2 The proposal

As required under the PER Guidelines, this chapter provides information on the proposal, including a summary of the regional information as it relates to the proposal. Detailed information on the existing conditions and potential environmental impacts is discussed in Chapter 4.

2.1 GENERAL INFORMATION

The Victoria River has a catchment area of 77,230 km^2 (Commonwealth of Australia 2005). The large catchment area, combined with the fact that the Victoria River area receives 85% of its average 938.5 mm rainfall in four months of the year, leads to flooding problems along much of the river system and the associated infrastructure (Bureau of Meteorology 2005).

Flooding of the Highway has a significant economic impact, with the loss of road connectivity between east and west Australia resulting in a direct, adverse impact on freight and tourist use of the Highway. Flooding of the Victoria River has direct impacts on the safety of road users, and has been responsible for the death of a motorist when he attempted to drive across the flooded bridge over the Victoria River.

The Victoria Highway is closed for parts of most wet seasons owing to the floodwaters rising above the existing Victoria River Highway Bridge. The Bridge has a deck level of approximately 12 m above the riverbed (DPI 2005). However, during the largest recorded flood event in 1991, the river rose to 23.43 m above the riverbed at the Bridge (KBR 2004).

Furthermore, the flooding of the Victoria River causes backflow into tributaries of the main channel, which also results in flooding of minor creeks and drainage lines, and hence sections of the Victoria Highway. Annual Average Times of Closure (AATOC) of the Victoria Highway at the Victoria River, Joe Creek, Lost Creek and Sandy Creek crossings are 96 hours/year, 16 hours/year, 45 hours/year and 10 hours/year, respectively (KBR 2004).

As well as road closures caused by flood events, the road pavement is saturated with water for periods of time before and well after the peak flood level, causing weakening of the pavement strength and severe damage to the road. As a result, DPI must impose weight and axle configuration limits on the Highway. These requirements adversely impact on heavy freight vehicles (trucks) and the ability of transport companies to efficiently deliver goods and produce.

Upgrading the road to a 1 in 20 year storm event would result in AATOCs of 6 hours/year for each of the Victoria River, Joe Creek and Lost Creek crossings, and 8 hours/year for Sandy Creek. This will result in a considerable improvement in access and safety to road users.

2.1.1 Australian Land Transport Network—Darwin to Perth corridor

The Victoria Highway is a component of the Darwin to Perth corridor of the declared Commonwealth Australian Land Transport Network (DOTAR 2004). It provides a very important local, regional and interstate transport route for business and recreational purposes. It also provides an important transport route for the trucking industry and transportation of primary and secondary produce across the continent. Between Kununurra and Katherine, the Highway forms the main access route for a sparsely populated area.

While the Victoria Highway is an integral part of Australia's highway system, at present it does not consistently meet the transport standards of a highway of its status owing to regular closures and weight restrictions resulting from flooding.

2.1.2 Upgrade of the Victoria Highway

The objective of the project is to reduce the road closure times and to bring the Victoria Highway more in line with the standards that highway users are familiar with elsewhere in Australia. Significantly reducing the flooding risk for the Highway will greatly reduce the economic impact of flooding owing to road closure and will raise the standard and safety of the Highway in keeping with its status.

As part of studies into the upgrading of the Victoria Highway, major realignments were considered for the section of the road on Victoria River flood plain. These were not pursued owing to engineering, economic and environmental impacts, primarily on the adjoining Gregory National Park and Aboriginal land.

The current project's design standards were included in the NOI for the proposal (DPI 2005). A summary of this information is as follows:

- the height of bridges and the capacity of under-road culverts will provide for a flood protection of
  - Q_{20} (probability of the maximum flood event occurring once every 20 years) with a maximum of 12 hours AATOC
  - Q_{50} (probability of the maximum flood event occurring once every 50 years) with a maximum of 24 hours AATOC
- bridges will be structurally designed for all flood events up to a 1 in 2000 year event (Q2000)
- bridges will be 9 m wide
- design speeds for the road will be between 100 km/h and 130 km/h, with minimum design speeds dictated by the existing horizontal alignment as environmental and/or economic constraints do not allow higher speeds
- compliance with Austroads' Rural road design: A guide to the geometric design of rural roads (2003)
- provision of two x 3.5 m wide sealed traffic lanes for the road, and 2 m wide shoulders each side (0.5 m sealed edge and 1.5 m unsealed)

- provision of 2 km long x 3.5 m wide sealed overtaking traffic lanes with 2 m wide shoulder (0.5 m sealed edge and 1.5 m unsealed). The final location of the passing lanes within potential areas will be dependent on environmental constraints
- cut and fill areas and batters will not encroach on any identified Aboriginal Sacred Site or archaeological site. Cut batters will be shaped to blend into the existing environment, minimise accelerated erosion and promote the growth of indigenous vegetation
- the pavement will be designed in accordance with Austroads' Pavement Design Guide (2004). The minimum base course thickness of 200 mm will comprise gravel
- earth material (soil) will be used for embankments.

Road alignments will follow the existing road corridor except where additional construction such as passing lanes or bridges requires re-working of alignments. The realigned sections of road at specified river and creek crossings will generally be located approximately 20 m upstream or downstream of existing crossings.

An Environmental Management Plan (EMP) for construction will be prepared, implemented, monitored and audited. An outline EMP has been prepared as part of this PER (Chapter 5) which, together with the outcomes from this PER, will form the basis for the development of the final EMP.

2.2 APPLICABLE LEGISLATION AND STATUTORY OBLIGATIONS

The proposed works will be undertaken in accordance with Territory and Commonwealth legislation. The key legislation that directs the PER for the proposal includes:

- EPBC Act 1999
- Environmental Assessment Act 1982.

The following Northern Territory Acts, including their amendments and Regulations, are also applicable to certain aspects of the proposal:

- *Bushfires Act 2004*
- *Control of Roads Act 1953*
- *Dangerous Goods Act 2004*
- *Fire and Emergency Act 2004*
- *Heritage Conservation Act 2000*
- *Land Title Act 2000*
- *Motor Vehicle (Standards) Regulations 2004*
- *Northern Territory Aboriginal Sacred Sites Act 2004*
- *Planning Act 1999*
- *Public Health Act 1952*
- *Soil Conservation and Land Utilisation Act 2001*

- *Territory Parks and Wildlife Conservation Act 2005*
- *Traffic Act 1979*
- *Waste Management and Pollution Control Act 2003*
- *Water Act 2002*
- *Weeds Management Act 2001.*

The *National Land Transport Act 2005* (Cwlth) applies to this project, and forms part of the basis for the proposed upgrading of the Highway. The *Native Title Act 1993* (Cwlth) is potentially relevant to land claims in the region, although it does not directly impact this proposal. It is addressed in conjunction with the *Aboriginal Land Rights (Northern Territory) Act 1976* (Cwlth).

Where necessary, licences, permits and approvals applicable or required under these Acts must be obtained by the contractor undertaking the works.

2.2.1 EPBC Act

The EPBC Act provides for the protection and conservation of matters of national environmental significance and the management of Commonwealth owned and controlled areas. The matters of national environmental significance, as they relate to this project, are:

- listed threatened species and their habitat and communities
- listed migratory species and their habitat
- marine species and the general environment.

The EPBC Act provides for the implementation and administration of international agreements to which Australia is a signatory, namely:

- CITES—Convention on International Trade in Endangered Species of Wild Fauna and Flora (1973)
- JAMBA—Agreement between the Government of Japan and the Government of Australia for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment (1974)
- CAMBA—Agreement between the Government of Australia and the Government of the Peoples Republic of China for the Protection of Migratory Birds and their Environment (1986)
- Bonn Convention—Convention on the Conservation of Migratory Species of Wild Animals, for which Australia is a range state under the Convention (1979)
- Earth Summit—Convention on Biological Diversity (Rio de Janeiro, 1992), biodiversity issues.

