41 Environmental management and monitoring

41.1 Introduction

Parts D and E of this report summarise the assessments undertaken to determine the effects of the Northern Expressway on the existing social, economic, biological and physical environments. Each of these assessments determined measures to minimise the effects of the Northern Expressway during planning and design, construction and operation. This section outlines the environmental management framework adopted for the project and how the environmental management and monitoring measures will be considered and implemented in each phase of the project.

41.2 Environmental management framework

DTEI is committed to developing and managing a transport system that is in harmony with the environment. This can be achieved through:

- minimising pollution
- · sustaining ecosystems
- conserving cultural heritage
- enhancing amenity.

To facilitate the achievement of these goals, DTEI has developed an environmental management framework as discussed below.

41.2.1 Environmental management system

DTEI has developed an Environmental Management System (EMS) based on the principles of the Australian Standard 14000 series of environmental management standards. The EMS is based on the philosophy of continual improvement and consists of the following elements (AS/NZS ISO 14001:1996):

- commitment and policy (ensuring top-level commitment to the environment)
- planning (how to assess and understand the environmental effects to be managed)
- implementation and operation (implementing environmental objectives, actions and ongoing procedures)
- checking and corrective action (reporting on and reviewing environmental performance and taking corrective action to mitigate effects on the environment)
- management review (ensuring management review of the system components).

As part of the EMS, the following series of environmental management documents have been developed to assist DTEI and its contractors with the management of construction and maintenance activities:

- Environmental Code of Practice for Construction Road, Bridge and Marine Facilities (1997a)
- Environmental Management Plan Guidelines for Construction Road, Bridge and Marine Facilities (1997b)

- Environmental Management Workbook for Roadside Maintenance Activities (2001)
- Environmental Workplan and Risk Assessment Guidelines for Road Maintenance Contracts (2004)
- Environmental Management Implementation Plan Guidelines for Construction Road, Bridge and Marine Facilities (1997c)
- Environmental Audit Guidelines for Construction Road, Bridge and Marine Facilities (1997d).

41.2.2 Environmental management in the planning phase

Part A, Section 1 identifies the key objectives of the Northern Expressway. It is acknowledged that in achieving these project objectives there will be both positive and negative effects on the existing social, economic, biological and physical environments.

The selection of the preferred route considered potential environmental effects such as noise, visual effects and community accessibility. The route selected had the lowest effect on the environment while providing the greatest benefits for society and providing value for money.

The Northern Expressway is currently in the planning phase. As part of the planning phase, an environmental assessment process is currently being undertaken. The development of this Environmental Report is an important component of the assessment process. It provides for public involvement, releases supporting technical documents and encourages public submission which will be considered prior to final approval of the proposed route by the Australian and South Australian governments.

The assessments summarised in Parts D and E determine the effects of the Northern Expressway and Port Wakefield Road Upgrade on the existing social, economic, biological and physical environments. They have identified that the key environmental objectives for the next phases of the project include:

- · minimising the effects on community accessibility
- · minimising the effects on existing land uses
- · minimising the effects on properties to be acquired
- · minimising adverse effects on the transport network
- · minimising the effects of noise on the local community
- · minimising the effects of vibration on structures and the local community
- · preventing or minimising disturbance to significant cultural heritage sites
- · minimising negative visual effects and enhancing visual opportunities
- · avoiding contamination of soils and managing contaminated sites affected
- · preventing the pollution of water and maintaining existing natural surface water flow
- minimising the effects of air quality on the community
- · reducing greenhouse gases associated with the construction and use of the road
- · preventing or minimising disturbance to native vegetation and the spread of weeds and disease
- preventing or minimising disturbance to native fauna and their habitat.

Tables 41.1 and 41.2 identify preliminary environmental management and monitoring schedules for the Northern Expressway and the Port Wakefield Road Upgrade respectively. The schedules have been developed from the measures identified in the assessments detailed in Parts D and E and include environmental requirements from DTEI's construction contract specification (available at www.transport.sa.gov.au/caps/division1general_/default.htm).

As the project is still in the planning phase, some issues are yet to be determined/resolved. Therefore, the schedules are not intended to be a complete list of specific actions, but rather proposed measures to address the key environmental objectives and to help meet the requirements of environmental legislation during the detailed design/pre-construction, construction and operational phases of the project.

The responsibility for developing and implementing the proposed measures will ultimately rest with DTEI, but may also be the responsibility of design and construction contractors.

The schedules will be used to guide the development of the project's Environmental Management Plans and ensure that, where required, issues are dealt with by construction contractors in their Construction Environmental Management Plan.

41.2.3 Environmental management in the design phase

There are several key components of the design/pre-construction phase of the project. These include undertaking the detailed design of the Northern Expressway, developing an Environmental Management Plan for the project, seeking legislative approvals and continuing community consultation.

