

4.0 Potential Impacts

Discussion of the potential impacts of the rail on each of the main ecological processes identified includes:

- Acid sulfate soils
- Migratory species
- Ramsar Wetlands
- Remnant Vegetation
- Threatened Species
- Threatened Populations and Ecological Communities
- Wildlife corridor and Essential Habitats.

4.1 Acid Sulfate Soils

In waterway habitats, drainage from oxidised acid sulfate soils:

- Destroys food resources
- Displaces biota
- Precipitates iron that smothers vegetation and microhabitats
- Alters the chemical and physical properties of the water
- Degrades spawning and nursery grounds.

Appropriate management techniques will need to be developed to deal with ASS disturbed as a result of the construction of the corridor.

4.1.1 ASS Management Principles

- 1) The disturbance of ASS should be avoided
- 2) Where disturbances of ASS are unavoidable, preferred management strategies include:
 - minimisation of disturbance
 - neutralisation
 - hydraulic separation of sulfides either on its own or in conjunction with dredging
 - strategic reburial (reinterment).

Other management measures may be considered but must not pose unacceptably high risks including:

- 1) Works should be performed in accordance with *best practice environmental management* when it has been demonstrated that the potential impacts of works involving ASS are manageable to ensure that the potential short and long term environmental impacts are minimised.
- 2) The material being disturbed (including the *in situ* ASS) and any potentially contaminated waters associated with ASS disturbance must be considered in developing a management plan for ASS and/or in complying with the *general environmental duty*.
- 3) Receiving marine, estuarine, brackish or freshwaters are not to be used as a primary means of diluting and/or neutralising ASS or associated contaminated waters.
- 4) Management of disturbed ASS must occur if the ASS *action criteria* identified by the DERM is reached or exceeded.
- 5) Stockpiling of untreated ASS above the permanent groundwater table with (or without) containment is not an acceptable long-term management strategy. For example, soils that are to be stockpiled, disposed of, used as fill, placed as temporary or permanent cover on land or in waterways, sold or exported off the treatment site or used in earth bunds, that exceed the ASS *action criteria* identified by the DERM should be treated/managed.
- 6) The following issues should be considered when formulating ASS environmental management strategies:
 - the sensitivity and environmental values of the receiving environment. This includes the conservation, protected or other relevant status of the receiving environment (eg. Fish Habitat Area, Marine Park, Coastal Management District and protected wildlife).
 - whether groundwaters and/or surface waters are likely to be directly or indirectly affected.
 - the heterogeneity, geochemical and textural properties of soils on-site.
 - the management and planning strategies of Regional Government and/or State Government.
 - including Regional or Catchment Management Plans/Strategies and State and Regional Coastal Management Plans.

4.1.2 ASS Conclusion

To adequately address the issues associated with ASS, it will be necessary to undertake a detailed assessment of the distribution and degree of ASS within the corridor to ultimately prepare an ASS Management Plan. This assessment should occur concurrently with the detailed design so that appropriate management measures are implemented to minimise off-site ASS impacts, and to ensure adequate treatment has been undertaken to protect the structures associated with the rail corridor.

4.2 Impacts on Migratory Species

Six migratory bird species listed under the EPBC Act were been observed in the study zone during 2007 surveys. These are bar-tailed godwit, eastern curlew, Latham's snipe, rainbow bee-eater, whimbrel and white-bellied sea eagle.

The bar-tailed godwit, eastern curlew, Latham's snipe, and whimbrel are expected to occur throughout the summer months in this area specifically for foraging. These species nest in the northern hemisphere during the southern winter period. These species may be negatively impacted by the proposed construction of the corridor due to the loss of small areas of foraging habitat, and short term impacts including disturbance during construction activities.

The white-bellied sea eagle is expected to occur throughout the year in this area. Nests can be located in a tree up to 30m above the ground, but may also be placed on the ground or on rocks, where there are no suitable trees. Nests are vulnerable to disturbance from construction activities during breeding season (May to October). No nests were observed during surveys.

