10 MOOLOOLAH RIVER TO MAROOCHY CENTRE

10.1 Introduction

This Chapter considers the environmental and social effects of the proposed scheme between the Mooloolah River and the Maroochy Centre. This section of the route is approximately 5km in length. In the section between the end of the MMTC and Plaza Parade in Maroochydore, the alignment traverses along the Sunshine Motorway. Within the Motorway corridor there are three route options to be considered. These are shown on Figures 3.4.2b, 3.4.2c & 3.4.3b and include a western, central and eastern motorway option. This chapter of the report assesses each of these route options and in section 10.12, the preferred option is presented.

Two stations are proposed in this section. The Mooloolaba station and associated car parking is proposed in part on the Buderim Transfer Station located west of the Sunshine Motorway on the south eastern corner of Elizabeth Daniel's Park. This station would largely cater for longer distance commuters and potentially some travel associated with the local schools and the expanding TAFE complex. The Maroochydore station is proposed just south of Plaza Parade and adjoining the proposed new Southern Access Link road.

Significance criteria have been applied to subject areas within this Chapter and used to describe the assessment of impacts. For details relating to the derivation of these criteria the reader is referred to Part A, section 4.6.

10.2 Land Use Planning

In the vicinity of the crossing of the corridor across the Mooloolah River, it traverses areas of Open Space designations reflecting their location adjoining the river; and on the north-western side of the river, impacts on land zoned and developed for low density residential purposes in the Marra Court locality.

North from this point, the route options are contained within the Sunshine Motorway reserve, which is adjoining by predominantly open space and community type uses (High School, TAFE, landfill, etc) on the western side and residential development on the eastern side in the Mooloolaba area.

The route option to the west of the corridor provides opportunities for a station which directly serves some of these community uses; while the eastern side would require careful consideration of the relationship to adjoining residential areas.

North of Mooloolabah Road, land use to the west of the Sunshine Motorway is dominated by the Buderim Gardens Retirement Village and a range of commercial, industry and community uses; whilst to the north-east a range of residential, industry and business uses are located.

In the area between the Sunshine Motorway and Maroochydore town centre, broadacre properties dominate, with several parcels subject to initial stages of development proposals.

The most recent planning for this area is contained within the draft Maroochy Planning Scheme currently on public display. This envisages a mixed housing area west of Dalton Drive; a mixed use commercial and residential area to the west of this mixed housing; and a cultural and office precinct west of the proposed station location in this area.

The area east of the station is planned for town centre frame uses which support the core activities within the traditional town centre area and the Sunshine Plaza shopping centre to the north-east.

There is significant potential for the establishment of major transit supportive development at this locality, to support existing higher order urban facilities and the progressive planned development of the Maroochydore centre as a Key Regional Centre under the SEQ 2001 Regional Framework for Growth Management. This would include opportunities to integrate the proposed route and station development within other higher order uses in this locality.

With respect to land use planning, the western option is preferred for a variety of reasons. It would provide better accessibility to the station site from the rail line and it provides greater separation between the rail facility and residential properties close to the motorway at Marra Court and Amarina Avenue which provides noise and general amenity benefits.

10.3 Local Transport Issues

The Mooloolaba station (see Figure 10.3) is proposed to be located in the south eastern corner of Elizabeth Daniel’s park which is in part currently being used as a land fill site (the Buderim Transfer Station). The transfer station and the various sporting facilities to the north of the park currently gain access through the new signalised intersection of Syd Lingard Drive with Mooloolaba Road. This single access point will not adequately connect the proposed station site with the local Mooloolaba area. The reason for this is two-fold. Firstly, because of existing congestion at the Buderim interchange on the Sunshine Motorway, and secondly because of the lack of collector and distributor roads in this part of Mooloolaba.
The Sunshine Motorway operates well as a north south arterial link but its construction severed various other opportunities for lower order link roads through and across Mooloolaba. The Mooloolaba station is the proposed location of a major commuter car park which therefore must have good accessibility to and from the Sunshine Motorway.

A number of alternative access options to serve this proposed station were developed and each can be expected to have different impacts on the local area. The proposed access arrangement illustrated in Figure 10.3 is considered to be worthy of more detailed investigation with Maroochy Shire and the DMR as it could also enhance access to the proposed new TAFE facilities currently only served by Lady Musgrave Drive. Resolution of these issues is beyond the scope of this report and requires discussions between Council, DMR and the adjoining land holders.

On the other hand, major car parking facilities should not be provided at Maroochydore station because of its function as the Key Regional Centre. This centre will attract a large number of trips and a large proportion of these trips should be encouraged to travel by public transport services, walking and cycling. Local commuters to other areas including Caloundra and Brisbane should therefore be directed to the Mooloolaba park and ride station off the Sunshine Motorway and kept away from the increasingly busy ‘downtown area’.

However, the demand for parking will often out strip potential supply, therefore good feeder bus services will need to be provided to and from the station to neighbouring population areas. Additionally, pedestrian and cycle access networks must be provided to this station and Council is strongly urged to update its bicycle network strategy to ensure provision is made to encourage cycle trips to the facility.

Certain major attractions are in close vicinity to this site including primary schools, secondary schools, the TAFE centre plus various other community facilities. This station is therefore likely to be both a significant attractor and generator of trips using the facility.

An assessment of the line demand at Mooloolaba station indicates that approximately 20% of users are destined for Caloundra, 22% for Beerwah/ Landsborough, 7% for Cooboolture and 16% for southern destinations including Brisbane. All other destinations make up the remainder. The significant proportion of trips to the southern areas in comparison with Maroochydore station, indicates that the majority of commuter trips are attracted to the park and ride facility at Mooloolaba.

Maroochydore station is the major end destination for the CAMCOS corridor. The designation of Maroochydore as the key regional centre means that the majority of users are likely to travel to Maroochydore for employment, shopping, recreational and other purposes.

An assessment of the line demand at Maroochydore station indicates that approximately 41% of users are destined for Caloundra, 35% for Kawana, 12% for Parrearra, 3% for Beerwah/ Landsborough and 5% for southern destinations including Brisbane. All other destinations make up the remainder.

Resolution of the access to the proposed Maroochydore station is reliant upon a number of factors, including the timing and form of the Southern Access Link road, and the timing and intensity of surrounding commercial development. It is also reliant upon the rate of traffic growth and the diversion to the SAL when it is eventually opened to traffic.

In its ultimate form as a rail station, pedestrian and vehicular access is expected to be integrated with the proposed new and relocated interchange. This facility will need careful planning and design so as to ensure it complements the ‘city image’ and provides a high level of service to users. It is essential that excellent transit facilities are provided for the large number of bus services. In addition, pedestrian walkways and cycle links to the central business area and the beach must be provided.

The impacts of construction traffic will need careful planning in and around the Mooloolah interchange where CAMCOS crosses the Sunshine Motorway. Local traffic management plans will need to be developed and approved by Maroochy Shire Council and Main Roads.

Similarly, careful planning for staged construction for the section north from Mooloolah station to Maroochydore will be essential to minimise local traffic delays. It is not possible to be more specific at this stage as there are many other significant changes that will result from other road network upgrades at the SAL and the Mooloolah interchange.

10.4 Residential, Business and Community Issues

10.4.1 Future Without Scheme

The Sunshine Motorway is likely to be upgraded to three lanes in each direction and 1 HOV lane in each direction in the future. This would also entail an upgrading of the Mooloolah River Interchange. Future development patterns on the Sunshine Coast and the support given to public transport through its usage may delay some of these works in the medium term and possibly negate the need for even further expansion of the road network in the longer term.
The broadacre property between the Sunshine Motorway and the centre of Maroochydore is currently under investigation for major urban developments, possibly including a cultural centre, sporting facilities, residential and commercial land uses.

### 10.4.2 Effects of the Scheme

This section focuses on the direct and indirect impacts on property, community facilities, access etc. The effects on residential amenity (including noise and visual impacts) have been assessed elsewhere in this chapter and have not been repeated here.

**Table 10.4.2a** summarises the numbers of properties affected by each of the options. As the table shows, the western option has the least impact on properties and individual landowners. The details of these property effects for the western option are provided in **Table 10.4.2b** which also shows the proportion of those properties likely to be affected by the scheme. **Figure 5.5.1e** provides the reader with the location of those affected properties.