Detailed design

The detailed design works for the Northern Expressway Project will be carried out by design contractors. The detailed design will determine the specifics for construction of the Expressway.

The measures identified in Table 41.1 and Table 41.2, together with environmental principles and specific design requirements in DTEI's design contract specification (available at <u>www.transport.sa.gov.au/caps/division7design_/default.htm</u>), will be incorporated into the detailed design of the Expressway and Port Wakefield Road Upgrade. The design will ensure that the key environmental objectives as indicated in Section 41.2.2 will be met.

Environmental Management Plan

An Environmental Management Plan (EMP) will be developed for the project. The EMP is a projectspecific source document detailing the environmental protection measures required to mitigate and minimise environmental effects. The EMP's primary purpose is to ensure that the environmental requirements and commitments associated with the project are carried forward into the construction and operation phases and are effectively managed.

The EMP together with DTEI's environmental contract specification, will form part of the construction contract. It provides the basis for the construction contractor to develop and document the way in which environmental management requirements will be implemented on site through the production of the Construction Environmental Management Plan (CEMP).

The project's EMP will incorporate the following sub-plans:

- Noise and Vibration Management Plan
- Aboriginal Cultural Heritage Management Plan

- Non-Aboriginal Cultural Heritage Management Plan
- Landscape Management Plan
- Surface Water Quality Monitoring Plan
- Vegetation Management Plan
- Soil Erosion and Drainage Management Plan.

Legislative approvals

There are several legislative approvals, licences and permits that will need to be obtained prior to the project moving into the construction phase. Any conditions attached to the approvals will be incorporated into the detailed design of the project and the EMP.

Community engagement

Community engagement regarding environmental issues will continue during the design and subsequent phases of the project with other Australian and South Australian Government agencies, local governments, the local Aboriginal community, interest groups and individuals either directly or indirectly affected by the project.

41.2.4 Environmental management in the construction phase

The construction of the Northern Expressway will be undertaken by construction contractors. The contractor will be required to comply with general and project-specific environmental requirements in DTEI's construction specification. These include operating under an environmental management system (EMS), developing a CEMP and undertaking monitoring activities.

Contractor's environmental management system

The construction contractor will be required to establish, implement and maintain an EMS in accordance with the requirements of Australian Standard 14001: Environmental Management System – Specification with guidance for use. Before tendering for infrastructure projects, contractors must pre-qualify under DTEI's criteria. This process requires contractors to have an established EMS.

The EMS will be used throughout the construction phase to ensure that the environmental aspects of the contractor's work comply with DTEI guidelines and environmental legislation.

Construction Environmental Management Plan

The construction contractor will be required to develop a CEMP in accordance with DTEI's guidelines. The CEMP will detail how the environmental management requirements, as identified in the DTEI construction contract specification and the project's EMP, will be implemented and managed on site. The CEMP will detail how the contractor will mitigate construction impacts and documents the contractor's response to inspecting, monitoring, verifying, internal auditing and correcting or improving environmental performance.

The main elements of the CEMP will be:

- · a brief description of the project and the environmental objectives
- · details of the contractor's EMS including:
 - contractor's environmental policy

- project organisation chart showing reporting and responsibility relationships
- list of environmental legislation applicable to the project
- how training of employees and subcontractors will occur to ensure they are aware of their environmental responsibilities
- details of EMS documentation and how a document control system will apply to the contract
- details of procedures to apply to inspection, monitoring and auditing including non-conformance and corrective action.
- environmental management schedules (including a Soil Erosion and Drainage Management Plan [SEDMP]) specifically related to the requirements of environmental legislation, the EMP and the construction contract specification. The CEMP schedules will detail:
 - the environmental objective to be achieved
 - specific on-site actions to achieve the objective
 - on-site inspection frequency
- responsible personnel.

Prior to the commencement of any on-ground works, the CEMP will be submitted to DTEI's Project Manager.

Complaints management

A complaints hotline and complaints procedure will be established to effectively deal with community concern regarding construction issues such as changes to access, noise, vibration, dust or other issues that may arise.

Environmental auditing

The construction contractor will be responsible for undertaking regular inspections/monitoring and internal audits to assess the effectiveness of the CEMP. Corrective action will be undertaken for any identified activities or conditions that do not conform with the standards and criteria set (i.e. non-conformances).

In addition, DTEI will arrange for external environmental audits to be undertaken during the construction phase. The audits will be undertaken to identify if the environmental objectives are being met and to identify any non-conformances with the CEMP, EMP, the construction contract specification and relevant environmental legislation. Where a non-conformance is detected during the audit, action will be taken to rectify the situation.

