Forrestfield Marshalling Yards
Shire of Kalamunda Town Planning Scheme 2
Amendment 177

Shire of Kalamunda

Report and recommendations of the Environmental Protection Authority

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Summary and recommendations

The Shire of Kalamunda proposes to rezone the substantive area of the Forrestfield Marshalling Yards to "General Industry" with portions zoned for "Light Industry", "Mixed Use" and reserved for "Public Open Space". The Amendment also provides for the relocation of the "Important Regional Road" reservation from Dundas Road to a location within the Forrestfield Marshalling Yards and the zoning and reservation of the land formerly required for that road to purposes consistent with adjoining land. This report provides the Environmental Protection Authority's (EPA's) advice and recommendations to the Minister for the Environment on the environmental factors, conditions and procedures relevant to the proposed scheme amendment.

Section 48D of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the proposed scheme amendment and on the conditions and procedures to which the scheme amendment should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

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) specially protected (threatened) fauna - adverse impacts on potential habitat for the Western Swamp Tortoise;

(b) wetlands - protection of Conservation Category wetlands;

(c) groundwater quality - adverse impacts on potential Western Swamp Tortoise habitat, regionally significant vegetation, Conservation Category wetlands, and future irrigation and other uses; and

(d) soil contamination - adverse impacts on potential Western Swamp Tortoise habitat, regionally significant vegetation, Conservation Category wetlands and future land uses.

Conclusion

The EPA has concluded that Amendment 177 to the Shire of Kalamunda Town Planning Scheme 2 to rezone the substantive area of the Forrestfield Marshalling Yards to "General Industry", "Light Industry", "Mixed Use" and reserve "Public Open Space", relocate the "Important Regional Road" from Dundas Road to a location within the Forrestfield Marshalling Yards, and the rezone and reserve the land formerly required for that road to purposes consistent with adjoining land can be implemented to meet the EPA's objectives provided the conditions recommended in Section 4 and set out in Appendix 3 are imposed and enforced.

Recommendations

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

1. That the Minister notes the proposed amendment being assessed generally comprises the rezoning of the substantive area of the Forrestfield Marshalling Yards to "General Industry", "Light Industry", and "Mixed Use", the reservation of "Public Open Space", the relocation of the "Important Regional Road" from Dundas Road to a location within the Forrestfield Marshalling Yards, and the rezoning and reservation of the land formerly required for that road to purposes consistent with adjoining land.

2. That the Minister considers the report on the relevant environmental factors of specially protected (threatened) fauna; wetlands; groundwater quality; and soil contamination as set out in Section 3.

3. That the Minister notes the EPA has concluded that the EPA's objectives can be met, provided there is satisfactory implementation by the Responsible Authority of the recommended conditions set out in Section 4.

4. That the Minister imposes the conditions and procedures recommended in Appendix 3 of this report.

5. That the Minister notes that where any future development proposal complies with the Plans and raises no additional environmental factors, the development proposal will not normally be subject to further assessment under Part IV of the *Environmental Protection Act 1986*. However, future development proposals will still be subject to the normal development approvals process, including licensing and pollution control provisions of the *Environmental Protection Act 1986* where applicable.

6. That the Minister notes that the recommendations for the proposal the subject of this Bulletin are consistent with the recommendations set out in Bulletins 925 and 926, which are the associated planning scheme amendments for the Metropolitan Region Scheme and the City of Belmont respectively.

Conditions

Having considered the information provided in this report, the EPA has developed a set of conditions which the EPA recommends be imposed if the Amendment is approved. These conditions are presented in Appendix 3. Matters addressed in the conditions include the following:

(a) a Drainage and Nutrient Management Plan be prepared and implemented for each drainage sub-catchment in the Amendment area;

(b) Soil Contamination Remediation Plans be prepared for the affected portions of the Amendment area;

(c) Groundwater Contamination Remediation Plans be prepared for the groundwater affected by the soil contamination within the Amendment area; and

(d) a Groundwater Abstraction Plan be prepared for the Amendment area.

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1. Introduction and background

The Shire of Kalamunda, the Responsible Authority, proposes to rezone the substantive area of the Forrestfield Marshalling Yards to "General Industry" with portions zoned for "Light Industry" and "Mixed Use", and reserved for "Public Open Space". The Amendment also provides for the relocation of the "Important Regional Road" reservation from Dundas Road to a location within the Forrestfield Marshalling Yards and the rezoning and reservation of the land formerly required for that road to purposes consistent with adjoining land. (Figures 1 and 2).

The EPA set the level of assessment for the proposal at formal Environmental Review (ER) mainly as a result of the juxtaposition of the Forrestfield Marshalling Yards and the System Six Area M52 (Perth Airport). The proposal could adversely impact upon the M52 area, which contains regionally significant bushland identified in *Perth's Bushplan* as well as wetlands which are potential habitat for the reintroduction of the declared rare Western Swamp Tortoise (*Pseudemydura umbrina*). Other issues considered when setting the level of assessment included potential soil and groundwater contamination associated with previous land uses within the Amendment area.

Two related amendments and their environmental assessments are being considered in conjunction with the Shire of Kalamunda Town Planning Scheme 2 Amendment 177 (Bulletin 927). They are Amendment 984/33 to the Metropolitan Region Scheme (Bulletin 925) and the City of Belmont Town Planning Scheme 11 Amendment 100 (Bulletin 926). Both the City of Belmont and Shire of Kalamunda Town Planning Scheme Amendments reflect the proposed rezoning in the MRS.

Further details of the proposed amendment are presented in Section 2 of this Report. Section 3 discusses environmental factors relevant to the scheme amendment. Conditions and procedures to which the scheme amendment should be subject if the Minister determines that it may be implemented are set out in Section 4. Section 5 provides the EPA's Other Advice. Section 6 presents the EPA's conclusion, and Section 7 the EPA's recommendations.

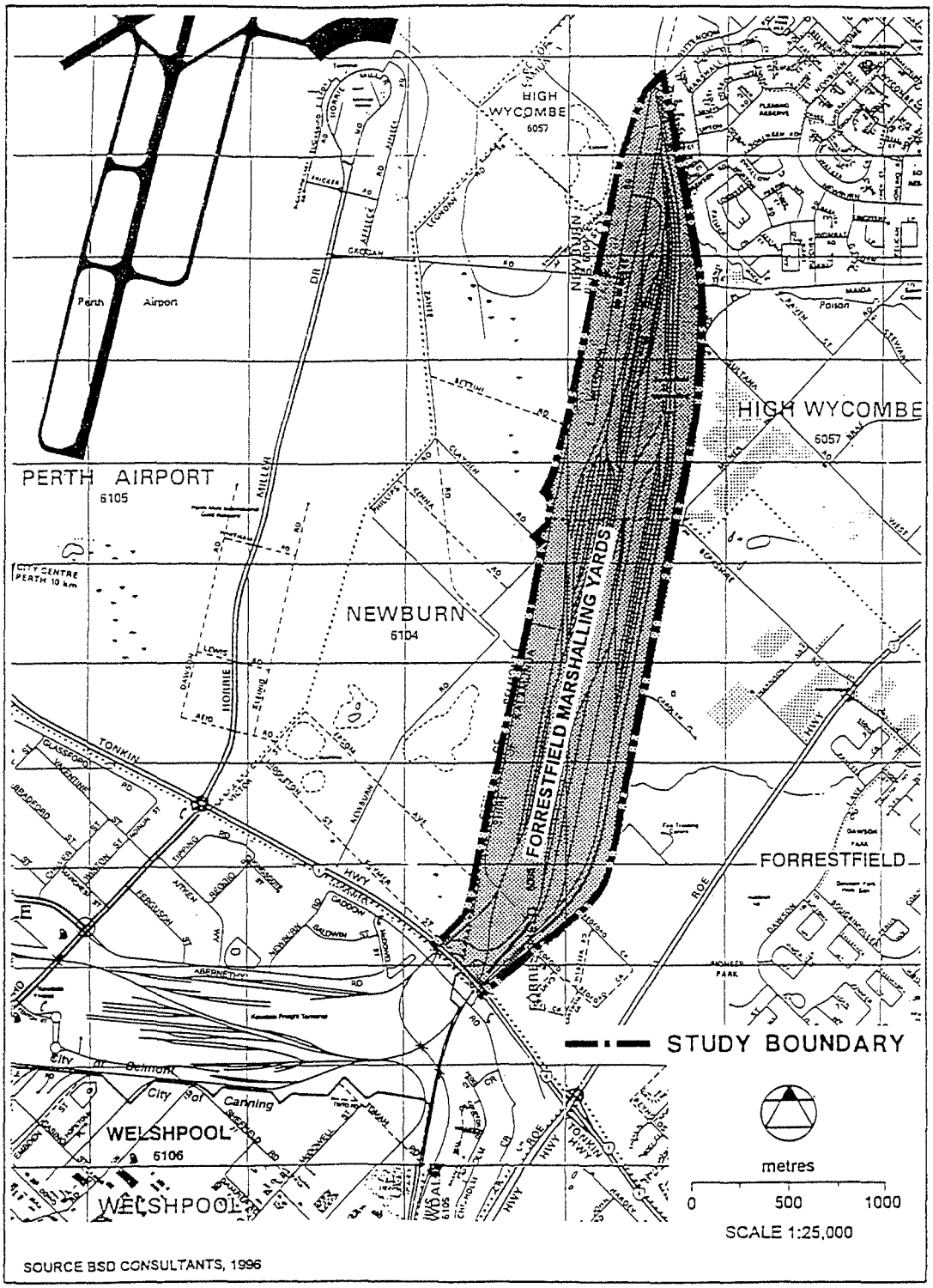
A list of people and organisations that made submissions is included in Appendix 1. References are listed in Appendix 2, and recommended conditions and procedures and Responsible Authority's commitments are provided in Appendix 3.