A proponent of any proposed development that may have an adverse impact upon matters of national environmental significance must submit a referral under the EPBC Act to the Commonwealth Minister of Environment. The Minister will assess the referral and determine if a formal assessment process (principally public environment report or environmental impact statement) is required.

The subsequent amendments to the EPBC Act also apply, including the *Environment and Heritage Legislation Amendment Act (No 1) 2003* (Cwlth). The amendment establishes a Commonwealth heritage regime that focuses on matters of national significance and Commonwealth responsibility; and lists places of national heritage significance.

2.2.2 Environmental Assessment Act

This Act provides for the assessment of the environmental effects of development proposals and for the protection of the environment. The assessment process ensures, to the greatest extent practicable, that each matter affecting the environment is fully examined and taken into account.

2.2.3 Other legislation

Aboriginal Land Rights (Northern Territory) Act 1976 and Native Title Act 1993 (Cwlth)

These Acts provide for the allocation of areas of land to traditional Aboriginal owners. Land is vested in Land Trusts created under the Acts and the land is managed in accordance with the requirement of the Traditional Owners, as ascertained by Land Councils established under the Act.

Bushfires Act

This Act aims to provide for the prevention and suppression of fires. The Bushfires Council and Fire Control Regions are established under the Act, which provides for the prohibition of, or conditions permitted for, fires.

Control of Roads Act

This Act authorises the Minister to construct and maintain roads, footpaths, bridges and culverts, together with associated signs, posts, fences and similar. Under the Act, the Minister may temporarily close a road for construction, alteration or repair.

Dangerous Goods Act

This Act provides for the establishment of regulations for the transportation, use and storage of dangerous substances and hazardous goods in the NT. Under the Act specific safeguarding measures are required when dangerous goods and substances are to be used.

Fire and Emergency Act

This Act provides for the establishment of the Northern Territory Fire and Rescue Service, the operational and emergency response activities of the Service, and the protection of life, property and the environment against fires and other emergencies and for related purposes.

Heritage Conservation Act

This Act provides for the identification, assessment, recording, conservation and protection of places and objects of prehistoric, protohistoric, historic, social, aesthetic or scientific value, including geological structures, fossils, archaeological sites, ruins, buildings, gardens, landscapes, coastlines and plant and animal communities or ecosystems of the Territory. A permit is required to undertake works that may destroy, damage, demolish or desecrate a heritage place or object.

Land Title Act

The object of this Act is to consolidate and reform the law related to the registration of land and interests in land, and to define the rights of persons with an interest in registered land.

Motor Vehicle (Standards) Regulations

This Act establishes means for the legal control of emissions from motor vehicles through the establishment of emissions standards.

Northern Territory Aboriginal Sacred Sites Act

This Act aims to provide a practical balance between the recognised need to preserve and enhance Aboriginal cultural tradition in relation to certain land in the Territory and the aspirations of the Aboriginal and all other peoples of the Territory for their economic, cultural and social advancement. It does this by:

- establishing a procedure for the protection and registration of Sacred Sites
- providing for entry onto Sacred Sites and the conditions to which entry is subject
- establishing a procedure for the avoidance of Sacred Sites in the development and use of an area
- establishing an Authority, the Aboriginal Areas Protection Authority (AAPA, the Authority), for the purposes of the Act and a procedure for the review of decisions of the Authority by the Minister, and for related purposes.

Pastoral Land Act

This Act is responsible for establishing management controls on pastoral lands within the NT, including the management of vegetation on pastoral leases. DPI land areas are excluded from the Pastoral Act. The Act has stringent requirements for the management of vegetation clearance through the development of Specifications and EMPs. Therefore, the Act is considered not to apply to this proposal.

Planning Act

This Act provides for appropriate and orderly planning and control of the use and development of land, and for related purposes. It stipulates the requirements for lodgement of Development Applications. The Act is generally not applicable to roadworks and its provision to establish vegetation clearance requirements over DPI is also not applicable.

Public Health Act

This Act states a requirement for the control of mosquitoes and disease outbreaks as well as the control of nuisance pest insects.

Soil Conservation and Land Utilisation Act

This Act makes provision for the prevention of soil erosion and for the conservation and reclamation of soil, through the establishment of a Soil Conservation Advisory Council, the declaration and management of erosion areas, and the use of precautionary and corrective measures.

Territory Parks and Wildlife Conservation Act

This Act establishes parks and reserves and provides for the study, protection, conservation and sustainable utilisation of wildlife. Wildlife management includes the classification of threatened species, general protection of wildlife and essential habitat areas, and the management of feral animals.

Traffic Act

Under this Act, a 'competent authority' is defined as a person, body or authority having the care, control and management of a road. The Act gives the competent authority the power to erect traffic control devices such as any sign placed, erected or displayed for the purpose of regulating, warning or guiding traffic. DPI is nominated as the competent authority for the Victoria Highway.

Waste Management and Pollution Control Act

The objectives of this Act are to:

- protect and, where practicable to restore and enhance the quality of, the Territory environment by
  - preventing pollution
  - reducing the likelihood of pollution occurring
  - effectively responding to pollution
  - avoiding and reducing the generation of waste
  - increasing the re-use and re-cycling of waste
  - effectively managing waste disposal
- encourage ecologically sustainable development
- facilitate the implementation of national environment protection measures made under the *National Environment Protection Council (Northern Territory) Act* (Cwlth).

Water Act

This Act provides for the investigation, allocation, use, control, protection, management and administration of water resources. The Act deals with surface water and groundwater resources. A permit will be required to extract water for construction purposes from the Victoria River, existing bores or new bores.

Weeds Management Act

The purpose of this Act is to protect the Territory's economy, community, industry and environment from the adverse impact of weeds, through the establishment of declared and potential weeds, the development and implementation of weed management plans, and quarantine and administrative mechanisms.

2.2.4 NT Government and DPI policies, strategies and documents

DPI takes the lead role in the development and application of policies relating to road construction. It has a suite of documents relevant to construction that will be applied to the contractor undertaking the works for this project.

The DPI environmental policy for roads is a component of its strategic statement 'Roads and the Environment A Strategy for the Sustainable Development, Use and Maintenance of Northern Territory Roads' (DIPE 2004).

This is available from the DPI website at
http://www.dpi.nt.gov/whatwedo/mvr/rgpolicies/pdf/roads_environment.pdf

For construction contracts, the Request for Tender (RFT) document includes a comprehensive section on environmental management requirements. This includes reference to statutory matters, which in this case would include the whole of the PER, and environmental and heritage management.

A substantial part of the RFT is the Roadworks Technical Specification. This Specification details the standards required of the construction contractor when building or maintaining the road asset. The Specification comprises sections, the major sections relating to the proposal being:

- Miscellaneous Provisions (including detailed requirements for the establishment and rehabilitation of borrow areas and water sources)
- Provision for Traffic (including Traffic management and Traffic Management Plan requirements)
- Clearing, Grubbing and Rehabilitation
- Earthworks
- Pavements and Shoulders
- Spray Sealing
- Road Furniture and Traffic Control Devices
- Bridgeworks.

All of these documents are included in Appendix B.

2.3 DESCRIPTION OF THE ENVIRONMENT

This section introduces the environmental characteristics of the region and the project area. Detailed information related to all of these topics is presented in Chapter 4.

2.3.1 Climate

The project area is located in a subtropical, monsoonal climate, with distinct wet and dry seasons. Of the annual mean rainfall of 938.5 mm for Timber Creek, 85% falls within the period December to March inclusive, with less than 1% occurring over June to August inclusive (Bureau of Meteorology 2005).

2.3.2 Geology and geomorphology

The area is dominated by weathered, deeply incised Proterozoic rocks (i.e. bluffs, escarpments, and valleys of sandstone, quartzite, basalt and limestone), with Cainozoic sediments confined to the footslopes, riparian landforms and alluvial channels. The Highway traverses gently undulating to undulating terrain, largely associated with the footslopes of the rocky escarpments, flood plains of the riparian systems and drainage depressions of the Victoria River and its tributaries.