<table>
<thead>
<tr>
<th>No.</th>
<th>Type</th>
<th>Category</th>
<th>Description</th>
<th>Total Area (ha)</th>
<th>% Affected</th>
<th>Affected by</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>C</td>
<td>No existing buildings or structures, land take only</td>
<td>Kawana</td>
<td>54.1</td>
<td>1.2%</td>
<td>Corridor</td>
</tr>
<tr>
<td>2</td>
<td>C</td>
<td>No existing buildings or structures, land take only</td>
<td>Kawana</td>
<td>1.5</td>
<td>16.9%</td>
<td>Corridor</td>
</tr>
<tr>
<td>3</td>
<td>C</td>
<td>No existing buildings or structures, land take only</td>
<td>Kawana</td>
<td>4.1</td>
<td>7%</td>
<td>Corridor</td>
</tr>
<tr>
<td>4</td>
<td>C</td>
<td>No existing buildings or structures, land take only</td>
<td>Kawana</td>
<td>20.9</td>
<td>3.1%</td>
<td>Corridor</td>
</tr>
<tr>
<td>5</td>
<td>G</td>
<td>Reserve, developed or leased, land take only</td>
<td>Mountain Creek High School</td>
<td>14.75</td>
<td>0.3%</td>
<td>Corridor</td>
</tr>
<tr>
<td>6</td>
<td>G</td>
<td>Reserve, developed or leased, land take only</td>
<td>MSC/ Lady Musgrave Park</td>
<td>4.3</td>
<td>0.2%</td>
<td>Corridor</td>
</tr>
<tr>
<td>7</td>
<td>G</td>
<td>Reserve, developed or leased, land take only</td>
<td>Landfill site</td>
<td>33.7</td>
<td>10%</td>
<td>Corridor</td>
</tr>
<tr>
<td>8</td>
<td>C</td>
<td>Existing business, land take only</td>
<td>Chaplin Place, driveway/easement</td>
<td>0.1</td>
<td>0.3%</td>
<td>Corridor</td>
</tr>
<tr>
<td>9</td>
<td>C</td>
<td>Existing business, land take only</td>
<td>BBC Hardware</td>
<td>0.9</td>
<td>4.2%</td>
<td>Corridor</td>
</tr>
<tr>
<td>10</td>
<td>C</td>
<td>Existing business, land take only</td>
<td>Aberkade Self Storage</td>
<td>1.1</td>
<td>4.3%</td>
<td>Corridor</td>
</tr>
<tr>
<td>11</td>
<td>C</td>
<td>Existing business, land take only</td>
<td>North Coast Plumbing</td>
<td>1.0</td>
<td>6.7%</td>
<td>Corridor</td>
</tr>
<tr>
<td>12</td>
<td>C</td>
<td>Existing business, land take only</td>
<td>Driving School</td>
<td>1.1</td>
<td>6.4%</td>
<td>Corridor</td>
</tr>
<tr>
<td>13</td>
<td>C</td>
<td>Existing business, building(s) affected</td>
<td>Maroochydore Self Storage</td>
<td>1.0</td>
<td>8.2%</td>
<td>Corridor</td>
</tr>
<tr>
<td>14</td>
<td>G</td>
<td>Reserve (uncommitted, drainage or buffer)</td>
<td>Road Reserve</td>
<td>0.8</td>
<td>10.6%</td>
<td>Corridor</td>
</tr>
<tr>
<td>15</td>
<td>G</td>
<td>Reserve (conservation or open space)</td>
<td>Council Reserve</td>
<td>3.6</td>
<td>5.3%</td>
<td>Corridor</td>
</tr>
<tr>
<td>16</td>
<td>C</td>
<td>No existing buildings or structures, land take only</td>
<td>Christadales</td>
<td>25.3</td>
<td>7.6%</td>
<td>Corridor</td>
</tr>
<tr>
<td>17</td>
<td>P</td>
<td>Rural, without buildings</td>
<td>Wise</td>
<td>70.7</td>
<td>2.1%</td>
<td>Corridor</td>
</tr>
<tr>
<td>18</td>
<td>C</td>
<td>Existing business, land take only</td>
<td>Golf Course</td>
<td>39.65</td>
<td>0.1%</td>
<td>Corridor</td>
</tr>
<tr>
<td>19</td>
<td>P</td>
<td>Rural, without buildings</td>
<td>Wise</td>
<td>19.6</td>
<td>0.03%</td>
<td>Corridor</td>
</tr>
<tr>
<td>20</td>
<td>C</td>
<td>No existing buildings or structures, land take only</td>
<td>Maroochydore Central Holdings</td>
<td>0.2</td>
<td>54.4%</td>
<td>Corridor and station</td>
</tr>
<tr>
<td>21</td>
<td>C</td>
<td>No existing buildings or structures, land take only</td>
<td>Maroochydore Central Holdings</td>
<td>0.1</td>
<td>4.8%</td>
<td>Station</td>
</tr>
<tr>
<td>22</td>
<td>C</td>
<td>No existing buildings or structures, land take only</td>
<td>Maroochody</td>
<td>0.2</td>
<td>33.6%</td>
<td>Station</td>
</tr>
<tr>
<td>23</td>
<td>C</td>
<td>No existing buildings or structures, land take only</td>
<td>Maroochody Central Holdings</td>
<td>0.2</td>
<td>26.6%</td>
<td>Station</td>
</tr>
<tr>
<td>24</td>
<td>C</td>
<td>No existing buildings or structures, land take only</td>
<td>Maroochody Central Holdings</td>
<td>0.2</td>
<td>22%</td>
<td>Station</td>
</tr>
</tbody>
</table>
10.4.2.1 Community and Recreational Facilities and Severance

No community facilities would be affected by the three proposed corridor options, however, it may be necessary to provide access to the proposed Mooloolaba Station through the TAFE college, Mountain Creek High School and Lady Musgrave Park properties, adjacent to the Sunshine Motorway. No buildings would be affected. The access arrangements associated with this station are yet to be resolved with Council.

Each option would require the reconstruction of the Mooloolaba Road overpass and Sugar Road underpass. This could entail some significant disruption to local traffic during construction.

As the route departs from the Sunshine Motorway and enters into Maroochydore, land would be required from the western edge of the Horton Park Golf Course. The amount of land required is 739m² from this 39.6ha site. This small amount of land take would not affect the functioning of the golf course.

10.4.2.2 Privately Owned Residential and Commercial Properties

Four commercially owned and currently undeveloped properties would be affected in the vicinity of the Mooloolah River. These are all owned by Kawana Estates Pty Ltd. This landtake would impact on the future development potential of two of these properties.

No private residential properties would be affected by the western option. The central option would directly affect five private residential properties on Marra Court (which includes six households as one of the properties is a duplex). Marra Court is located to the south of the Mooloolah Interchange. The eastern option would directly affect two private residential properties also located on Marra Court. Another consideration in this location is the potential for indirect impacts on properties adjacent to those directly affected.

One commercial property located on the eastern side of the motorway off Sugar Road (Maroochydore Self Storage) would be directly affected by all routes. The approximate proportion of the property affected is approximately 8% of the total, however, as the storage buildings are located close to the southern boundary of the property adjacent to the motorway, the scheme would have direct impacts on them.

Five other businesses also located off Sugar Road would also be directly affected by landtake, however, in each of these cases, there are no requirements for business premises (buildings or structures) to be affected by the route.

The Christadale land would be affected as the corridor enters Maroochydore. The southwestern portion of this property would be severed, which would impact on the future development potential of this site.

Continuing north, the CAMCOS route alignment would enter Maroochydore on the eastern side of the proposed Southern Access Link Road. At this location a small amount of land take would be required from property owned by PF Wise.

A 0.2ha section of land owned by Maroochydore Central Holdings adjacent to Southern Drive, would be directly affected by the proposed station at Plaza Parade.

10.4.2.3 Government Owned or Leased Properties

Part of the landfill site located west of the Sunshine Motorway off Syd Lingard Drive would be required for the provision of Mooloolaba Station. It is understood that the life of this landfill site is limited, and the site is being investigated for other uses by Maroochy Shire Council. As stated previously, land may be required from the Mountain Creek High School site, Lady Musgrove Park and the TAFE in order to provide access to the proposed station. As these requirements are conceptual at this stage and subject to agreement with Council, it has not been possible to provide an accurate calculation of required landtake.

One additional local government owned property which is a reserve for drainage would also be affected. This land currently operates as a retention pond near Sugar Road.

10.4.3 Response

10.4.3.1 Introduction

Many of the impacts associated with acquiring land for the corridor would be deemed to have been satisfactorily mitigated through the provision of compensation.

Requests to acquire designated land under hardship can be made under the Integrated Planning Act 1997 once the Minister for Transport designates the corridor.