The DEP's summary of submissions and the Responsible Authority's response to those submissions has been published separately and is available in conjunction with this report.

2. The proposed scheme amendment

The Amendment area comprises the substantial northern portion (approximately 226 hectares) of the location referred to as the Forrestfield Marshalling Yards (Figure 2). The Forrestfield Marshalling Yards are approximately 241 hectares in extent (roughly 4.5 kilometres long and 0.6 kilometres wide) and located about 10 kilometres east of the Perth Central Business District. The Yards are generally bounded by Dundas Road to the east, Tonkin Highway to the south, and the Perth International Airport to the west. The numerous shunting tracks and buildings within the Amendment area have been used for storage, servicing and maintenance of railway infrastructure, including a construction depot, wagon repair depots, wheel lathe building and carriage shed. Abutting land uses to the east are residential, industrial and rural, whilst the Kewdale Freight Terminal, the Kewdale Industrial Area and the Airport comprise the land uses to the south and west.

Westrail has sought the rezoning of the Forrestfield Marshalling Yards because the majority of land has been identified as surplus to its requirements under its land rationalisation project, the Right Track Programme. Westrail intends to consolidate its existing operation, remove redundant assets and dispose of the land, generally for industrial land uses. Some industrial uses, such as Co-operative Bulk Handling, Specialized Container Transport and Joe White Maltings have already been introduced to the Yards as a result of recent Government initiatives.



FORRESTFIELD MARSHALLING YARDS
LOCATION PLAN

Figure 1. Location Plan.

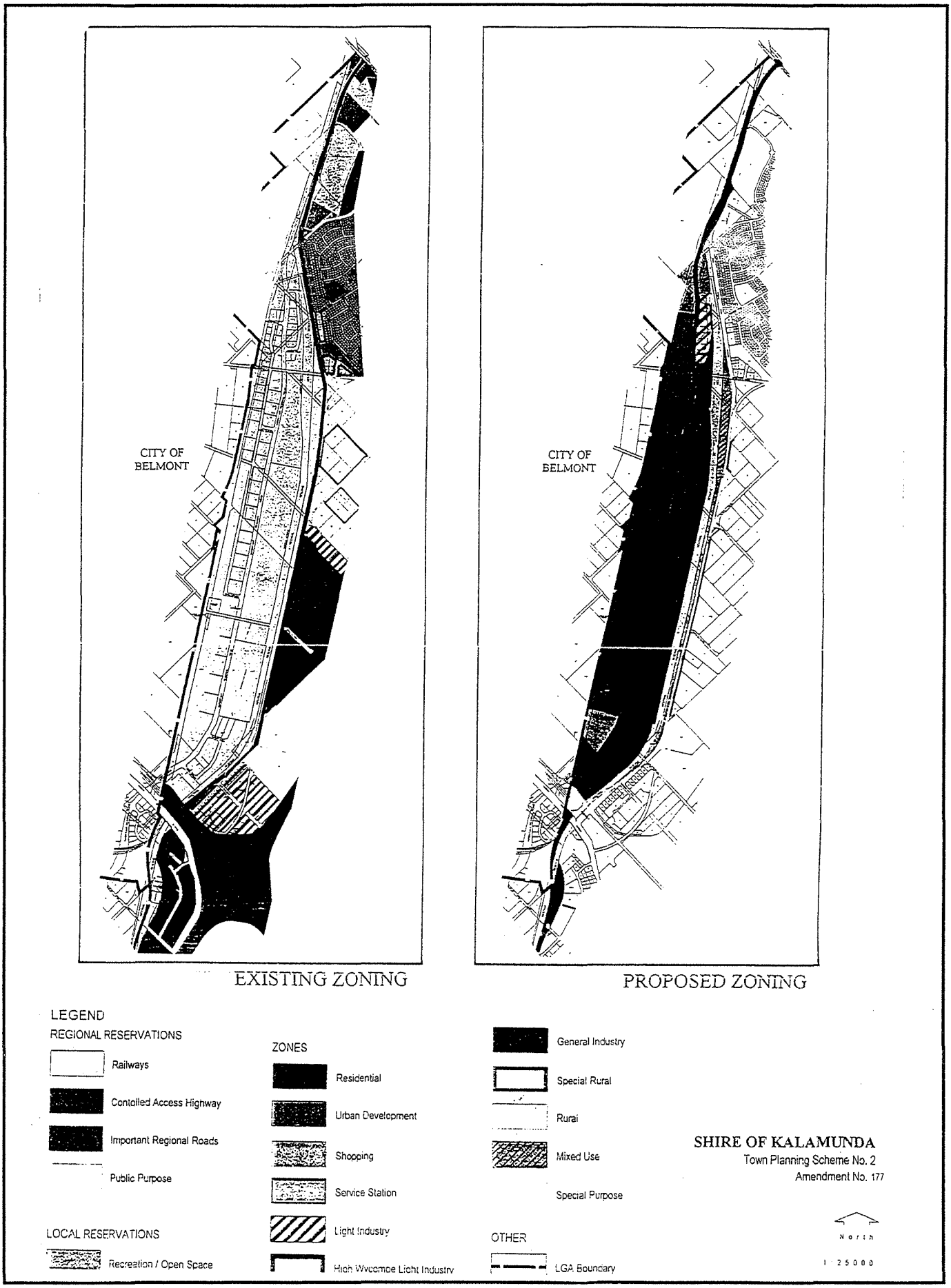


Figure 2. Proposed Amendment.

Details of Amendment 177 are:

a) to exclude the Amendment area from the "Railways" reservation;
b) to include land within the Amendment area in the "General Industry", "Mixed Use" and "Light Industry" zones with Additional Use Permit over portion of the land, and the "Public Open Space" and "Important Regional Road" reservations as depicted on the Amendment plan;
c) to remove the "Important Regional Road" reservation on that portion of the existing Dundas Road generally south of Wittenoom Road and amend the reservation on that portion of the road generally north of Wittenoom Road as shown on the Amendment plan;
d) to variously zone and reserve the land on the east side of Dundas Road and generally south of Wittenoom Road to "Rural", "Special Rural", "Light Industry", "General Industry" and "Regional Reservation - Special Use"; and
e) to amend the Scheme Text such that the Use Class "Office" is an "AA" use in the "General Industry" zone.

as depicted on the Scheme Amendment Map (Figure 2).

Small stands of remnant vegetation within the Amendment area are generally highly disturbed, and none has been identified as regionally significant. There is one Conservation Category wetland (a dampland) in the southwest portion of the Amendment area.

The main characteristics of the proposed scheme amendment are summarised in Table 1 below. A detailed description of the scheme amendment is provided in Section 2 of the Environmental Review (Western Australian Planning Commission, City of Belmont and Shire of Kalamunda, 1998).

Table 1 - Summary of key amendment characteristics

Element	Description
Total area of land	approximately 226 hectares
Existing land uses	railway purposes (numerous shunting tracks and buildings for storage, servicing and maintenance of railway infrastructure)
Dampland	it is proposed to incorporate in POS a Conservation Category wetland (dampland) located adjacent to the southwest of the Amendment area
Existing zoning/reservation in the Metropolitan Region Scheme	"Railways" and "Important Regional Road" reservations
Proposed Scheme modifications	TPS Amendment 177 proposes to • rezone part of the Amendment area to "General Industry", "Light Industry", and "Mixed Use"; • reserve part of the Amendment area as "Public Open Space and "Important Regional Road" (Abernethy Road); • variously rezone and reserve land east of Dundas Road to purposes consistent with adjoining land; and • include provision in the Scheme Text for "Office" to be and "AA" use in the "General Industry" zone.
Proposed environmental management measures	• Drainage and Nutrient Management Plan; • Soil Contamination Remediation Plans; • Groundwater Contamination Remediation Plans; and • Groundwater Abstraction Plan.