2.3.3 Soils

The soils of the project area are principally skeletal soils associated with the plateaux and escarpments, with deep profile transported (alluvial) soils located on the Victoria River flood plain area (Stewart 1970). Heavy clays are associated with the Highway around Lost Creek and Skull Creek.

2.3.4 Water resources

The Victoria River has a large catchment area of 77,230 km^2 (Commonwealth of Australia 2005). Within and near the project area, the main tributaries of the Victoria River are Ryan Creek, Matt Wilson Creek, Sullivan Creek, Lost Creek, Joe Creek and Sandy Creek.

As a result of the large catchment area and intense rainfall during the wet season, the Victoria River system regularly floods. During the dry seasons, the tributaries of the Victoria River stop flowing, and the Victoria River becomes very low late in the dry season. During most years the River maintains some flow during the dry season (G. Fischer, Chief District Ranger Northern Territory Parks and Wildlife Service [NTPWS], pers. comm., 2005).

Groundwater is available from a number of existing bores in the region, including some road construction bores previously used by DPI.

2.3.5 Fire

Fires are a regular occurrence in the Victoria River region (and the Top End generally), particularly during the late wet/early dry season, when understorey grasses start to dry off and controlled burns are undertaken. Mid and late dry season fires are avoided but some are started by lightning strikes and other agents. Fire frequency for prescribed (controlled) burns in the Victoria River region, including the Gregory National Park, is typically every three years, although some areas experience more or less frequent fires (G. Fischer, Chief District Ranger NTPWS, pers. comm., 2005).

2.3.6 Vegetation communities and native flora

The project area is located in the Victoria Bonaparte Bioregion of the NT and the vegetation communities in this Bioregion are typical of much of the Top End. All of the broad scale communities present here (Wilson et al. 1990) are common throughout the Top End and none is threatened. The flood plain vegetation of the road corridor is largely uniform across its length, with minor changes in species dominance. Rocky escarpment footslopes and riparian corridors have different species compositions and richness to that of the flood plains.

Based on Wilson et al (1990) the major vegetation communities in the region are:

- *Eucalyptus tectifica* (northern box), *Corymbia terminalis* (bloodwood) woodland with *Sehima nervosum* (white grass) and *Chrysopogon fallax* (golden beard grass) grassland understorey
- *Corymbia dichromophloia* (variable-barked bloodwood), *Eucalyptus miniata* (Darwin woolly butt) low open woodland with *Triodia pungens* (curly spinifex) open hummock grassland understorey
- *Terminalia arostrata* (nutwood) low open woodland with *Chrysopogon fallax (*golden beard grass) and *Dichanthium* (bluegrass) grassland understorey
- *Eucalyptus microtheca* (coolibah) open woodland with *Sehima nervosum* (white grass), *Panicum decompositum* and *Chrysopogon fallax* (golden beard grass) grassland.

Tall grassland areas of two cane grass species, *Chionachne cyathopoda* and/or *Mnesithea rottboellioide*, also occur. This community, which was too restricted in its distribution and extent to be mapped by Wilson et al. (1990), is associated with parts of the flood plain woodland of the Victoria River and its tributaries. The distribution of these grasslands is considered in the specialist report produced by HLA-Envirosciences (2005).

The above species and the community are of regional significance, primarily as a fauna habitat rather than as a vegetation community or flora species.

Species of threatened conservation significance occur in the wider region. However, no species of threatened conservation status or significance were identified in the road corridor during a review of the NT Herbarium flora database and in the field assessment of the impact areas in DPI (2005).

2.3.7 Weeds

Twenty-five introduced species have been recorded in the project area (DIPE 2005), of which 10 are declared weeds under the Weeds Management Act. *Calotropis procera* (rubber bush), *Jatropha gossypifolia* (bellyache bush), *Martynia annua* (devil's claw), *Parkinsonia aculeata* (Parkinsonia), *Passiflora foetida* (wild passionfruit) and *Xanthium strumarium* (Noogoora burr) are the key weeds of concern for this project, owing to their ecology, distribution and/or abundance. Other Weeds of National Significance (WONS), such as *Mimosa pigra* (mimosa), have not been recorded in the project area. Nonetheless, particular care will be undertaken not to introduce or spread WONS or declared or other environmental weeds as part of the works.

2.3.8 Fauna species

Thirty-eight mammal species (six introduced), 147 bird species (one introduced), 51 reptile species (one introduced), and 20 amphibian species (one introduced) have been recorded in the project area and region. About 40 species of fish have been recorded in the Victoria River system.

A number of species listed as threatened under NT legislation and nationally significant species have been recorded, or are potentially present, in the project area and region.

2.3.9 Fauna habitat

Key habitat for fauna along the Victoria Highway includes:

- riparian areas
- flood plain woodland and grassland
- rocky escarpment footslopes.

The riparian areas provide important breeding and non-breeding habitat for many wildlife species. During the dry season, remnant pools present along the drainage lines and the Victoria River provide important water sources for drinking. Riparian areas have a mild microclimate compared with the open woodland of the flood plains and slopes.

Remnant pools of water also provide important refuge habitat for fish, some reptiles and amphibians, and aquatic invertebrate populations during the dry season. However, it appears that few pools remain in any of the tributaries of the project area during the mid to late dry season.

Some of the large trees of the drainage lines are in 'fire shadows' and are hollow-bearing trees. Hence, they provide important roosting and/or breeding locations for bats, birds, and small mammals such as possums.

Tall grasslands are important fauna habitat for a number of mammal and bird species, including some species with threatened conservation status.

The rocky escarpment footslopes provide ideal habitat for small mammal and reptile fauna, as may the clay soils of the area west of Lost Creek.

2.3.10 Pest fauna species

Ten introduced pest mammal species have been recorded in the Gregory National Park (PWCNT 2001) and have been recorded, or could occur, in the project area.

Cane toad (*Bufo marinus*) has been recently recorded in the region (G. Fischer, Chief District Ranger NTPWS, pers. comm., 2005).

2.3.11 Aboriginal heritage

There are extensive areas of Aboriginal land in the region, including a number of properties adjacent to the project area.

The NT Register of Archaeological Places records a number of sites of archaeological significance in the Victoria River area, and the area supports a continuing Aboriginal relationship with the land.

Although Earth Sea Heritage Surveys (2005 and 2005a) found an isolated stone artefact 300 m from the project area at Joe Creek, no archaeological sites were found within the rest of the areas. Earth Sea Heritage Surveys (2005 and 2005a) determined that the risk of locating archaeological sites during the construction phases of this project was low at Victoria River, Joe Creek, Lost Creek and Sandy Creek.

Additional investigations are reported in Chapter 4.

There are numerous Sacred Sites in and adjacent to the project area. AAPA investigations have been commissioned for this proposal and numerous consultations have been undertaken with the Northern Land Council (NLC) and local custodians.

2.3.12 European heritage

A review of the Australian Heritage Place Inventory does not include any sites within the project area that would be affected by the proposal. One site of local European heritage significance was noted in the field.

2.3.13 Tenure and ownership

A large percentage (71%) of the road reserve is located adjacent to the Gregory National Park, administered by the Parks and Wildlife Commission of the Northern Territory. Beyond approximately Ch 210 km, the land tenure includes private freehold, Aboriginal owned land and pastoral land.

2.3.14 Land use

The principal land use for the land adjoining the road reserve of the Highway is conservation (i.e. in the Gregory National Park), Aboriginal land areas, pastoral production and service industry (i.e. Victoria River Inn).

Main trunk optical fibre cables (OFCs) from Katherine to Kununurra are located adjacent to the Highway and largely follow the road corridor. In a number of places, the cable is located within 5 m of the road edge. The cables cross the Highway several times, and a spur of an OFC is attached to the side of the Victoria River Bridge structure.

2.4 IMPACTS OF THE PROPOSAL AND THE IMPACT A REAS

Each of the major types of impact areas are described and discussed in this section.

