CALM) and the community.

4. CALM would like to be consulted in relation to buffer area planning and buffer area fencing. Fencing design will need to consider the access requirements of native animals to water sources and be designed and planned accordingly. Buffer areas will need to be designed with topography as a consideration when determining widths. With out diminishing the width of the proposed naturally vegetated buffer, provision for management access should also be considered.

Response

The extent of the buffer around the new Harvey reservoir is a requirement of the WRC and is designed to facilitate protection of reservoir water quality. The proponent's commitment to revegetate this buffer to enhance habitat and ecological values is normally not a requirement. However, the proponent will consult with CALM on how ecological values of the buffer may be enhanced.

5. The process and implementation of Water Corporation policies regarding the impact of inundation on Harvey Weir Plantation must be clarified.

Response

Compensation will be negotiated with CALM to account for the potential loss of profit and reasonable costs associated with inundation of the Harvey Weir plantation.

6. Monitoring of the management for the protection and conservation of environmental values is a key performance indicator for the project's successful implementation.

Response

Monitoring of rehabilitation areas will be undertaken in accordance with the EMP developed as part of this proposal to determine the progress of rehabilitation and the use of such areas by significant fauna (including the Western Ringtail Possum).

3. Submissions on the Selection of the Preferred Option

1. The underground/under river proposal is the best option for piping water between the Stirling Dam and the proposed Harvey Dam. With some care during the construction phase and responsible rehabilitation the bush will regenerate within two years or so.

Response

The Corporation has reviewed options for the trunk main route immediately downstream of the Stirling Dam. Tunnelling and pumped schemes were compared against the preferred option to gravitate water from the Dam within the valley profile. For the preferred option, the Corporation will adopt minimum disturbance construction techniques and will undertake a comprehensive rehabilitation programme over the entire disturbance width. The pipeline will be buried over the entire route down the valley and no formal access track will be left in place adjacent to the pipeline after construction.

2. The construction of a new dam is not the only means of addressing the water deficit. Other initiatives such as increased water use rates, education programs, and incentives to local government, developers and the public to encourage the retention and use of local native vegetation instead of lawns could be pursued. Sustainable population growth, decentralisation, recycling of wastewater, and desalination are also options to new dams.

Response

A comprehensive water supply strategy for Perth, Mandurah and the Goldfields has been developed by the Corporation and is documented in Perth's Water Future. The strategy includes a programme of water supply development, a water conservation programme and, research and development initiatives. The Corporation is committed to water conservation and has a water use efficiency programme in place for Perth that is continually reviewed and refined in response to consumer attitudes and water use levels. The Corporation's source development timetable is consistent with the targets for efficient water use determined by the Water and Rivers Commission.

3. It appears the tunnel option was discounted purely on cost. The advantages and disadvantages of the tunnel option needs to be discussed in greater detail to justify the preferred option. CALM favours the tunnel option as it appears to minimise the potential impact on landscape, recreational and environmental values in the Harvey River Valley through State forest.

Response

Pipeline route options considered a range of factors including vegetation, flora, dieback, erosion, construction, safety and cost. The tunnel option was primarily discounted on the grounds of cost as it is over $10M more expensive than the preferred option ($25.46M compared to $14.98M). However, the tunnel option also requires vegetation clearing along its route to enable test drilling of the tunnel profile and will have impacts in terms of site disturbance and dieback management. The selected valley option will be constructed using minimum disturbance techniques and any clearing undertaken as part of the construction will be fully rehabilitated after completion.

4. Submissions Relating to Epa Factors

4.1 Biophysical

1. While it is acknowledged that efforts have been made in the form of commitments including the rehabilitation of 237ha of land and changes to the original proposal to make the proposal more environmentally acceptable, this does not mean the preferred option is environmentally acceptable. The cumulative impacts of biodiversity loss has not been adequately factored

into the proposal and the provision of cheap water which will be wasted on Perth gardens is not worthy of the environmental trade-offs that put forward in this proposal.

Response

Biodiversity losses have been considered in the development of the proposal and in the formulation of environmental management measures and commitments. These losses must be kept in perspective as follows:

- *The total area of native vegetation being inundated by the proposal is 181 ha. The actual area of "less disturbed" native vegetation being inundated by the proposal is far less than 181 ha. Much larger areas of native vegetation have been removed or degraded by previous inundation, logging and agricultural activities. Any losses as a result of this project will be more than compensated for by rehabilitation and reservation of native vegetation.*

- *Some loss of peppermint stands in the bottom of the Lowdon vegetation complex will occur as a result of inundation. The floristic and structural composition of these areas have been severely affected by previous activities such as grazing, clearing and burning. These stands of trees will be re-established in adjacent areas on lower slopes with loam soils (refer rehabilitation commitments).*

- *Some small loss of biodiversity from a botanical perspective may occur as a result of the construction of the Stirling-Harvey pipeline. The total area disturbed is relatively minor and rehabilitation of these areas with local species will redress any local loss of botanical biodiversity.*

- *Some loss of biodiversity from a botanical perspective may occur from inundation of a small area of Forrestfield Complex vegetation. Other areas of this complex are currently being investigated as a means to secure a similar area (which would not otherwise be secure) in the wider conservation estate. The Forrestfield complex on the lower slopes within the proposed inundation area support approximately 5 to 6 ha of Wandoo woodland and the remaining 10 or so hectares is dominated by Jarrah – Marri.*

The proponent has identified (and committed to) a comprehensive package of rehabilitation measures:

- *Restoring 237 ha of currently cleared or highly degraded vegetation;*

- *Providing $750,000 to a trust for the purposes of restoring the Harvey river system including riparian vegetation; and,*

- *Securing additional land with substantial conservation value for the conservation estate.*

The proposal has been considered along with many other options for meeting the water supply needs of Perth. The Corporation's water supply strategy for Perth (Perth's Water Future) examined a range of water supply options and demand management measures to arrive at the preferred strategy for water supply to Perth to 2020. The selection process for the strategy included assessment against social, environmental, financial and technical criteria.

Perth's Water Future has been accepted by the Water and Rivers Commission and the EPA as a balanced framework for source development for Perth into the future.

The Corporation's water supply development programme, including the development of the Harvey Dam, is consistent with the targets determined by Water and Rivers Commission for efficient water use.

4.1.1 Terrestrial Flora

Vegetation communities

1. The inundation of 181 ha of vegetation is of some concern, however if the proposed management measures are implemented the predicted outcomes will be satisfactory in the long term.

Response

The proponent agrees and believes that the implementation of the proposal and the associated environmental management measures and commitments including:

- *the establishment of the Harvey River Restoration Trust;*
- *rehabilitation of areas (237 ha) degraded by previous land uses, and*
- *incorporation of additional areas into the conservation estate,*
- *are likely to result in a net environmental benefit.*

2. It appears there is considerable variation in the area to be inundated below the 78m AHD contour. EPA Bulletin 910 identified a small portion of Area 5 to be impacted by inundation below the 78m contour while the PER identifies a much larger area. Has the PER accurately addressed the impact of inundation on the vegetation of Area 5 and financial loss to all landowners concerned?

Response

The areas quoted in table 12 of the PER as impacted by inundation are based on the latest survey information.

The discrepancy in mapping information referred to in comment 2 is due to base contour data. EPA Bulletin 910 was based on information provided by the Water and Rivers Commission which was derived from earlier coarse contour data. The mapping used by the Water Corporation in the preparation of the PER is based on the latest detailed survey information and is the more accurate.

3. The proposed alignment of the pipeline under Option C within Lot 11 is located within the upper slopes of the Harvey River Water Course ranging between 20m and 50m from the existing river channel. WRC has stated that '...construction of the pipeline along the riverine area downstream of the Stirling Dam is considered to be an unacceptable impact: it could be avoided by locating the pipeline outside riverine areas (page 59)'.

   The Water Corporation PER states '...construction of the north of the river alignment would lead to greater disturbance of vegetation and higher risk of erosion because of its steeper grades and lower level of existing disturbance (page 27)'. However, no detailed vegetation or fauna survey was undertaken along the proposed pipeline route within Lot 11. Despite this the general vegetation complex is identified as 'Helena Landform' in the PER which is considered to be the highest order of significance '...due to the variety of habitats and therefore species on the steep slopes with granite outcropping (page 68).'

It is clear that the proposed route does not meet the WRC requirement of not being within the riverine vegetation and is likely to impact significantly on vegetation that is considered to have the highest order of significance.

Response

The concern over the riverine vegetation has since been addressed through joint site visits with experts from the botanical team and representatives from the Water Corporation and the Water and Rivers Commission. As a result, the concern over riverine vegetation has been addressed through the reduction in the number of creek crossings (so that there is minimal impact on the riverine areas). The experts also noted that the upper reaches of the riverine systems near the Stirling Reservoir have been modified extensively by past recreation activities and the "training" of the stream zone for canoeing activities. The Water Corporation is also addressing hygiene needs during construction so that activities are controlled in these areas to minimise the risk of dieback disease spread and intensification (eg. on Banksia littoralis and Banksia seminuda). Wherever possible the Water Corporation has committed to avoiding larger and older trees along the proposed pipeline route.

The Helena Complex is high in biodiversity values as a result of the range of structural types (lithic complexes, heaths, woodlands and forests), however the potential impact of the proposed pipeline on the vegetation within this complex is still restricted as the route has been selected to optimise the current cleared and grazed areas.

4. Will the regeneration work be carried out using professional assistance or left to volunteer groups?

Response

The planning of the revegetation work has already commenced and includes a team with extensive experience in rehabilitation in the Jarrah forest (J Quilty and E Mattiske combined have a minimum of 40 years of experience working in this area). Rehabilitation planning has already addressed current site needs, site remedial needs, selection of appropriate local native species by vegetation complex and site-vegetation type.

Regeneration work will be carried out using professional assistance if the nature of the work is specialised or special equipment is required. Volunteer groups may be utilised under supervision.

5. At the dam site on Saturday, 20 March 1999 representatives of the Water Corporation said all millable timber will be removed from the inundation area by CALM. Welker Environmental Consultancy Report (page 126) says 50% of trees or vegetation will be burnt on site and the rest left to decay. Which is the true situation?

Response

The PER (pg 126) does not contradict statements relating to the recovery of timber from any areas to be cleared . The PER does state "The calculation of greenhouse gas emissions released as a result of this loss (clearing) is based on the conservative assumption that all of the vegetation will be lost – 50% being burned on site and 50% allowed to decay". In other words, not knowing exactly how much timber would be recovered it was assumed that none would be recovered for the purpose of estimating greenhouse gas emissions. Good environmental impact assessment practice is to over-estimate greenhouse gases emissions where there is uncertainty in determining the amount of vegetation left to decay.

The process for dealing with vegetation from areas required to be cleared for dam or pipeline construction is:

- *Removal of all commercial timber by an approved CALM contractor;*
- *Removal of non-commercial timber (not necessarily by a CALM contractor), stockpiling at an agreed site for future use or sale by CALM;*
- *Logs deemed by the supervising CALM officer as suitable as potential habitats for native fauna will be marked and placed to one side of the clearing;*
- *Possible placement of some timber in the Harvey reservoir to provide improved habitat for fish and marron; and,*
- *Surplus forest material will be returned (mulched or unmulched) in the process of rehabilitation.*

As a last resort, cleared vegetation may be burnt with the approval of CALM in forested areas and/or in accordance with permits issued under the Bush Fires Act.

6. The proposal will result in the loss of pristine vegetation from the Helena Complex and a portion of the Lowdon Complex on the Sunnyvale Farm and adjoining property, Springfield (Area 5). The conservation significance of this area of private land was not considered by Havel (1994a and 1994b) during a study of the impacts on the vegetation and flora of the anticipated inundation area. Mattiske (1998) recorded the native vegetation of Area 5 at Sunnyvale Farm to be in very good composition with diverse flora and fauna habitats. The conservation value of this area is further strengthened by the presence of a population of Priority 4 species *Hibbertia silvestris* and the poor representation of the Lowdon Complex is conservation reserves.

   Mattiske Consulting Pty Ltd (1998) concluded that this loss was of 'greatest concern in terms of inundation of native vegetation' over the extent of remnant vegetation affected by the Scheme. Further, Mattiske (1998) recommended that the area of inundation be restricted to Zone One, thereby avoiding impacts to most areas recognised as supporting vegetation including Area 4, 5, 6 and most of Area 2.