41.2.5 Environmental management in the operational phase

DTEI will be responsible for the ongoing maintenance and environmental performance of the Northern Expressway. All maintenance activities will be undertaken with DTEI's *Environmental Management Workbook for Roadside Maintenance Activities* (Transport SA 2001).

Table 41.1

Preliminary environmental management and monitoring schedules – Northern Expressway

Issue	Design/Pre-construction	Construction	Operation
Access Objective	- Minimise the effects on community accessibility		
Access	 Design bridges and overpasses so that they can be built off-line with minimal effect on the existing road network 	 Engage the community to advise of any potential delays or access changes during construction Implement the requirements of the Traffic Management Plan 	
	 Develop a community engagement program to advise the community of changes to local access patterns due to construction activities and once the Expressway is operational 		
	 Liaise with emergency services to determine required emergency vehicle access locations 		
	 Develop a Traffic Management Plan to adequately manage traffic during construction 		
Property Objective	- Minimise the effects on properties to be acquired		
Property acquisition	 Ensure that property owners and occupiers are fully informed about the acquisition process 	 Implement measures determined with property owners and occupiers 	
	 Geometrically design the route to minimise property severance by locating the corridor close to existing property boundaries where feasible 		
	 Based on discussions with affected property owners and occupiers, determine: 		
	 minor modifications to further minimise the effects on property acquisition 		
	 fencing, access and noise mitigation measures 		

Issue	Design/Pre-construction	Construction	Operation
Transport Objective -	- Minimise adverse effects from the Expressway on	the transport network	
losure ruption	 Determine alternative routes for roads required to be closed 	 Where possible, undertake works off-line with minimal connection to the existing road network to avoid traffic disruption 	 Monitor the Expressway and surrounding road network to determine if they are operating as
Road c and dis		 Where possible, cart fill and other materials along the new road route 	predicted and to identify any unforeseen problems with the network
Noise Objective -	- Minimise the effects of noise on the local commur	nity	
	 Design the road to incorporate measures to minimise noise at source 	 Construct proposed noise barriers (also provides construction noise protection if installed early in the construction phase) 	 Assess effectiveness of noise treatments and validate the results of the noise modelling by
noise	 Finalise location, length and height of noise barriers 	 Install acoustic treatments at isolated dwellings requiring noise mitigation (also provides construction noise protection if installed early in the construction phase) 	undertaking noise monitoring
ad traffic r	 Design acoustic treatments for isolated dwellings requiring noise mitigation and architecturally 		
К	 Work with local councils to prevent noise- sensitive developments from occurring adjacent to the corridor 		
oise	 Prepare a Noise and Vibration Management Plan 	 Implement the requirements of the Noise and Vibration Management Plan including: 	
u uo		- locate noisy equipment away from noise-sensitive receptors	
tructi		 install appropriate temporary noise management infrastructure 	
Const		 maintain vehicles and equipment to minimise engine noise 	
0		 engage the community to inform them of activities 	

Issue	Design/Pre-construction	Construction	Operation
Vibration Objective -	- Minimise the effects of vibration on structures and	the local community	
vibration	 Prepare a Noise and Vibration Management Plan 	 Implement the requirements of the Noise and Vibration Management Plan including: 	 Assess the condition of buildings previously inspected and repair any damage caused by
	 Undertake a building condition inspection where required 	 undertaking vibration monitoring at selected residences less than 25 m from construction activities 	construction vibration
Ground		 minimise piling energy as necessary depending on receptor distance 	
		- engage the community to inform them of activities	
Aborigina Objective -	I heritage - Prevent or minimise disturbance to significant Abo	riginal cultural heritage sites	
	 Design the route to avoid affecting known Aboriginal heritage sites 	 Implement the requirements of the Aboriginal Cultural Heritage Management Plan including: 	
ge	 Develop an Aboriginal Cultural Heritage Management Plan to manage scattered artefacts and other heritage issues 	- restrict access to archaeologically sensitive areas	
ierita		 monitor earthworks in archaeologically sensitive areas 	
riginal h	 Monitor drilling operations in archaeologically sensitive areas 	 briefing of all construction staff on legal obligations for uncovering Aboriginal sites 	
Abor	 Engage Kaurna community representatives to determine process for managing sites identified during construction and develop procedures 		
Non-Abori Objective -	iginal heritage - Prevent or minimise disturbance to significant non-	Aboriginal cultural heritage sites	
eritage	 Design the route to avoid or minimise the effect on non-Aboriginal heritage places 	 Implement any requirements of the Non-Aboriginal Cultural Heritage Management Plan 	 Assess the condition of buildings previously inspected and repair any damage caused by
iginal h	 Undertake a building condition inspection of heritage places affected 	 Manage vibration effects on heritage places (as identified in the Noise and Vibration Management Plan) 	construction
Non-Abor	 Develop a Non-Aboriginal Cultural Heritage Management Plan to avoid adverse effects on heritage places 		