The potential impacts of the proposed amendment initially predicted by the Responsible Authority in the ER document (Western Australian Planning Commission, City of Belmont and Shire of Kalamunda, 1998) and their proposed management are summarised in Table 2 (Appendix 1).

3. Environmental factors

3.1 Relevant environmental factors

Section 48D of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the proposed amendment 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.

It is the EPA's opinion that the following are the environmental factors relevant to the proposed amendment, which require detailed evaluation in this report:

(a) specially protected (threatened) fauna - adverse impacts on potential habitat for the Western Swamp Tortoise;

(b) wetlands - protection of Conservation Category wetlands;

(c) soil contamination - adverse impacts on potential Western Swamp Tortoise habitat, regionally significant vegetation, Conservation Category wetlands, and future land uses; and

(d) groundwater quality - adverse impacts on potential Western Swamp Tortoise habitat, regionally significant vegetation, Conservation Category wetlands, and future irrigation and other uses.

The above relevant factors were identified from the EPA's consideration and review of all environmental factors (preliminary factors) generated from the Environmental Review document and the submissions received, in conjunction with the Amendment characteristics and alternative approval processes which ensure that the factors will be appropriately managed. On this basis, the EPA considers that the preliminary factor (vegetation communities) and other issues raised in the submissions do not require further evaluation by the EPA. The identification process is summarised in Table 2.

The land subject to this assessment is within the area affected by the Metropolitan Region Scheme Amendment 984/33 and the City of Belmont Town Planning Scheme 11 Amendment 100.

The relevant environmental factors are discussed in Sections 3.2 to 3.5 of this report and are summarised in Table 3.

3.2 Specially protected (threatened) fauna

Description

The limited extent and poor condition of the vegetation within the Amendment area has reduced the value of the habitat for all fauna, except species which are able to survive in highly disturbed situations, such as some bird species. Introduced mammals, such as the house mouse, cat, rabbit and fox, have severely affected the quality of the habitat and also directly affected the native species present.

Bird species of conservation interest which have been identified as possibly being present include the Peregrine Falcon (*Falco peregrinus*), Short-billed Black Cockatoo (*Calyptorynchus latirostris*), and the Long-billed Black Cockatoo (*Calyptorynchus baudinii*). Each of the bird species is likely to be a casual visitor to the site, making only incidental use of the area. The site's dampland (Conservation Category wetland) may be potential habitat for the gazetted rare

Table 2: Identification of Relevant Environmental Factors

FACTOR	AMENDMENT COMPONENT WITH POSSIBLE IMPACT	GOVERNMENT AGENCY AND PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT ENVIRONMENTAL FACTORS
BIOPHYSICAL			
Vegetation communities	Potential clearing of remnant vegetation within the Amendment area. Contamination and changes to hydrology may adversely impact upon regionally significant vegetation in the adjacent M52 area.	• It is crucial that the small areas of remnant bushland, of the Southern River Vegetation Complex are conserved. The Government aims to protect 10% of all vegetation complexes, but it is estimated that only 7% of the vegetation type remains due to extensive clearing on the eastern side of the Swan Coastal Plain. • Consistent with the conservation objectives of the Perth Airport bushland, development on the western boundary of the Marshalling Yards must be restricted to provide buffer areas adjacent to bushland of high conservation status. For example, bushland in the south-east corner of the airport links through to dampland scrub and heath in the southern part of the Marshalling Yards site. • The dampland scrub and heath area in good condition in the southern area of the Marshalling Yards site (Area No. 7, Figure 9 of the Environmental Review) has some surface water in winter and is almost certain to be habitat for the Southern Brown Bandicoot, and may be a nesting area for water birds. The area should be totally conserved. • The Perth Airport Bushland, some of which will be a conservation reserve, must be protected from "people pressure", fertilisers and pesticides ensuing from the proximity of industrial lots and an Office Park.	Remnant vegetation within the Amendment area is largely highly disturbed and none has been identified as regionally significant. The only remnant vegetation in excellent condition is addressed under the Wetlands factor. Potential off-site impacts are addressed through other factors. **Factor does not require further EPA evaluation.**

Specially Protected (Threatened) Fauna	A potential increase in the volume of drainage water discharging from the Amendment area as a result of industrial development and the proposed Important Regional Road, and an increase in the potential for changes to the regional watertable and contamination of surface waters may adversely impact on Western Swamp Tortoise potential habitats in the System Six M52 area (adjacent to the Amendment area)	• It is crucial that the wetlands which are potential habitat for the critically endangered Western Swamp Tortoise be conserved and protected. • The proposed amendment is endorsed subject to the implementation of an approved drainage and nutrient management strategy; and an approved groundwater abstraction strategy. • Although the Western Swamp Tortoise can be bred in captivity, there is insufficient suitable habitat to ensure its survival in the wild. Potential habitats have been identified in the Perth Airport land. The re-introduction of the tortoise will require significant funding, so such a venture cannot be threatened by alterations to the habitat by land use activities on the adjacent Marshalling Yards.	**Considered to be a relevant factor.**
Wetlands	A potential increase in the volume of drainage water discharging from the Amendment area, watertable changes, and contamination of surface and groundwater may adversely impact on the on-site Conservation Category wetland and those wetlands on the adjacent Perth Airport land (M52)	• As at November 1996 there was a large body of surface water in a wetland within the Marshalling Yards site, roughly in line with Clayden Road. Its existence is not mentioned in the Environmental Review. • Siting the link road to Great Eastern Highway Bypass in close proximity to Munday Swamp would do enormous damage to the Swamp and its surrounds. Runoff, accidents, chemical spillages and greater public access pose a threat to the Swamp, which Western Airports Corporation intends to set aside as a conservation area. The option should be removed and the alignment located as far from the Swamp as possible. In any event, rezoning for such a road must not be treated as a final environmental approval for its construction.	**Considered to be a relevant factor.**
Surface water quantity	The Amendment area lies within an existing drainage network, receiving water from upstream catchments and discharging to a drainage system connected to the Swan River Catchment. A potential increase in drainage water emanating from the Amendment area as a result of industrial development and the proposed Important Regional Road may cause unacceptable impacts both on-site and off-site.	• The objective of neither increasing nor decreasing the rate of stormwater discharge into the Airport is supported. • Drainage from any site within the Amendment area must be investigated by the developer to ensure that drainage levels across airport land remain at pre-development (current) levels. The investigation of drainage requirements shall recognise the development of the remainder of the Forrestfield Marshalling Yard site.	**Considered to be a relevant factor, but addressed under the factor of Wetlands.**

FACTOR	AMENDMENT COMPONENT WITH POSSIBLE IMPACT	GOVERNMENT AGENCY AND PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT ENVIRONMENTAL FACTORS
POLLUTION			
Surface water quality	Development of the Amendment area for industrial purposes and proposed Important Regional Road may increase the potential for contaminants to enter the drainage network and this may impact on the Swan River Catchment.	• The existing contamination which has occurred on the Marshalling Yards site over the years is of major concern because it is possible the surface drainage may spread the contamination into Airport land. The contaminated areas should be cleaned up as soon as possible.	**Considered to be a relevant factor, but addressed under the factors of Wetlands, Groundwater quality and Soil contamination.**
Groundwater quality	A thorough investigation of the nature and extent of groundwater contamination detected high levels of mineral oils and heavy metals in a few groundwater samples below the Amendment area. If not remediated, contaminated groundwater may move beyond the Amendment area resulting in adverse impacts on adjacent land uses. Groundwater contamination within the Amendment area may be incompatible with some proposed land uses.	• Existing groundwater contamination must be cleaned up. • Groundwater may spread contamination into Airport land, so existing contaminated areas should be cleared up as soon as possible. • It is essential that contaminated water (from proposed industrial activities) does not leave the site, either in the longer term or as a result of an accident, so that Perth Airport wetlands and bushlands are fully protected. • It is difficult to believe that the industrial lots and Office Park will not cause contamination of groundwater.	**Considered to be a relevant factor.**
Soil contamination	A thorough investigation of the nature and extent of soil contamination identified restricted areas of soil contaminated by mineral oils and heavy metals as a result of historical use of the site. If soil contamination is not remediated, there could be adverse on-site and off-site impacts.	• Existing contamination must be controlled so as not to affect the remnant bushland on both the Marshalling Yards and Perth Airport sites. • Contamination from future industrial developments must be carefully considered and prevented.	**Considered to be a relevant factor.**