   The conclusions relating to loss of significant vegetation in Area 5 and the recommendations presented in the Mattiske report have been omitted from the PER.

Response

Mattiske Consulting (1998) was considered in the preparation of the PER. However, since these earlier concerns regarding the vegetation within the proposed inundation areas, more field work has defined a higher degree of disturbance in some of these inundation areas (and hence their values are not necessarily as high as initially thought). Also options for rehabilitation and possible land security of other areas have been investigated and reported on since this earlier work to redress these concerns.

Hibbertia silvestris – is classified as a Priority species by the Department of Conservation and Land Management. On the basis of Koch and Mattiske's previous studies in the northern Jarrah forest, and more specifically the recent survey work along the pipeline by the Mattiske Consulting Pty Ltd, some plants of this priority species will be disturbed by the proposed pipeline activities. However on the basis of some 40 years of experience in the wider area by Koch and Mattiske, there is little doubt that this species is widespread in the Dwellingup to Collie districts and has appeared in most botanical surveys undertaken by Mattiske Consulting Pty Ltd in recent years. The species was recorded along both sides of the Harvey River between the Stirling Dam and the proposed extension to the Harvey Weir and therefore at the worst within the project area it is estimated that the pipeline will disturb a minor proportion of the thousands of plants known to occur over a wider geographical range.

7. The PER states that the areas affected by occasional inundation 'will result in the mortality of species which are susceptible to waterlogging'. All species of flora in the mid to upper slopes will be susceptible to waterlogging resulting in extensive tree deaths and loss of habitat. The assessment of environmental impacts should take this into consideration.

Response

There is no doubt that there will be some mortality in the inundation areas, however the type and extent depends on the species present and the length of inundation. In other studies of a similar nature in the western Darling Ranges there has been a shift in plant communities as a result of shifting levels of inundation and soil moisture regimes. The latter in part occurs in response to climatic conditions and there is evidence in other catchments within the northern Jarrah forest for this shift. The latter then becomes related to the degree of change and what species and communities are affected in aerial extent by such shifts. Historically many species are able to adjust to these changes, however this may take some time.

8. The WRC Water Allocation Plan states 'A study (Hocking 1997) found the Harvey Hills to be a landscape of cultural significance at the state and local levels. A new Harvey Dam would make a significant modification to the landscape of the area (Page 54)'. The proposed Harvey Dam and Stirling Harvey pipeline will result in the loss of significant areas of remnant vegetation, soil erosion and increased land degradation along the Harvey River Valley. As the proposed pipeline easement would be cleared for construction and only partly revegetated with understorey plants, a major scar would remain across the landscape in the Harvey River Valley. Given the significant historic land clearing and development that has occurred on the coastal plain and Darling Scarp, it is important that the few areas of remnant vegetation are preserved for the use and enjoyment of future generations.

Response

Refer to response to comment 1, section 4.1.

The pipeline access required by the Corporation after construction will be minimal. The pipeline will be buried over its entire length and all disturbed ground will be reinstated. In areas of native vegetation, rehabilitation will re-establish native habitat. Permanent access to the pipeline after construction will not be required and no formal access track in forested areas will be created.

9. For the pipe to be buried in a way to minimise erosion a much wider level of disturbance than the 20m proposed will be necessary. The overstorey will be removed and not replaced. There are few if any disturbed areas on which to place topsoil or lay pipes (p27). The tracks referred to are little more than a pair of wheel tracks. The submitter is concerned that the extent of clearing required has been understated and the potential for erosion understated in the PER.

Response

The disturbance zone will be as described in the PER (ie, 11-13m in forested areas) and the design will be optimised to reduce clearing and disturbance zones. Where possible the trees will be kept and the pipeline route has been designed to minimise any removal of trees. There is no need to have areas cleared specifically for pipe storage or for topsoil stockpiling. Instead it is proposed to have the pipe stored away from the riverine area and brought in as the trench is excavated. The topsoil would normally be pushed to each side of the disturbed area to form two rows. In general the design is specifically aimed to reduce the extent of clearing and the potential for erosion. Other erosion control practices will be utilised as necessary. Topsoil will be replaced immediately after construction and the surface will be revegetated.

10. To assist with evaluation of the impacts of the proposal a more detailed comparison of vegetation communities within the areas of Forrestfield complex which will be affected by the dam and similar communities on the Swan Coastal Plain and/or Darling Plateau is required. Comparison of the species composition of communities at the dam site with other sites on the Coastal Plain or Darling Plateau using suitable computer analysis software may be appropriate.

Response

A more comprehensive analysis of the vegetation of the Forrestfield complex areas is currently underway by Mattiske Consulting Pty Ltd both within the proposed inundation area and similar areas outside the project area for comparative purposes.

Refer also to response to comment 11.

11. The PER does not report or comment on the requirements of EPA Bulletin 910 except to make a commitment for further rare flora studies along pipeline routes prior to construction.

Response

The PER addressed all studies and further actions listed in EPA Bulletin 910 (pg 20). More specifically:

- *Additional Declared Rare Flora work was carried out by Mattiske Consulting Pty Ltd (refer also to response to comment 12 below) and was reported in the PER (pg 73-74);*
- *Vegetation surveys were conducted at site vegetation type level because it not only incorporates the plant community but also includes the critical site parameters that determine community distributions. A comparison with vegetation in other areas was also made. Further comprehensive comparative analysis is currently underway on areas within the proposed inundation area and similar areas outside the project area (refer also to response to comment 10);*
- *The PER (pg 70-73,78-81,87 and 91-94) describes measures and provides commitments to offset the loss of conservation values of vegetation as a result of the implementation of the proposal;*

- *Surveys were conducted to confirm the presence of the Western Ringtail Possum (none were located). The presence of the Western Ringtail Possum was assumed in the PER and a commitment has been made to prepare and implement a management strategy (which includes even further surveys) for this species to the requirements of CALM (pg 81-82 of the PER). Translocation of the species will only be undertaken as a last resort;*

- *The alignment of the Stirling-Harvey pipeline was established following consideration of a number of options (PER pg 27-29). The preferred alignment was selected in consultation with the Water and Rivers Commission and avoids riverine areas except where it crosses the Harvey River (at two locations).*

Declared Rare and Priority Flora

1. What is being done to protect Declared Rare Flora (DRF) (eg: Spider orchids, Tall Donkey orchids, Dwarf Hammer orchids, *Eucalyptus granitcola*)? These are known DRF in the area to be inundated and are protected by the *Wildlife Conservation Act 1950* and the *Conservation and Land Management Act 1984.*

Response

Declared rare flora (DRF) and priority flora searches have been conducted by an experienced botanist in all areas to be affected by the proposal. A further detailed search for DRF and Priority flora has also recently been conducted along the proposed pipeline alignment between Stirling and Harvey Dams. No declared rare plants were found along the route. Environmental induction programs are currently being developed for the Water Corporation's project construction contractors. The inductions will include sections on rare and priority flora and the management measures and notification responsibilities regarding these. CALM will be notified of the discovery of any declared rare flora within the disturbance areas of the proposal, and management measures developed and employed accordingly. The protection of declared rare flora and the appropriate management measures, will be outlined in the EMP for the project.

2. CALM will need to be consulted as to where bridging would be undertaken for pipelines across gullies to avoid impacting on declared rare or priority flora. This could be detailed in the EMP.

Response

CALM has been consulted regarding river crossings along the Stirling-Harvey pipeline in the vicinity of Stirling Dam. CALM has stated that under-river crossings are preferred due to aesthetic reasons. This is the option preferred by the Water Corporation, as the pipe would be protected from falling trees and fire if below ground. CALM and WRC are being consulted with respect to potential environmental impacts from under or over river crossings. Management measures will be employed, as agreed with CALM, should any declared rare or priority flora be found within the impact zone of the proposal. These management measures will be outlined in the EMP.

4.1.2 Fauna

Terrestrial Fauna

1. The vegetation proposed for inundation provides habitat for species of rare and vulnerable fauna such as Baudin's Black Cockatoo (*Calyptorhynchus baudinii*), listed as Schedule One on the *Wildlife Conservation Act 1950*, and the Forest Red-tailed Black Cockatoo (*Calyptorhynchus latirostris*) which is listed as Priority Four on the CALM Priority Species list. The principal impacts on these species will be the loss of feeding and breeding habitats. The clearing of mature Eucalypts should be kept to a minimum and rehabilitation of the site should commence as soon as possible.

Response

The proponent recognises the potential impact of clearing mature eucalypt trees on Black Cockatoo (Calyptorhynchus baudinii), and the Forest Red-tailed Black Cockatoo (Calyptorhynchus latirostris). Table 13 in the PER outlines the management measures that will be applied to protect rare and vulnerable fauna. This Table indicates that the clearing of mature eucalypt trees will be kept to a minimum and as many overstorey trees as possible will be retained below the full supply level.

The proponent will commence rehabilitation of areas not affected by the proposal as soon as environmental approval is obtained.

The level of security for fauna in the Stirling catchment will increase after public access is restricted (through implementation of the Source Protection Plan), and surveillance by Water Corporation rangers commences.

2. Approximately 1.2ha would be affected by the proposed pipeline on Lot 11 (based on 18m clearing width over 654m) resulting in a significant loss of habitat. The Water Corporation only intends to replace cleared vegetation along the pipeline with local understorey vegetation which would result in the permanent loss of a significant area of habitat for the remaining populations of Western Ringtail Possum and other Priority species as listed in the PER.

Response

With reference to the area of land affected by construction, the disturbance will not result in a significant loss of habitat as only a thin strip of land will be cleared.

In regard to the grove of Peppermint trees on Lot 11 where there may be a habitat that supports the Western Ringtail Possum, more detailed surveys are being completed and a Western Ringtail Possum Management Strategy Plan is being developed in consultation with CALM.

3. Lot 500 includes 200 acres of land registered with CALM as "Land for Wildlife" registration number 68. If the pipeline goes through Lot 500 it will cause considerable disturbance to habitat trees including those frequented by red tailed black cockatoos and rare river banksia. The Road pipeline option (p41) should be given further consideration as an alternative route to avoid these impacts.

Response

Construction of the pipeline will adopt best practice techniques to minimise clearing and avoid mature trees and river banksias in particular (not classified as priority or rare) where at all possible. All areas disturbed during pipeline construction will undergo comprehensive rehabilitation as soon after construction as is practicable. The area of disturbance will be restricted to 11 to 13m in areas of native forest. The proponent recognises the potential impact of clearing mature eucalypt trees on Black Cockatoo (Calyptorhynchus baudinii), and the Forest Red-tailed Black Cockatoo (Calyptorhynchus latirostris). Table 13 in the PER outlines the management measures that will be applied to protect rare and vulnerable fauna.

4. The proposed inundation will require the re-routing of a section of the access road to Sunnyvale Farm through an area of pristine bushland proposed for the release of native endangered fauna under a program supervised by CALM. The PER does not make any reference to the proposed realignment of the road in this area.

Response

The alignment of the access road has not been finalised. The road will be reconstructed to ensure minimum impact by re-routing around the area of bushland or forming the road in a cleared area of the river.

5. The WRC Surface Water Allocation Plan states '...the Western Ringtail Possum was present in the proposed inundation area [and] this population may be at a critically low density...'. A detailed survey of the pipeline alignment was not undertaken by the Water Corporation or WRC within Lot 11 hence it is not known if populations of the Western Ringtail Possum are present. It is important to note that habitat where the possum was located (the proposed inundation area) is largely cleared and therefore significantly degraded. By contrast parts of the proposed pipeline alignment within Lot 11 pass through a significant grove of Peppermint trees in pristine condition which the Water Corporation acknowledges is a form of habitat that supports the Western Ringtail Possum.

Response

Refer to response to comments 2 and 3.

6. CALM will need to be closely consulted in relation to a Management Strategy for western ringtail possums. CALM needs to be closely consulted as to preference for any purchase of equivalent areas for conservation into the conservation estate. Improvements for the proposed Korijekuo Conservation Park through rehabilitation of degraded areas would best be done in the context of a management plan that would take into consideration existing vegetation condition and depict areas for recreation and select special conservation by appropriate zoning.