2.4.1 Road impact area locations

The eight impact areas along the road are located on the Victoria Highway, between Ch 185 km and 220 km. This approximates to that section of the Highway between 8 km east of the Victoria River Bridge to the Fitzroy Station turn-off (Figure 1.1).

Six of the sites (sites 1 to 6 on Figure 1.1) are located within the easement of the Highway, which is managed by DPI and is adjacent to the Gregory National Park. The other two sites (sites 7 and 8) are located west of the western boundary of the National Park.

The maximum impact area for all of the eight sites is 72.05 ha along 16.6 km of the Highway. Table 2.1 summarises the sites, the proposed works and the impact areas. Aerial photographs of each of the sites are included in Appendix B.

Table 2.1 Proposed Victoria Highway impact areas (maximum size)

Site	Works	Chainage	Maximum corridor length (km)	Maximum impact width (from existing road centreline)	Maximum impact area (ha)
Site 1	Widening of road to provide passing lane, i.e. 3 lanes	Ch 186.2–189.2 km	3.0	30 m one side only	9.0
Site 2	Victoria River. New bridge & realignment	Ch 192.8–195.2 km	2.4	15–60 m downstream side; 0–30 m upstream side	12.6
Site 3	Highway to be raised	Ch 195.5–196.5 km	1.0	15–40 m both sides	6.0
Site 4	Highway to be raised	Ch 202.3–202.9 km	0.6	15–45 m downstream side; 15–50 m upstream side	3.75
Site 5	Joe Creek. New bridge & realignment	Ch 203.5–205.4 km	1.9	15–60 m downstream side; 15–30 m upstream side	8.2
Site 6	Lost Creek. New bridge over two channels & realignment	Ch 206.7–209.7 km	3.0	15–45 m downstream side; 15–80 m upstream side	16.4
Site 7	Widening of road to provide passing lane, i.e. 3 lanes	Ch 210.5–213.5 km	3.0	30 m one side only	9.0
Site 8	Sandy Creek. New bridge & realignment	Ch 216.6–218.3 km	1.7	15 m downstream side; 15–50 m upstream side	7.1

2.4.2 Bridge structures and approach roads

The proposed bridge sites discussed in Table 2.1 have been selected owing to their current flooding potential and the need to minimise or eliminate most of the flooding that causes road closure conditions at these sites. Outside these road sections within the project area, flood events are rare or have minimal impact on the safe use of the Highway.

The locations of the new bridge structures and approaches have also been selected to minimise impact on the environment, especially the biological components, Aboriginal sacred and archaeological sites, and the main trunk OFC between Katherine and Kununurra. Road geometry is not a significant determinant of the location of the new bridges, as both upstream and downstream sides can be accommodated in design and construction requirements. Environmental factors have been the main determinants of the location of the new bridges. However, engineering and geotechnical considerations have also been a significant input to the preferred location of the bridges.

The recommended siting for each bridge structure was considered and revised in the NOI to take account of the presence of Aboriginal heritage sites, trunk cable OFC, and the presence of threatened species, especially habitat for the purple-crowned fairy-wren (DPI 2005). A summary of these constraints is discussed below for each of the proposed bridge sites. Appendix B includes copies of the plan showing the preferred location of the realignment at each bridge site.

Victoria River Bridge

In consideration of the constraints at this site, the preferred location for the new Victoria River Bridge is 20 m downstream of the existing bridge.

Joe Creek Bridge

As a result of the environmental and engineering constraints at this site, the preferred location for the new Joe Creek Bridge is approximately 20 m downstream of the existing crossing, between the existing road and the boundary of the restricted work area associated with the nearby Sacred Site.

Further discussions with AAPA are currently being undertaken to finalise the alignment as part of a Clearance Certificate.

Lost Creek Bridge

Owing to the known constraints, the preferred location for the new Lost Creek Bridge is within 20–30 m upstream of the existing crossing. This would minimise impact on the purple-crowned fairy-wren population and its habitat on the downstream side at this site. Discussions with AAPA are ongoing and its conclusions will not be available during this stage of the PER (i.e. determination whether realignment upstream into an Avoidance Area is acceptable). Therefore, the results of AAPA's consultations with Traditional Owner groups are not available at this time.

Sandy Creek Bridge

The preferred location for the new Sandy Creek Bridge is 20 m upstream of the crossing to avoid the OFC. Further discussions with AAPA are being undertaken to determine whether realignment upstream into an Avoidance Area is acceptable.

Passing lanes

The passing lane sites (Sites 1 and 7) have been selected based on the combination of a number of features, especially:

- general absence of geological and geomorphologic constraints, such as hills, escarpments and flood plains
- absence of hydrological constraints
- likely absence of environmental, cultural and heritage constraints
- overall safety considerations for use as a passing lane, primarily owing to good line of sight distances associated with relatively flat, straight stretches of road.

Road strengthening and widening

As a result of past flooding and saturation, about 15.5 km of the Highway within the project area requires strengthening and widening. All of these works will be undertaken in the existing disturbance corridor of the Highway. These works are part of normal road maintenance activities, although they will be more extensive than usual. No additional impacts adjacent to the Highway will result from these works. However, additional quantities of gravel will be required for this aspect of construction.

2.4.3 Construction phases, timing and construction methods

The duration of the works is anticipated to be several years. If the PER is approved, then some activities, such as gravel extraction and stockpiling, may be able to be undertaken in 2006, with most of the work on the road and its bridges occurring over 2007 and 2008 and completion in 2009.

Specific requirements for all of the different aspects of construction under DPI contracts are well established. Examples of contract documents and Specifications are provided in Appendix B. However, it will be up to the contractor to establish which specific methods will apply to construction at specific sites.

Design phase

Detailed design and documentation of the road and bridge works will be undertaken by DPI, which will ensure that all requirements arising from the PER are addressed during the design phase.

Construction contract

A construction contractor will be selected following a formal Tender process.

DPI will prepare the Tender documentation (including RFT, Specifications and engineering drawings) to address all requirements arising from the PER, ensuring that the successful contractor is aware of all environmental requirements during the construction phase.

Construction preparation activities

Pre-construction phases will involve surveying and pegging the road and bridge worksites, including re-alignments, and delineating all avoidance areas. These will be marked on construction drawings and subsequently in the field. The contractor will establish site offices and accommodation areas during the phase.

Road construction

Construction will largely be conducted during the dry season when there are a minimum of delays owing to flooding. Some activities, including bridge construction (above water level), may be undertaken in the wet season, if practical. To eliminate the potential for significant accelerated erosion to occur, no earthworks or vegetation clearance will be undertaken during the wet season without adequate control measures being established.

Given the size of the project and the presence of an annual wet season, it is unlikely that work at all sites will be commenced and completed within one year. Most of the works are expected to encompass two dry seasons. It is likely that the contractor would suspend works during the wet season and recommence them in the following dry season. However, if the wet season between the two dry seasons were to be a 'light' season (i.e. there was minimal rain and/or flooding), it is possible that the contractor may elect to continue working. In that case, the contractor would need to ensure that environmental management controls are sufficient to ensure compliance with the EMP.

All road and bridge construction activities and other impacts associated with construction will take place within a defined construction precinct that is agreed between DPI and the contractor undertaking the works. Each of the proposed construction sites will have a defined precinct. During roadworks there will be a requirement for turning areas to allow large road construction plant and machinery to safely execute a turn without having to 'back and fill'. These areas will be located in existing disturbed areas where possible. DPI allows for approximately one turning area per kilometre. If the contractor requires additional turning areas, these will be independently reviewed and assessed for environmental impacts under the requirements established by this PER.