Issue	Design/Pre-construction	Construction	Operation
Visual Objective	 Minimise negative visual effects and enhance visual 	al opportunities	
Urban and landscape design	 Develop an Urban Design Framework to establish design objectives which consider visual effects in design Design and leasts the route and structures to 	 Implement the requirements of the Landscape Management Plan including: where possible, retain existing trees to minimise construction visual effects 	 Maintain landscape plantings within the road reserve and control weeds Replant landscape areas where plants have died
	 Design and locate the route and structures to reduce the visual effect of structures of embankments and the visual intrusion of interchange lighting at night 	visual effects – undertake landscaping works as soon as practicable after works are completed	
	 Prepare an Urban and Landscape Design Strategy that is visually integrated with land use and vegetative patterns 		
	 Collect local seed from remnant native vegetation in the region to revegetate key locations along the Expressway corridor as part of the landscaping works 		
Soils and Objective	site contamination – Avoid contamination of soils and manage contamin	ated sites affected	
	Undertake a preliminary site contamination investigation to determine medium and high risk sites affected by the route that will require a site history assessment	 If required, implement the requirements of the Contamination Management Plan including: 	 If required, manage any areas of site contamination
		- managing excavation of potentially contaminated soils	
tion	 If required, undertake soil testing to identify 	 managing dust and odour emissions from contaminated soils 	
ninat	potential risks where it is determined that the	 management of stockpiled sites and contaminated materials 	
contan	activities	 handling and possible disposal of hazardous waste materials and off-site disposal of contaminated soils to licensed waste 	
Site c	 If required, develop a Contamination Management Plan for sites that have been identified as contaminated and where there is potential risk to the community and environment (liaise with the EPA for significant site contamination identified) 	repositories	

Issue	Design/Pre-construction	Construction	Operation
Acid sulphate soils	 Determine if potential acid sulphate soils are present within the construction footprint 	 If required, implement any mitigation and management measures for controlling acid sulphate soils 	 If required, manage any areas of acid sulphate soils
	 If required, develop mitigation and management measures for controlling acid sulphate soil effects 		
Water qua Objective -	ntity and quality, erosion and sediment control - Prevent the pollution of water and maintain existing	g natural surface water flow	
oding and drainage	 Design the minor drainage system for the road with a 20 year ARI capacity and the crossing of the Gawler River and Smith Creek outfall to a 100 year ARI capacity 	 Maintain the existing drainage capacity of the Gawler River, Smith Creek outfall and local minor drainage systems to allow natural flow paths to continue 	
	 Maintain existing natural surface water flow across the plains by provision of waterway openings in embankments (e.g. culverts) 		
Р. Н	 Strategically locate detention basins to assist in the drainage function 		
/ater quality	• Undertake a water quality risk assessment to address the effects of the project on local water quality and identify measures to mitigate the effects. The assessment will	 Implement the requirements of the Surface Water Quality Monitoring Program, potentially including monitoring the following: – turbidity 	 Maintain water quality improvement devices including swales and detention basins
	address measures to control construction effects (e.g. siltation and erosion control measures) and operational effects (e.g. swales and detention basins)	 – suspended solids – others including those required by EPA licences (e.g. electrical conductivity, pH, heavy metals, nutrients) 	
-	Determine the level of monitoring required and prepare a Surface Water Quality Monitoring Program	 To protect groundwater quality (i.e. shallow aquifers, recharge points) where possible contain and treat site water and divert natural surface flows away from the construction site and provide spill containment and isolation structures in high risk locations 	

Issue	Design/Pre-construction	Construction	Operation
	• As part of the CEMP develop a Soil Erosion Drainage Management Plan (SEDMP) in line with the EPA's Code of Practice on Stormwater Pollution Prevention for Local, State and Federal Governments	Implement the requirements of the SEDMP including:	 Adequately maintain vegetation on road batter
it control		- installing erosion and sediment control devices	slopes to prevent erosion
		 inspecting erosion and sediment control devices during and immediately after rain periods/events and weekly during dry 	
	The plan will include erosion and sediment control measures such as:	weather	
dime	- staging of clearing operations	 where required, maintaining any erosion and sedment control devices protecting stockpiles of potentially erodible material by temporary seeding and/or other erosion control measures Vegetate road batter slopes as soon as practical to prevent erosion 	
ind sec	 – location of diversion drains 		
ision a	 location of erosion control devices such as hay bales and silt fences 		
ш	 location of stockpiles and management measures 		
	 Include road batter slope protection as part of the project's landscaping plan 		
Air quali Objective	ty e – Minimise the effects of air quality on the communit	y	
	 Develop a dust management plan to minimise dust creation as part of the CEMP 	Implement air quality management strategies including:	Work with the operators of existing almond groves
		 minimising the area of cleared land 	adjacent to the Expressway to manage any potenti safety bazard as a result of dust created from their
		 providing a temporary seal by watering on haul roads 	almond harvesting
Just		- siting construction compounds away from residential areas	
		 – constructing wind fences as necessary 	
		 Monitor dust creation though the installation of real-time dust monitors and if an exceedence occurs, undertake measures to 	

