15. Visual and lighting impacts

This section describes the existing landscape features, panoramas and views within the project area that have, or could be expected to have value to the community of local, regional, State-wide, national or international significance. The following issues are addressed:

- Major views, view sheds, existing viewing outlooks, ridgelines and other features contributing to the amenity of the area, including assessment from private residences in the affected area
- Focal points, landmarks (built form and topography), gateways associated with the project area and immediate surrounding areas, waterways and other features contributing to the visual quality of the area and the project area
- Character of the local and surrounding areas, including character of the built form (scale, form, materials and colours), vegetation (natural and cultural vegetation) and land use
- Identification of the areas within the project area that have the capacity to absorb land use changes without detriment to the existing visual quality and landscape character
- The value of existing vegetation as a visual screen

The assessment of visual and lighting impacts are based on investigations of the project area to obtain an understanding of the landscape features and general character of the areas adjacent to the existing rail infrastructure and maintenance facility. Investigations included:

- Description of the existing landscape and visual features
- Description of local amenity to understand its value to the local community
- Identification of potential visual and lighting impacts on local amenity

15.1 Methodology

On 3 March 2008 the project area and surrounding areas were surveyed to assess potential visual and lighting issues associated with the Project.

Identification and assessment of potential visual impacts was based on the QR Environmental and Planning Processes Manual (September 2006) and the DMR Road Landscape Manual (September 1987). The assessment methodologies in both these manuals were adopted with appropriate modifications to suit this Project. The assessment methodology in this EIS was as follows:

- Undertaking a view shed analysis to identify where proposed infrastructure elements would be visible
- Identifying the visual sensitivity of various infrastructure elements when viewed at a local and regional scale
- Calculating a visual absorption capacity (VAC)
- Identifying the level of change to the visual character by describing the level of contrast between the existing visual landscape and what is proposed
- Identifying the effect on visual amenity for the local community and visitors
- Identifying mitigation measures to minimise visual impacts

For the purposes of the visual amenity assessment the project area was focused around clusters of sensitive receptors (refer Figure 15.1) located as follows:

- Yarwun township and the surrounding rural lots including rural lots along Flynn Road[1]
- Mount Larcom township and the surrounding rural lots
- Rural lots along the Dawson Highway near Daetz Road. This also included rural lots to the north of the Calliope River

[1] Flynn Road is located in the GSDA. Some of the properties are vacant, however there are a number which are currently occupied (leased or privately owned)

15.1.1 Visual absorption capability

Visual absorption capability (VAC) is an indication of the landscape's capacity to absorb visual modification such as roads, residential and other anthropogenic activities. It is a function of existing land use, vegetation cover and type, topography, location and visibility. It is a measure of the degree of the existing visual landscape to absorb contrasting elements.

The methodology adopted for this visual assessment was developed from the following:

- Resources Inventory Committee, British Columbia, 1997
- North Shore City study, undated
- Waitakere City Study undated
- Department of Natural Resources, State of Alaska, 1978

Existing land use

A VAC value will be higher if the proposed development is similar in form, scale, colour and materials to existing development in the vicinity. The same development may stand out visually, and consequently score a lower VAC, if it were to be placed on a greenfield site surrounded by remnant bushland.

Table 15.1 outlines the values used to assess the VAC of existing land uses within the project area.

Table 15.1 VAC for existing land use

High	Moderate	Low
Fully developed industrial, commercial or residential areas	Development or agriculture covers 50% or more of the land surface	Little evidence of industrial, commercial or residential areas

Vegetation cover and type

VAC values will be highest in parts of the landscape where there are visual contrasts in the vegetation, for example when there is a mosaic of forest and grasslands. The VAC are lowest in areas of vegetation which is uniform in colour, form and texture or areas devoid of vegetation such as grassland, which is unable to screen the proposed new element.

Table 15.2 outlines the values used to assess the VAC of existing vegetation cover and type within the project area.