Response

A fauna survey will form the basis for the development of the Western Ringtail Possum Management Strategy and Fauna Management Plan, both of which will be developed in close consultation and association with CALM.

The Water Corporation has initiated discussions regarding suitable land to purchase for inclusion into CALM's Conservation Estate. Mattiske Consulting and Welker Environmental Consultancy, the Corporation's Environmental Consultants, are currently surveying areas around Harvey to identify sites of similar conservation and ecological value to the Forrestfield Complex vegetation to be inundated by the proposed new Harvey reservoir. When suitable sites are identified, DEP and CALM will be consulted to determine the suitability of one or more of these sites for inclusion into their Conservation Estate.

Preliminary discussions regarding Water Corporation's assistance with the clean-up/rehabilitation of Korijekup Conservation Park have also been initiated with CALM. A meeting to develop a management plan for the park is to be arranged for the first week of June. ALCOA, who also wish to provide assistance, has contacted the Water Corporation to develop an assistance package.

7. The Carpet Python is also recognised as a rare species in the PER whose habitat includes granite outcrops. The proposed pipeline route could significantly impact on remnant populations of the Carpet Python which local residents have identified in granite outcrop areas within 500m of Lot 11, and by association is also likely to live within the granite outcrop areas of Lot 11.

Response

The pipeline route has been designed to avoid, as far as practicable, granite outcrops that are potential habitat for the Carpet Python. The pipeline will pass in proximity to one outcrop on Lot 11 and the proponent will consult with CALM on appropriate measures to minimise impacts in this area.

Aquatic fauna

1. Monitoring of impacts on terrestrial and aquatic fauna should be continued.

Response

A monitoring programme for terrestrial fauna to establish the efficacy of management measures (including rehabilitation) will be an element of the Corporation's Fauna Management Plan.

A programme of aquatic fauna monitoring will be developed in conjunction with the Water and Rivers Commission. Sites in the Stirling catchment and downstream of the proposed Harvey Dam have been identified to monitor water quality, channel morphology and fauna composition.

4.1.3 Wetlands

Watercourses

1. Releases of water from the Stirling dam over the last 50 years has resulted in elevated water levels in the river over the summer months. This has allowed the river bank vegetation to thrive, provided an abundant water supply for stock, and has created a natural barrier to stock, wildlife and feral animals.

   Releases of additional water over the summer months to allow canoeists to use the white water slalom course has resulted in severe erosion of those sections of the river bank not well protected by vegetation.

   The submitter is concerned that the introduction of a new pipeline from the Stirling Dam will result in the bulk of the water being diverted to the Perth water supply scheme rather than being released to the river over the summer months. This reduced summer flow combined with a commitment to release sufficient water to flood the white water course will result in severe degradation of the river. The wetting and drying cycle would cause the riverbanks to become very unstable and prone to erosion.

Response

The current release regime from the Stirling Dam to the Harvey Weir is highly modified. Large volumes of water are released to the Harvey River downstream from the Stirling Dam during the summer months when, under a normal hydrological regime, flows would be very small. The proposed change in release volume (from a current maximum of about 45GL to the proposed 16GL) will not impact the environmental values of the Harvey river downstream from the Stirling Dam.

The commitment to make provision for release of water for canoeing purposes is consistent with the conditions specified by the Water and Rivers Commission for an allocation of water from the Stirling Dam for public water supply.

2. Degradation of the river would result in large amounts of sediment and plant matter being washed downstream increasing the turbidity in the new dam.

Response

Under the normal irrigation release rate of 6-7 cumecs, very little degradation of the river channel occurs. If water is required to be released at a higher rate for whitewater canoeing, the Water Corporation will work with the Amateur Canoe Association of Western Australia to manage the releases to minimise impact on downstream channel stability.

3. The in-stream water allocation for the Harvey River should be set at the current levels with only the volume of water pumped from the Harris Dam diverted down the pipeline. This would require a smaller pipeline, with a reduced environmental impact, and maintain the health of the vegetation currently established on the riverbanks. The extra water

running into the proposed Harvey Dam could then be diverted into the Perth pipeline at a point neat the new dam wall.

Response

Options for development of the Stirling Harvey system are discussed in section 2.2 of the PER.

The option to divert water to Perth from the proposed Harvey Dam has been considered. The water quality associated with the Stirling reservoir is far superior to that in the lower reservoir at Harvey and, whereas Harvey water would require comprehensive treatment, water from Stirling can be used with disinfection only. Coupled with this, water abstracted from Harvey would require pumping to reach Perth (water will gravitate from the Stirling reservoir to Perth).

4. The re-introduction of white water canoeing will require careful management and monitoring to ensure minimal damage to the river and its habitat.

Response

The Water and Rivers Commission has determined that a release of water from the Stirling Dam for whitewater canoeing purposes is a beneficial use and that the developer of the Harvey resource will be required to make provision for its continued operation. The Water Corporation acknowledges this condition and has made provisions within its planning and definition of the Harvey Dam project for this activity to occur in future if conditions allow.

5. Water is essential for the continued eco-system of both the Harvey River and the Harvey Diversion Drain. Will current volume of water entering these systems be maintained?

Response

Environmental water requirements have been determined by the Water and Rivers Commission for the region downstream of the proposed Harvey Dam. The Commission has determined that the needs of the downstream environment can be adequately met by flows from other unregulated and semi regulated streams within the basin and that there is no need for a specific release of water from the proposed Harvey Dam for environmental purposes. The system downstream from the proposed Harvey Dam will be monitored to confirm the Commission's determination.

6. The physical impact of whitewater releases on the Harvey River, the basis of a number of investigations by independent and government hydrologists and engineers (Water and Rivers Commission), has been omitted from the PER.

Response

The proponent was advised that results of investigations on physical impact of whitewater releases, referred to by the submitter, were not available for public release or reference because they were subject to legal privilege.

7. The access track proposed adjacent to the pipeline would be particularly prone to erosion on the steep slopes of Lot 11. It is highly likely that localised destabilisation will result in minor earth slips and increased erosion over time, especially in the steeper areas where the width of disturbance will be greater (as stated in the PER).

Response

There is no permanent track proposed for the purposes of access to the Stirling Harvey pipeline through Lot 11.

8. To minimise impacts on the environment the proposed pipeline should either be tunnelled, located in existing road reserves and cleared lands, or relocated out of riverine areas and areas of significant vegetation.

Response

The proposed pipeline route is located outside of riverine areas and follows, where possible, tracks and areas that have already been cleared. The Corporation, in conjunction with WRC, has reviewed options for the trunk main route immediately downstream from the Stirling Dam. Tunnelling and pumped schemes were compared against the preferred option to gravitate water from the Dam within the valley profile.

9. In the absence of comprehensive ecological understanding the initial in-stream flow recommendations should be regarded as estimates only. Provisions must be made for these estimates to be refined and adjusted with time.

Response

The WRC has, through the Harvey Basin Surface Water Allocation Plan, established environmental water requirements (EWRs) for the key ecological values and features of the Harvey River. The EPA considered these EWRs were adequate but recognised that a monitoring program should be developed to determine the efficacy of EWRs for aquatic fauna and riparian vegetation. The PER includes a commitment (No. 20) for the proponent to prepare and implement such a program jointly with the WRC.

It is understood that the WRC would use results of such a program to refine EWRs as required.

10. The whole tone of the report plays down the environmental impact of the redevelopment scheme and proposed future management programs the reader is expected to believe will fix the damage. There is no reference to what will happen to the permanently running river.

Response

The report objectively documents the environmental factors and environmental impacts associated with the proposed Stirling Harvey Redevelopment Scheme. The information provided in the report has been sourced from consultants widely recognised in their respective fields of expertise. The Corporation's environmental commitments have been developed in consultation with expert consultants, expert agencies and through public consultation.

4.2 Pollution management

4.2.1 Air

Particulates / Dust

1. Have dust levels east and west of South Western Highway been monitored and recorded? If so, will monitoring continue during construction?

Response

Dust levels will be monitored and recorded at sensitive locations east of the South West Highway before and during construction of the Harvey Dam.

The PER identified that dust sensitive land uses in the vicinity of the dam construction site include residential areas and table grape vineyards (PER pg 114). A Dust Management Plan, which includes dust monitoring, is being prepared as part of the EMP.

Environmental dust criteria for residential areas are described in the PER (pg 113).

Discussions with the Department of Agriculture have indicated that there are no definitive dust criteria to protect table grapes. Consequently the proponent will be adopting best practice dust suppression methods to minimise emissions.

A monitoring program has been initiated to establish background dust levels and to determine whether residential criteria will be met and to identify changes in dust levels at table grape vineyards.

Dust monitors and associated meteorological station will be located as follows:

Location	Parameters monitored
Agricultural school	Continuous Total Suspended Particulates (TSP) monitor, continuous PM10 monitor, deposition gauge, meteorological station (measuring wind speed direction sigma theta, temperature, solar radiation and humidity on a continuous basis)
Jackson Vineyard (eastern boundary)	Continuous TSP monitor, deposition gauge

The EMP will describe procedures for reporting monitored dust levels and responding to any complaints of excessive dust.

4.2.2 Water

Surface water quality

1. An analysis of the 'Impact on Agriculture' should be incorporated into Table 2 of the PER. The PER contains minimal discussion on the effects of the Harris-Stirling pumpback operation on Wellington Dam. The Wellington Dam currently receives fresh water from the Harris River which decreases salt levels and improves water quality. The fresh water input complements the Recovery Plan that aims at making Wellington Dam water potable by 2015. Pumping water from the Harris Dam to the Stirling Dam will most probably decrease flow into the Wellington Dam, thus effecting the salt concentration in the dam and consequently the outcomes of the Recovery Plan.

Response

The volume of water available from the Harris Dam for supply to Perth has been determined by the Water and Rivers Commission. In allocating the water, the Commission has stipulated that, inter alia, the needs of South West Irrigation (including salinity management at Wellington Reservoir) must not be adversely impacted. Furthermore, the Commission has stated that local needs for the environment, Great Southern Towns Water Supply, power generation and Wellington salinity management have precedence over water supply to Perth. The Corporation understands these conditions on the allocation of water from Harris Dam.

The Corporation has completed salinity modelling for the Harris-Wellington system under various water supply and demand scenarios and has determined that taking water for supply to Perth has a very small impact on the ability of Harris Dam to manage salinity levels in the Wellington reservoir.

2. Proposed catchment management planning must be undertaken in conjunction with existing groups, agencies and mechanisms currently involved in catchment management activity.

Response

Section 10.4.2 of the PER states that the Water and Rivers Commission (WRC) will direct the preparation of a Catchment Management Plan. This Catchment Management Plan is now called a Source Protection Plan to reflect the emphasis on protection of water quality.

An important part of preparing a Source Protection Plan is consultation with all stakeholders within a catchment. Stakeholders will include agencies associated with activities in the catchment, recreation and interest groups that use the catchment and landowners and residents in, or neighbouring the catchment. This consultation will be achieved through having a representative from each of these parties on a Reference Group.

3. Effects on water quality from various activities, and water quality requirements for the Stirling Harvey Reservoirs should have been made clearer in the document.

Response

The PER refers to Source Protection and Recreation Planning in section 10.4.2. In this section the process is briefly outlined. However, since the protection of the source is a legitimate WRC function it was not discussed in depth in the PER. Further, since most aspects of the Source Protection Planning process require consultation with all stakeholders in the catchment the PER was not deemed the appropriate vehicle for this component.

The Source Protection Plan is considered a very important component of the overall scheme and consequently an in depth study has commenced under the direction of the WRC.

4. The risk to water quality identified on page 137 of the PER conflicts with comments on the Town of Harvey water supply (page 139).

Response

The quality of the existing water supply to the Town of Harvey (which is drawn from the Harvey Reservoir) is inferior to that of the Stirling Reservoir. However, the proponent recognises there are risks to the water quality of the Stirling Reservoir from existing land uses and that these risks will be minimised by the application of best management practices.

The WRC has advised that it will require such practices to ensure water resource protection objectives are met.