10.4.3.2 Community and Recreational Facilities and Severance

With respect to the Mooloolaba Road overpass and Sugar Road underpass during construction, mitigation strategies to alleviate traffic congestion could include
construction staging, side tracking and reduced traffic speeds. Other strategies could include encouraging traffic to use alternative routes for certain journeys, such as using Maroochydore Road, which is currently being duplicated.

The Golf course would need to be appropriately compensated for the loss of land on the western side of their property.

10.4.3.3 Privately Owned and Commercial Properties

As stated previously, the central and eastern options would have direct impacts on residential properties on Marra Court. Appropriate levels of compensation would need to be provided to private property owners. Depending on the option chosen in this section, it is recommended that Queensland Transport give consideration to purchasing additional properties on Marra Court if residents of adjacent properties wish to be resumed.

With respect to commercially owned properties, it is not known if the direct impacts on Maroochydore Self Storage would affect the viability of the business. Once this assessment has been undertaken appropriate levels of compensation should be provided to the owners. Similarly with respect to the remaining commercial properties that are directly affected, appropriate levels of compensation would need to be agreed.

10.4.4 Assessment

The land take requirements from Kawana Waters properties which are currently undeveloped is considered to be a minor adverse effect assuming that appropriate levels of compensation are provided.

In accordance with the significance criteria outlined in Part A, section 4.6 the effect of the western option on residential properties would be not significant whereas the central option would impose severe adverse effects on residential properties in Marra Court. The assessment of the significance of effects on residential properties with the eastern option would be major adverse. This assessment also assumes that affected landowners are appropriately compensated for loss of their properties.

The impact on Maroochydore Self Storage is considered to be moderate adverse it is anticipated that the land take required would affect the functioning of the business, but not its viability. With regard to the other six business in this location that are affected by land take (without affecting business premises) the impact of the scheme is considered to be minor adverse. This also assumes that these landowners are appropriately compensated for loss of their properties.

In the section from the Sunshine Motorway into Maroochydore, the effects on private property owners is considered to be minor adverse assuming that they are appropriately compensated for loss of their land.

The landtake from Horton Park Gold Course would not impact on the functioning of the golf course as a recreational facility and the impact is assessed as minor adverse.

10.5 Terrestrial Ecology

10.5.1 Future Without the Scheme

The following activities may occur in this section in the next 10-15 years and may or may not have an effect on the ecology of the area:

- The Kawana Waters land at Parrearra will be developed for residential property. This area has already been cleared leaving only a mangrove fringe along the river frontage.
- The Bundilla land (currently covered in mangrove and melaleuca vegetation) will be cleared and developed.
- The Sunshine Motorway will be widened to 3 lanes in each direction and one HOV lane in each direction within the next ten years. The widening will also involve a significant upgrading of the Mooloolah River interchange.
- The Southern Access Link Road will be constructed. This and associated connecting links will require the clearance of the vegetated portion of Christadales land and also part of DMRs property adjacent the motorway.
- The Christadale property will likely be developed for residential (at least in part).

10.5.2 Effects of the Scheme

10.5.2.1 Rare and Threatened Species

No rare or threatened plant species are likely to be significantly impacted by construction of this section of the railway line.

Three significant fauna species, including the Grey Goshawk (Accipiter novaehollandiae) and Powerful Owl (Ninox strenua), are known to occur within habitat types affected by this section of the railway, though it is unlikely that the development of the rail alignment, as part of the existing motorway easement, would significantly impact on either.

Vegetation clearing may affect Wallum Froglet (Crinia tinnula) though this is not considered to significantly impact on the species within the area.
10.5.2.2 Marine Plants

Mangroves associated with the Mooloolah River would need to be removed in a number of places. Some 0.9ha of mangroves would be directly affected if the eastern/central option were to be constructed (440m length in all, along the southern bank and across the top of the mid-stream island), while approximately 1.0ha would need to be cleared if the western option were to be constructed (over some 480m, along a short stretch of the southern bank, then through the centre of the mid-stream island and finally an area on the northern bank).

The western option would involve clearing of relatively disturbed mangroves on both the northern and southern banks, and would roughly bisect the relatively intact mangrove island. The central/eastern option would have an impact upon the already degraded fringe along the southern river bank, but would have minimal impact upon the mangrove island (a higher quality patch of mangroves). Therefore, the central or eastern option would be the preferred options, from a mangrove-clearing perspective.

As with previously discussed sections, the railway would be constructed on viaduct through this section, and it is therefore expected that some mangrove specimens could be retained within these areas during construction, and that others would be able to grow under the railway lines during the operation phase.

As for all marine plants, a permit would be required from the DPI for the removal/disturbance of these mangrove areas.

10.5.2.3 Riparian Vegetation

The principal riparian vegetation to be affected by this section of the route alignment is the mangroves associated with the Mooloolah River. All three options would involve disturbance of this riparian vegetation, but the western option would cause the most significant disturbance, as discussed above under “Marine Plants”. The central or eastern options are therefore preferable from a riparian vegetation perspective.

10.5.2.4 Significant Vegetation Types

The key areas of Priority 1 vegetation types in this section are associated with:

- Mooloolah River; and
- Lands within Motorway Easement.

In all, the approximate areas of each Priority 1 vegetation type which would be directly affected by each alignment option in this section are:

<table>
<thead>
<tr>
<th>Priority 1 Vegetation Type</th>
<th>Approximate Area to be Disturbed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western Option</td>
<td>Central Option</td>
</tr>
<tr>
<td>Melaleuca</td>
<td>0.4ha</td>
</tr>
<tr>
<td>Heathland</td>
<td>1.0ha (in motorway Easement)</td>
</tr>
<tr>
<td>Mangroves</td>
<td>1.0ha</td>
</tr>
</tbody>
</table>

Other than the mangroves, the bulk of the priority vegetation to be affected within this section occurs as disturbed and degraded narrow remnant strips within the motorway easement.

From an overall Priority vegetation perspective, the central option is preferable.

10.5.2.5 Areas of Regional and/or local fauna habitat value

Within this area, fauna habitat has been reduced by rapidly expanding urban development to several small isolated remnants. These vary greatly in size, vegetation characteristics and value to fauna (see Low, 1997). The wet sclerophyll and closed forest elements at Buderim (Buderim Transfer Station and Hospital sites) near and to the west of the motorway support habitat of high fauna habitat values. This area and the paperbark remnant adjacent and to the eastern side of the motorway would be unlikely to be significantly affected by development of the railway which would be contained within the predominantly cleared motorway easement.

10.5.2.6 Bushland/Wildlife Corridors

Bushland within this area is highly fragmented and has been reduced to relatively small remnant bushland areas. The existing motorway is likely to represent an established barrier to fauna movement, particularly for ground-dwelling species. The addition of a railway alignment, within the motorway easement would not significantly reduce fauna movements.

10.5.2.7 Local Council Protected Areas

The eastern alignment option lies adjacent to Amarina Avenue Park 2, Emerald Woods Environment Park, Lilac Park and Dalton Drive Park. The central alignment option lies between the two roadways, and would not affect any LCPAs. The western option lies adjacent to Lady Musgrave Park, the Buderim Transfer site and Elizabeth Daniels Park. Some encroachment of edge effects would be expected into the vegetation contained within any parks lying adjacent to the finally selected alignment, as an indirect impact, but these would be expected to be relatively minor as the remnants within the easement are already disturbed and buffering the adjoining vegetation poorly.
All three alignment options lie within the motorway easement, and none directly impact on any of the LCPAs, but the Central option would be preferred from a LCPA perspective, as it would not be expected to have even indirect impacts such areas.

10.5.3 Response

See section 8.6.3 for discussion regarding compensatory habitat measures and policy.

Minimising clearing within the required “safety clearing zone” along the railway lines is recommended. This zone is the area either side of the railway lines which would be required to be maintained free of trees and/or other objects likely to be able to fall on or otherwise damage the power lines associated with the train lines, or the train lines themselves. This is recommended to minimise the disturbance to the existing native vegetation in this section and the subsequent degradation to habitat and other ecological values of the area.

It is envisaged that measures which would be undertaken to minimise clearing in these areas would include:

- lopping of trees within the clearing zone, in preference to completely removing them;
- retaining the low-growing vegetation layers (shrub-layer and ground-layers) except for areas where further clearing is absolutely essential; and
- where clearing must occur during the construction phase, avoiding bulldozing (or otherwise clearing completely to ground level) - at most, slashing of existing vegetation layers should be undertaken, so that the diversity of native plant species retained is maximised, and that maintenance slashings be as infrequent as possible, to maximise the habitat value of those areas.