Table 15.2 VAC for vegetation cover and type

High	Moderate	Low	No visually effective vegetation cover
Tall (>18 m) closed forest (including rainforest) with a good pattern of discrete areas of vegetation across the landscape	Open forest 8-18 m tall with less discrete areas of vegetation across the landscape or dense vegetation in small patches (<10 ha) moderately spaced across the landscape	Open woodland or widely spaced patches of closed forest or a homogeneous cover of forest across the landscape	Open grassland, mudflats, bare soil or rock

Topography

Visual elements are more difficult to hide in areas where the topography is steep as these slopes are visible from further away. Similarly a bulky or tall element will be difficult to screen if there are no hills or other topographical features in the landscape. Elements are easiest to screen in landscapes with a uniform cover of rolling hills providing the element is not placed at the top of a hill.

Table 15.3 outlines the values used to assess the VAC of existing topography within the project area.

Table 15.3 VAC for topography

High	Moderate	Low
Very undulating land with moderate slopes (25% - 60%)	Moderately undulating land with moderate slopes (25% - 60%)	Land with very steep slopes (>60%) or very flat land (0% - 25%) or areas which have an uninterrupted view across water

Location and visibility

An element placed in an area highly visible from a long distance and by a high number of people will be harder to screen than one placed in an area that is difficult to see and is only viewed by a small number of people.

Table 15.4 outlines the values used to assess the VAC of existing location and visibility within the project area.

Table 15.4 VAC for location and visibility

High	Moderate	Low
An area only visible from road and rail corridors used for industrial traffic or seen by a low number of viewers or only visible to other viewers from a distance of 5 km or more	An area visible from residential areas, local road and rail networks from a distance of 1-5 km by a moderate number of viewers	An area visible from major tourist boat, road and rail corridors, or tourist lookouts and resorts at a distance of 0-1 km by a large number of viewers

Overall VAC

An area with a high overall VAC score has the greatest capacity to absorb or hide contrasting visual elements placed within it. An area with a low VAC has little capacity to absorb contrasting visual elements placed within it.

Table 15.5 outlines the characteristics used to assess the overall VAC.

Table 15.5 Overall VAC

High	Moderate	Low
Landscape has a high ability to absorb alteration and maintain its visual integrity	Landscape has a moderate ability to absorb alteration and maintain its visual integrity	Landscape has a low ability to absorb alteration and maintain its visual integrity

15.2 Existing environment

15.2.1 Description of visual amenity

Regional-scale

Gladstone is a city with a significant number of existing industries and established rail and road networks that serve them. Existing industrial facilities in and around Gladstone include:

- RG Tanna coal loading facility
- QAL alumina refinery
- Rio Tinto Alumina Refinery
- Boyne Smelters Limited aluminium smelter
- NRG Gladstone Power Station
- Orica Australia chemical plant
- Cement Australia cement kiln
- Queensland Energy Resources Limited shale oil plant
- Fisherman's Landing ship loading facility
- Clinton Coal Wharf
- Auckland Point Wharf
- Theiss-Peabody Mitsui Coal Wharf (Barney Point)
- South Trees Point Wharf
- Callemondah Rail Yard

There are also a number of additional industrial facilities proposed (refer Section 3). These include:

- Aldoga Aluminium Smelter (partially developed)
- Gladstone Pacific Nickel Plant and residual dam
- Wiggins Island Coal Terminal

Local scale

The visual amenity of the site is typical of a rural landscape in the coastal region of Central Queensland. The Project will provide a new view element in the local landscape which currently includes:

- Existing large industry (Aldoga Aluminium Smelter and Rio Tinto Alumina Residual Storage Area)
- Existing road corridors
- Existing rail corridors
- Gently undulating grazing lands
- Native regrowth within areas previously cleared for grazing
- Planted fruit trees
- Forested hills and mountains
- Tree-lined creeks
- Rural residences
- Linear infrastructure, including transmission lines and pipelines

The undulating terrain and mountain range in the project area between the townships of Mount Larcom and Yarwun screens the existing rail infrastructure from the view of residents from each of the townships. The Gladstone-Mount Larcom Road and the existing NCL occur within the northern end of project area between the Mount Larcom and Yarwun townships. The balance of the project area consists of open pasture with scattered patches of remnant bushland and native regrowth.