5. Pesticides, fertilisers and roading impacts need to be addressed in a broader context as private property landuse and management practices should share an equal consideration of risk to water quality.

Response

These issues will be addressed through the Source Protection Planning process which will be completed under the direction of the Water and Rivers Commission.

4.2.3 Non-chemical Emissions

Noise and Vibration

1. Will noise monitors be placed around the work area? If so, what radius from the work site will they be? Will they be kept in place for the duration of construction?

Response

A continuous noise monitor will be located at either a residence in the Aachen Way residential area, or the Agricultural School, which lies immediately north of the Aachen Way residential area. Both locations are about 1 km from the construction site. The monitor will be used

throughout the construction period. Monitoring results will be made available to the community on a monthly basis during the construction seasons.

The continuous noise monitor may also be used to measure traffic noise levels by location at residences close to Weir Rd. Alternatively, traffic noise will be periodically monitored (not less than one day per month) at the roadside using a hand-held meter.

Blast noise and vibration monitoring will also be undertaken at a location between the construction site and the Aachen Way residential area (most likely on the Agricultural School grounds). All results will similarly be made available to the community on a monthly basis during the construction seasons.

2. It appears from the PER that there will be an additional 40-100 heavy vehicle movements per day with 100-200 light vehicles, 6 days per week between October and March for two years. Given the average working day during construction to be 11 hours, up to 200 truck and trailer movements a day, this equates to a truck movement every 6.6 minutes past a given point.

   - what will be the gross weight of the average truck and trailer?
   - what is the projected increase in total movements along Weir Road (expressed as a total number and as a percentage)?
   - how many vehicle (truck + workers + supervisors + visitors) will pass along Weir Road from or to South Western Highway, thereby passing the High Schools?
   - will turn off ramps at the intersection of South Western Highway and Weir Road be installed?
   - what restrictions during construction will apply to minimise disruption of living and working in the area five kilometres from the work site?

Response

The PER suggested that the number of heavy vehicle movements along Weir Rd associated with dam construction may be up to 40-50 but would increase up to 80-100 if crushed rock and gravel was sourced externally to the construction site (p123).

More recent estimates of external construction material requirements for the dam are for 140,000 tonnes of sand and up to 120,000 tonnes of other dam filter materials. These estimates are consistent with those presented in the PER (pg 25, Table 7).

Typically, a combination of truck and trailer will cart construction materials with payloads of 40 tonnes and a gross weight of 55 tonnes.

Materials will be delivered for embankment construction between September and May of the second construction season (PER pg 25), over a period of about 200 working days. The number of deliveries required over the construction period is therefore 3,500 to 6,500. This corresponds to about 20 to 35 per day (40 to 70 heavy vehicle movements per day).

Up to 50 trips in light vehicles are anticipated each day by contractors and Water Corporation personnel associated with the construction (ie. 100 movements per day).

Summarised results from a traffic survey conducted by the Shire of Harvey over 6 days in January 1999 show that in addition to log truck/trailer combinations, the daily traffic along Weir Rd comprises about 390 passenger vehicles and 75 trucks (including articulated).

The expected increase in vehicular traffic associated with dam construction is therefore 13% more passenger vehicles and between 33% and 50% more trucks, depending on whether log trucks are included or not. If the 120,000 tonnes of dam filter materials are required to be sourced externally, the increase in truck movements is from 60% to 95%.

The proponent intends to upgrade (seal parts thereof) Honeymoon Rd to enable its use, in future, by logging trucks from plantations and forests to the east of the Harvey Dam. This will

significantly reduce the future use of Weir Rd by log trucks. This reduction has not been included in the estimates of vehicle traffic changes described above.

Most of the materials imported to the construction site are expected to be sourced from the north. A turn off ramp will be installed on South Western Highway (eastern side) at the intersection with Weir Road.

In relation to traffic management, the proponent has committed to preparing a traffic management plan that will describe permissible trucking routes, speed restrictions and other traffic management measures for the construction phase to minimise impacts on local residents and other road users. Materials delivered to the construction site by heavy vehicles will avoid school drop-off and pick-up times. Other measures to reduce noise impacts from heavy vehicle traffic are described in the response to comment 9 below.

3. The PER references heavy truck movements but past experience suggests that movements of light vehicles such as 4WD and personal transport for the workers to and from the site are likely to be even greater. What increase in light vehicle movement is expected? Are any speed restrictions or other constraints pertaining to their activity being proposed?

Response

Refer to response to comment 2.

5. How will the 40km/h speed limits be enforced? The Shire of Harvey has advised that they have no jurisdiction in this matter. Unless they can be enforced they are meaningless.

Response

Signs will be erected on Weir Rd advising of the 40 km/h speed limit applying to heavy vehicles. The speed limit will be enforced through independent speed check audits and community involvement in enforcement. The speed limit requirement will also be included as a contract condition on contractors.

6. What penalties will be imposed on the proponent should noise levels be exceed? Who benefits, financially or otherwise, from the imposition of the penalties?

Response

The proponent is subject to the requirements of the Environmental Protection Act 1986. Should criteria for noise levels established under the Act be exceeded, the proponent may be subject to the penalty established under the relevant provision of the Act for the breach. In the event of a successful prosecution, any penalty imposed would be to the benefit of the Crown.

The Water Corporation intends to meet all environmental criteria established through the environmental impact assessment process together with the community's expectations for excellent environmental performance through the use of its Environmental Management System (summarised on pg 63-64 of the PER). A key component of the EMS is the preparation and implementation of an EMP for this project which is being developed in consultation with the community and key government agencies.

7. The PER acknowledges the 'noise level [is] likely to be more than operational assigned noise levels in residential areas on the east side of the South Western highway for a significant amount of time.' How will the noise mitigation measures be negotiated with residents more than 500m from the proposed dam wall?

Response

The quote in this comment does not accurately reflect statements made in the PER.

Assigned noise levels are described in the Environmental Protection (Noise) Regulations 1997 and shown in the PER (pg 116). Noise associated with construction over normal working hours is not required to meet the assigned noise levels, provided:

- *good noise control practices are employed; and*
- *the quietest reasonably available machinery is in use.*

The PER refers to assigned noise levels on the basis that if these are able to be met, noise impacts from the proposal should meet the community's expectations. Notwithstanding, the PER identified a number of residences east of the South West Highway where amenity may be unduly affected by noise impacts from the proposal (PER pg 121). Negotiations with the occupiers of these residences to provide special noise mitigation arrangements are proceeding.

The PER advised that a noise and vibration management plan will be developed in consultation with the local community, the Shire of Harvey and the DEP (pg 122). This is being conducted through the development of the EMP. The proponent understands that its commitment to prepare the EMP will be a condition of any environmental approval given to the project.

8. The proposed hours of operation are of some concern considering the Hillside Road and surrounding area is a relatively tranquil place to live. It is requested that the hours of operation be restricted to 0700 to 1700.

Response

Construction over the first season will take place between 0700 to 1900 excluding Sundays and public holidays. If the hours were restricted to 0700 to 1700, the construction phase (spillway and dam foundation) may not be completed by the following winter when construction would have to be curtailed. This may cause the construction period to extend another year as well as adding considerably to project costs. It is considered that the community would generally prefer the construction to be limited to two seasons rather than three.

The PER advises that the embankment will be constructed in the second season over a 30 week period by working from 0700 to 2200 hours excluding Sundays and public holidays (pg 122).

Once embankment construction has commenced, it is necessary to complete the construction prior to the dam filling, or incur a severe and unacceptable safety risk. The planned construction period and times are designed to meet this objective. The construction period could be shortened by working longer hours each day, however it is considered that this may cause unacceptable night-time noise impacts.

9. Truck movements quoted in the Executive Summary (page ii) and section 10.5.1 are extreme maximums and should be put into context when used as comparisons to the proposed usage by this project. That is, harvesting activities would not cover the same period. Recent operations in Tallanalla Plantation produced a maximum of 16-18 trips per day (32-36 truck movements).

Response

The information presented in the PER (pg 123) for logging truck movements was sourced from CALM and was acknowledged as being a maximum by the use of the words "Up to 40-50 truck movements (with trailer) may occur each day.....".

Refer also to responses to comments 2 and 14.

10. Meteorological data used for modelling noise in the PER was sourced from the Wokalup Research Station for the period March 1988 to February 1989. This is a restricted timeframe and may not reflect the average or worst case situation. The Wokalup Research Station has data covering 85 years and CALM collects weather data on a daily basis at its Harvey Office. Would it be more pertinent to base a model on data sourced from a location closer to the area under investigation?

Response

The methodology for calculating noise levels followed that described in the EPA Guidelines for the Assessment of Environmental Factors – Environmental Noise (Draft) No 8" published by the EPA in June 1998 (PER pg 119). This methodology requires that meteorological data considered representative of the site be analysed to determine whether the day and night time wind direction frequencies from the noise source to noise-sensitive areas exceeds 2% for any month of the year. If 2% is exceeded, noise modelling is required using the worst case meteorological conditions specified in EPA Guidance No 8.

The meteorological data set used for the assessment of wind direction frequencies, sourced from the DEP's Wokalup site, indicated that 2% was exceeded for both day and night-time. Therefore the noise impact predictions in the PER were actually based on the worst case meteorological conditions defined in EPA Guidance No 8 (see PER pg 120). The choice of any other meteorological data set to assess wind direction frequencies could only have led to less conservative predictions of noise levels than was actually undertaken

11. Neither the Main Roads WA criteria nor the draft Guidance EIA No.14 - Road and Roil Transportation Noise are considered applicable to assessment of an increase in truck traffic on a minor country road. Consideration should be given to internal noise criteria and the criteria for assessment of an increase in traffic flow.

Response

Discussions with DEP officers, other Government agencies and noise consultants, both before and after the release of the PER, indicate that there is no generally accepted specific criteria for assessing the acceptability of changes to residential noise levels that may arise from the temporary proposed increases in traffic associated with this proposal. Various criteria may be used as guidance including those used by the Main Roads Department and those described in EPA Guidance for the Assessment of Environmental Factors – Road and Rail Transportation Noise (Draft) No. 14. These are referenced in the PER.

Recent advice from DEP generally suggests a preference for adopting noise impact criteria and measures to minimise noise impacts based on the principles contained in EPA Guidance No 14. These are:

- *the maximum pass-by noise level (Lmax) from any heavy vehicle associated with the proposal should not exceed that from any existing vehicle which complies with ADR28/01;*
- *the maximum pass-by noise level (Lmax) from any heavy vehicle associated with the proposal should be reduced in proportion to the increased in heavy vehicle movements above that which presently exists; and*
- *all reasonable measures should be undertaken to minimise noise impacts.*

The measures to reduce noise impacts identified so far, which will be implemented, include:

- *limiting heavy vehicle movements to between 7:00am and 7:00pm Mondays to Saturdays (excluding public holidays);*
- *Upgrading Weir Road adjacent to residential areas prior to construction, to reduce noise emissions from all future traffic;*
- *Establishing a sound power level criterion for heavy vehicles that is a "reasonably quietest level";*
- *Prohibiting construction-related heavy vehicles from using engine braking on Weir Road; and*
- *Limiting the maximum speed of construction-related vehicles on Weir Road to 40 km/hr.*

Other noise control measures which are still being investigated include maximising the proportion of construction-related vehicles which have:

- *a minimum rated power output of 388 kw (520 hp);*
- *airbag/pneumatic suspension systems in lieu of conventional springs; and*
- *a sound power level less than the ADR 28/01 specifications.*

A monitoring program will be undertaken to determine noise levels from existing traffic on Weir Rd. The results of this together with information on existing traffic levels will be used to assist in determining environmental noise criteria.

Ongoing noise monitoring and/or audits will be carried out over the duration of the construction period to verify that truck traffic is in compliance with agreed noise criteria and noise control commitments.

12. The report states that there are no statutory standards for vibration in WA but omits to mention the conditions placed on licensed premises under the Environmental Protection Act where blasting is carried out. The criteria used in licence conditions normally specify a peak particle velocity of 5mm/s for 9 in any 10 consecutive blasts and 10mm/s for any blast, where blasting is carried out during the day.

Response

The proponent is committed to meeting a peak particle velocity of 5mm/s for 9 in any 10 consecutive blasts and 10mm/s for any blast.