In areas where the alignment passes through relatively intact areas of disturbance-sensitive vegetation types, such as melaleuca forest and rainforest/ecotonal forest areas, buffer plantings along the exposed forest edges is recommended, to minimise edge-effect impacts to the remaining forest areas. Such plantings should include appropriate native understorey species such as those present within the remaining forest area itself. They should be planted at the forest edges at a level of density which would provide adequate protection to the forest environment in terms of shading, weed inhibition and microclimate control in general.

At the Mooloolah River crossing clearing in the riparian zone would be restricted where possible to lopping of taller trees, with complete-to-ground clearing avoided. Separate crossings for access tracks would not be constructed, as access would be able to be gained to the crossing area from both sides of the river.

The design of the rail alignment to date has been such that it has incorporated specific design features to aid in the mitigation of both direct and indirect effects on ecological features. These features include:

An 850m length of viaduct over the Mooloolah River for the western option, and a 920m length for the central and eastern options.

Few mitigation measures would be practical for the Priority Vegetation areas, as most of the remnant would be removed during construction, and there would be little of value to protect. The main exceptions would be the margins of the Emerald Woods Environmental and Lilac Parks, which would benefit from measures taken to minimise clearing and undertake buffer planting (as described above), to protect their remaining vegetated areas.

10.5.4 Assessment of Effects

The following tables describe the assessment of effects of the scheme (with proposed mitigation) for each of the proposed route options on terrestrial ecology.

<table>
<thead>
<tr>
<th>Area</th>
<th>Level of Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Severe</td>
</tr>
<tr>
<td>Mooloolah River (north of the MMTC)</td>
<td>Severe</td>
</tr>
<tr>
<td>Lands near TAFE</td>
<td></td>
</tr>
<tr>
<td>Roadside Remnant (Elizabeth Daniels Park &amp;</td>
<td></td>
</tr>
<tr>
<td>Buderim Transfer site)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Area</th>
<th>Level of Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Severe</td>
</tr>
<tr>
<td>Mooloolah River to Maroochydore Centre Section</td>
<td></td>
</tr>
<tr>
<td>(Central option)</td>
<td></td>
</tr>
</tbody>
</table>

Table 10.5.4a: Degree of Ecological Impact - Mooloolah River to Maroochydore Centre Section (Western option)

Table 10.5.4b: Degree of Ecological Impact - Mooloolah River to Maroochydore Centre Section (Central option)
10.6 Aquatic Ecology

10.6.1 Effects of the Scheme

The construction related aquatic ecology impacts associated with crossing the Mooloolah River under each of the three alignment options relate to:

- **Inputs of pollutants to the waterway, such as increased suspended sediment loadings.** The assessment of the impacts relating to water quality indicates that unmitigated potential inflows could be significant, unless suitable management practices are implemented to minimise this issue. The ecology of the Mooloolah system would be adapted to periodic disturbance events, such as floods and therefore re-establishment of aquatic flora and fauna would be rapid following any disturbance event. As such, this issue is only of minor concern with respect to aquatic ecology.

- **Disturbance/loss of habitat, including mangroves.** It is likely that the construction of the railway alignment would result in the disturbance and/or loss of some intertidal predominantly mangrove areas, and subtidal areas. The actual footprint of the railway would be relatively small given the proposed construction technique, limited to the basal area of the supporting pylons. The construction and positioning of the pylons has the potential to disturb/remove aquatic fauna in the immediate vicinity of the pylon locations. Sessile fauna, such as benthic epi- and in-fauna at these locations is likely to be removed. However, the communities are expected to be comprised of species common to the region and are expected to rapidly recolonise the area following construction works. Additionally, the pylons are likely to be colonised by a range of encrusting fauna following placement. More mobile aquatic fauna, such as estuarine fish species, are likely to avoid the area during the construction phase should conditions be unsuitable. Opportunistic species, such as Bream (*Acanthopagrus australis*), are likely to prey upon benthic fauna disturbed by the construction process.

- **Disruption/restriction to fishing activities.** During the construction phase it is likely that some plant and equipment would be required to operate in the waterway to install the pylons for the railway. These may restrict access to the works areas for recreational and traditional fishers. However, given the relatively small area of operations, it is unlikely that this will provide a significant constraint to the railway proposal. Access to the immediate vicinity of the crossing locations may be restricted in part during the construction, but is likely to be short term and limited in extent. This would represent a very construction of the supporting pylons may be required, it is unlikely that these will provide an impediment to aquatic fauna movement within the system. As such, the potential for this process to provide a significant impact is limited.

<table>
<thead>
<tr>
<th>Area</th>
<th>Level of Impact</th>
<th>(Central option)</th>
<th>(Eastern option)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mooloolah River (north of the MMTC)</td>
<td>Severe</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lands near Tafe</td>
<td></td>
<td>Negligible</td>
<td></td>
</tr>
<tr>
<td>Roadside Remnant (Lilac Park)</td>
<td>Negligible</td>
<td></td>
<td>Minor</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Area</th>
<th>Level of Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mooloolah River (north of the MMTC)</td>
<td>Severe</td>
</tr>
<tr>
<td>Lands near Tafe</td>
<td>Negligible</td>
</tr>
<tr>
<td>Roadside Remnant (Lilac Park)</td>
<td>Minor</td>
</tr>
</tbody>
</table>
small area of that available for recreational and/or traditional fishing within the River. Access past the construction site in the form of a navigation channel would be maintained at all times in accordance with Transport Regulations.

Based on the current (July 1999) distribution of mangroves within the Mooloolah River, the Western route option includes approximately 1.0ha of mangroves. The Central/Eastern option includes approximately 0.9ha of mangroves. The mangroves within both route options are species common to south eastern Queensland, and associated with the majority of estuarine systems within the area. However, due to extensive modification of the Mooloolah River, only small portions of mangrove habitat has currently been retained (13.8ha in total mapped by Hyland and Butler, 1988). As such, the proportion within the route options represents 6% and 7% of the local resource respectively.

Given the proposed construction method, it is unlikely that all of the mangroves within the alternative routes would be removed whilst other areas within the route are likely to be retained. Mangroves within the vicinity of the piling structures and at strategic locations required for access would be disturbed/removed. As such, the actual area of impact, whilst difficult to accurately predict, is likely to be significantly less than the figures presented above. Additionally, it is anticipated that the mangroves would naturally re-establish following construction.

With respect to the route options (western vs eastern vs central) the area of mangroves to be removed within each is similar. Additionally, the habitat types present within each route, and thus potentially disturbed, is also likely to be similar. As such, the preference as to the route option is based on the opportunity to maintain the integrity of the island within the western option by selecting the eastern/central option. The ecology of the systems associated with the central/eastern options are likely to be detrimentally impacted upon by the adjoining residential developments, thus reducing their conservation significance.

The proposed route includes the development of a terminus station adjacent Cornmeal Creek. Based on the water quality assessment (see section 10.8), which indicates that the unmitigated development may result in a short term deterioration to water quality within Cornmeal Creek, the construction phase of the CAMCOS project also has potential to impact upon the aquatic ecology of the system, unless mitigation measures are adopted.

The potential operational impacts of the development of the railway upon the Mooloolah River relate to:

- **Inflows of contaminants from the railway.** As discussed in the water quality impact assessment (see section 10.8), the pollutant inputs for the railway track itself are likely to be minor, and are unlikely to result in a significant deterioration in water quality within the Mooloolah River. Potential impacts from stations and carparking areas is higher, with some water quality degradation likely to occur in receiving waters, unless mitigation measures are adopted.

- **Alteration of the hydrodynamic regime within the system.** The hydrological assessment presented in section 10.7 indicates that the development of the railway route will not significantly impact upon the hydrological regime of the system. As such the potential for this issue to impact upon the aquatic fauna of the system is considered minimal.

- **Shading of underlying vegetation.** As discussed above, the proposed construction technique at this point in the route is a viaduct supported by pylons. It is likely that either mangroves will remain along the route or re-establish following construction. There is the potential that the railway structure would shade these mangroves, thereby reducing the photosynthetic capacity of the plants. However the railway is to be constructed above the height of the existing mangroves, would be partially open in design allowing sunlight penetration, and would be less than 10m wide. As such it is unlikely that the shading resulting from the development of the structure would result in a significant deterioration in mangrove health along the route.

- **Restriction to fauna movement and fishermen.** As the proposed construction technique would provide only minimal access restriction to fishermen at the pylon locations, and is not anticipated to alter the hydrological regime within the River (see section 10.7), the potential for this issue to provide a significant impact is considered minimal.