Rainbow bee-eaters are most often found in open forests, woodlands and shrub lands, and cleared areas, usually near water. The species will use disturbed sites such as quarries, cuttings and mines to build its nesting tunnels. This species may be negatively impacted by the proposed construction of the corridor due to the loss of small areas of foraging habitat, and short term impacts including disturbance during construction activities.

With appropriate measures to minimise impacts during construction, the impacts upon these species are likely to be of minor significance.

4.3 Impacts on Populations and Ecological Communities

No threatened ecological communities listed under the *EPBC Regulation 2000* occur within the study zone. The proposed construction of the corridor is likely to affect the sensitive ecological communities associated with Hays Inlet, Freshwater and Black Duck Creeks. The removal of aquatic plants and disturbance associated with the construction and operation of the corridor is likely to have an impact of minor significance on water quality.

Impacts on other ecological communities may result from the construction of the corridor. Loss of remnant vegetation will promote competition for limited resources that can lead to mortality or reduced rates of breeding success. This occurs because displaced native fauna currently residing in the corridor will be forced into adjacent areas of similar or better quality habitat, which are most likely already inhabited by other individuals of the same species or different species. This displacement places additional pressure on local fauna populations due to a shortage of available foraging, roosting and/or nesting resources.

4.4 Impact on Ramsar Wetlands

Saltwater Creek is identified as part of the Moreton Bay Ramsar Wetland. As proposed construction activities will occur within the nominated area, there are expected to be direct impacts to approximately 0.15ha of this area. The loss or disturbance to marine plants and various species of migratory and resident marine bird species and their associated habitats is likely to occur during the construction of bridging structures and associated earthworks. Whilst the high conservation value of Hays Inlet has already been acknowledged and incorporated into the design by reducing the infrastructure and corridor between Rothwell Station and Bremner Road, it will be necessary to ensure all works associated with the proposed corridor will not adversely impact the ecological values of this wetland. A referral to DSEWPC for the construction of the proposed corridor with respect to impacts upon Hays Inlet has been undertaken.

4.5 Impacts on Remnant Vegetation

The project is likely to require the removal of approximately 12.5 ha of remnant vegetation identified under the RE Mapping from the DERM (Version 6.0, 2010). This does not include regrowth vegetation (total area 27.5 hectares) which has not been included in Table 12.

Clearing of remnant vegetation will increase the degree of habitat fragmentation for the remnants that remain in an area largely under pressure from urban development. Fragmentation causes isolation making species more vulnerable to disease, predation, competition and extinction. Loss and/or modification of 0.5% of the remaining saltmarsh community that occurs within Moreton Bay Regional Council is considered of minor significance. Loss and/or modification as a result of fragmentation to the endangered scribbly gum open forest north-east of Petrie station and adjacent to Yebri Creek is considered of moderate significance because of the resultant isolation of the remaining vegetation to the west of the alignment at this location. The additional loss of scribbly gum open forest on Lot 16 on RP205744 and Lots 1-3 on RP200652 is also considered ecologically significant.

Table 12 Area to be removed from each vegetation community within the rail corridor.

| Vegetation Community | Total Regional Ecosystem vegetation identified in Moreton Bay Regional Council Area (ha) | | Total area of Regional Ecosystem to be removed | |
|--|--|------------------|--|-------------|
| | Pure RE | Additional Mixed | ha | % of Stands |
| Saltmarsh (RE12.1.2) | 553.6 | 96.4 | 1.5 | 0.25 |
| Mangrove (RE12.1.3) | 1,132 | 9 | 1.3 | 0.11 |
| Paperbark forest (RE12.3.5) | 120.2 | 58.9 | 3.41 | 1.9 |
| Paperbark-Queensland blue gum, swampbox woodland (RE12.3.6) | 61.9 | 96.4 | 0.86 | 0.54 |
| Queensland blue gum, grey ironbark, pink bloodwood open forest (RE12.3.11) | 242.7 | 28.5 | 1.9 | 0.7 |
| Queensland blue gum, pink ironbark grassy woodland (RE12.5.2) | 18.01 | 0 | 1.8 | 10 |
| Scribbly gum open forest (RE12.5.3) | 175.3 | 5.1 | 1.8 | 1.0 |
| She-oak forest (RE12.1.1) | 42.1 | 91.3 | 0 | 0 |