13. The results presented in the PER show some residential locations will receive noise levels well above those which would normally be set by regulations 7 and 8. However, construction noise is regulated under regulation 13, which does not require compliance with regulations 7 and 8 for normal working hours, provided:

    - good noise control practices are employed; and
    - the quietest reasonably available machinery is in use.

    Commitment 24 is very general in this regard, only referring to preparation of as noise management plan (NMP). Further information is needed to show how the proponent will meet both the dot points above. While some detail will appear in the NMP the elements of it need to be identified at this stage.

Response

Regulations 7 and 8, which do not relate to construction activities, require that noise emissions from any premises should not cause noise levels at noise-sensitive premises to be greater than 5 dB(A) below the assigned noise level. The assigned noise levels are specified in terms of Lmax (effectively, an "instantaneous" level), LA1 (the level measured exceeded for 1% over a representative assessment period) and LA10 (the level measured exceeded for 10% over a representative assessment period). A representative assessment period can be from 15 minutes to four hours, as appropriate for the type and nature of the noise emission.

As described in the response to comment 8 regarding choice of meteorological data for noise modelling, the predicted noise levels shown in Figures 24 and 25 of the PER are an "instantaneous" levels based on "worst case" meteorological conditions. For noise impacts to the residential area on Weir Rd, these are considered to be easterly winds at 4 m/s with a temperature lapse rate of 0 °C (see PER pg 120). Since this combination of meteorological conditions occurs for only a small fraction of the time, actual noise levels will fluctuate below, and up to, the predicted level for each summer.

The predicted worst case noise levels for the Weir Rd residential area were about 58dB(A) in the first construction summer and about 53 dB(A) in the second summer (PER Figures 24 and 25). These are below the LAmax assigned level, which is also an "instantaneous" level.

The predicted noise levels cannot be directly compared to the LA1 and LA10 assigned levels because the fluctuation in noise levels below the worst case level, due to changing meteorological conditions, cannot easily be modelled.

The construction work will be carried out in accordance with practices described in Australian Standard 2436-1981 "Guide to Noise Control on Construction, Maintenance and Demolition Sites". This will be specified as a condition of construction contracts.

A continuous sound level meter and logger will be established in the vicinity of the Aachen Way residential area on Weir Rd. The results of this will be used to ensure that noise levels do not become unacceptable. The cause of any excessive noise levels will be investigated and remedial action taken where possible.

As described in the response to comment 14, special agreements are being struck with residents whose amenity may be unduly affected by noise emissions from the proposal (PER pg 121).

14. Construction work out of hours requires further measures under regulation 13 if it is not to meet regulations 7 and 8. Theses additional measures are identified in the list of noise management measures.

Response

Construction work outside normal hours will be carried out in accordance with a separate "Noise Management Plan - Construction Outside Normal Hours", which addresses:

- *justification for the work having to be done outside normal hours;*
- *types of activity which could be noisy;*
- *predictions of noise levels;*
- *control measures for noise and vibration;*
- *monitoring for noise; and*
- *complaint response.*

This Plan is being prepared as part of the EMP.

15. Further information is needed to enable a Ministerial Condition to be set to ensure and acceptable outcome. Such a Condition could specify an internal noise level to be achieved and a date by which it is to be achieved, and may specify a process to be used. Details of any negotiation begun or completed in this regard should be supplied and the process which is used or envisaged for these negotiations.

Response

The proponent will ensure that sound power level criteria for heavy vehicles, which reflects a "reasonably quietest level" for these vehicles, is imposed as a condition of contract. Independent experts will audit the sound power levels of these vehicles to ensure compliance with such criteria.

The PER identified a number of residences where amenity may be unduly affected by noise impacts from the proposal (PER pg 121). Negotiations with the occupiers of these residences to provide noise mitigation arrangements are proceeding. Written confirmation of these agreed arrangements with the residents indicating their satisfaction with the outcome of the negotiations will be forwarded to the DEP prior to the commencement of construction.

16. An analysis of the likely increases in truck traffic show that draft Guidance No.14 is met provided the trucks are no louder that the existing trucks. If the rock and gravel for the project are carted in from outside the site the traffic associated with the proposal would double and the draft Guidance would require that the source levels be 3dB(A) lower than those of the existing trucks. For the two months (April and May) when there are no timber trucks, the source level from the trucks associated with the proposal would need to be 5dB(A) below the base level of 73dB(A) at 30 metres assumed in the report in order to meet draft Guidance No14 or 8dB(A) below the base level if rock and gravel are to be carted in.

Response

The definition of "existing traffic noise levels" needs to be considered on a basis consistent with the level of data available. As stated in the PER (pg 123), the usage of Weir Rd by logging trucks may vary from month to month and year to year. As described in the response to question 2, a detailed traffic survey conducted by the Shire of Harvey in January 1999 showed that other heavy vehicles also use the road. However the level of detailed information of vehicle usage of Weir Rd provided by this particular survey is not available for other months or previous years because no similar monitoring has been undertaken.

17. Further work is needed to quantify the benefits and additional commitments needed for some of the strategies identified in the report to manage heavy vehicle noise. For example:

- upgrading and/or widening of the sealed road to minimise banging of empty truck trailers;
- contractual measures the procure and maintain the trucks art a specified 'reasonably quietest' level (draft Guidance No14 provides some guidance on this);
- restricting hours to 7am-7pm as specified in Section 10.5.2 of the report; and
- ensuring compliance with the nominated speed restriction of 40km/h on the sealed road.

Response

Refer to response to comment 10 above.

18. Section 10.5.2 of the report indicates that 4 truck movements per hours would be required for 24 hours a day over a period of up to 6 days for a continuous concrete pour. This would be likely to result in substantial and unacceptable sleep disturbance. The possible alternative of an on-site batching plant identified in the report is strongly recommended from a noise standpoint. If this is not feasible, other mitigation measures need to be identified at the present stage to enable assessment of this issue.

Response

The proponent would prefer to batch concrete for this pour on-site. If this proves not to be feasible, the "Noise Management Plan - Construction Outside Normal Hours" (referred to in the response to comment 12) will be amended in consultation with the community to address this issue.

4.3 Social surroundings

4.3.1 Social

Public health and safety

1. What safety practices will be in place should there be a major accident at the treatment plant just south east of the dam wall?

Response

As a result of further definition work that has been completed since the submission of the PER, the site for the chlorination plant has been relocated (refer to section 1.2 and figure 1).

The chemical dosing facilities will be designed constructed and operated in accordance with DOME and DEP requirements. These requirements include an integrated chlorine hazard and safety management system and the conduct of a quantified risk assessment on the facility.

The Water Corporation has a long history of operating such facilities safely and without incident.

2. With both Agricultural College and Harvey High Schools being close by and the possibility of dangerous gasses escaping from the treatment plant, what warning or alarm system for the schools and local community, including the town, will there be?

Response

Refer to response to comment 1.

3. How many tankers carrying hazardous chemicals will be travelling along South Western highway to the treatment plant in Weir Road per month after the treatment plant is activated?

Response

There will be approx 3 deliveries of chlorine, 1 delivery of fluorosilic acid and 4 deliveries of carbon dioxide per month

4. Have the local State Emergency Service been consulted and trained to control any emergency concerning chemicals that might be transported to the water treatment plant?

Response

Refer to response to comment 1.

5. How safe will the proposed dam wall be?

Response

The design of the dam will be based on the Australian National Committee on Large dams (ANCOLD) guidelines and design practices of organisations such as the United State Bureau of Reclamation (PER pg 148).

6. What warning systems will be in place for the people living and working below the dam wall? What time frame for evacuation is there?

Response

The ANCOLD guidelines require the development of a Dam Safety Emergency Plan (DSEP) for the Harvey and Stirling dams (PER pg 149). A new DSEP will be prepared for the Harvey Dam which will:

- *Identify emergency conditions which could endanger the integrity of the dam and which require immediate action;*
- *Prescribe procedures which would be followed by the dam owner and operating personnel to initiate emergency procedures; and*
- *Provide timely warning to appropriate emergency management agencies for their implementation of protection measures for downstream measures.*

7. The impact of additional vehicle movements on the traffic flow and safety of pedestrians and road users at the intersection of Weir Road/South West Highway/Uduc Road have not been addressed.

Response

The impact of additional heavy vehicle movements has been considered. The proponent is committed to prepare a traffic management plan in consultation with the Shire of Harvey and community (PER pg 146). This plan includes:

- *upgrading and widening Weir Road;*
- *speed restrictions on Weir Road;*
- *installing a turn off ramp on South Western Highway (eastern side) at the intersection with Weir Road;*
- *a heavy vehicle route around the Harvey Town centre;*
- *potential upgrading of Honeymoon Road to enable logging trucks to be diverted away from Weir Road; and*
- *avoiding set down and pick times at Harvey Senior High School.*

8. During early spring and autumn vehicles driving into the sun on Weir Road in early morning and evening will encounter a 'dead spot' approximately 100m west of the Weir Road/Hillside Road intersection. The road is quite narrow with deteriorating edges at this point.

Response

The road at this point will be widened from 6m to 7.4m with horizontal curves eased. Total width of road will be 10m (includes 2.4m for shoulders).

Also refer to response to comment 7 above.

9. It appears that impact of dam construction on the volume of traffic on Weir Road has been underplayed both in terms of direct impact on local residents and road safety.

Response

This is not the case, refer to responses to comment 7and 8 above.

10. There is a school bus run along Weir Road from 8.00am to 8.25am and from 3.25pm to 4.00pm picking up and setting down school children each weekday. The additional heavy vehicle traffic along Weir Road, the lack of vision around tight corners and the quality of the road raises significant safety concerns for the school children.

Response

Refer to response to comments 7 and 8 above.

Negotiations between the Water Corporation and the High School have resulted in an agreed 30 minute no-truck movement period in the morning and afternoon to coincide with peak pick-up and set-down times of school children and bus movements. The School has agreed to publish the dates for the construction and truck-movement times in its school newsletter in September, prior to the onset of construction traffic, to raise the awareness of both students and parents. The Water Corporation also plans to publish the same information in the local Harvey Reporter to raise the safety awareness of the general community. Plans to upgrade the road, and impose 40km/hr restrictions on all Water Corporation trucks will also ensure that safety standards are maintained throughout the duration of the project.

Post development landuse

1. Discouraging public access to private property from the proposed pipeline route will be a significant problem. The natural lay of the land originally provided all the security that was required however the Water Corporation pipeline and access provisions are likely to exacerbate problems such as trespassing and vandalism in a similar way to the Western Power access.

Response

The pipeline access required by the Corporation after construction will be minimal. The pipeline will be buried over its entire length and all disturbed ground will be reinstated. In areas of native vegetation, rehabilitation will re-establish native habitat. Permanent access to the pipeline after construction will not be required and no formal access track will be created. The Corporation's proposed pipeline easement differs from a Western Power easement in that the pipeline route will be essentially rehabilitated to its former state; a Western Power easement is maintained in a cleared state and does provide easy access to third parties.

4.3.2 Aesthetic

Visual amenity

1. The river crossings below the Stirling Dam describe an aesthetically designed footbridge and some barely visible wires as impacts on the landscape. The submitter does not subscribe to this view and suggests that a 1.4m permanently placed pipe and the associated vegetation clearing will result in major irreversible impacts on the landscape.

Response

The proponent intends to place the pipeline under the riverbed at all river crossings between the Stirling Dam and the first causeway over the new Harvey Reservoir.

4.3.3 Culture and Heritage

European Heritage

1. It appears that Jardup Homestead will be inundated by the proposed redevelopment. The grave of Ephraim Mayo (Bunbury's first mayor and one of the longest serving members of parliament in WA's upper house) is believed to be located in the vicinity of Jardup Homestead. Perhaps he and the other pioneers of the area could be commemorated in some way. A suitable plaque at the new dam is one suggestion.

Response

A suitable plaque at the proposed recreation site below the new Harvey Dam will be considered.