Cornmeal Creek is presently a degraded system with deteriorated water quality resulting from the urbanisation of the adjacent area and catchment. Without mitigation there is the potential for there to be adverse impacts on aquatic ecology of the creek.

### 10.6.2 Response

As discussed above, the assessment for this section of the route with respect to water quality and hydrodynamics indicates that the mitigated development has only minor potential to impact upon either the Mooloolah River and/or Cornmeal Creek. Whilst the crossings would involve the removal of a corridor of riparian vegetation, this would be minimised. Additionally construction impacts would be minimised by adherence to the Environmental Management Plans (EMP’s) presented in Chapter 12.
10.6.3 Assessment

The assessment of the operational phase of the development from a water quality and hydrodynamic perspective indicates that the proposed development presents a negligible potential for impact. Accordingly, the potential for impact upon the aquatic ecology during the operation of the railway and associated infrastructure is considered minor adverse.

10.7 Hydraulics

10.7.1 Introduction

This section of the route crosses Mooloolah River, Cornmeal Creek, and several minor drainage paths. The locations of the required drainage structures are shown in Figure 4.7.6e and the 100 year ARI flood levels and discharges, and the structure sizes are given in Table 10.7.4.

10.7.2 Mooloolah River

The Mooloolah River crossing in this section of the route is the third crossing of the River with the last two being a continuous bridge. Three alignment options, MM1, MM2 and MM3 from upstream to downstream, are being considered. Whichever alignment is adopted the bridge would be continuous with bridge CM9. The northern abutment of MM1 has been positioned close to Seriata Way at about the 2.5m contour which puts the abutment clear of the flood prone land immediately to the south. Detailed modelling may show that some of this low lying is flood storage rather than a conveyance region and hence it may be possible to shorten the bridge, although Queensland Rail may require that the abutment is positioned clear of the 100 year flood to minimise the risk of settlement. It is not expected that the small loss of storage associated with positioning the abutment in the flood prone land would impact on flood levels.

Hydraulically MM2 and MM3 are identical. If adopting MM2 or MM3 the following guidelines should be used for a preliminary bridge fixings before a detailed hydraulic analysis is done to ensure minimal impact in floods:

- The girder soffit level of the rail bridge must be the same as or higher than the adjacent road bridges (approximately 2.4 m above the 100 year flood level);
- The 100 year waterway area under the rail bridge, calculated by projecting the 100 year flood level and abutment positions of the road bridge to the rail crossing, must not be less than the waterway area of the road bridge.

The first criterion is required to maintain the same navigational clearance as provided by the road bridges. Criteria 2 above may be difficult to achieve depending on the pylon configuration. If the waterway is reduced there would be a small increase in flood levels which may impact on any remaining properties immediately upstream of the northern abutments. Apart from a possible increase in upstream water level due to constriction of the flow, there would be a small increase in upstream water level as a result of form losses generated by the additional pylons, regardless of their alignment with the road bridges. Minor works may be required to mitigate these effects.

The girder soffit of option MM1 should also be set at the level of the road bridges to maintain navigational clearance. With the bridge at this level there would only be minor increases in flood levels up to the 100 year event as a result of flow constriction and form loss associated with the pylons. It is not expected that this would impact on properties upstream, although modelling should be undertaken to confirm this assumption.

Ignoring the cost differences, there are no significant hydraulic issues that would require the selection of one alignment over the other.

The CAMCOS route would not significantly alter the hydrology or hydraulics of the Mooloolah River system of watercourses in floods up to the 100 year event assuming that redistribution of flows does not occur as discussed in section 9.7.

10.7.3 Minor Drainage Structures

North of the Mooloolah River the rail line would be adjacent to the Sunshine Motorway. There are several minor drainage structures in the motorway which need to be duplicated in the rail embankment. Either control works between the embankments to minimise flow expansion or extension of the culverts between the embankments would be required to minimise the increase in water level. These structures are identified as MM4 to MM7 in Figure 4.7.6e. It was not possible to estimate a flood level at these locations because of limited topographical information. The CAMCOS route would not significantly alter the hydrology or hydraulics of the of these minor drainage paths in up to a 100 year flood event.

10.7.4 Cornmeal Creek

The Cornmeal Creek catchment drains from the east to the west across the Sunshine Motorway into low lying land where Cornmeal Creek becomes a defined channel prior to passing under Plaza Parade. The rail line runs adjacent to the Sunshine Motorway, but a spur into Maroochydore, which would pass through the low lying land to the east of the Motorway and across a drain (MM11), is being considered. On the through line, eight drainage structures (MM8, MM9, MM10, MM12, MM13, MM14, MM15, MM16 in Figure 4.7.6e) are...
required to convey the flow from Cornmeal Creek catchment; these structures are located adjacent to existing structures in the motorway. Flood information for this part of the route was obtained from WBM(1992), Rod Tate & Partners(1999), and the Maroochy Shire Council (facsimile transmission). The discharges in the WBM and Rod Tate & Partners reports were from or near the upstream boundaries of the models. The information from boundaries of hydraulic models can not be relied on for detailed design, but is considered to be of sufficient accuracy for the purposes of this study. The discharges adopted for this report were the larger of those given in WBM (1992) and Rod Tate & Partners reports.

Contours in the WBM report and level differences between the pegged base line and control line on shift in Main Roads plans of the motorway indicate that the ground surface is rapidly dropping away towards the low lying land downstream of the route. Flood levels in the low lying region would be controlled by a weir to be constructed on Cornmeal Creek upstream of Plaza Road as part of the development of this land. The weir is modelled by Rod Tate & Partners and it is a flood level from that report which is used to directly calculate the flood level at MM11 and indirectly at MM8 and MM9. All other drainage structures are sufficiently elevated such that the flood level at those locations is not controlled by the weir. Rod Tate & Partners did not supply flood levels at the outlet of culverts in the Sunshine Motorway, so at these locations flood levels from the WBM model were adopted but with slight increases where the Rod Tate & Partners discharge was higher than WBM.

Preliminary checks on afflux indicates that it is likely that the design event for the culverts in the motorway was less than 100 years, ie, the afflux for a 100 year discharge is larger than normal design practice. If the existing motorway culverts were duplicated in the rail line and the design standard for the determination of the rail level of 100 year plus 1.5 m is adopted, the level of the rail line would be approximately 6.5 m compared to the motorway which is graded at approximately 5.0 m. Therefore the design approach for this section of the route was to determine the waterway required so that the rail level can be fixed at about the motorway grade level (approximately RL 5.0 m). The assumption in this approach is that the size of the culverts in the motorway would be increased accordingly. This approach may cause concern for developers downstream as they will have modelled the existing drainage structures in the motorway. Increasing the size of the drainage structures in the motorway may increase the discharges in events up to about the 100 year, and hence flood levels, downstream of the motorway depending on the storage characteristics upstream of the motorway. Conversely flood levels upstream of the motorway would be reduced in floods up to the 100 year event.

If the impact on downstream properties is significant, then it would be possible to reduce the culvert size recommended in Table 10.7.4 and provide better protection to the railway embankment.

Because of the rapidly varying ground levels in the vicinity of MM10, MM12, and MM13, the coarseness of the existing models in this region, and the vicinity of the route to the upstream boundaries of the models, it was difficult to accurately determine flood levels. Therefore it is recommended that further modelling be undertaken on Cornmeal Creek.

The structure sizes for MM14 to MM16 were calculated using flood information from the WBM model and discharges from WBM and Rod Tate & Partners. The structures were sized to maintain a rail level of 5.0m and in an afflux of 150 mm in the 100 year event. The adjacent drainage structures in the motorway would need to be upgraded to match those in the rail line. From the available information it appears that in a 100 year event the Maroochydore Road overpass would convey flood waters. MM16 has been sized accordingly.
### Table 10.7.4: 100 Year ARI Flood Levels & Discharges, and Structure Sizes - Mooloolah to Maroochydore