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Issue	Design/Pre-construction	Construction	Operation		
Greenhou Objective -	Greenhouse gases Objective – Reduce greenhouse gas emissions associated with the construction and use of the road				
Greenhouse gases	 Undertake a greenhouse gas assessment for the Northern Expressway Project and 	 Implement any relevant greenhouse gas mitigation measures identified through the assessment 			
	incorporate results into the Supplement	 Implement fuel efficiency measures including: 			
	 Investigate options for offsetting greenhouse gas emissions associated with the 	 adequately maintain vehicles so they are operating at their maximum level of efficiency 			
	Expressway e.g. vegetation planting and revegetation of areas adjacent to the Expressway	 locate pick-up or drop-off points close to the construction site to reduce distance travelled 			
Flora Objective -	 Prevent or minimise disturbance to native vegetal 	ion and the spread of weeds and disease			
ation	 Undertake a detailed vegetation survey of the route mapping the location of all native 	 Ensure site staff receive appropriate instruction in the identification of native vegetation and weeds 	 Monitor and maintain any relocated vegetation to ensure its survival 		
vegeta	species Design the road to minimise the effect on 	 Protect important native vegetation areas and identify these locations to contractors in site induction program 			
Native	native vegetation and retain appropriate vegetation in accordance with the urban and landscape design	Where possible, carefully relocate any important native vegetation			
e tion	 Develop a Vegetation Management Plan to offset the removal of native vegetation and 	Implement the requirements of the Vegetation Management Plan	 Ensure remnant native vegetation is protected during weed control and maintenance works 		
Nati [,] vegeta offse	provide a significant environmental benefit as required under the Native Vegetation Act		 Ensure revegetated areas become established by providing adequate maintenance 		