Table 3: Summary of Assessment of Relevant Environmental Factors

RELEVANT FACTOR	RELEVANT AREA	EPA OBJECTIVES	EPA ASSESSMENT	EPA ADVICE
Specially Protected (Threatened) Fauna	Swan Coastal Plain	Protect Specially Protected (Threatened) Fauna and Priority Fauna species and their habitats, consistent with the provisions of the *Wildlife Conservation Act 1950*.	The EPA considers that the Responsible Authority has provided sufficient information to confirm that potential adverse impacts upon the off-site potential habitat for the Western Swamp Tortoise can be managed, under the Responsible Authority's management measures (to be applied as conditions), to meet the EPA's objective. The EPA notes that: • The wetlands assessed as potential habitat for the Western Swamp Tortoise are located adjacent to the Amendment area. • CALM advises that the hydrological regime of those wetlands immediately adjacent to the Forrestfield Marshalling Yards has already been substantially altered as a result of the Perth Airport Southern Main Drain. • These wetlands are not the preferred area for reintroduction of the Western Swamp Tortoise. • CALM considers that the viability of the proposed reintroduction program for the Western Swamp Tortoise will not be affected, providing the rate of surface water leaving the Amendment area is maintained at pre-development levels. • there is a commitment to remediate soil and groundwater contamination. The EPA recommends that the proposed management measures be applied as conditions so that the following Management Plans be prepared prior to submission of an application for subdivision or development approval, whichever occurs first: • a Drainage and Nutrient Management Plan; and • a Groundwater Abstraction Plan; to ensure water quality and water quantity leaving the Amendment are meets appropriate criteria, and that groundwater levels are managed to protect the potential habitat of the Western Swamp Tortoise.	Having particular regard to: • CALM's advice; • management measures for a Drainage and Nutrient Management Plan, and a Groundwater Abstraction Plan; and • commitment for remediation of soil and groundwater contamination; it is the EPA's opinion that the proposed amendment can be managed to meet the EPA's objective for specially protected (threatened) fauna.

Wetlands	Swan Coastal Plain	Maintain the integrity, functions and environmental values of wetlands.	The EPA considers that the Responsible Authority has provided sufficient information to confirm that impacts upon wetlands can be managed, under the Responsible Authority's management measures which will be applied as conditions, to meet the EPA's objective. The EPA notes that: • A survey of existing Amendment area conditions revealed that the only wetland is a dampland in the southwest corner of the site. The dampland, which is a Conservation Category wetland, and its associated vegetation will be retained in public open space. • The proposed management measure to prepare and implement a Drainage and Nutrient Management Plan prior to subdivision or development should ensure that the rate of stormwater leaving the development is kept at present levels. • The proposed management measure to prepare and implement a Groundwater Abstraction Management Plan prior to subdivision or development should ensure that the groundwater levels are not adversely impacted upon. • Following remediation under the proposed management measure for Soil Contamination Remediation Plans and Groundwater Contamination Remediation Plans, there is likely to be minimal impact to surface water quality. Prior to remediation, it is unlikely that overland surface flow will spread contamination into wetlands on the Forrestfield Marshalling Yards and the Airport land because the major contaminants, namely, heavy mineral oils, have long-chained hydrocarbons which display low solubility and high viscosity in water. The heavy metal contamination (lead and chromium) is restricted to two relatively small areas within the Forrestfield Marshalling Yards. • Development proposals for future industrial land uses will be subject to normal development approval processes, including environmental licensing and pollution control provisions of the *Environmental Protection Act 1986*. The EPA recommends that the proposed management measures be applied as conditions so that the following Management Plans be prepared prior to submission of an application for subdivision or development approval, whichever occurs first:	Having particular regard to: • the objective of maintaining surface water discharge at present levels (or less if necessary); • the management measure for a Drainage and Nutrient Management Plan, which will be applied as a condition to meet the above objective, • the management measure for a Groundwater Abstraction Plan, which will be applied as a condition; • the commitment for remediation of soil and groundwater contamination; and • development approval process requirements, including environmental licensing, for future development proposals; it is the EPA's opinion that the proposed amendment can be managed to meet the EPA's objective for wetlands.

			• a Drainage and Nutrient Management Plan; • Soil Contamination Remediation Plans; • Groundwater Contamination Remediation Plans; and • a Groundwater Abstraction Plan to ensure that the values of wetlands are maintained or even improved, the rate of stormwater leaving the development is kept at present levels, and the quality of the stormwater meets relevant criteria before discharging from the Amendment area.	
Soil contamination	Amendment area	Ensure the rehabilitation of the site to an acceptable standard that is compatible with the intended land use, consistent with appropriate criteria	The EPA considers that the proponent has provided sufficient information to confirm that soil contamination can be remediated and managed, under the Responsible Authority's management measures (to be applied as conditions) to meet the EPA's objective. The EPA notes that: • A detailed soil contamination investigation has identified contamination from heavy mineral oils in six areas within the Forrestfield Marshalling Yards, and lead, zinc and chromium concentrations at two sites. • The Responsible Authority has proposed management measures to prepare Soil Contamination Remediation Plans and Groundwater Contamination Remediation Plans to implement remediation works. • Potential contamination from future industrial and other land uses will be controlled through the development approvals process, and the licensing and pollution control provisions of the *Environmental Protection Act 1986*. The EPA recommends that the proposed management measures be applied as conditions so that the following Management Plans be prepared prior to submission of an application for subdivision or development approval, whichever occurs first: • Soil Contamination Remediation Plans; and • Groundwater Contamination Remediation Plans; to ensure that the site is remediated according to guidelines recognised by the EPA.	Having particular regard to: • the presence of contaminated soils within the Amendment area; • the management measure for a Soil Contamination Remediation Plan, to be applied as a condition; and • development approval process requirements, including environmental licensing, for future development proposals; it is the EPA's opinion that the proposed amendment can be managed to meet the EPA's objective for soil contamination.

Groundwater quality	Amendment area and those areas immediately adjacent.	Ensure that the beneficial uses of groundwater can be maintained, consistent with the draft WA Guidelines for Fresh and Marine Waters (EPA, 1993)	The EPA considers that the proponent has provided sufficient information to confirm that groundwater quality can be managed, under the Responsible Authority's management measures (to be applied as conditions), to meet the EPA's objective.
			The EPA notes that:
			• A detailed investigation of the extent and severity of groundwater contamination revealed the following concentrations within the Forrestfield Marshalling Yards:
			  • mineral oils at levels above Dutch B criteria but below Dutch C criteria at one site;
			  • lead above Dutch C criteria and zinc above Dutch B criteria in one area; and
			  • chromium above Dutch B criteria at another site.
			  Preliminary testing has not detected any high levels of heavy metals in the groundwater down gradient from a contaminated site.
			• Removal of contaminated soil within the Forrestfield Marshalling Yards is likely to result in an improvement in groundwater quality due to the removal of the primary source of groundwater contamination.
			• Determination of whether or not groundwater needs to be remediated following removal of the soil contamination will form part of the proposed management measures for Groundwater Contamination and Remediation Plans.
			• Potential contamination from future industrial and other land uses will be controlled through the development approvals process, and the licensing and pollution control provisions of the *Environmental Protection Act 1986*.
			The EPA recommends that the management measures be applied as conditions so that prior to submission of an application for subdivision or development approval, whichever occurs first, Groundwater Contamination Remediation Plans be prepared.
				Having particular regard to:
				• the remediation of soil contamination prior to subdivision;
				  the management measure for the preparation of a Groundwater Contamination Remediation Plan which will be applied as a condition, to determine whether or not there is a need for groundwater remediation; and
				• development approval process requirements, including environmental licensing, for future development proposals;
				it is the EPA's opinion that the proposed amendment can be managed to meet the EPA's objective for groundwater quality.

Southern Brown Bandicoot (*Isoodon obsesulus*), and the Carpet Python (*Morella spilota*) may possibly be present in the Amendment area.

The Amendment area lies adjacent to the System Six Area M52 (Perth Airport) which contains wetlands and vegetation identified in *Perth's Bushplan* as regionally significant bushland, both of which are potential habitat for the reintroduction of the declared rare Western Swamp Tortoise (*Pseudemydura umbrina*) (see Figure 3). The Tortoise is listed on Schedule 1 of the Commonwealth *Endangered Species Protection Act 1992* and Schedule 1 of the Western Australian *Wildlife Conservation Act 1950* and is considered one of Australia's most endangered vertebrate species. Only a small number of potential habitats for the reintroduction of this species on the Swan Coastal Plain were identified in a habitat assessment made during spring and summer of 1995/96 (Kuchling & Burbidge, 1996). Reintroduction of the species is being considered by various government agencies, but no formal plans have been developed.

Assessment

The area considered for assessment of this factor is the Swan Coastal Plain.

The EPA's objective in regard to this environmental factor is to protect specially protected (threatened) fauna and priority fauna species and their habitats, consistent with the provisions of the *Wildlife Conservation Act 1950.*

Given the evidence of heavy infestation of rabbits and foxes, and lack of detection of any Southern Brown Bandicoot individuals during a trapping program in September 1995, it is unlikely that bandicoots persist on the site.