<table>
<thead>
<tr>
<th>Waterway Identification</th>
<th>100 Year ARI Discharge (m³/s)</th>
<th>100 Year ARI Upstream Flood Level (mAHD)</th>
<th>Structure Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>MM1</td>
<td>-</td>
<td>2.1</td>
<td>950 m</td>
</tr>
<tr>
<td>MM2 &amp; MM3</td>
<td>-</td>
<td>2.1</td>
<td>660 m</td>
</tr>
<tr>
<td>MM4</td>
<td>-</td>
<td>-</td>
<td>5/1500 RCP</td>
</tr>
<tr>
<td>MM5</td>
<td>-</td>
<td>-</td>
<td>2400 x 2400 RCBC</td>
</tr>
<tr>
<td>MM6</td>
<td>-</td>
<td>-</td>
<td>2/1650 RCP</td>
</tr>
<tr>
<td>MM7</td>
<td>-</td>
<td>-</td>
<td>2/1800 RCP</td>
</tr>
<tr>
<td>MM8</td>
<td>50</td>
<td>3.5</td>
<td>34 m²</td>
</tr>
<tr>
<td>MM9</td>
<td>36</td>
<td>3.5</td>
<td>25 m²</td>
</tr>
<tr>
<td>MM10</td>
<td>12.5</td>
<td>3.7</td>
<td>12.5 m²</td>
</tr>
<tr>
<td>MM11</td>
<td>20</td>
<td>3.0</td>
<td>16.5 m²</td>
</tr>
<tr>
<td>MM12</td>
<td>57</td>
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<td>57 m²</td>
</tr>
<tr>
<td>MM13</td>
<td>12</td>
<td>3.7</td>
<td>12 m²</td>
</tr>
<tr>
<td>MM14</td>
<td>26</td>
<td>3.5</td>
<td>20 m²</td>
</tr>
<tr>
<td>MM15</td>
<td>14</td>
<td>3.5</td>
<td>11 m²</td>
</tr>
<tr>
<td>MM16</td>
<td>14</td>
<td>3.5</td>
<td>26 m²</td>
</tr>
</tbody>
</table>

### 10.8 Water Quality

#### 10.8.1 Effects of the Scheme

In this section, the waterways potentially affected are the Mooloolah River and Cornmeal Creek. Based on available water quality information and the water quality survey undertaken for this study, both these waterbodies exhibit moderate to poor water quality (see section 5.11).

The potential impacts to water quality from the CAMCOS route are higher in the construction phase. Areas exposed from the earthworks phase could contribute a high sediment load to the receiving waters, unless mitigated. Increased sediment loads to the receiving waters (Mooloolah River and Cornmeal Creek for this section of the route), would be undesirable due to the adverse ecological effects which could result, including decreasing light penetration (which has implications for photosynthetic and respiration processes), reducing the suitable habitat for some aquatic species which cannot tolerate such turbid conditions and reducing the aesthetic appeal of waterways. Siltation of the waterways may also occur, which can smother aquatic submerged macrophytes (which stabilise creek banks) and benthic fauna.

A smaller potential impact to water quality arises from accidental spillages of materials associated with rail construction (eg. fuel, lubricants etc.) during the construction phase. These materials could cause water quality degradation in downstream waterways, if not prevented from entering waterways.

During the operational phases, potential water quality impacts from the railway line are smaller than during the construction phase, with railways having only a minor potential for water quality impacts. Some increase in pollutant loads from the railway track may result, including some oils and greases and possibly herbicides (used to keep the tracks weed free). The potential for large hydrocarbon or pollutant spillages during the operational phase would also be nil, as the railway would be electrified.

During the operation phase of the railway, pollutants may accumulate on station carpark areas during dry periods and be washed into downstream waterways during subsequent runoff events. Depending on the pollutants accumulated, water quality degradation and adverse impacts to aquatic flora and fauna may result. Section 7.4 details the runoff characteristics anticipated from carpark areas, with increased metal and hydrocarbon loads likely, unless mitigation measures are installed. However, the small amount of carparking at Maroochydore Station and the distance of Mooloolaba Station from the Mooloolah River (1-1.5km) would result in negligible water quality impacts from carparks in this section of the route.

These potential water quality impacts have the potential to impact on the water quality of the immediate receiving waters, including the Mooloolah River and Cornmeal Creek. As detailed previously, water quality of both these waterways appears to be poor. The Mooloolah River is considered a feature of regional significance, and any increase in the pollutant load to either the Mooloolah River or Cornmeal Creek would be undesirable.
10.8.2 Route Option Assessment

The three route options in this section of the railway are similar from a water quality perspective. All three options involve considerable works in the River and/or floodplain areas, where water quality impacts from the construction works would be difficult to mitigate. Where works are undertaken within the waterway or floodplain, there is little opportunity to mitigate water quality impacts prior to pollutants entering the waterways. However, the water quality impacts would be largely associated with the construction phase, and would only be of short duration.

10.8.3 Response

The potential water quality impacts from the railway construction and operation would include the following measures.

10.8.3.1 Best Practice Sediment and Erosion Control Measures

Providing best practice sediment and erosion control measures are implemented and maintained during the entire construction phase, the potential impacts to water quality would be minimised. Such best practice sediment and erosion control measures would include the provision of sedimentation basins, flocculation of basin discharges, minimising exposed soil areas and diverting upstream runoff from exposed areas. More detail on the sediment and erosion control measures recommended for the construction phase of the railway would be determined at the design stage of the project.

10.8.3.2 Treatment of Track Runoff by Vegetated Swales

It has been recommended that runoff from the railway and access tracks be directed into vegetated swales to filter runoff prior to it flowing into vegetated areas and/or waterways. Natural topography and drainage features would be utilised to direct runoff into the vegetated swales, and native vegetation would be retained for this purpose, where possible.

10.8.3.3 Minimise and Manage Herbicide Application

It is recommended that the application practices of many herbicides are carefully controlled, with no excess herbicide applied. Herbicides which have been designed to minimise potential water quality and faunal impacts, by degrading rapidly to harmless by-products are recommended.

10.8.4 Assessment

The potential for erosion and high sediment loads arising from the construction phase of the CAMCOS route would be largely mitigated by the use of best practice sediment and erosion control measures. Such best practice sediment and erosion control measures would include the provision of sedimentation basins, flocculation of basin discharges, minimising exposed soil areas and diverting upstream runoff from exposed areas. More detail on the sediment and erosion control measures recommended for the construction phase of the railway would be determined at the design stage of the project.

Some increased potential for high sediment export would still exist, as large storm events cannot be effectively treated, even with the adoption of best management practice measures. This increased potential for sediment export during the construction phase would result in a minor adverse water quality impact.

During the operational phase, potential water quality impacts are minor as carparking areas are small in extent and/or are distant from receiving waters and the railway route itself has only a minor potential for adverse water quality impacts. Mitigation measures for the carparking areas, would ensure the potential pollutant loads from carparking areas are minimised and only minor increases, if any, in pollutant concentrations would result in receiving waters.

Therefore, during the operational phase the impacts from the proposed railway would be not significant, based on only a slight potential for increased pollutant loads to locally or regionally significant waterways.

Mitigation measures recommended to reduce the load of pollutants from carparking areas prior to entering receiving waters include:

- Inclusion of sediment removal structures, such as Continuous Deflective System or CDS units, at major stormwater outlet points. Sediment removal units (such as CDS’s) are capable of removing 95% of all gross pollutants (ie litter and coarse sediment) from stormwater (Cargill R., July 1997). These units are also effective for removing hydrocarbons from stormwater runoff;
- Inclusion of vegetated swales, where possible, to filter minor runoff flows prior to discharge from carparking areas; and
- Regular sweeping and maintenance of carparking areas to minimise the accumulation of pollutants in carparking areas.
10.9 Cultural Heritage

10.9.1 Future Situation Without the Scheme

One site was defined within this area. This site is registered with the EPA. The EPA is responsible for management of all registered sites. If the scheme does not proceed, the local Shire Council and the EPA should be informed of the site’s condition and the need to preserve the tree.

10.9.2 Effects of the Scheme

The eastern and central options are anticipated to have a direct impact on only one site (S19) which is a scarred tree located on the east bank of the Mooloolah River. The western option would not affect this site.

10.9.3 Response

The response to this direct impact associated with the eastern and central options is to flag the tree with marker tape and leave alone. Negotiations would be needed with the Traditional Owners if the impact and removal is considered unsatisfactory. A possible solution is to make a latex cast of the scar before the tree is removed.

It is also recommended that monitoring by Aboriginal representatives occur in the following locations:

- Along the north bank of the Mooloolabah River;
- Near Horton Park Golf Course; and
- The banks of the Maroochy River.

10.9.4 Assessment of Effects

The assessment of effects of the eastern and central options on this scarred tree is major adverse. The effect of the western option would be not significant.

10.10 Noise and Vibration

10.10.1 Effects of the Scheme

10.10.1.1 Construction Noise and Vibration

The main construction activities would be:

- Construction of two railway stations at Mooloolaba and Maroochydore;
- Construction of a cut and cover tunnel and an overpass for Sunshine Motorway to pass over the railway line; and
- Construction of a railway embankment through mainly flat terrain.