Construction activities will be undertaken in the following stages, with some overlap between the stages:

- finalising the search for borrow materials (gravel and fill), followed by field geotechnical investigations of each source to ensure that the characteristics of these materials are suitable for the project. Assessment of these areas for Sacred

Sites, archaeological sites and biological issues will be undertaken before field investigations are undertaken

- drilling at each of the proposed bridge sites to obtain additional information on geotechnical conditions. These data will supplement existing geotechnical information held by DPI and will be used to confirm the suitability of the foundations for each of the proposed new bridges
- vegetation clearing plus initial development of alternative habitat sites, fencing of revegetation areas and weeds management
- installation of temporary drainage management and control works, structures and devices
- survey to establish surface levels, including cut and fill activities
- installation or upgrade of permanent drainage structures, such as culverts
- construction of earthworks for the new approach roads for the realigned sections into the new bridge sites
- construction of earthworks for the sections of raised Highway and passing lanes.
- placement and compaction of a gravel pavement
- placing a bitumen spray seal on the surface of the road pavement
- installation of road furniture, such as guard rails, guide posts and road signs, plus line marking
- final rehabilitation and stabilisation of cleared surfaces and areas including borrow areas
- decommissioning, demolition and removal of the old bridges and rehabilitation of the old road surfaces and bridge areas
- post-construction environmental monitoring and remediation.

Bridge construction

Bridge construction commences with construction of the foundations (described in more detail later in this section), followed by construction of the upper part (or super-structure) of the bridge. The sequence of activities for the latter is:

- pile caps of reinforced concrete are built on top of the foundation
- piers are built from the pile cap to a cross-head
- beams are placed on top of the cross-head
- the bridge deck is constructed on top of the beams. Sometimes, the type of beam built may mean that this step (of building a separate deck) is not required
- kerbs are added, then the bridge rails are constructed above the kerbs. The approach guard rails are attached to the ends of the kerb
- as required, a surfacing, usually asphalt, is applied to the top of the bridge deck.

However, the key construction component for the bridges will be establishing a solid foundation for the bridge structures. Three options are potentially applicable for footing design and these are discussed here.

Spread footings

Spread footings are used when there is sound rock at or near the surface. The rock is trimmed to establish horizontal surfaces on which a reinforced concrete slab is placed (as a concrete pour). The reinforced concrete is keyed into the rock to provide horizontal restraint. The bridge piers are then established in these slab foundations using reinforced concrete.

The site conditions at the Victoria River and Joe Creek are suited to this type of foundation. Unlike pile driving, there is no heavy vibration associated with this type of foundation. Noise and vibration likely to occur during construction of the foundations will be from the removal of rock by jackhammers to produce the flat horizontal base.

Bored piles

Bored piles are used when the rock to be used as the base for the bridge foundation is covered by surface soil. In this case, a hole is bored into the earth until solid rock is encountered, with the earth being excavated while the hole is bored. The rock is then excavated to create a 'socket' that forms the base of the pile and the hole is filled with reinforcing steel and concrete. Often a pile cap of reinforced concrete is poured at or near the surface, above which the bridge piers are then added.

This type of foundation is potentially applicable at Lost and Sandy creeks.

Driven piles

These are either steel or pre-cast concrete piles that are driven into the softer earth by ramming with a heavy weight, similar to hammering a nail into timber.

This type of pile is used when there is no rock foundation in the area, as may occur in river flats with deep areas of sand, silt, clay and gravel. Because of the geotechnical conditions at Victoria River, Joe, Lost and Sandy creeks, it is unlikely that driven piles will be used.

2.4.4 Construction materials and equipment

Construction materials and equipment will be provided by the contractor. It is expected that a range of machinery typical of large-scale earthmoving and roadworks will be used, including various capacity trucks (both single units and road trains), bulldozers, excavators, backhoes, water trucks, compressors, front-end loaders, graders, rollers and smaller items of plant to suit specific jobs.

Bridge works will require the use of large cranes. On-site concrete batching plants will be used, and concrete agitator trucks will transport the concrete from the batch plant to the worksites. Welding equipment and smaller cranes are likely to be used at various sites.

All materials used in the construction will be new.

2.4.5 Borrow pit and borrow areas (fill and gravel sources)

A large amount of fill and gravel material will be required for the project as a result of the road being raised above its current level in six areas, namely:

- Site 2 (Victoria River) to be raised approximately 7.0 m above the existing bridge
- Site 3 to be raised approximately 3.9 m above the existing pavement
- Site 4 to be raised approximately 2.1 m above the existing pavement
- Site 5 (Joe Creek) to be raised approximately 2.0 m above the existing bridge
- Site 6 (Lost Creek) to be raised approximately 7.0 m above the existing bridge
- Site 8 (Sandy Creek) to be raised approximately 1.9 m above the existing bridge.

Sites 1 and 7 are passing lanes and the road will not be raised at these locations. However, additional fill and gravel will be required for each of the new lanes.

Road rehabilitation and widening will not involve raising the road surface. However, additional gravel will be required for the works.

DPI proposes that the contractor source fill and gravel material from existing and new sites in the project area. Two major potential sources of gravel are under consideration for this project, either a terrestrial source or from adjacent to the Victoria River. All sites are located on privately owned land and are not located in the Gregory National Park.

Details of these potential sites are outlined by Campbell Project Managers Pty Ltd (CPM, 2005). Access, environmental and heritage matters will continue to be defined by ongoing consultation with specific groups, especially AAPA, the NLC, the Traditional Owners and Gregory National Park management staff.

The decision on which areas will be nominated for use is an iterative one, as explained below.

Firstly, the possible sources need to be identified. AAPA inspections will than be undertaken and clearances obtained for specific areas. Approval to access pits is required from the NLC if the pits are located on Aboriginal owned land. Only after approval can testing of the material be carried out. If the testing shows that the material is unsuitable in quality and/or quantity, replacement or additional pit sites must be found and the process of obtaining heritage and environmental clearances repeated.

At the time of preparation of the PER several important areas of possible fill and gravel material had either not been assessed or cleared by the AAPA or were rejected for use owing to their proximity to Sacred Sites. Consequently the search, clearance and testing process has started again and is continuing.

Gravel

In this proposal, the term ‘gravel’ is applied to a mixture of coarse particles, sand and fine binder (clay and silt). Gravel is used in the upper-most layers of the road and provides the strength to carry the traffic loads.

An estimated 30,000 m^3 of gravel is required for the works associated with raising road levels for flood protection. However, up to 80,000 m^3 may be required if the scope of the construction contract is expanded to include pavement rehabilitation between Ch 186 km to Ch 220 km. The 30,000 m^3 of gravel will be required within two years of commencement of construction. The larger quantity of gravel (an additional 50,000 m^3) will be required over a longer period of time, probably during the next two to 10 years. This would coincide with the provision of funding to reconstruct and strengthen sections of deformed pavement over this longer period of time.

Detailed searches for gravel sources have been conducted along the Victoria Highway over the last 30 years by DPI and others. These searches were aimed at locating natural gravel deposits suitable for use as pavement material. The most recent investigations were conducted by CPM (2005) and RMG Geotechnical (2004).

Over the years many deposits have been identified, some of which had previously been used for road construction. Other identified potential gravel sources have been prohibited for use owing to cultural (Sacred Site presence) and environmental restrictions (they occur within the Gregory National Park). Sources of suitable material close to the proposed works are now mostly depleted, excluded for Aboriginal cultural reasons, or excluded or undesirable for environmental reasons.