4.6 Impacts on Threatened Species and Populations

4.6.1 Flora

Whipstick wattle (*Acacia attenuata*) and frogbit (*Hydrocharis dubia*) are considered to have a moderate potential of occurring within the study zone. This is primarily due to the availability of suitable habitat supported by the EPBC database indicating that they may occur in the study zone. Clearing of vegetation within the corridor may result in the loss of individual specimens or several individuals of the species population. These species are considered vulnerable under the *EPBC Regulations 2000* due to their limited geographical distribution, the estimated number of mature individuals left and the rate which these numbers continue to decline. The probability of species extinction in the wild is at least 10% in the medium-term future (as defined in the *EPBC Regulations*, Division 7.01).

4.6.2 Koala

A significant koala population occurs in the study zone. It is likely that this koala colony will be adversely impacted by the clearing and operation of the proposed corridor. Clearing of the proposed corridor will involve the removal of approximately 33.82 hectares of this species' habitat. This has been calculated from the concept rail alignment. The overall activity level across the study zone of 65% suggests that this area is highly significant for locally occurring koala, notably breeding females. Little suitable habitat exists outside of the study zone due to the high levels of urban development in this locality.

The Pine River Koala Management Plan estimates a total population of koala in the area of approximately 6300 individuals (Dique *et al*, 2003). Urban and commercial development together with the associated impacts (including traffic) have placed pressures upon this population. Continuing urban expansion is likely to further diminish this koala population.

The proposed corridor will result in the clearing of approximately 6.32 hectares of RE and a further 27.5 hectares of regrowth vegetation. Based upon the likely area required for clearing and upon the densities of koala recorded within the locality in the Pine Rivers Koala Management Plan, it has been estimated that approximately 30 koala are likely to occur within the proposed study zone and will therefore be directly affected by the loss of habitat. It is also expected that additional individuals are also using this habitat as a minor component of their larger home ranges.

Therefore, the proposed construction of the corridor will result in the direct displacement of approximately 30 individuals. It will also result in contraction of available food resources for other individuals in the locality. This impact is likely to further destabilise koala colonies in the vicinity of the corridor leading to increased stress and further loss of individuals.

Transport infrastructure and operation are known to impede koala movement patterns and be a significant cause of koala mortality in urban areas. From the previous Pine Rivers Shire, a total of 140 koalas were treated at Moggill Koala Hospital and the Australian Wildlife Hospital in 2005/6 for road-related injuries. This is consistent with other urban areas; Redland Shire reported around 800 koalas hit by car from 1997 – 2000, an average of 200 koalas hit each year (Redland Shire Council, 2003). Less is known about rail-strike mortality, however it is widely accepted that transport corridors represent a barrier to movement and increase the environmental pressures on a population. It is considered the overall impact on koala population and habitat is of major significance.

4.6.3 Amphibians

Clearing of the corridor will result in the loss or modification of approximately 4.27 hectares of amphibian habitat. Three species protected under Queensland legislation, tusked frog (*Adelotus brevis*) wallum froglet (*Crinia tinnula*) and wallum sedge frog (*Litoria olongburensis*) and one species protected under Commonwealth legislation, giant barred frog (*Mixophyes iteratus*) are considered to have moderate likelihood of occurring in this habitat. The giant barred frog (Endangered under the *EPBC Regulations 2000*) is generally found in deeply incised rainforest streams and considered to have a very restricted geographical distribution. There are a very low number of mature individuals remaining that continues to decline at a very high rate. The probability of extinction in the wild is at least 50% in the immediate future (EPBC Regulation, 2000). It is highly unlikely the species will occur within the study area, despite appearing in searches.