Aboriginal culture and heritage

1. The PER states that 'Archaeological sites are most likely to be associated with water sources, rock outcrops, or breakaways containing rock shelters. Previous survey found sites tended to be located near creek lines that cross the area. There are five or six such creeks along the alignment that have not been surveyed to date (page 142).' This is significant as Lot 11 contains water courses and rock outcrops adjacent to the Harvey River which means it is possible that archaeological or ethnographic sites are present within Lot 11. Any disturbance of Aboriginal sites during the pipeline construction process would be in contravention of Section 18 of the *Aboriginal Heritage Act 1972.*

Response

The statement of page 142 of the PER refers to the Harris-Stirling pipeline route and not the Stirling–Harvey pipeline route which passes through lot 11. The Stirling-Harvey pipeline route is in the Stirling-Harvey area which was surveyed for Archaeological sites by Quartermaine Consultants (Quartermaine Consultants 1998). In this area two sites were found but none were located on the pipeline route.

The Stirling-Harvey pipeline alignment has been designed to avoid features where archaeological sites could occur. After a detailed alignment is finalised, but before construction operations begins, the alignment on Lot 11 will be surveyed in detail for archaeological sites. If any sites are found and cannot be avoided, approval will be sought for such disturbance pursuant to section 18 of the Aboriginal heritage Act 1972.

4.3.4 Recreation

Recreation

1. Supreme Court proceedings undertaken by Warren Tucker Pty Ltd against the Water Corporation has resulted in legally enforceable undertakings which prevent the release of water from the Stirling Dam for the purposes of whitewater canoeing. These undertakings are attached to the property and are enforceable by any subsequent owners of Sunnyvale. In addition, the severity of erosion resulted in a settlement to provide for rehabilitation of the eroded banks at the Sunnyvale farm.

   All reference to the continuance of whitewater canoeing and releases of water from the Stirling Dam for this purpose should be excised from the PER as the Water Corporation has given legally enforceable undertakings that such releases cannot occur.

Response

The Water and Rivers Commission has determined that whitewater canoeing should be recognised as a beneficial use of water and has made an allocation to this activity accordingly. The Corporation has acknowledged this determination and has made provisions within its planning and definition of the Harvey Dam project for this activity to occur in future should the legal situation change.

2. The introduction and maintenance of a slalom canoe course in the Harvey River is supported. (several submitters)

Response

The Corporation acknowledges the allocation made by the Water and Rivers Commission to whitewater canoeing in the Harvey river.

3. The Slalom and Wildwater Committee is very concerned about conservation and recognise the use of water has the potential to create some stress on the river. The Committee is committed to responsible action in terms of conservation of the environment and will continue to work with government bodies to ensure the Harvey River remains in a healthy state.

Response

The Corporation will support the Amateur Canoe Association of Western Australia in managing any releases made for canoeing purposes.

4. Recreational issues should not be considered to be more important than environmental issues.

Response

The PER is required to address all environmental factors (including recreation) listed in the EPA guidelines (Appendix 1 in the PER). The PER describes the likely impacts of the proposal on recreation and the commitments by the proponent to mitigate these impacts. However, any recreational usage will have to be consistent with water source protection objectives of the WRC and maintenance of significant ecological values.

5. The new Harvey Dam represents an opportunity for increased angling, including boat angling. However the potential for this industry and recreational pastime to develop would be severely impacted by the presence of high speed power boating and skiing in the same area. High speed power boating and skiing cause wash, generate surface scum from engine exhaust emissions, create significant noise impacts, and pose a significant safety issue for other users of the area. There is a need and opportunity for some separation of the activities of fishing and skiing with the opening of Harvey Dam.

Response

Section 10.4.3 of the PER states that "Protection of the Harvey Hills will also preclude the introduction of powered recreational uses such as speed boats or jet skis" on the Harvey Reservoir.

The source protection planning process will identify compatible recreation activities with the Harvey and Stirling Reservoirs. Detailed recreational planning following this process will be based on the recommendations of the Source Protection Plan.

6. CALM notes the proponent's commitment to facilitate the development and planning of the tourism precinct in accordance with an agreed recreation plan for the area below the reservoir. The tourism precinct should be included in the area covered by any future catchment management plan so that the public sees it in context. The tourism developments need to be placed in the context of a regional approach to tourism planning.

Response

Two recreation nodes are proposed as part of the Harvey Dam project. A recreation facility downstream of the proposed new dam will provide walking, BBQ, and general passive recreation areas consistent with those provided at the Harris and North Dandalup Dams. The facilities are being planned in conjunction with the Shire of Harvey. A second recreation node is proposed to allow access to the new reservoir. This site will be planned in conjunction with the Shire of Harvey and other stakeholders in the Harvey catchment including the Water and Rivers Commission, Fisheries WA and CALM. This site will be upstream of the proposed new dam and will be included in the source protection planning process currently underway.

7. Some recreational facilities will be inundated by the proposed new Harvey Dam. It is suggested that land-based recreational activity facilities are provided near the dam.

Response

Refer to response to comment 5

8. The statement in the PER indicating the '...proponent has agreed to provide funds towards the preparation of recreation plans and subsequent development and management of facilities on, around and below the Harvey Reservoir' should be included as a commitment.

Response

Refer to response to comment 5

9. Restoration of the facilities at Gibbs Pool when the construction work is completed is supported.

Response

Gibbs Pool will form a central part of the recreation node proposed at the Harvey Dam site.

9. The pipeline in the Harvey River Valley may impact on the canoe course, associated recreational facilities, and the natural environment. There is a need to integrate, in consultation with CALM, siting and landscape treatments with a recreation site development plan and an environment protection plan.

Response

The Corporation proposes to work with CALM in the definition of recreation and landscape treatments in the areas disturbed by the proposed pipeline downstream of the Stirling Dam. Work with CALM has already commenced.

4.3.5 Economics and funding issues

1. Is ongoing funding for regeneration activities guaranteed?

Response

The Corporation has committed to provide $750,000 to the Harvey River Restoration Trust for the purposes of river restoration in the Harvey Basin. It is anticipated that this trust will be in place for a number of years.

The Corporation has committed to preparing and implementing vegetation management and rehabilitation plans which will achieve regeneration of native vegetation and stabilisation of the landscape. The implementation and effectiveness of these plans will be monitored by the proponent in accordance with its EMP and audited by the Department of Environmental Protection in consultation with CALM.

2. While it is acknowledged that the proximity to the dam and associated recreational areas may add value to homes in the area if someone needed to sell now (for example one of the older residents) their property would likely attract a reduced selling price. Some financial compensation should be available during the period of construction activity to account for this potential situation.

Response

The Water Corporation's land acquisition policy is stated in the PER.

The Corporation does not intend to purchase any property that is not directly impacted by inundation or required to facilitate asset creation.

3. Lot 579 should be acquired by the Crown. This would assist in meeting the environmental commitments made by the Water Corporation.

Response

The proponent does not need to acquire Lot 579 to meet its environmental commitments

4. The MOU between the Water Corporation and the Harvey Shire needs to be distinguished from the Harvey River Trust Fund to avoid any misunderstanding within the community and shire as to the Water Corporation plans for compensation to benefit the community.

Response

The Shire of Harvey have been advised by the proponent that the Harvey River Restoration Trust will be established for the purpose of providing funding for river restoration projects across the whole of the Harvey Basin. Any funds made available from the Trust will be through a transparent administration process developed by the Water Corporation in conjunction with the Water and Rivers Commission.

5. Guidelines for the Harvey River Trust Fund should be prepared as soon as possible in conjunction with local Land Conservation District Committees.

Response

The Trust is likely to be established as soon as the project receives approval from the Minister for the Environment. Principles and guidelines for the Trust will be established by the Water Corporation and Water and Rivers Commission in consultation with, inter alia, local Land Conservation District Committees.

6. The proposal may have significant impacts on the productivity of local agricultural systems reliant upon irrigation water from Wellington Dam, this could result in salinity increases in soils irrigated from that reservoir, and or lower productivity levels that should be expected.

Response

The volume of water available from the Harris Dam for supply to Perth has been determined by the Water and Rivers Commission. In allocating the water, the Commission has stipulated that, inter alia, the needs of South West Irrigation (including salinity management at Wellington Reservoir) must not be adversely impacted. Furthermore, the Commission has stated that local needs for the environment, Great Southern Towns Water Supply, power generation and Wellington salinity management have precedence over water supply to Perth. The Corporation understands these conditions on the allocation of water from Harris Dam.

The Corporation has completed salinity modelling for the two dam system under various water supply and demand scenarios and has determined that taking water for supply to Perth has a very small impact on the ability of Harris Dam to manage salinity levels in the Wellington reservoir.

7. The proposal should include an analysis of the impact of the proposal on the Wellington Dam Recovery Catchment plan, irrigation water quality and associated impacts on the productivity of the region's agriculture.

Response

Refer to response to comment 6

8. The discharge points for the Harris-Stirling pipeline appear to be within, or very close to, the Tallanalla Plantation. The extent to which this will constitute a restriction for access and/or plantation activities or present environmental concerns is unclear.

Response

Neither of the two discharge points, A and B, are in the Tallanalla Plantation. Section 3.4 of the PER indicates that the pipeline will follow the Muja Northern Transmission line, not a CALM road, and will be buried at least 0.75m below the surface. Consequently, the pipeline will not effect CALM access.

With regard to effect on plantation activities the Corporation will be responsible for the provision of causeways at points where existing forestry tracks cross the tributaries. The maximum flow to be discharged into these two tributaries will be 400 L/s and access via the proposed causeways will be possible at all times.

9. Due consideration will need to be given to changes in the status of CALM's capital investment in plantations roads, firebreaks and CALM's ongoing management of the forests; and changes to community values such as changes to existing land-use activities and recreational activities permitted on and around the Stirling and Harvey reservoirs.

Responses

The management of land use activities in the Harvey and Stirling Catchments will be addressed in the Source Protection planning process. CALM representatives will be part of the Source Protection planning process by participating in the Reference Group.

The Water and Rivers Commission is organising this Reference Group and it will commence in June 1999.

10. Priority 1 classification for all Crown land within the Harvey-Stirling catchment is not appropriate and is of major concern if it means that existing CALM commercial investments such as pine plantations are not given fair treatment and consideration. There is inconsistency between the controls applying to softwood plantations and agricultural land uses. There seems to be an inequity with the classification and restrictions to land use between CALM-managed land and private land in the catchments. CALM's preferred option is for plantations to be zoned P2.

Response

Refer to response to comment 9

11. Access to the Harvey Weir plantation will be restricted to Honeymoon Road once construction on the new dam commences. Extra road construction for harvesting activities will be required as there will be no through road network. The Shire has not issued extra mass permits for Honeymoon Road in the past in preference for Quindanning Road. An adequate replacement toad system will need to be provided. The loss of 40ha

of Harvey Weir plantation requires compensation for loss of wood production potential as well as assets.

Response

Access and plantation development issues are being addressed through discussions between CALM and the proponent.

12. CALM would be interested in discussing plantation development options involving private land purchased by the Water Corporation within the catchment.

Response

Refer to response to comment 11

13. The PER has identified the whitewater canoeing course on the Harvey River as highly beneficial to the economics of the town of Harvey. Discussions with local commercial outlets indicate the economic benefits are actually minimal.

Response

The PER indicated that "whitewater canoeing is believed to bring significant economic benefits to the Town of Harvey". This statement is based on earlier work by Beckwith and Associates, 1998, and the Proposed Harvey Basin Water Allocation Plan.

6. References

Mattiske Consulting Pty Ltd 1998a, *Harvey Basin Allocation Plan – Assessment of Flora and Vegetation Values.* Report to the Water and River Commission, February 1998.

Streamtec 1999, *Freshwater Fish of the Harvey and Harris River Catchments: An assessment of Translocation Scenarios*, Report to the Water Corporation, February 1999.

Beckwith and Associates 1998, *Harvey Stirling Dam Options Social Impact Analysis*, Report to the Water and Rivers Commission.

Stirling Harvey Redevelopment Scheme

Response to Submissions
Supplementary Information

Appendix 1
Land Acquisition and Rehabilitation Strategy

Conservation Offset Measures

- The offset measures offered should be considered as a package of a number of initiatives to obtain a range of ecological and conservation benefits that result in a net environmental gain through the implementation of the project.
- For instance, the restoration of the riparian zone in the Harvey Basin not only provides substantial sediment and erosion control benefits, but also:
- reduces the export of nutrient to the Peel Harvey Estuary.
- restores and protects local vegetation communities.
- increases biological diversity and fauna habitat.
- restores ecological processes in the Harvey riverine system.