A summary of known gravel and rock sources that have been considered as a source of pavement construction materials is shown in Table 2.2:

Table 2.2 Potential sources of gravel and rock for pavement construction

Area No.	Location	Material type	Advantages	Constraints
1	Victoria River channel bed deposits, adjacent to Ch 203 (RG2), 215 (RG3) and 218 (RG7) Potential source for this proposal	Mixture of boulders, cobbles, gravel and sand; needs a fine grained binder to hold it together	Close to job site. Material can be easily obtained from the large point bar deposits in the river. Likely to cause only minimal environmental effects as it will be properly managed during the dry season	Extraction needs to be carefully planned and executed to avoid downstream bed and bank erosion and preserve the existing ecosystem. Material needs to be crushed and a low plasticity clay binder added. Higher processing cost
2	Adjacent to Ch 194 to 218 km Potential source for this proposal	Loam for blending with the crushed river gravel	Close to job site. Material can be easily won. Likely to cause only minimal environmental effects	Need to avoid heritage or environmentally sensitive areas
3	Areas 20, 21 and 22 Areas are adjacent to Ch 218, 243 and 215 km respectively Potential source for this proposal	Existing terrestrial deposits	Traditional gravel pits (past use sites). Good quality laterite or chert gravel within reasonable economic haul distance from the job	No major environmental constraints apparent at this stage
4	Willeroo Ch 120 km, Innesvale Ch 153 km, Stokes Range Ch 218 km	Tabletop plateaux — shallow lateritic gravel	Fair to good quality gravel. Relatively straightforward extraction	Useable gravel layer is shallow; large areas need to be disturbed; the plateaux appear to be environmentally sensitive areas. All of the Coolibah plateau is an AAPA

Area No.	Location	Material type	Advantages	Constraints
				Avoidance Area and cannot be used
5	Adjacent to Ch 240 to 270 km, RHS	Chert gravel	Good quality gravel with proven track record. Not too far from job site.	High plasticity can be a problem. This can be rectified by mixing with river gravel.
6	Adjacent to Ch 300 to 340 km	Palaeo-alluvial gravel deposits in terrestrial areas	Good quality material; traditional gravel extraction methods can be used. Potentially large volumes of gravel	Haul distance >80 km from west end. Material may need crushing of oversize. No major environmental constraints apparent at this stage
7	Vicinity of Limestone and Scott creeks, Ch 55 to 65 km	Laterite gravel	Good quality gravel, traditional gravel extraction methods can be used.	Haul distance >120 km. No major environmental constraints apparent at this stage
8	Existing old quarry, Ch 127 km	Hard basalt rock - would need to be drilled, blasted and crushed to produce fine crushed road base	Small established quarry area. Haul distance 50 km to east end. Unlikely to be significant environmental constraints	Quarry is quite close to the road. Basalt has high secondary mineral content and is subject to breakdown. Cost to produce crushed road base is high, with high set-up costs
9	Existing old quarry, adjacent to Ch 260 km	Hard limestone rock; would need to be drilled, blasted and crushed to produce fine crushed road base	Small established quarry area, haul distance approximately 40 km to west end, unlikely to be significant environmental constraints	No major environmental constraints apparent at this stage. Cost to produce crushed road base is high, with high set-up costs
10	Katherine, commercial quarry supplier	Crushed limestone road base from an existing supplier	Material quality and quantities are known, no set-up costs, less risk, no environmental issues	High cost to purchase and haul to the job site. Haul distance 185 km to east end
11	Kununurra – commercial quarry supplier	Crushed quartzite road base from an existing supplier	Material quality and quantities are known, no set up costs, less risk, no environmental issues	High cost to purchase and haul to the job site. Haul distance 360 km to west end

Tabletop plateaux

Gravel for road construction has previously been extracted from the top of tabletop plateaux that occur in this section of the Victoria River region, such as Willeroo Plateau and Innesvale Plateau. All sites have steep side-slopes with relatively flat tops. Skeletal soils occur on the tops of these plateaux and it is this layer that has previously been extracted and used for pavement construction. The gravel layer on these plateaux is shallow, with a useable gravel depth of only 0.5 m to 0.8 m thick. Consequently large areas of open eucalypt woodlands would need to be cleared to obtain sufficient quantities of gravel.

Stokes Range also contains a large series of plateaux with natural gravel deposits. It is located adjacent to the western end of the proposed works, south of the Victoria Highway and has not been used previously for gravel extraction.

Gravel sources still remain on all plateaux. However, it is not proposed to extract gravel from Willeroo and Innesvale plateaux and Stokes Range because of the location of Sacred Sites, the environmentally sensitive nature of the tabletops and the potential for accelerated soil erosion.

Proposed sources of gravel

Gravel is used in the upper most layers of the road and provides the strength to carry the traffic loads. The bituminous wearing surface is placed directly on the gravel layer. The parameters that are specified for the gravel material are particularly important, as the material must be able to be compacted to a high degree in order to provide the necessary strength in the road.

In December 2004 discussions were held with representatives for the Wanimyn People, who had a commercial joint venture proposal to produce crushed rock pavement material from a riverbed deposit on the Victoria River (site RG3). They intended to supply this material to the Bradshaw Field Training Area project being developed by the Department of Defence north of Timber Creek. The joint venture was also keen to supply material to DPI for the Victoria Highway project. The material would be extracted from the riverbed deposit at site RG3. Subsequent geotechnical and environmental investigations were undertaken on the gravel deposit as a possible source for road pavement material.

A recent search for potential gravel sources by CPM (2005) was based on an aerial survey to enable a detailed visual assessment of existing and potential new sources of gravel within reasonable haul distance of the proposed works. A thorough search was conducted of adjoining areas. CPM (2005) states:

> A helicopter traverse of the area up to 15 km north and south of the highway revealed no new additional potential deposits of material. The majority of the existing deposits were established prior to the declaration of the Gregory National Park; these deposits are now considered as unsuitable for environmental reasons. Three of the existing deposits outside the National Park have potential for extension, but will not yield sufficient quantity (i.e. 80,000 m^3 *in situ* of gravel) for the project. Three sites within the Victoria River may be suitable for crushing and blending with loam to produce road base. These channel bed deposits are extensive and have the potential to produce a sufficient quantity for pavement materials.

The three proposed existing gravel deposits outside of the Gregory National Park are as follows:

- Site 20—Ch 218.1 km, offset 11.5 km left (via link road opposite Fitzroy Station)
- Site 21—Ch 243.46 km, offset 0.35 km right (via a link road opposite Coolibah Station)
- Site 22 Ch 215.19 km, offset 4.35 km (via a link road opposite Coolibah Station).

The three gravel sites originally proposed adjacent to the Victoria River on privately owned land are as follows:

- Site RG 2—Ch 202.89 km, offset 0.35 km right (via a link road from Victoria Highway)

- Site RG 3—Ch 215.09 km, offset 5.0 km right (via Coolibah Station access road)
- Site RG 7—Ch 218.09 km, offset 4.0 km right (via Fitzroy Station access road).

Five locations were originally selected as sources of soil for blending with the crushed river gravel and sand:

- Site RG7—Ch 218.09 km, offset 4.0 km right (via Fitzroy Station access road)
- Site 25—Ch 215.09 km, offset 4.0 km right (via Coolibah Station access road)
- Site RG3—Ch 215.09 km, offset 5.0 km right (via Coolibah Station access road and link road)
- Site RG2—Ch 202.89 km, offset 0.35 km right (via a link road from Victoria Highway)
- Site 24—Ch 194.10 km, offset 1.0 km left (via Victoria River Inn rubbish dump access road).

An application for an Authority Certificate to allow extraction of material from four of these 11 areas was lodged with the AAPA. The outcome of consultations with Traditional Owners in relation to clearances for these potential extraction areas indicated that many of these sites could not be used due to the presence of Sacred Sites.

Details of the consultations and outcomes to date are discussed in Section 4.11. Site RG3 and Sites 20, 21 and 22 are likely to be clear of Sacred Sites and available for use.

Further field reviews of the region were undertaken by DPI in March 2006 with a Traditional Owner. This resulted in three general areas being defined in the vicinity of Sandy Creek and two areas in the vicinity of Skull Creek. Additional information about the location of specific borrow areas within these localities will be available on the conclusion of current AAPA and NLC consultations with Traditional Owner representatives. This information will be reported to the EPA at a later stage.

There is an Aboriginal living area at Fitzroy Station within the general vicinity of the Victoria Highway project. This area will not be impacted by the gravel extraction sites.

The amount of area involved in gravel extraction, processing and stockpiling is estimated to be 10 ha.