4.6.4 Mammals

The spot-tailed quoll (*Dasyurus maculatus maculatus*), water mouse (*Xeromys myoides*) and grey-headed flying fox (*Pteropus poliocephalus*) have been recorded within searches for the study area. Despite their being suitable habitat in the area in terms of appropriate vegetation, anthropogenic disturbance and high number of European fox (*Vulpes vulpes*) mean that these areas are now unsuitable for the species.

The grey-headed flying fox is listed as vulnerable under the EPBC Act. The species is known to occur in the study zone predominantly around waterways and clearing will result in the loss of a small area (approximately 5.31 ha) of foraging resources, but will not impact on a roosting site. The overall loss of foraging resources for this species, in relation to the availability of alternative foraging and necessary compensatory planting as part of the recommended mitigation measures, is considered relatively minor.

4.6.5 Bird Species

Eight bird species listed under the *NC (Wildlife) Regulations 2006* either have been observed or are considered as having a high likelihood of occurrence in the study zone. These include beach stone curlew (*Esacus neglectus*), black necked stork (*Ephippiorhynchus asiaticus*), chestnut teal (*Anas castanea*), freckled duck (*Stictonetta naevosa*), grey goshawk (*Accipiter novaehollandiae*), little tern (*Sterna albifrons*), painted snipe (*Rostratula benghalensis*), and sooty oystercatcher (*Haematopus fuliginosus*). The proposed works may result in the loss or modification of habitat for these species totalling approximately 8.55 ha.

4.6.6 Impacts on Aquatic Species

The species recorded within the main creek systems of the study zone are considered generally common for SEQ streams with diversity relatively comparable between sites. Abundance was however, more unevenly distributed potentially as a result of suitability of buffering vegetation, subsequent water quality and adjacent habitat types. The high abundance and wide dispersal of mosquito fish (*Gambusia holbrooki*) within the waterways present within the study zone is expected to have adversely impacted upon native fish and other aquatic organisms.

In summary, it is apparent that waterways present in the study zone are generally disturbed due to anthropogenic habitat disturbance (cover, diversity of environs and food sources adjacent to the study area) and prevalence of mosquito fish (*Gambusia holbrooki*). These processes are likely to continue to influence aquatic species with an increase in diversity considered unlikely. The proposed works associated with the rail corridor are not expected to result in adverse impacts upon these already disturbed aquatic habitats provided best management practice is employed prior to, during and following construction activities. These measures will need to ensure water quality is maintained and where disturbance occurs, suitable sedimentation and erosion control practices are implemented. Where channels are disturbed, rehabilitation will need to be undertaken.

4.7 Impacts on Wildlife corridors and Essential Habitat

The minimal historic clearing of the study zone suggests that it has retained the conservation and biodiversity values typically required by many fauna species. The vegetation present within the study zone is relatively intact and evidently supports a variety of fauna movement both within the study zone and between vegetation communities adjacent to the study zone. The DTMR and Moreton Bay Regional Council have recognised the significant fauna corridor associated with Freshwater Creek (refer Figure 4c). This recognition has included extensive landscaping and conservation works under the existing Bruce Highway to ensure the long term viability of this wildlife corridor.

According to FIASR (2003), Hays Inlet from McKillop Street to Hercules Road in particular appeared to provide high foraging and roosting opportunities for the majority of species detected.

Clearing associated with the proposed rail corridor is expected to have a major impact on the availability and quality of habitat for a variety of fauna. Vegetation associated with the future corridor has been left untouched for an extensive period of time courtesy of transport corridor protection, rather than a desire to protect the vegetation. Changes to vegetation and habitat characteristics associated with edge effects, weed invasion and alteration in hydrological regimes are likely to alter the species composition and abundance of terrestrial and aquatic fauna species in the study zone.