sue	Design/Pre-construction	Construction	Operation
	 Identify weeds within the construction corridor during the vegetation survey 	 Implement the requirements of the Weed Management Plan including controlling proclaimed and environmental weeds, by: 	 Implement a program to control proclaimed and environmental weeds
se control	Develop a Weed Management Plan	- carrying out weed control works where required	
	 Identify any areas of <i>Phytophthora</i>, Mundulla Yellows and <i>Phylloxera</i> within the 	 prevention of the spread of weeds through cleaning of earth moving equipment 	
Isea	construction footprint	- preventing the import of infested topsoil	
t and d	 If required, develop measures for managing <i>Phytophthora</i>, Mundulla Yellows and <i>Dhylloyara</i> 	 eradicating any outbreaks of weeds caused by construction activities 	
ea, pes	- nyiloxolu	If required, implement measures for managing <i>Phytophthora</i> , Mundulla Yellows and <i>Phylloxera</i> , including:	
Me		 designated wash-down facilities 	
		- treatment of wash-down water	
		 containing topsoil within any infected area 	
	 Prevent or minimise disturbance to native fauna ar 		
· j · · · · ·	e – Prevent or minimise disturbance to native fauna ar		
cies	As part of the vegetation survey identify potential habitat areas along the route and	Implement the requirements of the Vegetation Management Plan to provide significant environmental benefit for any habitat requiring	 Minimise the use of herbicides along roadsides (particularly in close proximity to waterways)
species	 Prevent or minimise disturbance to native fauna and As part of the vegetation survey identify potential habitat areas along the route and develop protocols for relocation of affected fauna 	Implement the requirements of the Vegetation Management Plan to provide significant environmental benefit for any habitat requiring removal Ensure site staff receive appropriate instruction in the identification	 Minimise the use of herbicides along roadsides (particularly in close proximity to waterways) Maintain soil and erosion control measures to protect aquatic fauna pabilate.
auna species	 Prevent or minimise disturbance to native rauna and As part of the vegetation survey identify potential habitat areas along the route and develop protocols for relocation of affected fauna Design the road to minimise the effect on 	 Implement the requirements of the Vegetation Management Plan to provide significant environmental benefit for any habitat requiring removal Ensure site staff receive appropriate instruction in the identification of native fauna 	 Minimise the use of herbicides along roadsides (particularly in close proximity to waterways) Maintain soil and erosion control measures to protect aquatic fauna habitats
at and fauna species	 Prevent or minimise disturbance to native rauna and the vegetation survey identify potential habitat areas along the route and develop protocols for relocation of affected fauna Design the road to minimise the effect on native vegetation and habitat areas likely to be inhabited by native fauna and retain appropriate vegetation in accordance with the 	 Implement the requirements of the Vegetation Management Plan to provide significant environmental benefit for any habitat requiring removal Ensure site staff receive appropriate instruction in the identification of native fauna Protect important habitat areas and identify these locations to contractors in site induction program 	 Minimise the use of herbicides along roadsides (particularly in close proximity to waterways) Maintain soil and erosion control measures to protect aquatic fauna habitats
or nabitat and rauna species	 Prevent or minimise disturbance to native rauna and a spectrum of the vegetation survey identify potential habitat areas along the route and develop protocols for relocation of affected fauna Design the road to minimise the effect on native vegetation and habitat areas likely to be inhabited by native fauna and retain appropriate vegetation in accordance with the urban and landscape design As part of the Vegetation Management Plan 	 Implement the requirements of the Vegetation Management Plan to provide significant environmental benefit for any habitat requiring removal Ensure site staff receive appropriate instruction in the identification of native fauna Protect important habitat areas and identify these locations to contractors in site induction program Undertake a fauna inspection of the construction area prior to the removal of vegetation and relocate any affected fauna 	 Minimise the use of herbicides along roadsides (particularly in close proximity to waterways) Maintain soil and erosion control measures to protect aquatic fauna habitats
tection of nabitat and rauna species	 Prevent or minimise disturbance to native rauna and overlap potential habitat areas along the route and develop protocols for relocation of affected fauna Design the road to minimise the effect on native vegetation and habitat areas likely to be inhabited by native fauna and retain appropriate vegetation in accordance with the urban and landscape design As part of the Vegetation Management Plan provide a significant environmental benefit for any habitat requiring removal 	 Implement the requirements of the Vegetation Management Plan to provide significant environmental benefit for any habitat requiring removal Ensure site staff receive appropriate instruction in the identification of native fauna Protect important habitat areas and identify these locations to contractors in site induction program Undertake a fauna inspection of the construction area prior to the removal of vegetation and relocate any affected fauna Implement soil and erosion control measures to protect aquatic fauna habitats 	 Minimise the use of herbicides along roadsides (particularly in close proximity to waterways) Maintain soil and erosion control measures to protect aquatic fauna habitats
Protection of habitat and fauna species	 As part of the vegetation survey identify potential habitat areas along the route and develop protocols for relocation of affected fauna Design the road to minimise the effect on native vegetation and habitat areas likely to be inhabited by native fauna and retain appropriate vegetation in accordance with the urban and landscape design As part of the Vegetation Management Plan provide a significant environmental benefit for any habitat requiring removal Design soil and erosion control measures to protect aquatic fauna habitats 	 Implement the requirements of the Vegetation Management Plan to provide significant environmental benefit for any habitat requiring removal Ensure site staff receive appropriate instruction in the identification of native fauna Protect important habitat areas and identify these locations to contractors in site induction program Undertake a fauna inspection of the construction area prior to the removal of vegetation and relocate any affected fauna Implement soil and erosion control measures to protect aquatic fauna habitats 	 Minimise the use of herbicides along roadsides (particularly in close proximity to waterways) Maintain soil and erosion control measures to protect aquatic fauna habitats

Issue	Design/Pre-construction	Construction	Operation
Manageme Objective -	ent of materials and construction facilities - Manage construction facilities and materials to pre	event pollution, minimise waste and minimise effects on the local commu	nity
Auxiliary facilities	 For temporary compounds and batch plants (if required) ensure they are located: 	 If an EPA licence is required for batch plants, implement associated conditions (including monitoring requirements) 	Remove temporary facilities and restore
	 in areas that are central to a substantial portion of the works and are readily accessible to the road network 	 Provide lighting at compounds for night-time security in a way that does not interfere with local residences 	
	 at suitable separation distance from residential areas and waterways (or as required by the EPA) and in areas not containing native vegetation or fauna 		
ent	 Develop emergency spill response procedures for responding to chemical spills during 	 Store and use chemicals in bunded areas (which meet the requirements of AS 1940) 	
manageme	construction, including notifying the EPA of any significant spill events	 Locate appropriate spill control and clean-up equipment in areas where chemicals are used or transported and ensure staff are trained in its use 	
emical		 Ensure mobile refuelling vehicles are equipped with spill control and clean-up equipment 	
Ch		 In the event of a spill ensure contaminated materials are disposed of to a licensed waste disposal facility 	
ŧ	 Identify potential uses of waste materials in 	Mulch vegetation cleared and reuse for batter slope stabilisation	
Vaste agemer	road construction activities	 Reuse topsoil removed from the corridor for areas to be landscaped 	
man		 Provide adequate waste disposal facilities on site and remove regularly 	