Fill

Fill is soil and rock material used to build up the base or formation of a construction site. The fill materials need only to be of medium quality, therefore the parameters specified for its use are more generous than those specified for gravel material used in the top layer of the road. In addition, a relatively small amount of soil will be required for blending with gravel. The exact amount of fill required cannot be determined until the detailed design of all construction sites is completed. However, the fill requirements for the project are estimated to be in the order of 430,000 m^3.

This material was proposed to be extracted from one location (an area of about 25–30 ha) from a borrow pit south of the Victoria River Inn to a nominal depth of 1.5–2.0 m. The proposed borrow pit is located on NT Portion 5458 Freehold, which is owned by M & D Cattle Contracting. This site is no longer available owing to the proximity of Sacred Sites.

It is likely that sources of suitable fill will be available from the vicinity of Sandy Creek and Skull Creek, as referred to in the previous section. A maximum area of 30– ha will be involved.

Operation of borrow areas (gravel and fill)

It is currently not known which of the potential gravel sources will be suitable and available for use. The following discussion relates to the likely methods of extraction and processing of gravel from the river gravel site (RG3) and terrestrial borrow areas. DPI Specifications, which are best practice requirements, must be followed by the contractor using these sites.

Gravel

Extraction and processing of material to be used for gravel from the Victoria River at RG3 (if this site is used) will probably include the following activities:

- construction of a controlled access track to the site, including some clearing of trees and vegetation to enable construction. The track would be of minimum width, sufficient to allow trucks to access the site; that is, in the order of 5 m wide
- removal of the uppermost layer of the raised gravel and sand channel bed deposits in the Victoria River
- transport of the material to a mobile screening and crushing plant
- screening and crushing of materials
- stockpiling the sorted materials according to their size and/or quality
- stockpiling locally imported loam-type material to blend with the crushed product
- blending of the various stockpiles to produce gavel material of the required quality
- transport of stockpiled material by truck to the worksite.

The main stockpiling and blending area is likely to be located just north of the Victoria Highway near the access road to Coolibah Station.

Similar processes will be applied to terrestrial gravel sources (if available and used). The process of construction and operation at these sites is likely to involve:

- clearance of vegetation from the site and stockpiling to one side for re-spreading over the site during later rehabilitation
- removal of topsoil to a minimum of 100 mm deep and stockpiling to one side for re-spreading over the site during later rehabilitation
- excavation of material of the required quality. (This will be pushed up into heaps or stockpiles in the borrow pit areas)

- loading and carting of stockpiled material directly to the worksite and placement on the construction site or surface
- ripping or scarifying of the borrow site after use has been completed, and the spreading of stockpiled topsoil and cleared vegetation material over the area to promote regrowth of native plants.

Fill

Fill material will be removed directly from terrestrial borrow areas and transported directly to the work area in which it is required. A small amount of stockpiling will be required to provide a source of fill for blending with gravel.

The steps involved in extracting fill material will include the following:

- vegetation will be cleared from the site and stockpiled at one side for re-spreading over the site during rehabilitation
- the topsoil will be removed to a minimum of 100 mm deep, and stockpiled at one side for re-spreading over the site during rehabilitation
- fill material of the required quality will be excavated and pushed up into heaps or stockpiles in the borrow pit areas
- stockpiled fill material will be loaded into trucks, carted directly to the worksite and placed appropriately
- when the borrow pit is finished with, the area will be ripped or scarified and the stockpiled topsoil and cleared vegetation material will be spread over the area to promote regrowth of native plants.

The operation, management and rehabilitation of all borrow areas will be in accordance with the DPI Specification 'Miscellaneous Provisions', a copy of which is included in Appendix B.

2.4.6 Water sources

During the roadworks programme, it is estimated that 200 kL/d will be required for all aspects of construction and domestic use. The likely duration of this demand is seven days/week for up to ten months/year for two dry seasons.

In the dry season, surface water resources are limited in the Victoria River area. Many of the smaller creeks dry up completely or only retain small remnant pools. Larger yields of water are only available from the Victoria River or from groundwater.

The contractor will obtain the construction water requirements from existing or new bores, with extraction from the Victoria River only when the river has sufficient capacity. Management of water in the NT is through the Natural Resources group of NRETA, which usually allows use of up to 20% of flowing surface water. No water will be sourced from tributaries of the Victoria River or remnant pools. The contractor's use of water will be regulated and managed by the Natural Resources group of NRETA.

2.4.7 Accommodation, work camps and plant and equipment depots

The most likely preferred location for the construction camp, including accommodation for the construction workforce and a depot for plant, equipment and materials will be at the Victoria River Inn precinct. This is likely to be the focal point for the contractor since it is close to existing infrastructure and easily identified for the delivery of goods and materials. The establishment of these facilities would probably involve erection of transportable buildings and the establishment of minor infrastructure, such as fenced and locked compounds. It is expected that any small field depots will be established within the construction area footprint approved by DPI.

Alternatively, the contractor may elect to establish a work camp away from the Inn. Should this be the preferred option, then the contractor will be responsible for obtaining all relevant approvals and clearances, payment of any fees associated with the site, and for rehabilitation of the site. It is expected that the NTWPS will not approve a work camp within the Gregory National Park.

Lay-down, stockpile and storage areas

It is likely that the main storage compound for the project will be in the vicinity of the Victoria Highway Inn precinct. Most equipment and materials will be transported to this site and stored until required. This would include all large items such as bridge materials and raw materials for a temporary concrete batching plant.

Based on experience with similar projects, smaller items such as guard rails and posts are likely to be delivered and stockpiled in a temporary lay-down area close to the site where they will be used. These areas will be in the construction precinct controlled by the contractor.

Construction precincts, access roads and detours

There are eight construction sites over 16.6 km of the 34 km of road involved in this project. Once a contractor has been appointed to undertake the works, then all construction areas (precincts) will be that contractor's contractual responsibility. Under DPI's requirements for its contracts, it is mandatory that all methods proposed by the contractor must be provided to DPI for review and final, formal agreement or approval by DPI before construction commences.

2.4.8 Timing and works programme

All major construction work must be undertaken during the dry season to ensure that:

- progress is not interrupted owing to rain and wet soils
- there is adequate access into and out of the area for construction activities, personnel and equipment (i.e. no road closures owing to flooding)
- the potential for accelerated erosion and adverse environment impacts are minimised in areas of cleared vegetation, before rehabilitation and stabilisation arecompleted
- a wet, muddy, dangerous and possibly impassable road is not left for road users to try to negotiate.

Some activities that can be undertaken during the wet season include aspects of bridge construction, such as any associated with the upper levels of the bridge—pouring of the deck slab, installation of guard rail and bridge rail and similar. Major soil disturbance or earthwork activities will not be conducted during the wet season. The main construction activities (roadworks and bridges) are estimated to commence in 2007 and be finalised in 2009.

2.5 OTHER MATTERS RELATED TO CONSTRUCTION

2.5.1 Wastes

The contractor will be required to provide adequate and approved sewage treatment plant (STP) facilities at the main work campsite. This could involve connecting to the existing STP at the Victoria River Inn or establishing a portable STP. Worksite sewage facilities will be chemical toilets or similar (e.g. a *Portaloo*). All wastewater systems will comply with the NT Code of Practice for sewage and sullage systems and the requirements of the Katherine West Health Board—Environmental Health.

Construction wastes will be stockpiled and either recycled or disposed of appropriately at landfill sites according to the NT waste disposal regulations.

Domestic wastes will be disposed of daily at a landfill site.

2.5.2 Chemicals and hazardous materials, including dangerous goods

All chemicals and hazardous materials, such as petroleum products and fuels, oils and lubricants, acids, paints, thinners, solvents, gases and similar materials. will be controlled in accordance with NT legislation, Australian Standards and Material Safety Data Sheet requirements. This includes their transport, storage and use. This will be the responsibility of the contractor through a combination of its EMP, Health and Safety Plan (HSP) and Emergency Response Plan (ERP). All plans will be audited by the contractor and DPI to ensure compliance with the contractor's plan and statutory requirements.