As mentioned above, certain wetlands within the Perth Airport land, outside but adjacent to the Forrestfield Marshalling Yards, have been identified as potential habitat for the reintroduction of the Western Swamp Tortoise.

With respect to the potential habitat within the adjacent Perth Airport land for the reintroduction of the Western Swamp Tortoise, the Department of Conservation and Land Management (CALM) has advised that the hydrological regime of the adjacent ephemeral wetlands has been substantially altered as a result of the Perth Airport Southern Main Drain. The Drain draws water away from the wetlands. Reintroduction of the Tortoise would require considerable modification to the area, including the possible closure of the Main Drain to restore the hydrology. Consequently, the wetlands are not the preferred area for reintroduction of the Western Swamp Tortoise, but may still be used for this purpose.

CALM has advised that the viability of the proposed reintroduction program for the Tortoise on this site would not be affected, providing the rate of flow of water leaving the Amendment area is maintained at pre-development levels.

The EPA considers that maintenance of pre-development water flow levels can be achieved through the preparation and implementation of a Drainage and Nutrient Management Plan and a Groundwater Abstraction Plan prior to subdivision or development. These Plans are covered by the management measures proposed by the Responsible Authority and the EPA recommends that they be applied as environmental conditions. The Drainage and Nutrient Management Plan should be consistent with the Environmental Protection (Swan and Canning Rivers) Policy 1997 and incorporate best practice water management techniques to ensure post-development surface water quantities are equivalent to pre-development levels and ensure water quality discharging from the Amendment area meets acceptable criteria.

As discussed in Sections 3.4 and 3.5, soil and groundwater contamination within the Amendment area will also be remediated and managed. This remediation will remove the potential for adverse impacts upon the proposed reintroduction area for the Western Swamp Tortoise, adjacent to the southwest portion of the Amendment area.

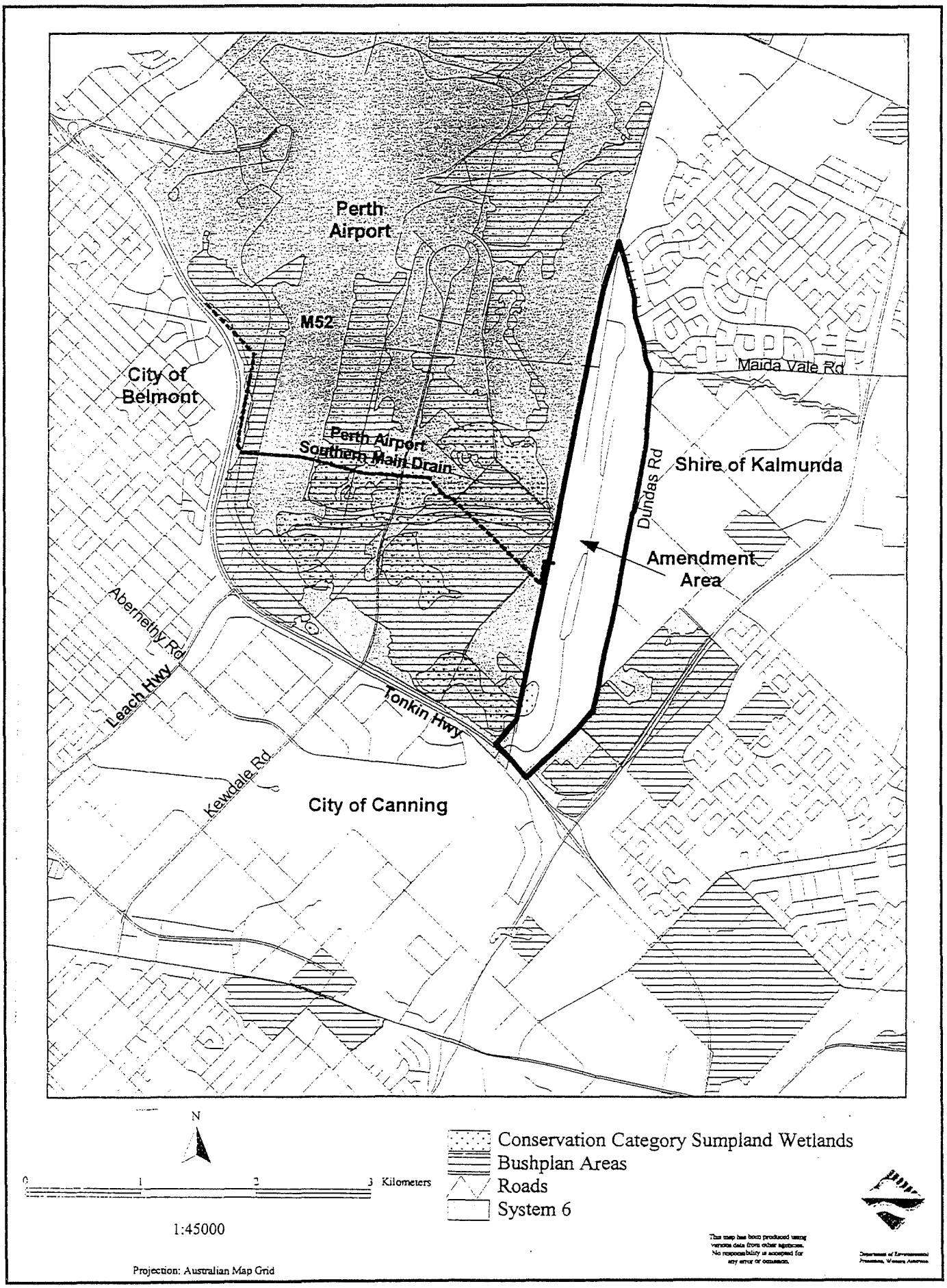


Figure 3. Environmental Features.

Summary

Having particular regard to the:

(a) Department of Conservation and Land Management's advice;

(b) management measures proposed by the Responsible Authority for a Drainage and Nutrient Management Plan and a Groundwater Abstraction Plan, which will be applied as conditions; and

(c) commitment for remediation of soil and groundwater contamination;

it is the EPA's opinion that the proposal can be managed to meet the EPA's objective for specially protected (threatened) fauna.

3.3 Wetlands

Description

A dampland is located in the southwest corner of the Amendment area. The dampland has been identified as a Conservation Category wetland. The dampland's vegetation is substantially intact and in excellent condition. It includes *Melaleuca preissiana, Melaleuca rhaphiophylla*, Flooded Gum and *Nuytsia floribunda* over a dense heath dominated by *Pericalymma ellipticum* with *Baumea articulata* and numerous other species of herbs and sedges. There is less evidence of vegetation disturbance by grazing and fire than elsewhere within the Amendment area, with the result that weeds represent only a minor element of the flora.

The general direction of flow of surface waters is from east to west (Figure 4). The result is that flows from Poison Gully exit from the Amendment area via the Poison Gully Branch Drain, which is an open drain feeding swamps within the airport, including Munday Swamp, and thence to the Swan River, whereas flows from the Crumpet Creek drain eventually exit via the Water Corporation's Perth Airport Southern Main Drain, traverse the Perth Airport via a main drain and crosses underneath the Airport runway. A third catchment to the north of Crumpet Creek contributes to surface flows within the Amendment area, but only after major storm events.

The Crumpet Creek catchment has had flooding problems in the past, and these continue. During large flows, insufficient provision of compensation basins upstream of the Amendment area cause flooding of Airport land, to the west of the Amendment area. However, this prevents flooding of the Airport runway and Westrail's railway.

A change in the quantity of surface water discharges arising from the industrialisation of the Amendment area and construction of the "important regional road" may increase the risk of flooding or inundation downstream of the Amendment area. Any resulting changes to the hydrological regime of Conservation Category wetlands (both within the Amendment area and the System Six M52 area on the adjacent Airport land) may change the composition of vegetation and fauna habitat. In addition, increases or decreases in the volume of water infiltrating to the superficial aquifer may alter groundwater table levels and have associated consequences for down gradient users and wetland areas.

The quality of surface waters exiting the site is largely influenced by the quality of waters entering the site from upstream catchments. Soil contamination within the Marshalling Yards, comprising heavy mineral oils and two relatively minor areas contaminated by lead and chromium, may also contribute pollutants and nutrients to the surface runoff and subsurface flows in the Amendment area. Westrail's trade waste treatment plant is located within the northern half of the Forrestfield Marshalling Yards. The treated wastewater form the treatment plant discharges into an open drain and then into the Poison Gully Branch Drain. There is the potential for increased loads of nutrients or pollutants to adversely impact upon the wetlands within the Amendment area and the adjacent System Six M52 area.