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Table 41.2

Preliminary environmental management and monitoring schedules – Port Wakefield Road Upgrade

lssue	Design/Pre-construction	Construction	Operation
Access Objective -	- Minimise the effects on community accessibility		
Access	• Develop a community engagement program to advise the community of changes to local access patterns due to construction activities and once the Upgrade is complete	 Engage the community to advise of any potential delays or access changes during construction 	
Property Objective -	- Minimise the effects on properties to be acquired		
L.	 Identify any land acquisition required 	 Implement measures determined with property owners and 	
oquisitio	 Ensure that property owners are fully informed about the acquisition process 	occupiers	
Land ag	 Discuss fencing and access arrangements with property owners and occupiers affected by acquisition 		
Transport Objective -	- Minimise adverse effects from the Upgrade on the	transport network	
, road e and otion	 Provide service roads where necessary to restrict access onto Port Wakefield Road 	 Stage works to minimise operational delays Source construction materials locally to reduce transportation 	 Monitor the operation of Port Wakefield Road and surrounding road network to determine if they are
Safety closur disrup	 Where required, prohibit right turns at intersections 	· Source construction materials locally to reduce transportation requirements	operating as predicted and to identify any unforeseen problems with the network
Noise Objective -	- Minimise the effects of noise on the local communi	ity	
Road traffic noise	 For any new surface treatments, consider the use of a low noise road surface where dense graded asphalt is not required 		
Construction noise	 Prepare a Noise and Vibration Management Plan 	 Implement the requirements of the Noise and Vibration Management Plan 	

Issue	Design/Pre-construction	Construction	Operation		
Vibration Objective -	Vibration Objective – Minimise the effects of vibration on structures and the local community				
Ground vibration	 Prepare a Noise and Vibration Management Plan 	 Implement the requirements of the Noise and Vibration Management Plan 	 Assess the condition of buildings previously inspected and repair any damage caused by construction 		
	 Undertake a building condition inspection where required 		construction vibration		
Aboriginal Objective -	l heritage - Prevent or minimise disturbance to significant Abo	riginal cultural heritage sites			
itage	 Develop an Aboriginal Cultural Heritage Management Plan to manage scattered 	 Implement the requirements of the Aboriginal Cultural Heritage Management Plan 			
l her	artefacts and other heritage issues	 Monitor earthworks in archaeologically sensitive areas 			
origina	 Consult with Kaurna community representatives to determine process for managing sites identified during construction 				
Abo	and develop procedures				
Non-Abori Objective -	ginal heritage - Prevent or minimise disturbance to significant non	-Aboriginal cultural heritage sites			
Non- original eritage	 Not applicable as sites will not be significantly affected by the Upgrade 				
Ab Ab					
Visual Objective -	- Minimise negative visual effects and enhance visu	al opportunities			
nd lesign	 Develop an Urban Design Framework to establish design objectives which consider 	 Where possible, retain existing trees to minimise construction visual effects 	 Maintain landscape plantings within the road reserve and control weeds 		
an ai pe d	visual effects in design	Undertake landscaping works as soon as practicable after works			
Urbar landscap	 Prepare a landscape theme that is visually integrated with land use and vegetative patterns along the corridor 	are completed			

Issue	Design/Pre-construction	Construction	Operation
Soils and Objective -	site contamination - Avoid contamination of soils and manage contami	nated sites affected	
contamination	 Undertake a preliminary site contamination investigation and if required, undertake soil testing to identify potential risks where it is determined that the site has been affected by contaminating activities 	 If required, implement the requirements of the Contamination Management Plan 	 If required, manage any areas of site contamination
Site o	 If required, develop a Contamination Management Plan 		
Acid sulphate soils	 If required, develop mitigation and management measures for controlling acid sulphate soils effects 	 If required, implement any mitigation and management measures for controlling acid sulphate soils 	 If required, manage any areas of acid sulphate soils
Water qua Objective -	ntity and quality, erosion and sediment control - Prevent the pollution of water and maintain existin	g natural surface water flow	
Flooding and drainage	 Design the minor drainage system for the road for a 5 year ARI capacity consistent with the design standards 	 Maintain an adequate standard of drainage during construction works 	
	 Undertake a water quality risk assessment to address the effects of the project on local 	 Implement the requirements of the Surface Water Quality Monitoring Program 	
/ater quality	water quality and identify measures to mitigate the effects. The assessment will address measures to control construction effects (e.g. siltation and erosion control measures)	 To protect groundwater quality (i.e. shallow aquifers, recharge points) where possible contain and treat site water and divert natural surface flows away from the construction site and provide spill containment and isolation structures in high risk locations 	
	 Determine the level of monitoring required and prepare a Surface Water Quality Monitoring Program 		
Erosion and sediment control	• As part of the CEMP develop a Soil Erosion Drainage Management Plan (SEDMP) in line with the EPA's Code of Practice on Stormwater Pollution Prevention for Local, State and Federal Governments	 Implement the requirements of the SEDMP Vegetate road batter slopes as soon as practical to prevent erosion 	 Adequately maintain vegetation on road batter slopes to prevent erosion