The main sources of noise during the construction would be the earth moving equipment, large trucks and embankment compaction equipment. The construction of the viaducts and bridges would produce noise from the use of earth and concrete moving trucks, cranes, compressors, generators and piling equipment.

This section of the proposed route is the most densely populated area along the proposed route. The background noise levels in this section are variable, depending on the proximity of the monitoring location to major transport corridors, such as Sunshine Motorway. The residential areas adjacent to the Sunshine Motorway have a background noise levels ranging from 40 dB(A) by night to 60 dB(A) by day (see Table 5.13b in section 5.13). The background noise by day is relatively high and much of the construction noise would be only slightly higher than the current background levels. In spite of this there would be some temporary loss of amenity for noise sensitive places during the construction, depending on the type of activities being undertaken and their proximity.

Available plans for future development along this section of the route indicate that there may be extensive noise sensitive development along most of this section of the proposed route. The largest scale of development is envisaged in the area from the main railway route to the proposed Maroochydore station. As a result, at the time of railway construction the number of noise sensitive places potentially affected by construction noise may be significantly greater, if future development is not undertaken with regard for the proposed railway route.

Provided proper noise mitigation measures are implemented (as specified in the EMP) the noise impacts from the construction activities can be controlled to an acceptable level which would involve a temporary impact at noise sensitive places.

Vibration levels due to construction activities are expected to be generally very low and would typically not be perceptible at the nearest residential locations. The activities which would tend to create the highest levels of vibration would be piling, rock breaking (if required), and vibrating compaction equipment. If this work is expected to occur within 25m of residences then vibration may become perceptible and monitoring would be undertaken in accordance with the EMP to address any concerns residents may have regarding the activities.

10.10.1.2 Operational Noise and Vibration

This section includes three options for the final railway alignment. Predicted noise levels indicate that for each of the three options, the EPP (Noise) planning criteria would be meet at a distance of 22m from the centre-line of the track on embankments and 27m from the centre-line of the track if constructed on concrete bridges or viaducts (see Figure 10.10.1).
The impact on noise sensitive places for each one for each of these options is discussed below.

**Eastern Option**

With the eastern option there would be 9 existing noise sensitive places in Mooloolaba (4 residential properties at the northern end of Amarina Avenue and 5 residential properties at the end of Parkway Drive, Jackaranda Drive and Lilac Court) that would be approximately 10m from the rail alignment. In this area the EPP (Noise) planning criteria is met at a distance of 22m, there would be significant noise effects at these properties, and noise barriers would need to be constructed to reduce levels to meet the EPP (noise) policy criteria.

The other acoustically sensitive areas associated with this option are properties in Amarina Avenue and Incana Court, Mooloolaba. The closest residential properties in Amarina Avenue are located 45m from the eastern option, while at Incana Court the closest properties are located 53m away from this option. Although the EPP (Noise) planning criteria is met before the boundaries the train noise would be clearly audible. Considering that the railway line would be very close to the densely developed areas to the east of the railway line, the number of residences that would experience noise levels in excess of the noise indicator levels would be greatest with this option.

All of these impacts are associated with the railway line that would be built on an embankment north of the Mooloolah River Bridge.

The nearest existing residences to the eastern route at the Mooloolah River Bridge, are located at a distance of approximately 240m from the proposed rail centre-line. Considering that some future residential development may be constructed closer to the proposed railway route at this location it is likely that the noise impact from the eastern option for the Mooloolah River Bridge would be significant at the time of railway line construction and operation.

**Central Option**

In relative terms, the central option would have less of an impact in acoustic terms than the eastern option as it allows for a larger buffer distance from the rail alignment to the noise sensitive places at Incana Court and Ulmarra Court, Mooloolaba. The EPP (Noise) planning criteria would not be exceeded at any of the noise sensitive receptors along the route. The distance from the track centre-line to the nearest residential properties is 40m (compared to only 10m for the eastern option). Although train noise would be clearly audible at this distance.

Given the proximity of the central and eastern options at the Mooloolah River Bridge the noise impacts would be virtually the same.

**Western Option**

The EPP (Noise) planning criteria would not be exceeded at any of the noise sensitive receptors along the route with the western option. This option would allow for a larger buffer distance from the rail alignment to noise sensitive places (such as the TAFE college and Mountain Creek High School). The distance from the track centre-line to the nearest residential properties is 70m (compared to 10m with the eastern option and 40m with the central option).

At the Mooloolah River Bridge the alignment is brought closer to the existing residential development on the Mooloolah River. Particularly to the properties around Carwell Place and Imara Court, Mooloolah Waters. The nearest residential properties would be at a distance of 125m from the track centre-line.

**Sugar Road to Maroochydore**

Further north from Sugar Road, the three options converge into one alignment. Land use in this area comprises mainly light industrial and commercial premises, with a small pocket of high density residential development around Dalton Drive (nearest properties 72m from the railway centreline).

Considering that the development plans for the area envisage further residential development closer to the proposed railway route, it is likely that the noise impact from the railway operation may in the future affect a larger number of noise sensitive places than currently exist.

Vibration levels due to electric passenger trains passing residential areas are not expected to be perceptible to building occupants.

In addition to the running of electric passenger trains, maintenance work forms part of the operational noise associated with the rail lines.

Railway stations for this section of the route are proposed at Mooloolaba, Maroochydore and Bradman Avenue. The two potential sources of noise form the stations are public address (PA) systems used for announcing train information to passengers, and vehicle noise associated with passenger set-down and pick-up and carparks. Mooloolaba, Maroochydore and Bradman Avenue Stations are intended to have 300-600 spaces, no car spaces and 50 car parking spaces respectively.
10.10.2 Response

Eastern Option

In the following residential areas where the EPP (Noise) planning criteria is exceeded, noise barriers would need to be constructed to reduce levels to meet the EPP (Noise) policy criteria:

- The northern end of Amarina Avenue; Camphor Court, Parkway Drive; Jakaranda Drive and Lilac Court;
- Under the Mooloolah River Bridge, Mooloolaba,

Central Option

While the EPP (Noise) criteria are not expected to be exceeded, consideration should be given to providing some form of noise attenuation in the noise buffer strip between the proposed railway line and noise sensitive receptors. The efficiency of the noise buffer, as a noise mitigation measure, can be enhanced by landscaping arrangements of earth mounds (acting as visually non-intrusive noise barriers) and dense vegetation. For elevated track sections noise attenuation could be gained from positioning of the tracks on solid structures and provision of acoustically solid guard rails (safety fences) along the edge of the viaducts. Alternatively, acoustically solid fences could be used instead of plain safety fences, combined with mounds and vegetation cover to act as an acoustic barrier. This is part of the voluntary noise mitigation measures that the design and operator of the railway line should consider in order to ensure that the railway operation has minimal impact on noise sensitive receptors along the route.

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Stations

The PA systems will be designed to minimise noise to neighbours while maintaining speech intelligibility for passengers on the station platform. Design considerations include the use of directional loudspeakers aimed along the platform and spaced close together (eg, 15m) to allow the source level to be reduced. Modern systems also include the use of an automatic gain control circuit to control the level of automatic train announcements.

Noise impacts would be minimised by arranging the carparks to be accessed as directly as possible via busier roads. In the case of Mooloolaba Station, an access road is proposed adjacent the sports ovals to minimise traffic noise on local streets. Where carparks are directly adjacent noise sensitive places, noise barrier fences may be erected to reduce intrusion from noise and car headlights.

Maintenance

Most maintenance vehicles are powered by diesel motors and are fitted with exhaust silencers and in some cases acoustic enclosures are installed around the engines to minimise noise. While this would reduce the noise, the primary operations of tamping, grinding, ballast screening and placement are often noisier and are more difficult to treat. However, these operations are performed only occasionally and hence are not considered to represent a significant noise impact. For example, on the new Gold Coast rail line, rail grinding is carried out once a year and ballast tamping twice a year.

10.10.3 Assessment of Effects

With the installation of suitable noise barriers the noise impact at the most exposed noise sensitive places can be reduced to a moderate adverse effect.

From the noise point of view the preferred option is the central option. The eastern option would have a major adverse impact on a number of properties along Amarina Avenue, while the western option is likely to cause relatively greater noise impacts for properties along the Mooloolah River.

10.11 Landscape

10.11.1 Introduction

The landscape analysis has focused on those areas that have been identified by the Consultants and through the public consultation process as being of concern to local residents. Within this section of the route the following locations are assessed.

- Mooloolah River Crossing where the rail would be on viaduct structure; and
- The entry into Maroochydore.