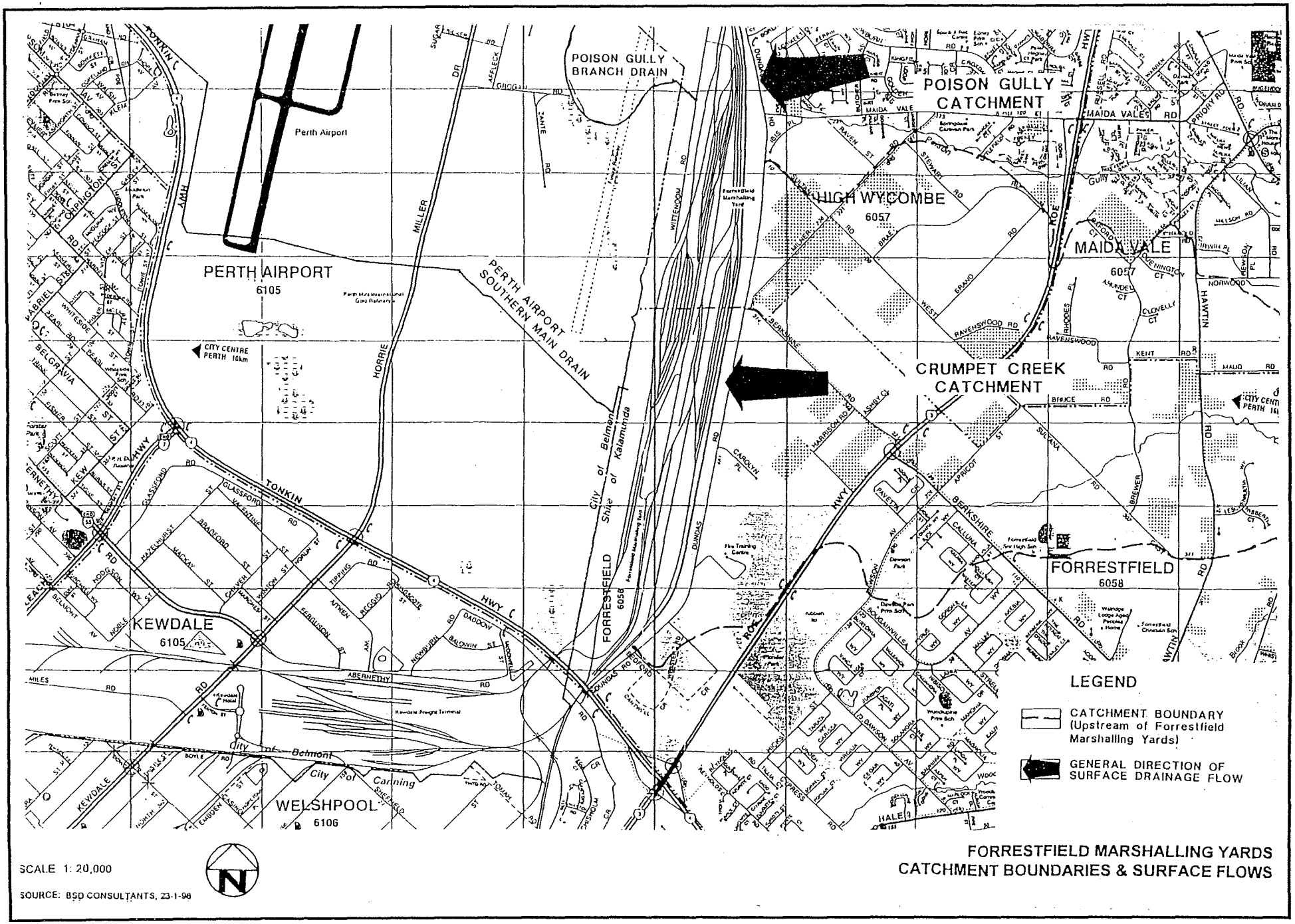


Figure 4. Catchment Boundaries and Surface Flows.

Assessment

The area considered for assessment of this factor is the Swan Coastal Plain.

The EPA's objective in regard to this environmental factor is to maintain the integrity, functions and environmental values of wetlands.

The dampland and its associated vegetation will be retained in public open space (POS) under this Amendment.

The EPA considers that maintenance of the environmental values of wetlands within the Amendment area and the adjacent System Six M52 area can be achieved through the preparation of a Drainage and Nutrient Management Plan, Soil Contamination Remediation Plans, Groundwater Contamination Remediation Plans and the Groundwater Abstraction Plan prior to subdivision or development. These Plans are covered by the management measures proposed by the Responsible Authority and the EPA recommends that they be applied as environmental conditions.

The drainage design for the Forrestfield Marshalling Yards is constrained by existing conditions, including the fixed points of entry and exit of surface water. The limited capacity of the drainage infrastructure downstream of the Perth Airport runway is also a constraining factor, limiting the amount of water which can be discharged from the site. The Drainage and Nutrient Management Plan will need to address these constraints as well as incorporate best practice water management techniques to achieve post-development surface water quantities leaving the site which are equivalent to pre-development levels (or less if necessary). The Plan should incorporate water sensitive design and integrated catchment management techniques to maximise on-site retardation time, and vegetation planting to ensure filtering and slowing of run-off. Retardation will facilitate nutrient uptake, sediment deposition, and management and containment of pollutants in the event of any spillage on the site. Prevention of surface water contamination by hydrocarbons should be achieved through installation of interceptor pits where required at lot connections. Surface water quality aspects should be met before discharge through the Water Corporation's Perth Airport Southern Main Drain. In addition, provision of basins designed with sufficient size to compensate for the rate of stormwater which will be produced from the development should ensure that overflows of the Perth Airport Southern Main Drain will be largely maintained at present levels.

As discussed in Section 3.4, soil contamination within the Amendment area will also be remediated and managed. This remediation will further improve the quality of surface water runoff and ultimately the health of the Conservation Category wetlands.

Future industrial developments in the Amendment area will be subject to normal development approval processes, including environmental licensing and pollution control provisions where necessary.

A Groundwater Abstraction Plan will ensure that groundwater regimes are protected so as not to adversely impact upon the Conservation Category wetlands. As discussed in Section 3.5, groundwater contamination within the Forrestfield Marshalling Yards will be remediated and managed. This remediation will remove the potential for adverse impacts upon the environmental values of the wetlands.

Summary

Having particular regard to the:

a) intention to retain and protect the Forrestfield Marshalling Yards dampland in POS;

b) objective of maintaining surface water discharge at present levels (or less, if necessary) and of a satisfactory quality ;

c) management measure proposed by the Responsible Authority for a Drainage and Nutrient Management Plan, which will be applied as a condition, to meet the above objective;

(d) management measure proposed by the Responsible Authority for a Groundwater Abstraction Plan, which will be applied as a condition;

e) commitment for remediation of soil and groundwater contamination ; and

f) development approval process requirements, including environmental licensing, for future development proposals;

it is the EPA's opinion that the proposed scheme amendment can be managed to meet the EPA's environmental objective for wetlands.

3.4 Soil contamination

Description

A high potential for areas of contaminated soil would appear to be likely as a result of the operation of railway-related activities within the Forrestfield Marshalling Yards. Activities have included the maintenance, refuelling and oiling of locomotives; storage of lubricants, oils and fuels; transfer and storage of freight; storage of railway salvage and construction material; and storage of radio and electrical equipment.

The soil contamination investigation of the Forrestfield Marshalling Yards (Golder Associates, 1996 and 1997) involved a preliminary assessment and broad evaluation of contamination, assessment of risk to human health, and further investigation to delineate the extent of the contamination. Criteria used during the assessment of soil contamination were the Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites. The guidelines distinguish between levels considered to be typical background concentrations and those requiring further investigation. Dutch B ('investigation required') and Dutch C ('clean-up') criteria specified in the Guidelines were used, but it is noted that they give no values for medium and very heavy mineral oils in soil.

The investigation has identified soil contamination from heavy mineral oils in six areas within the Forrestfield Marshalling Yards. Concentrations are greater than Dutch C criteria between <0.3 metres to >1.5 metres below the surface. An additional area has concentrations of contamination from heavy mineral oils greater than the Dutch B criteria.

Lead and zinc contamination above Dutch C criteria was found at one site, and will require remediation.

Traces of chromium below Dutch B criteria were detected at another site.

One known site of a major diesel spill is subject to ongoing remediation and other areas of diesel spills have also been identified at several locations within the Forrestfield Marshalling Yards.

Soil contamination by PCBs, organochlorine pesticides, benzene, toluene, ethylbenzene, xylene, phenols and cadmium was not detected in the areas considered to have the greatest potential to be contaminated by these compounds. The vast majority of results were below the laboratory detection limit, and none indicated concentrations greater than the Dutch B criteria.