Additional habitat value is attributable to its connectivity with relatively large and undisturbed areas of bushland, riparian areas, and sparsely populated farming areas that act as a source of and/or refuge for fauna within the corridor (FIASR, 2003). The wildlife corridor is likely to be wider than the actual easement by utilising adjacent vegetation; however, it is considered that the existing corridor is likely to provide fundamental connectivity values for arboreal and terrestrial mammals.

Koalas are considered likely to be most affected where the construction of the proposed corridor will result in high levels of fragmentation to limited koala habitat areas. This is considered of major significance to the koala population.

4.8 Summary of Potential Impacts

Potential impacts have been summarised into two tables, Table 13 identifies the potential impact of the project specifically on MNES. A person who proposes to take an action that will have, or is likely to have a significant impact on a matter of environmental significance must refer the action to the Minister for a decision on whether assessment and approval is required under the EPBC Act.

Table 13 Assessment of the potential impacts on Matters of National Environmental Significance under EPBC Act 1999

| Matter of National Environmental Significance | Potential Impact of Project |
|---|--|
| World Heritage Properties | There are no World Heritage properties within the corridor or that would be affected by the rail transport link. |
| National Heritage places | There are no National Heritage places within the corridor or that would be affected by the rail transport link. |
| Wetlands of International importance (declared Ramsar wetlands) | Moreton Bay is a listed Ramsar wetland; this includes Hays Inlet (refer to Figure 2). The proposed corridor crosses Hays Inlet west of McKillop St. The project is considered by the DSEWPC to not have a significant impact on these matters and as such advised that the project is 'not a controlled action'. |
| Threatened species and ecological communities | No threatened ecological communities have been identified within the study zone. However, grey-headed flying fox (<i>Pteropus poliocephalus</i>) has previously been recorded in the study zone. A further five Commonwealth listed threatened species are considered to have a moderate likelihood of occurring within the corridor (<i>Acacia attenuata</i> , <i>Hydrocharis dubia</i> , giant barred frog (<i>Mixophyes iteratus</i>), spotted tailed quoll (<i>Dasyurus maculatus maculatus</i>) and water mouse (<i>Xeromys myoides</i>). A self-assessment to determine whether a significant impact is likely on these species was prepared and is contained within Appendix C. The project is considered by the DSEWPC to not have a significant impact on these matters and as such advised that the project is 'not a controlled action'. |
| Migratory species | Sixteen migratory species listed under the EPBC protected matters database are considered to have a high likelihood of occurring within the corridor. Of these, bar-tailed godwit (<i>Limosa lapponica</i>), eastern curlew (<i>Numenius phaeopus</i>), Latham's snipe (<i>Gallinago hardwickii</i>), whimbrel (<i>Numenius phaeopus</i>) and white-bellied sea eagle (<i>Haliaeetus leucogaster</i>) have previously been recorded in the corridor. A self-assessment to determine whether a significant impact is likely on these species was prepared and is contained within Appendix C. The project is considered by the DSEWPC to not have a significant impact on these matters and as such advised that the project is 'not a controlled action'. |
| Commonwealth marine areas | The corridor does not occur within any Commonwealth marine areas. |
| Nuclear actions | The corridor does not involve any nuclear actions. |

Table 14 Summary of all potential impacts and recommendations at time of assessment (2007)