2.5.3 Materials transport requirements

Materials could be sent from Darwin or elsewhere in Australia via the Adelaide to Darwin railway line to Katherine and transported by road transport to the construction contractor's base camp. Alternatively, road transport will supply all of the materials.

Local transport requirements will be established by the contractor to suit the requirements at each construction site.

All vehicles transporting materials, either from more distant locations to the project area or from the material stockpile sites to the worksite, will be legally registered to travel on the road network.

All load limit, load segregation and road safety requirements will apply.

2.5.4 Infrastructure requirements

The contractor will be required to establish or provide all infrastructure requirements specifically associated with the project. Establishing a base at the Victoria Highway Inn precinct may allow the contractor to share some of the existing infrastructure.

2.5.5 Potable water

Potable water will be sourced from existing or new bores or via a water sharing arrangement with the proprietors of the Victoria River Inn.

2.5.6 Traffic management

DPI has a Specification for management of traffic during roadwork. Compliance with this Specification is mandatory for all contractors undertaking works under a DPI contract or on its behalf. A copy of the complete Specification is provided in Appendix B. The requirements of the Specification are based on a series of Australian Standards and guideline publications, especially AS 1742.3 Manual of uniform traffic control devices—Traffic control devices for works on roads, and AS/NZS 3845 Road safety barrier systems.

The aim of traffic management is always to minimise obstruction and inconvenience to the public and to provide for the safe conduct of traffic through or around the works, 24 hours a day.

The contractor will establish a Traffic Management Plan (TMP), which must be designed, installed, modified and supervised by people who have passed a nationally accredited course for Traffic Management at Worksites.

The TMP must address all of the issues relevant to traffic conditions at the worksite. DPI reserves the right to request modifications to the plan during the works.

Examples of items to be addressed include temporary work zone speed limit, works being carried out 'under traffic', detours and side-tracks, night work and worksite illumination, separation of traffic and work areas, and advanced and ongoing warning of the works.

Separate traffic plans may be required for discrete work elements; for example, lane or road closure arrangements for each stage of a project to be carried out 'under traffic'.

The TMP will be submitted to DPI for review and acceptance prior to construction. It is mandatory that all aspects of the TMP are addressed by the contractor before construction commences. DPI reserves the right to require that the TMP is amended as necessary.

Inspecting Officers from DPI (Road Projects) will undertake random audits of traffic management at worksites as part of their duties. These audits will include assessment of the TMP in progress and observation of the routine daily tasks and record keeping for traffic control at the worksite, including modifications to the TMP.

If traffic management is not being carried out in accordance with the TMP, or the Inspecting Officer deems modifications to the TMP are necessary, the Construction Site Superintendent may arrange for corrections to be carried out immediately.

2.5.7 Emergency matters

It is a requirement under DPI contracts for the contractor to have an approved and agreed ERP that applies to all areas and elements of the project and works. This is a component of the TMP. The ERP would provide detailed information relating to the management of all emergencies and contingency plans to manage impacts. Contact details for authorities are included. Summary information about the management of emergencies is provided in the EMP in Chapter 5 and Chapter 6.

2.5.8 Rehabilitation of sites

DPI has a Specification for the rehabilitation of sites during and following roadworks. Compliance with this Specification will be mandatory for all contractors undertaking works under a DPI contract or on its behalf. A copy of the complete Specification is provided in Appendix B.

The basis of rehabilitation is a Vegetation Management Plan, which will be prepared by the contractor. Example matters considered in the Specification include clearing, penalties and compensation for excess clearing, retaining and management of environmentally sensitive areas, topsoil management, reinstatement and site cleanup.

Specific requirements will be included in the Terms and Conditions for this Contract to ensure that:

- all works are managed in accordance with the NTPWS requirements adjacent to the Gregory National Park
- environmentally and heritage sensitive sites are protected and all requisite measures are established and monitored.

Similar to other contractor requirements developed under DPI Specifications, a draft Rehabilitation Plan will be submitted to DPI for review prior to construction. This Plan includes a Vegetation Management Plan. It is mandatory that all aspects of the plans be addressed by the contractor before construction commences. DPI reserves the right to require that the plans are amended. Auditing of the plans will be undertaken by DPI.

2.5.9 Protection of Aboriginal Sacred Sites

The standard DPI contract for roadworks includes detailed and specific requirements for the protection of Sacred Sites. DPI will provide the AAPA clearance certificates to the contractor, who will be required to establish, as a component of the EMP for the project, a plan to ensure that Sacred Sites are not impacted by the work. That plan must be implemented before construction can commence. If the sites are damaged during construction, all construction work in the vicinity must stop, and the area be inspected by AAPA and the Traditional Owners. AAPA will determine what restoration work (if any) must occur before construction work can recommence, and will also consider if the contractor is to be charged under the *Northern Territory* Aboriginal Sacred Sites Act. DPI's Sacred Site protection requirements are provided in Appendix B.

2.5.10 Employment of Aborigines

The Northern Territory Government is committed to advancing the well being of Aboriginal people. DPI supports this and has specific claus es in its Specifications that require the contractor to employ and train local Aboriginal people.

The clause requires that a minimum of 15% of the labour hours in the contract are taken by Aboriginal people, and that 50% of those people must undergo formal on-the-job training to enhance their future employment opportunities.

DPI's Aboriginal employment and training requirements are provided in Appendix B.

2.6 EMPLOYMENT AND BUSINESS OPPORTUNITIES

The Contract for the works will be a detailed design and document process undertaken by DPI followed by a construction Tender and Contract. The contractor appointed to undertake the works will be responsible for ensuring that maximum local employment and business opportunities are established. It is possible that the successful company or consortium will be NT-based. A DPI Specification applies to this matter, especially in relation to the employment of a percentage of the labour force from the local community.

Supply of specialist and skilled labour will be dictated by the successful contractor's negotiations with others.

Supply of materials will be sourced according to the successful contractor's suppliers, some of which will be from within the NT and some from outside the Territory.

Local employment opportunities are emphasised in the Terms and Conditions of the DPI contract. Owing to the isolated area and lack of large communities, it is expected that the district would be able to provide only limited resources. The obvious opportunities are associated with providing equipment and labour for aspects of the construction workforce. For example, specific sub-contracts could be established for activities such as earthmoving and stockpiling, fencing, control of pest species, land management activities and some specialist tasks, and 'locals' could be employed as part of the overall construction workforce.

An additional source of employment will be the increased opportunities associated with catering for and management of the workforce. This could be associated with the Victoria Highway Inn or the construction camp.

The contractor will be required to submit an Industry Participation Plan with the Tender. This plan must show how the contractor will engage with local suppliers during the project.

The requirement for an Industry Participation Plan is shown in Appendix B.

2.7 POLICIES AND RESOURCES

DPI has a strong commitment to sustainable development and sound environmental management within its department and as a component of its projects. The proponent and the contractor undertaking construction will be required to follow the commitments made in PER and the requirements of the NT Minister's Assessment Report. Statutory and contractual requirements applicable to the proposal and the works are discussed in Section 2.2.

The DPI environmental policy for roads is a component of its strategic statement, 'Roads and the Environment—A Strategy for the Sustainable Development, Use and Maintenance of Northern Territory Roads' (DIPE 2004), which is available from the DPI website:

http://www.dpi.nt.gov/whatwedo/mvr/rgpolicies/pdf/roads_environment.pdf

The key elements of DPI's environmental policy for roads are (DIPE 2004, p.13):

The Department will demonstrate due diligence in the provision of its road network services and will strive for continual improvement by:

- ensuring compliance with relevant environmental legislation and regulations
- setting appropriate environmental management strategies
- developing and implementing sound environmental policies and practices
- minimising the environmental impacts of its activities
- providing our employees with the skills to achieve environmental outcomes
- improving the way we manage our contractors and suppliers
- involving the community in planning and implementation issues
- reporting publicly on environmental performance.