While the project will result in the loss of some botanical and ecological values through inundation by the new Harvey Dam, there are many environmental benefits gained through the protection or restoration of botanical and ecological values in other areas. The proposal also provides an opportunity to protect and manage some remaining values inside and outside the project area that are under threat from existing land use activities. In addition the package offered provides the opportunity to expand the conservation estate to included some of the Forrestfield and Lowdon vegetation complexes (which are under-represented in the conservation estate if the 10% of original distribution is adopted as a criterion).
The initiatives offered to offset the loss of environmental values through the implementation of the project are described in the attached table and include:

- Acquisition, increased security, protection and management for conservation of a substantial amount of land containing native vegetation complexes that have been extensively cleared by previous land use activities.
- Substantial resourcing of the restoration of the Harvey River and its tributaries through the Harvey River Restoration Trust to facilitate the restoration of ecological processes and communities lost through previous land use activities.
- Rehabilitation and subsequent protection of substantial areas to re-establish faunal habitat and self-sustaining vegetation communities that are consistent with the current composition of vegetation complexes found in the area.
- Development of a management framework for the proposed Korijekup Conservation Park and Falls Brook Nature Reserve to protect conservation in these areas.

The attached table also describes the existing condition and values of the vegetation complexes affected by the project. Vegetation maps covering the area of the inundation are also attached for your information.

Rehabilitation Plan

The recommended scope and contents of a rehabilitation plan that is consistent with commitment 17 is attached.

Land Acquisition and Rehabilitation Strategy

			Before Implementation					After Implementation				
Location	**X-ref**	**Area ha**	**Condition**	**Con value**	**Threatening Processes**	**Tenure / Purpose**	**Management**	**Condition**	**Tenure / Purpose**	**Management**	**Con value**	**Comment**
Impacts												
Inundation area												
Lowdon		56	Native vegetation, relatively good condition, potentially habit for Western Ringtail Possum	High	Weeds fire grazing	Freehold Farmland	Private land	52 ha lost, 4 ha affected by occasional inundation **(3)**	Water Reserve	N/A **(4)**	Low	Loss
Lowdon		77	Degraded by clearing and grazing understorey almost absent	Low	Weeds fire grazing	Freehold Farmland	Private land	68 ha lost, 9 ha affected by occasional inundation **(3)**	Water Reserve	N/A **(4)**	Low	Loss
Lowdon		12	Degraded, by clearing and grazing understorey almost absent	Med to low	Weeds, fire, uncontrolled access	Water reserve 24002 & VCL	None	Inundated	Water Reserve	N/A	Nil	Loss
Helena		14	Native vegetation good condition	Med	Weeds fire grazing	Freehold Farmland	Private land	5 ha lost, 9 ha affected by occasional inundation **(3)**	Water Reserve	N/A **(4)**	Low	Loss
Forrestfield (West Lot 1)		16	Native vegetation, very good condition in atypical location	Very high	Weeds, fire, uncontrolled access	Water Reserve 15515	None	14 ha lost, 2 ha affected by occasional inundation **(3)**	Water Reserve	N/A **(4)**	Low	Loss
Forrestfield (North Lot 2)		3	Degraded, high weed invasion and cleared understorey	Low	Weeds fire grazing	Freehold Farmland	Private land	Inundated	Water Reserve	N/A	Nil	Loss
Darling Scarp		5	Degraded as partly cleared and tracks present	Med	Weeds fire grazing	Freehold Farmland	Private land	Inundated	Water Reserve	N/A	Nil	Loss
Pipeline routes												
Helena		6	Native vegetation	Med to high	Weeds fire grazing	Freehold Farmland	Private land	Rehabilitated native vegetation	Freehold/ Farmland	Rehabilitated Private land	Medium - high (long term)	Short term loss
Dwellingup and Yarragil **(1)**		19	Native vegetation, good condition, dieback infected	Low	Weeds fire grazing	State Forest	None	Rehabilitated native vegetation	State Forest	Rehabilitated State Forest	Medium - high (long term)	Short term loss

			Before Implementation					After Implementation				
Location	**X-ref**	**Area ha**	**Condition**	**Con value**	**Threatening Processes**	**Tenure / Purpose**	**Management**	**Condition**	**Tenure / Purpose**	**Management**	**Con value**	**Comment**
Land Acquisition												
Lowdon	P5	30-40	Native vegetation, very good condition	High	Weeds, fire, grazing	Freehold Farmland	Private land	Native vegetation	A class conservation	Reservation for conservation	High	Gain
Yarloop Loc 5322 (Forrestfield)	P5	5	Native vegetation, very good condition	Very high	Weeds, fire and residential development	Freehold rural residential	Private land	Native vegetation	A class conservation	Reservation for conservation	Very high	Gain
Western Part of Lot1 (Forrestfield)	P5	8	Native vegetation, good condition	High	Weeds, fire, grazing	Freehold Farmland	Private land	Native vegetation	Water Reserve/ Conservation	Fenced, weed control, conservation	Very High	Gain
Eastern Part of Lot 2 (Forrestfield)	P5	31	Native vegetation, slightly disturbed	Med	Weeds, fire, grazing	Freehold Farmland	Private land	Native vegetation	Water Reserve/ Conservation	Fenced, weed control, conservation	High	Gain
Land Rehabilitation												
Eastern Part of Lot1	P17	20	Gravel/sand quarry	Neg	Cleared, gravel extraction	Freehold Farmland	Private land	Rehabilitated (Forrestfield) conservation	Water Reserve/ Conservation	Fenced, rehabilitated, conservation	Medium to high (long term)	Gain
Part of Slabwell	P17	35	Cleared /degraded	Low to neg	Weeds, fire, grazing	Farmland Freehold	Private land	Rehabilitated (Lowdon) conservation Western ringtail habitat	Water Reserve	Fenced, rehabilitated, conservation	Medium to high (long term)	Gain
Buffer area (Lowdon, Helena, Forrestfield)	P17	31 (5)	Native vegetation	Med	Weeds fire grazing	Freehold Farmland	Private land	Native vegetation	Water Reserve	Fenced, weed control, conservation	Medium to high	Gain
Buffer area	P17	104 (5)	Cleared/ degraded	Low to neg	Weeds fire grazing	Freehold Farmland	Private land	Rehabilitated (Lowdon) conservation	Water Reserve	Fenced, rehabilitated, conservation	Medium (long term)	Gain
Korijekup	P6		Native Vegetation	High	Weeds, fire, uncontrolled access	Reserve	None	Native Vegetation	Reserve	Weed control, controlled access	High	Gain

			Before Implementation					After Implementation				
Location	**X-ref**	**Area ha**	**Condition**	**Con value**	**Threatening Processes**	**Tenure / Purpose**	**Management**	**Condition**	**Tenure / Purpose**	**Management**	**Con value**	**Comment**
Other Offset Measures												
Part of Water reserve 15515 (Forrestfield)		10	Native vegetation, good condition	High	Weeds, fire, grazing	Water reserve	None	Native vegetation	Water Reserve/ Conservation	Fenced, weed control, conservation	Very high	Gain
Korijekup	P6		Native Vegetation	High	Weeds, fire, uncontrolled access	Reserve	None	Native Vegetation	Reserve	Management framework in place	High	Gain
Falls Brook Nature Reserve	P6		Native Vegetation	High	Weeds, fire, uncontrolled access	Reserve	None	Native Vegetation	Reserve	Management framework in place	High	Gain
Contribution to Harvey River Restoration trust	P14	230 (2)	Cleared /degraded	Low	Weeds fire grazing, erosion	Freehold Farmland	Private land	Rehabilitated conservation	River Reserve	Fenced, rehabilitated, conservation	Medium (long term)	Gain

Notes

1 The Water Corporation is currently negotiating with Western Power to install the Harris pipeline entirely within the existing powerline corridor - this is expected to be the final outcome.

2 The area of rehabilitation resulting from the Corporation's contribution to the Harvey River Restoration is an estimate based on the Commission's guidelines for the Trust. The actual area of rehabilitation is expected to be greater.

3 Vegetation between the 75m and 78mAHD level will not be cleared.

4 The vegetation left uncleared between 75 and 78mAHD will be managed as part of the reservoir buffer system (ie, fenced and weed control).

5 The buffer area is expected to be greater than that stated because of land rationalisation constraints.

SCOPE AND CONTENT OF REHABILITATION PLAN

1. Rehabilitation objectives

Rehabilitation objectives will be provided for the following rehabilitation areas. Preliminary rehabilitation objectives are as follows:

Areas disturbed by the pipeline construction in native forest

- To create a stable landscape with self-sustaining vegetation communities that are consistent with the current composition of vegetation complexes found in the area.
- All seed to be collected from local native species and applied in mixtures based on the recognised floristic composition of the site-vegetation types (as used in the rehabilitation planning) which occur within this valley system.

Forrestfield Complex Rehabilitation Area (gravel pit site)

- Reinstate self-sustaining vegetation communities that approach the form, cover, diversity and resilience of the original Forrestfield Vegetation complex found in the vicinity.
- All seed to be collected from local native species and applied in mixtures based on the recognised floristic composition of the site-vegetation types (as used in the rehabilitation planning) which occur within the Forrestfield Complex Area.

Peppermint woodland area (cleared grazing land)

- To encourage the development of a peppermint woodland with habitat values for Western Ringtail possums and other significant fauna that may occur in the vicinity.
- To encourage peppermint woodlands, restoration work to be based on a mixture of seeding and plantings to enable both a range of native species to be re-introduced into these largely modified landscapes and also to provide a mosaic of different peppermint ages for assisting with fauna habitat restoration. Further investigative work, as well as trials, will be completed as part of the rehabilitation programme to assess the viability of transplanting.

Borrow pit and quarry areas

- Create a safe, stable, landscape with visual amenity and a cover of native vegetation based on local native flora species.

Buffer area (previously cleared areas)

- To establish habitat for locally significant fauna and encourage the establishment of native vegetation with flora species that are consistent with vegetation complexes that occur in the local area.
- To reduce the risk of turbid runoff to the Harvey Reservoir and improve water quality.

2. Management of vegetation disturbance

Procedures to be employed to minimise the disturbance of native vegetation by construction operations.

3. Pattern of rehabilitation

Site plans area will be included which will describe rehabilitation in each area. In some areas opportunities may be taken to create a diversity of habitats and communities. Such habitats and communities would be consistent with those that occur in the local area.

4. Description of rehabilitation methodologies

Methodologies will be described which incorporate best practice in rehabilitation including:

- the use of smoke for seed germination, collection of local provenance seed, direct seeding, planting of seedlings and direct translocation of non weed-infested topsoil from inundation areas into rehabilitation areas;
- retention of as much forest debris as possible in rehabilitation areas;
- transplanting of mature peppermints;
- increasing the range of species present in disturbed and modified areas, which in turn will lead to a diversity of structural layers and communities for the fauna species;
- respreading of topsoil, ripping, seeding and fertilising, in quarry and borrow pit areas above the zone of inundation;
- construction of specific fauna habitat.

5. Dieback and Weed management

The methods to be employed for weed control may include removal of topsoil containing weed seeds from cleared grazing areas and application of herbicides that are consistent with protection of reservoir water quality.

Forest hygiene and weed management measures (to CALM requirements) will be written into contract documents.

Monitoring protocol for weeds and dieback will be described and remedial actions in the event of unacceptable weed infestations and dieback disease being detected (outside existing infested areas) will be identified.

6. Description of completion and rehabilitation performance criteria

- Preliminary completion criteria related to rehabilitation stages will be provided for each rehabilitation area. Criteria and rehabilitation may be based on a number of factors including:
- Soil stability;
- Recruitment of fauna into rehabilitation areas;
- Diversity and abundance of native flora species;
- Development of a diversity of structure (height and plant cover) and composition of local plant communities;
- Presence of weeds and dieback disease;
- Establishment of ecological processes;
- Resilience to fire.
- Preliminary performance targets and criteria will be established for each rehabilitation stage. These will be reviewed annually following monitoring.