Issue	Design/Pre-construction	Construction	Operation	
Air quality Objective – Minimise the effects of air quality on the community				
Dust	 Develop a Dust Management Plan to minimise dust creation as part of the CEMP 	 If required, monitor dust creation though the installation of real-time dust monitors and if an exceedence occurs undertake measures to reduce dust levels 		
Flora Objective -	- Prevent or minimise disturbance to native vegetat	ion and the spread of weeds and disease		
Native vegetation	 Undertake a detailed vegetation survey mapping the location of all native species 	 Ensure site staff receive appropriate instruction in the identification of native vegetation and weeds 	 If required, monitor and maintain any relocated vegetation to ensure its survival 	
	 Design the upgrade of the road to minimise the impact on native vegetation and retain appropriate vegetation 	 Protect important native vegetation areas and identify these locations to contractors in site induction program 		
		• Where possible, carefully relocate any important native vegetation		
Native vegetation offset	 Develop a Vegetation Management Plan to offset the removal of native vegetation and provide a significant environmental benefit as required under the Native Vegetation Act 	 Implement the requirements of the Vegetation Management Plan 	 Ensure remnant native vegetation is protected during weed control and maintenance works 	
			 Ensure revegetated areas become established by providing adequate maintenance 	
Weed, pest and disease control	 Identify weeds within the construction corridor during the vegetation survey 	 Implement the requirements of the Weed Management Plan including controlling proclaimed and environmental weeds 	 Implement a program to control proclaimed and environmental weeds 	
	 Develop a Weed Management Plan 	 If required, implement measures for managing <i>Phytophthora</i>, Mundulla Yellows and <i>Phylloxera</i> 		
	 Identify any areas of <i>Phytophthora</i>, Mundulla Yellows and <i>Phylloxera</i> within the construction footprint 			
	 If required, develop measures for managing <i>Phytophthora</i>, Mundulla Yellows and <i>Phylloxera</i> 			

Issue	Design/Pre-construction	Construction	Operation		
Fauna Objective – Prevent or minimise disturbance to native fauna and their habitat					
Protection of habitat and fauna species	 As part of the vegetation survey identify potential habitat areas along the road and develop protocols for relocation of affected fauna If required, as part of the Vegetation Management Plan provide a significant environmental benefit for any habitat requiring removal 	 Implement the requirements of the Vegetation Management Plan to provide significant environmental benefit for any habitat requiring removal 	 Minimise the use of herbicides along roadsides (particularly in close proximity to waterways) 		
		 Ensure site staff receive appropriate instruction in the identification of native fauna 			
		 Protect important habitat areas and identify these locations to contractors in site induction program 			
	 Design soil and erosion control measures to protect aquatic fauna habitats 	 Undertake a fauna inspection of the construction area prior to the removal of vegetation and relocate any affected fauna 			
		 Implement soil and erosion control measures to protect aquatic fauna habitats 			
Pests	 Plan provision for waste storage and removal to prevent attracting pest animal species during construction 	Remove or securely store waste to prevent access of pest animals			
Management of materials and construction facilities Objective – Manage construction facilities and materials to prevent pollution, minimise waste and minimise effects on the local community					
Chemical management	Develop emergency spill response procedures for responding to chemical spills during construction, including notifying the EPA of any significant spill events	 Store and use chemicals in bunded areas (which meet the requirements of AS 1940) 			
		 Locate appropriate spill control and clean-up equipment in areas where chemicals are used or transported and ensure staff are trained in its use 			
		 Ensure mobile refuelling vehicles are equipped with spill control and clean-up equipment 			
		 In the event of a spill ensure contaminated materials are disposed of to a licensed waste disposal facility 			
Waste management	 Identify potential uses of waste materials in road construction activities 	Mulch vegetation cleared and reuse for batter slope stabilisation			
		 Reuse topsoil removed from the corridor for areas to be landscaped 			
		 Provide adequate waste disposal facilities on site and remove regularly 			

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