| Degree of Potential Impact | Description of Impact | Legislation at Time of Assessment | Project Response | Comment |
|----------------------------|--|---|---|---|
| Minor/Moderate | Disturbance to Ramsar wetland. | EPBC Act | The self-assessment undertaken by Maunsell (now AECOM) determined that a referral to DSEWPC is required due to the potential impact on a MNES, this being the disturbance to Moreton Bay. | The project is considered by the DSEWPC to not have a significant impact on these matters and as such advised that the project is 'not a controlled action'. |
| Minor | Disturbance to migratory species (bar-tailed godwit, eastern curlew, Latham's snipe, rainbow bee-eater whimbrel, and white-bellied sea eagle). | EPBC Act | The self-assessment undertaken by Maunsell (now AECOM) determined that a referral to DSEWPC is not required. | A referral to DSEWPC is not required for this issue. |
| Minor | Disturbance to listed threatened species (grey-headed flying fox, water mouse, frogbit). | EPBC Act | These threatened species are not expected to be impacted by the proposed corridor. | A referral to DSEWPC is not required for this matter. |
| Major | Disturbance to listed threatened species (beach stone curlew, black necked stork, chestnut teal, freckled duck, green-thighed frog, grey goshawk, koala, little tern, painted snipe, sooty oystercatcher, and wallum froglet). | NC Act | Disturbance to these species habitat is expected to result in harm to these species, and therefore a 'take'. | A permit will be required from the EPA. |
| Major | Severe loss of core habitat of listed threatened species (koala). It is estimated that approximately 30 koalas could be displaced as a result of the corridor through the clearing of approximately 33.82 hectares. | NC Act | Significant areas of primary habitat will be cleared as a result of the proposed corridor. Potential offset opportunities to enhance and rehabilitate alternative habitats and corridors should be developed and potential options are illustrated in Figure 8. | Wherever possible avoidance of habitat will provide the greatest mitigative measure to ensure the long term survival of koalas. Should this not be possible, the compensatory areas identified in Figure 8 and discussed below should be rehabilitated/revegetated as a priority. It will take approximately ten years for any compensatory area to provide any habitat value for koala. Further to this, it is unlikely that a similar carrying capacity to that of the existing vegetation can be achieved within this time frame even with a 5:1 replacement area. However, it is anticipated that over time, the carrying capacity will improve. A Koala Management Plan should be developed for the site to guide the future design of the corridor. |
| Moderate | Disturbance to amphibian habitat. | NC Act | Determine the occurrence of threatened amphibian species during and following significant rainfall events during both winter and summer period. | It may be possible, between formal approvals and actual construction activities to determine and establish appropriate compensatory areas to mitigate impacts upon amphibians. Avoidance of habitat is however the best mitigative measure to ensure the long term survival of these species in the locality. |
| Minor | Removal of marine plants - approximately 2.8 hectares of marine plants will be removed for construction of the proposed corridor. | Fisheries Act | Identify suitable compensatory planting opportunities. | A permit will be required from the DPIF. This is also likely to involve compensatory planting of species disturbed. |
| Minor | Disturbance to Fish Habitat Area. | Fisheries Act | Sedimentation and erosion controls measures must be implemented prior to, during and following construction to ensure minimal impacts upon fish habitat areas. | Appropriate management controls for sedimentation and erosion should be implemented to ensure limited impacts during and following construction. |
| Moderate | Loss and/or disturbance to remnant vegetation. | VM Act | Identify suitable compensatory planting opportunities. | It may be possible, between formal approvals and actual construction activities to determine and establish appropriate compensatory areas to mitigate habitat loss and promote rehabilitation of disturbed areas. |
| Minor | Spread of national environmentally significant weed (<i>Lantana camara</i>). | Land Protection (Pest and Stock Route Management) Act | A number of significant weed species have been recorded within the study area. | Appropriate management controls for weed management must be implemented prior to, during and following construction activities. These appropriate control techniques should be detailed within a Weed Management Plan for the corridor. |
| Moderate | Fragmentation of wildlife corridor | VM Act | Detailed design must consider appropriate structures to ensure existing corridors are not impacted. | Freshwater Creek has been identified by the DTMR and Moreton Bay Regional Council as a significant fauna corridor. Phase 3 koala habitat assessment has identified Saltwater Creek as an additional fauna crossing point. A Landscape Management Plan should be prepared to detail the mitigation measures to either avoid or eliminate impacts upon these significant corridors. |