7. Monitoring Program and contingency measures

A monitoring program to assess the effectiveness of rehabilitation will be outlined and contingency plans outlined where performance criteria have not been met.

8. Allocation of rehabilitation resources

- The equipment and personnel that will be applied to rehabilitation will be described.

Appendix 5

1987 Ministerial Statement

Harris Dam project

Ass # 040

Bull # 272

State # 008

MINISTER FOR ENVIRONMENT

STATEMENT THAT A PROPOSAL MAY BE IMPLEMENTED (PURSUANT TO THE PROVISIONS OF THE ENVIRONMENTAL PROTECTION ACT 1986)

HARRIS RIVER DAM PROJECT

WATER AUTHORITY OF WESTERN AUSTRALIA

This proposal may be implemented subject to the following conditions:

1. The proponent fulfilling the commitments given in the Environmental Review and Management Plan and in subsequent correspondence (copy of major commitments attached).

2. The proponent shall provide details of the:

   - water pipeline alignment; and
   - construction and proposed rehabilitation methods;

   to the Environmental Protection Authority's satisfaction prior to construction.

3. The proponent shall review current research projects and the existing catchment management programme, in particular the reforestration programme, with a view to:

   - assessing the prospects for a range of alternative strategies, including tree farming, to control saline discharges from affecting areas; and
   - assessing possible time frames for implementing further catchment management options and redirecting research and development programmes as appropriate.

   The proponent shall report to the Environmental Protection Authority following this review with proposals for meeting condition 1 and the associated commitments.

Barry Hodge, MLA
MINISTER FOR ENVIRONMENT

5 NOV 1987

7th Floor, May Holman Centre Phone (09) 325 4133

MANAGEMENT COMMITMENTS MADE BY THE PROPONENT

The Water Authority of Western Australia is committed to the long term objective of returning the Collie River to a salinity level such that the quality of water supplied from Wellington Reservoir is suitable for domestic water supplies.

The following management commitments were presented in the ERMP:

CLEARING OF FOREST AND REHABILITATION

Trees and large scrub up to the full supply level will be removed before flooding the reservoir.

CALM will be contacted as early as possible to arrange for logging of suitable timber in the reservoir basin. Timber to the east of the dam could be logged at the same time. The remaining vegetation will be heaped up within the cleared reservoir basin and the immediate area of the dam wall and associated works. Full liaison will be maintained with CALM, in accordance with forest hygiene requirements.

Topsoil from the reservoir area will be stockpiled for use in rehabilitation of disturbed areas. Disturbed areas above full supply level which do not support improvements will be rehabilitated. Such areas will include cut and fill faces and construction pads which are not required for further construction activities and the Griffin sand pit. Topsoil that has been stockpiled during construction will be used to cover the disturbed areas. They will then be deep ripped to promote water infiltration, control erosion and encourage root penetration. Revegetation in the vicinity of the dam wall will conform to a landscaping plan prepared in consultation with CALM officers. Elsewhere, CALM prescriptions for rehabilitation in the jarrah forest will be adhered to.

Regular inspections of rehabilitated areas will be undertaken to identify areas requiring further treatment and maintenance. These inspections will be undertaken annually, prior to each winter season. The prescribed treatments will include:

- control of noxious weeds;
- repairs where signs of soil erosion are evident;
- replanting as required.

Such treatments will be regarded as routine maintenance. It is anticipated that once satisfactory rehabilitation is achieved, it will be self-sustaining.

SURFACE DISTURBANCE AND EROSION CONTROL

The extent of these effects will be minimised by:

- most of the earthworks will be carried out during the summer period when runoff is normally low which will minimise the opportunities for erosion and limit the extent of sediment transport downstream;
- early construction of the dam outlet culvert will bypass river flows around the construction site.

TRANSPORTATION

The following guidelines for relocation of Tallanalla Road will be used in the final design:

- all affected authorities including CALM, Collie and Harvey Shires, SECWA, Worsley Alumina Company and property owners will be consulted regarding relocation;

- relocation west of the current alignment will take into account the need to minimise the potential for the spread of dieback as well as maintain water quality.

Access for forestry management activities east of the dam will be provided in consultation with officers from CALM. The opportunity for further control of access may well be consistent with the conservation and disease management needs of this area. Liaison will be maintained with the Shires regarding the need for increased road maintenance due to construction traffic. It is anticipated that the unsealed portion of the Collie-Tallanalla Road will be sealed.

DOWNSTREAM ECOSYSTEMS

The site investigations have provided baseline information for species distribution and abundance. Additional surveys after construction and reservoir flooding would provide information on changes in species diversity and abundance.

It may be possible, with more precise ecological information, to use the aquatic ecosystem to gauge the physical and chemical condition of the stream. Some organisms, such as the nymph, Tasmanocoensis tillyardi, may become useful biological indicators. However, the lack of information concerning aquatic biology in the southwest of Western Australia precludes this possibility for management purposes at this time.

Accordingly, the following management guidelines will be adopted for a dam located at Dam site 5.

- release of warmer epilimnion water during the dry season and colder hypolimnion water during winter to minimise adverse thermal effects on aquatic organisms;

- surveys to assess changes in species distribution and abundance - the results of which will be notified to appropriate government departments.

PROPOSED SPILLWAY

The spillway will be designed to incorporate a stilling basin structure which will minimise scour where spillway flow enters the river.

IMPACT OF THE PIPELINE ON EXISTING ENVIRONMENT

The proposed pipeline will follow the transmission line corridor and the Collie-Tallanalla Road throughout its length. Current indications are that the pipeline will be buried and the backfilled trench allowed to revegetate by separate return of stockpiled topsoil over backfilled spoil. The most likely form of river crossing will be pipebridges, although the Harris River crossing may be buried.

MANAGEMENT OF FOREST DISEASE RISK AREA

As Dam site 5 and the majority of the reservoir are located within the disease risk area stringent conditions will be enforced by the Water Authority on its staff and contractors to minimise the spread of dieback in the disease risk area. The Water Authority will establish guidelines for dieback control in consultation with CALM.

AQUATIC ECOSYSTEMS

To protect Twenty-Two Mile Pool, the full supply level of Harris Dam has been fixed at 223.5 m. The low gradients in this area will mean that the reservoir surface will remain at least half a kilometre from the pool. To further ensure the integrity of the pool ecosystem, it is proposed to retain a buffer area of swamp vegetation below it. This will be achieved by limiting clearing in the shallow upper part of the reservoir to the 223 m contour. As this part of the reservoir will dry out annually, the existing vegetation is expected to survive since it is adapted to seasonal inundation.

Vegetation upstream of Twenty-Two Mile Pool will be protected by selection of the 223.5 m contour as full supply level.

FAUNA

The full supply level has been set at 223.5 m to avoid the swamps above Twenty-Two Mile Pool, on which sensitive species such as the Quokka (Setonix brachyurus) depend.

Inundation of dense stream zone vegetation will reduce the habitat available to the Red-eared Firetail finch. As this species has now been shown to be more widespread than previously thought (Nichols, 1982), and there is a large area of similar habitat upstream, this loss is unlikely to significantly affect the overall status of the species.

FOREST MANAGEMENT USE

CALM will be consulted regarding utilisation of timber remaining in the reservoir area, before the reservoir fills. Access to the east of the dam will be retained via Norm Road. The Water Authority will liaise with CALM to ascertain if direct access to the Collie-Tallanalla Road is required in the long term for fire control and reserve management.

BEEKEEPING

The Water Authority will liaise with CALM and affected apiarists on the need to rationalise and relocate apiary sites, in keeping with the need to minimise conflict with other land uses while maintaining honey production.

MINING

In the longer term as Bauxite Mining approaches the reservoir, the Water Authority will liaise with the relevant parties as it now does regarding sites elsewhere in the Darling Range. It is possible that constraints will be placed on future mining operations in order to maintain water quality.

Elsewhere environmental impacts from surface disturbance will be minimised by:

- restricting clearing operations to the minimum required for construction and safe access;
- utilising the area upstream from the dam wall and below full supply level for borrow material and construction facilities;
- in consultation with the relevant authorities, upgrading and using existing roads for access during logging, clearing and construction;
- revegetate disturbed areas outside the storage area as soon as possible after construction is completed.

DUST AND NOISE

Noisy, heavy equipment will only operate during daylight hours to minimise any inconvenience to residents. Residents will be fully informed of any blasting operations and all people will be excluded from the danger area during shot firing. The sealing of the Tallanalla Road from Collie will minimise noise and dust due to heavy vehicle traffic.

Working areas will be sheeted with gravel or when necessary, watering will be carried out using a water tanker fitted with sprays. Watering will be minimised consistent with dieback control requirements where relevant. Employees exposed to unacceptable noise or dust levels will be issued with suitable protective equipment.

CONSTRUCTION OPERATIONS

Adverse impact upon the site environment will be minimised by:

- using cleared areas below full supply level, wherever feasible, for construction facilities and parking areas for workers' cars;
- removal of temporary buildings, construction refuse and hardstand material at the completion of the construction programme;
- supplying appropriate facilities for workers, with regular removal of refuse to appropriate disposal facilities.

Upgrading of Tallanalla - Collie Road will include:

- sealing the road and constructing table drains;
- drainage off the road will be controlled wherever practicable.

Care will be exercised in storage and handling of petroleum based products, as there is the potential for contamination of surface soils and water from oil or fuel spills. All oils and fuel will be stored according to the requirements of the appropriate regulations. All wastes will be collected in a sump and trucked to an approved waste disposal site.

IMPACT OF RESERVOIR ON WATER SUPPLY

The Harris Dam will be operated and managed to achieve:-

- immediate improvement in the quality of water supplied to the GSTWS by the supply of low salinity Harris River water;

- a small improvement on average in quality of Wellington Dam water, reducing the salinity of irrigation water supplied to users in the Collie Irrigation District.

NATURE OF PROPOSED RESERVOIR

To minimise the exposure of bare reservoir bed in the gently sloping upper reaches, it is proposed that the bed remain uncleared beyond the 223 m contour in the area of swamp immediately downstream of Twenty-Two Mile Pool. Vegetation in this area would be expected to tolerate seasonal inundation, as it does now.

RESERVOIR HABITATS AND ECOSYSTEMS

The reservoir and its shores will be inspected to detect the introduction of any aquatic weeds and appropriate remedial measures will be implemented.

SHORELINE HABITATS AND ECOSYSTEMS

Retention of existing vegetation down to the 223 m contour, immediately below Twenty-Two Mile Pool, will limit the extent of bare reservoir bed exposed and limit opportunities for the establishment of exotic species. Controls on public access to the reservoir margin will further limit the disturbance to the exposed bed.

IMPACT ON AESTHETICS

It is proposed to capitalise on the aesthetic opportunities provided by a new dam by:

- landscaping the area adjacent to the dam wall;

- providing vistas across the reservoir at selected sites.

IMPACT ON RECREATION

The Water Authority also proposes to:

- examine the suitability of the area downstream of the dam for recreation, particularly picnicking and bushwalking;

- in conjunction with other relevant authorities, give due consideration during the design stage to the tourism potential of the rerouted section of Collie-Tallanalla Road;

- restrict public access, consistent with guidelines for the protection of water quality on Class 1 catchments for public potable supplies (WA Water Resources Council, 1985). The rerouted Tallanalla-Collie Road will remain open to public access.

WELLINGTON RESERVOIR

In conjunction with affected landholders, State and Local Government agencies and other interested parties, the Water Authority will prepare a management plan defining opportunities for recreation, on the waterbody and on the shorelines around Wellington Reservoir. This plan would indicate the locations and densities of recreational facilities and activities taking into account:

(a) engineering services and access;

(b) environmental issues -

- water quality
- erosion
- flora and fauna

(c) landscape quality;

(d) conflicts in recreation use;

(e) finance, management and maintenance;

(f) public attitudes to development of the area.

ARCHAEOLOGICAL SITES

- The Water Authority acknowledges its obligations to site protection as outlined in the Western Australia Aboriginal Heritage Act, 1972-80, and will comply with any directions given by the Minister.
- Sites S1848, S1869 and S1878 will be test pitted.
- Sites S1865 and S1871 will be recorded in detail and the archaeological material collected.
- Any new sites discovered during the course of the work will be reported to the Registrar.