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- Mooloolah River Crossing where the rail would be on viaduct structure; and
- The entry into Maroochydore.
10.11.2 Effects of the Scheme

10.11.2.1 Mooloolah River Crossing

There are three options for crossing the Mooloolah River, eastern, central and western.

The eastern and central alignments at the crossing point south of the Mooloolah Interchange have a similar alignment and have been treated the same from an impact assessment perspective. The elevated bridge structures in these options follows the alignment of the existing Sunshine Motorway bridge more closely. The structure would be most visible from the Sunshine Motorway bridge crossing which would be in close proximity. The elevated structure would be in the middle ground to long distance views from the residences along and off Cootamundra Drive. The existing bridge structure currently frames the eastern views from Marra Court and this will be reinforced by the almost parallel rail bridge.

These options would have a reduced visual impact upon surrounding residences. In addition to this, the structure is partially buffered at ground level by existing mangrove vegetation behind which the route is aligned. This would help to minimise the visual impact at ground level and would help to preserve some of the existing environment.

The western option crosses the River on an elevated bridge structure (see Figures 10.11.2a&b) that connects into the Sunshine Motorway. The bridge would be viewed primarily from residences along and adjacent to Cootamundra Drive and Marra Court and from the Sunshine Motorway crossing of the River.

The alignment of the structure is in the foreground views of the residences along the spine of Cootamundra Drive and as a consequence there is a significant visual impact upon their visual amenity. The alignment would require the loss of a significant portion of the wetlands environment creating an adverse impact upon the visual quality of the existing surrounds. The new bridge crossing would be most visible and therefore have the most visual impact from the existing bridge. The elevation of the new bridge would be compatible with the existing structure and this would reduce the overall size and impact of the structures upon their surrounds.

10.11.2.2 Entry into Maroochydore

The rail alignment is follows a similar alignment to the proposed Southern Access Link (SAL) Road as it travels to the west of Horton Park Golf Course. It is also at the same height as the SAL Road at this location. The SAL Road would be constructed before CAMCOS.

The corridor would be viewed from the surrounding proposed mixed use and commercial development on the Wise’s property and also from the SAL Road.

The visual impact of the rail alignment at this location is not considered to be significant as the SAL Road boulevard and buffer planting along the corridor would minimise the scale of the corridor. Figure 10.11.2c is an aerial photograph which shows the existing situation looking north into Maroochydore CBD, whilst Figures 10.11.2d&e show the busway and rail options in the CAMCOS corridor with the SAL Road in place as photomontages.

As this precinct develops and consolidates its role as the Maroochydore CBD, the transport corridors would be absorbed into the surrounds. This is an opportunity for the new Maroochydore station to form the nucleus of this area. Figures 10.11.2f&g show existing and future situations for the proposed terminus station at Plaza Parade.

10.11.3 Mitigation

No mitigation is proposed for crossing of the Mooloolah River part of the route.

10.11.4 Assessment of Effects

10.11.4.1 Mooloolah River Crossing

Overall the eastern and central options would have the least impact upon residences and the surrounding environment and are preferred over the western option in landscape and visual terms. It is considered that the eastern and central options would result in minor adverse effects whilst the western option would result in a major adverse effect.

10.11.4.2 Entry into Maroochydore

The proposed public transport system has been assessed in relation to the proposed changes to the existing landscape in this area from the Sunshine Motorway to Plaza Parade that are likely to occur before and during construction of the rail alignment. The landscape character will change considerably with the SAL Road and commercial and other development on the eastern fringe of the Wise’s property and CAMCOS proposals are considered not significant in visual terms given this other development.

10.12 Option Preference and Overall Effects

This section summarises the effects associated with the three options that extend between the end of the Multi-Modal Transport Corridor and the intersection of Sugar Road on the Sunshine Motorway and provides an assessment of the preferred option.
In engineering terms the western and central options would involve staged construction of a cut and cover tunnel structure between the Mooloolaba Road and Sugar Road. Motorway realignment and bridges would require advanced construction techniques and extensive temporary works, adding to the cost and program and causing more disruption to motorway traffic than the eastern option. The estimated construction costs for the three options (between points J and K) are; west $47.3M, central $44.8 and east $30.7M. The proposed Mooloolaba Station would be located on the western side of the motorway on an existing landfill site for all three options.

With respect to transport planning, the western option is preferred for a variety of reasons. It provides better accessibility to the station site utilising Syd Lynyard Drive and has the potential to enhance access to the proposed new TAFE facilities currently only served by Lady Musgrave Drive. The opportunities for station sites on the eastern side of the motorway are constrained due to the presence of residential properties located close to the motorway, areas of remnant vegetation and road accessibility problems.

In amenity terms, the western option provides greater separation between the rail facility and residential properties close to the motorway on Marra Court and Amarina Avenue. In addition, the western option had overwhelming public support from people living in the local area. The concept of a rail alignment adjacent to properties on Amarina Avenue for example was less preferred than An upgraded motorway.

The station site at Plaza Parade provides significant potential for the establishment of major transit supportive development integrating the station development with other higher order uses.

The central option would affect the greatest number of properties followed by the eastern and western options. At Marra Court where residential properties are directly affected severe adverse effects would result from construction of the central option with major adverse effects being generated by the eastern option. The western option would not directly affect any residential properties and is preferred on these grounds.

With issues such acid generating soils, water quality and aquatic ecology the three route options pose similar impacts to each other and therefore are not considered to be issues that can help in route selection. During operation the impact of the either option on water quality is considered not significant. Operational effects associated with aquatic ecology would be minor adverse. Impacts on acid generating soils would result in minor adverse effects.

In ecological terms there are option preferences depending on the features discussed. With respect to riparian vegetation (mangroves in this instance) the western option would cause the most significant disturbance followed by the central and eastern options. From an overall priority vegetation and Local Council Protected Areas perspective, the central option would be preferred. Overall from an ecological perspective, the central option is preferred over the eastern and western options.

**Major adverse** effects are expected due to the impacts of the eastern and central options on a scarred tree site (S19). The western option would not impact on this site and therefore in relation to cultural heritage matters the western option is preferred.

With respect to noise, the central option is preferred. Noise sensitive properties adjacent to the motorway at the northern end of Amarina Avenue/ Parkway Drive would experience unacceptable noise levels (exceeding the EPP (Noise) planning criteria without mitigation) with the proximity of the proposed eastern option. Noise barriers would need to be constructed to reduce noise levels to below the EPP (Noise) planning criteria giving rise to **moderate adverse** noise impacts.

Overall the eastern and central options would have the least impact upon residences and the surrounding environment and are preferred over the western option in landscape and visual terms. It is considered that the eastern and central options would result in **minor adverse** effects whilst the western option would result in a major adverse effect with limited opportunities for mitigation.

The entry into Maroochydore and the relationship between CAMCOS and the Southern Access Link Road has been the subject of much discussion during the IAS process. In visual terms CAMCOS has been assessed in relation to the proposed changes to the existing landscape in this area from the Sunshine Motorway to Plaza Parade that are likely to occur before and during construction of the rail alignment. The landscape character will change considerably with the SAL Road and commercial and other development on the eastern fringe of the Wise’s property. Given the landscape character and development context within which the CAMCOS project would be operated, the visual impacts are considered to be **not significant**.

The following table summarises the overall effects of each option and shows that the western option is the most preferred for a range of factors:
### Table 10.12: Overall Option Preference at Mooloolaba

<table>
<thead>
<tr>
<th>Generic Criteria</th>
<th>Eastern Option</th>
<th>Central Option</th>
<th>Western Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction Cost</td>
<td>***</td>
<td>**</td>
<td>*</td>
</tr>
<tr>
<td>Constructability</td>
<td>***</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>Ecology</td>
<td>**</td>
<td>***</td>
<td>*</td>
</tr>
<tr>
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<tr>
<td>Water Quality</td>
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</tr>
<tr>
<td>Noise</td>
<td>*</td>
<td>***</td>
<td>**</td>
</tr>
<tr>
<td>Cultural Heritage</td>
<td>*</td>
<td>*</td>
<td>***</td>
</tr>
<tr>
<td>Visual Intrusion</td>
<td>***</td>
<td>***</td>
<td>**</td>
</tr>
<tr>
<td>Landtake (no. of properties)</td>
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<td>***</td>
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</tr>
<tr>
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</tr>
<tr>
<td>Disruption during construction</td>
<td>**</td>
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</tr>
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<td>***</td>
</tr>
<tr>
<td>Community Preference</td>
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<td>*</td>
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</tr>
<tr>
<td><strong>Overall Preference</strong></td>
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</tr>
</tbody>
</table>

**Preference**

- *** most preferred
- ** second most preferred
- * least preferred