Assessment of the site in terms of risk to human health indicate estimated cancer risk is below the acceptable risk limit in all areas. However, non-cancer health effects of exposure to some metals and mineral oils were assessed as above acceptable risks at five areas.

Failure to sufficiently remediate the impacts of any soil contamination may pollute the superficial aquifer beneath the Forrestfield Marshalling Yards, and contaminate surface waters both within the Amendment area and off-site within the drainage system with the consequences that wetlands, vegetation and fauna habitat may be degraded and public health may be placed at risk.

Assessment

The area considered for assessment of this factor is the Amendment area.

The EPA's objective in regard to this environmental factor is to ensure the rehabilitation of the site to an acceptable standard that is compatible with the intended land use, consistent with appropriate criteria.

Contamination investigations undertaken in consultation with the Department of Environmental Protection has sufficiently delineated the lateral and vertical extent of soil contamination to enable remedial action to be proposed for each of the areas found to have levels of heavy mineral oils or heavy metals above the Dutch B criteria. The Dutch B criteria or other criteria recognised by the EPA for assessment and remediation of soil contamination should be used as the basis for the clean-up of the Amendment area.

Remediation of soils contaminated by mineral oils in excess of the Dutch C criteria will involve excavation of contaminated soils, screening and disposal at an appropriate landfill. Less contaminated soil with levels in excess of Dutch B criteria could be bioremediated on-site.

Heavy metal contamination cannot be effectively remediated by on-site treatment of soil. Therefore, soils with contamination in excess of the Dutch C guideline should be excavated and disposed of at an appropriate landfill. Salvage and recycling of some of the lead wastes should be achieved where practical.

The EPA considers soil remediation should be further detailed in a Soil Contamination Remediation Plan, to be prepared prior to subdivision or development, whichever occurs first. This Plan is covered by the management measures proposed by the Responsible Authority and the EPA recommends that it be applied as an environmental condition.

The EPA notes that it is currently proposed to use Dutch B and Dutch C criteria for soil remediation, but recommends that if these are replaced by the draft National Environmental Protection Measure for the Assessment of Site Contamination or any other criteria prior to remediation commencing, then the most current criteria be applied.

The EPA notes that the scope of the contamination investigation did not include assessment of the extensive network of sub-surface wastewater drains and fuel reticulation pipes, and that there is a need for the proposed Soil Contamination Remediation Plan to include an assessment of these pipes and drains to ensure that they have been properly decommissioned and that no potential remains for them to contribute to soil pollution.

Potential contamination from future industrial and other land uses will be controlled through the development approvals process, including the licensing and pollution control provisions of the *Environmental Protection Act 1986*.

Summary

Contaminated soils have been found within the Forrestfield Marshalling Yards, but having regard to the:

(a) management measure proposed by the Responsible Authority for a Soil Contamination Remediation Plan, which will be applied as a condition, to remediate soil contamination; and

(b) development approval process requirements, including environmental licensing, for future development proposals;

it is the EPA's opinion that the proposed scheme amendment can be managed to meet the EPA's environmental objective for soil contamination.

3.5 Groundwater quality

Description

The Forrestfield Marshalling Yards are situated over the Cloverdale groundwater system. Groundwater flow is generally westward towards the Perth Airport and System Six M52 area. The watertable is generally at shallow depth, ranging from approximately 1.6 metres to 3.2 metres below the surface in mid summer and 0.2 meters to 2.2 metres below the surface in winter. The area is underlain by extensive confined aquifers, at depths of up to 1,000 metres, which provide good yields of potable water.

In view of the previous use of the site, a detailed assessment of the extent and severity of groundwater contamination below the Forrestfield Marshalling Yards was undertaken in conjunction with the soil contamination assessment (Golder Associates, 1996 and 1997). Concentrations of mineral oils at levels above Dutch B criteria ('investigation required') but below the Dutch C criteria ('clean-up') were detected in the groundwater at one site within the Forrestfield Marshalling Yards. Lead concentrations above Dutch C criteria were detected in one area, together with zinc concentrations above Dutch B criteria. Chromium concentrations above Dutch B criteria were detected at another site. Preliminary testing (down gradient from one of the contaminated sites) did not detect any levels of heavy metals sufficient to require remediation in the down gradient groundwater.

If not remediated, contaminated groundwater may move beyond the Amendment area, resulting in adverse impacts on Perth Airport's wetlands and bushlands, or adjacent land uses. Additionally, groundwater contamination within the Amendment area itself may not be compatible with some proposed land uses. There is also the potential that future industrial land uses will pollute the groundwater.

Assessment

The area considered for assessment of this factor is the Amendment area and those areas immediately adjacent.

The EPA's objective in regard to this environmental factor is to ensure that the beneficial uses of groundwater can be maintained, consistent with the Australian Water Quality Guidelines for Fresh and Marine Waters (ANZECC, 1992).

The EPA considers that a Groundwater Contamination Remediation Plan and a Groundwater Abstraction Plan should be prepared prior to subdivision or further development. These Plans are covered by the management measures proposed by the Responsible Authority and the EPA recommends that they be applied as environmental conditions.

The Groundwater Contamination Remediation Plan will assist with improvement of groundwater quality. Removal of the contaminated soils which are the primary source of groundwater contamination will be undertaken as part of the proposed Soil Contamination Remediation Plan (refer to Section 3.4 for more detailed discussion). Removal of the contaminated soils within the Forrestfield Marshalling Yards may improve the quality of the groundwater to such an extent that only management of the impacts of future land uses upon the groundwater resource will be required. Evaluation of the need for groundwater remediation and, if necessary, the remediation measures to be implemented, will be addressed in the Groundwater Contamination Remediation Plan.

The Groundwater Abstraction Plan should ensure that groundwater regimes are maintained for the purpose of protection of the Conservation Category wetlands within the Amendment area and the adjacent System Six M52 area. The Plan should incorporate a monitoring program to demonstrate that groundwater performance criteria are being met, and contingency measures in the event that they are not.

Potential contamination from future industrial and other land uses will be controlled through the development approvals process, including the licensing and pollution control provisions of the *Environmental Protection Act 1986*.

Summary

Having particular regard to the:

(a) remediation of soil contamination prior to subdivision or development;

(b) management measure proposed by the Responsible Authority for the preparation of a Groundwater Contamination Remediation Plan, which will be applied as a condition, to determine whether or not there is a need for groundwater remediation;

(c) management measure proposed by the Responsible Authority for the preparation of a Groundwater Abstraction Plan, which will be applied as a condition; and

(d) development approval process requirements, including environmental licensing, for future development proposals;

it is the EPA's opinion that the proposed scheme amendment can be managed to meet the EPA's environmental objective for groundwater quality.

4. Conditions

Section 48D of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the Amendment and on the conditions to which the Amendment should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

In developing recommended conditions, the EPA's preferred course of action is to have the Responsible Authority provide an array of management measures and/or scheme provisions to ameliorate the impacts of the amendment on the environment. The management measures are considered by the EPA as part of its assessment of the amendment, and following discussion with the Responsible Authority the EPA may seek additional management measures or scheme provisions.

The EPA may, of course, also recommend conditions additional to that relating to the Responsible Authority's management measures.

Having considered the Responsible Authority's environmental management measures and the information provided in this report, the EPA has developed a set of conditions which are consistent with but replace those environmental management measures in the Amendment documentation if the proposed amendment is approved for implementation. These conditions are presented in Appendix 3. Matters addressed in the conditions include:

(a) preparation and implementation of a Drainage and Nutrient Management Plan;

(b) preparation and implementation of Soil Contamination Remediation Plans;

(c) preparation and implementation of Groundwater Contamination Remediation Plans;

(d) preparation and implementation of a Groundwater Abstraction Plan; and

(e) provision to annotate the relevant TPS maps so that the environmental conditions inserted in the TPS texts are identified.

5. Other advice

The EPA notes there is potential for portions of the Amendment area to be contaminated by future industrial and other land uses. It is the EPA's opinion that this can be adequately managed and controlled through the development approvals process, including the licensing and pollution control provisions of the *Environmental Protection Act 1986*. Where proposals raise additional relevant environmental factors, they may require assessment under Pt IV of the *Environmental Protection Act 1986*.

6. Conclusions

The EPA has concluded that Amendment 177 to the Shire of Kalamunda Town Planning Scheme 2 to rezone the substantive area of the Forrestfield Marshalling Yards to "General Industry" with portions rezoned for "Light Industry" and "Mixed Use", and reserved for "Public Open Space" and "Important Regional Road", and various other rezonings and reservations of the land formerly required for that road to purposes consistent with adjoining land, can be implemented to meet the EPA's objectives provided the conditions recommended in Section 4 and set out in Appendix 3 are imposed and enforced.

7. Recommendations

Section 48D of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the proposed amendment 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 EPA submits the following recommendations to the Minister for the Environment:

1. That the Minister notes the proposed amendment being assessed generally comprises the rezoning of the substantive area of the Forrestfield Marshalling Yards to "General Industry", "Light Industry" and "Mixed Use", the reservation of "Public Open Space", the relocation of the "Important Regional Road" from Dundas Road to a location within the Forrestfield Marshalling Yards, and the rezoning and reservation of the land formerly required for that road to purposes consistent with adjoining land.
2. That the Minister considers the report on the relevant environmental factors of specially protected (threatened) fauna; wetlands; groundwater quality; and soil contamination as set out in Section 3.
3. That the Minister notes the EPA has concluded that the EPA's objectives can be met, provided there is satisfactory implementation by the Responsible Authority of the recommended conditions set out in Section 4.
4. That the Minister imposes the conditions and procedures recommended in Appendix 3 of this report.
5. That the Minister notes that where any future development proposal complies with the Plans and raises no additional environmental factors, the development proposal will not normally be subject to further assessment under Part IV of the *Environmental Protection Act 1986*. However, future development proposals will still be subject to the normal development approvals process, including licensing and pollution control provisions of the *Environmental Protection Act 1986* where applicable.
6. That the Minister notes that the recommendations for the proposal the subject of this Bulletin are consistent with the recommendations set out in Bulletins 925 and 926, which are the associated planning scheme amendments for the Metropolitan Region Scheme and the City of Belmont respectively.

Appendix 1

List of submitters

Organisations:

City of Belmont
Conservation Council of Western Australia Inc
Friends of Perth Airport Bushland
Urban Bushland council WA Inc
Westralia Airports Corporation Pty Ltd
Wildflower Society of Western Australia (Inc.)

Individual:

T R Clayton
T & S Netherway

Appendix 2

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Appendix 3

Recommended Environmental Conditions

Recommended Environmental Conditions

SHIRE OF KALAMUNDA TOWN PLANNING SCHEME 2 AMENDMENT 177 (FORRESTFIELD MARSHALLING YARDS)

Scheme Purpose:

a) to exclude the Amendment area from the "Railways" reservation;
b) to include land within the Amendment area in the "General Industry", "Mixed Use" and "Light Industry" zones with Additional Use Permit over portion of the land, and the "Public Open Space" and "Important Regional Road" reservations as depicted on the Amendment plan;
c) to remove the "Important Regional Road" reservation on that portion of the existing Dundas Road generally south of Wittenoom Road and amend the reservation on that portion of the road generally north of Wittenoom Road as shown on the Amendment plan;
d) to variously zone and reserve the land on the east side of Dundas Road and generally south of Wittenoom Road to "Rural", "Special Rural", "Light Industry", "General Industry" and "Regional Reservation - Special Use"; and
e) to amend the Scheme Text such that the Use Class "Office" is an "AA" use in the "General Industry" zone.

Responsible Authority: Shire of Kalamunda

Responsible Authority Address: 2 Railway Road
KALAMUNDA WA 6076

Assessment Number: 1143

Report of the Environmental Protection Authority: Bulletin 927

Subject to the following conditions, there is no known environmental reason why the planning scheme Amendment to which the above report of the Environmental Protection Authority relates should not be implemented:

1 Drainage and Nutrient Management Plan

1-1 Prior to submission of an application for subdivision approval (other than an application for consolidation or minor modification to existing boundaries) or development, whichever occurs first, the Responsible Authority shall require preparation of a Drainage and Nutrient Management Plan for the drainage catchment that contains the proposal within the Amendment area, to meet the following objective:

- to maintain or enhance the quality of surface water so that existing and potential uses, including ecosystem maintenance, are protected consistent with the Environmental Protection (Swan and Canning Rivers) Policy 1997, and the West Australian Water Quality Guidelines for Fresh and Marine Waters (Environmental Protection Authority Bulletin 711).

The Drainage and Nutrient Management Plan shall be prepared to the requirements of the Responsible Authority with the concurrence of the Department of Environmental Protection and the Water and Rivers Commission.

1. The Plan shall include:
2. management actions and objectives consistent with the Environmental Protection (Swan and Canning Rivers) Policy, relevant subregional drainage and catchment management plans, and water sensitive urban design principles and best management practices;
3. mechanisms to minimise erosion during and after the development phase;
4. mechanisms to protect the water regimes and water quality of the conservation category wetlands, within the Amendment area and adjacent System Six M52 area, including water quality and water levels;
5. a monitoring program, including definition of performance criteria and analysis procedures, to demonstrate whether the objectives for the catchments are being achieved;
6. contingency measures to be implemented in the event that performance criteria are not met; and
7. identification of responsibilities for implementation of the Plan.

1-2 The above mentioned Drainage and Nutrient Management Plan shall be implemented.

2 Soil Contamination Remediation Plans

2-1 Prior to submission of an application for subdivision approval (other than an application for consolidation or minor modification to existing boundaries) or development, whichever occurs first, the Responsible Authority shall require preparation of a Soil Contamination Remediation Plan for the subject land to the requirements of the Responsible Authority with the concurrence of the Department of Environmental Protection, to meet the following objective:

- to ensure the rehabilitation of the site to an acceptable standard that is compatible with the intended land use, consistent with appropriate criteria.

Each Plan shall include:

1. establishment of soil quality criteria to be achieved following remediation of contaminated soils, based on the intended land uses;
2. identification of areas of soil contamination resulting from previous activities in the portion of the Amendment area which is the subject of the subdivision or development application;
3. development of a remediation plan for contaminated soils in areas where the soil quality criteria are not met
4. identification of responsibilities for implementation of the Plan.

Note: Criteria for assessment and remediation recognised by the EPA include those in the ANZECC and NHMRC "Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites" (1992), "Dutch B and C" (1986), or the most current soil remediation criteria, the ANZECC "Australian Water Quality Guidelines for Fresh and Marine Waters" (1992), NHMRS and ARMCANZ "Australian Drinking Water Guidelines - National Water Quality Management Strategy (1996).

2-2 The above mentioned Soil Contamination Remediation Plan shall be implemented.

3 Groundwater Contamination Remediation Plans

3-1 Prior to submission of an application for subdivision approval (other than an application for consolidation or minor modification to existing boundaries) or development, whichever occurs first, the Responsible Authority shall require preparation of a Groundwater Contamination Remediation Plan to the requirements of the Responsible Authority with the concurrence of the Department of Environmental Protection and the Water and Rivers Commission, to meet the following objective:

- to ensure that the beneficial uses of groundwater can be maintained, consistent with the Australian Water Quality Guidelines for Fresh and Marine Waters (ANZECC, 1992).

Each Plan shall include:

1. establishment of groundwater quality criteria to be achieved, based on the most sensitive beneficial use of the groundwater;
2. determination of the extent, and any movement, of contaminated groundwater beneath the portion of the Amendment site subject to the subdivision or development application;
3. development of groundwater management plans for contaminated groundwater, including remediation if necessary, in the event that groundwater quality criteria are not met; and
4. identification of responsibilities for implementation of the Plan.

Note: Criteria for assessment and remediation recognised by the EPA include those in the ANZECC and NHMRC "Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites" (1992), "Dutch B and C" (1986), or the most current soil remediation criteria, the ANZECC "Australian Water Quality Guidelines for Fresh and Marine Waters" (1992), NHMRS and ARMCANZ "Australian Drinking Water Guidelines - National Water Quality Management Strategy (1996).

3-2 The above mentioned Groundwater Contamination Remediation Plan shall be implemented.

4 Groundwater Abstraction Plan

4-1 Prior to submission of an application for subdivision approval (other than an application for consolidation or minor modification to existing boundaries) or development, whichever occurs first, the Responsible Authority shall require preparation of a Groundwater Abstraction Plan to the requirements of the Responsible Authority with the concurrence of the Department of Environmental Protection and the Water and Rivers Commission, to meet the following objective:

- to ensure that the beneficial uses of groundwater can be maintained, consistent with the draft WA Guidelines for Fresh and Marine Waters (EPA, 1993).

The Plan shall include:

1. mechanisms to protect the groundwater regimes of the conservation category wetlands within the Amendment area and the adjacent System Six M52 area;

2. a monitoring program, including definition of performance criteria and analysis procedure, to demonstrate whether the objectives for the groundwater are being achieved;

3. contingency measures to be implemented in the event that performance criteria are not met; and
4. identification of responsibilities for implementation of the Plan.

4-2 The above mentioned Groundwater Abstraction Plan shall be implemented.

5 Scheme Map

5-1 The Scheme Map for the Metropolitan Region Scheme shall be amended by inserting an appropriate symbol on the Scheme Map and a corresponding modification to the legend, to show that environmental conditions apply to the subject land, to the requirements of the Responsible Authority with the concurrence of the Environmental Protection Authority.