A significant portion of the Moura Link follows the existing road and rail infrastructure, including the Bruce Highway and the EEMBL.

Part of the southern portion of the Moura Link includes the MSL that follows the Dawson Highway. There is a small patch of riparian vegetation along a stretch of Larcom Creek, a major tributary of the Calliope River. Within the project area the Calliope River contains a series of large, deep waterholes. Waterways within the project area are predominantly ephemeral with isolated pools.

15.2.2 Description of existing light sources

The main artificial light source within the project area is the limited lighting in and around the existing railway and the township of Yarwun. Other major artificial light sources within the project area include those from Rio Tinto's residual dam located west of the Yarwun township and south of the Gladstone-Mount Larcom Road.

Vehicular traffic at night is fairly limited given that sections of the project area have only local access roads as the main thoroughfare. The light from these sources will therefore be minimal and intermittent. Vehicular traffic along Gladstone-Mount Larcom Road, Bruce Highway and Dawson Highway is higher due to their regional connector function. Rail traffic is more constant, 76 trains per day along the road between Aldoga and Callemondah, but lighting is restricted to the locomotives and is an intermittent directional point source.

As the existing rail facilities have been operating for a considerable amount of time, it can be expected that local residents have become habituated or have implemented measures to exclude the light from entering their homes. Consideration will be given to light reduction measures during the detailed design phase to ensure that the amenity of nearby residents is not compromised. QR is required to adhere to relevant lighting provisions specified in current QR operating standards to maximise operational safety and security.

No other permanent light sources occur within the local area.

15.3 Description of environmental values

15.3.1 View shed analysis

A view shed analysis has been undertaken based on assessing terrain likely to be visually exposed to views of the project area and the proposed Aldoga Rail Yard.

It should be noted that distance has a strong influence on potential visual impact of any proposed development (as well as the scale and form of what is proposed). The further away an object is from the viewer the less visually prominent it becomes as it accounts for a smaller percentage of the total view. A view of a development can be defined as:

- Local if it is within 0-1 km of the viewer
- Sub-regional if it is 1-5 km of the viewer
- Regional if it is more than 5 km from the viewer

The view shed analysis has been conducted for each of the three sensitive receptor clusters. This involved a site inspection, photo analysis description of the surrounding landscape from which the site and the proposed service infrastructure may be viewed and identification of key public views to the service infrastructure.

Based on the view shed analysis and site visit, views that have the potential to be affected would be:

- Views from Port Curtis Way through an increase in rail traffic
- Views from the NCL

- Views from the Gladstone-Mount Larcom Road
- Views from the Bruce Highway
- Views from the Dawson Highway
- Views from Mount Sugarloaf to the south of Yarwun
- Views from Mount Larcom and the Mount Larcom Range to the north of the project area

The NCL, the major north-south rail line between Brisbane and Cairns passes through the project area. This line carries the major passenger train services, including the Tilt Train, Spirit of the Outback and the Sunlander.

Photos of the project area are shown in Photos 15.1 to 15.9 and the locations from which they were taken are shown in Figure 15.2.

Yarwun township area

The main views of the project area within the Yarwun township and surrounds are from the following major viewpoints:

- Gladstone-Mount Larcom Road (local view)
- Calliope River Road (local view)
- Flynn Road (local view)
- NCL supports passenger train services such as the Tilt Train, Spirit of the Outback and the Sunlander (local view)

Photos 15.1 and 15.2 show local views of the project area from various locations.

Photo 15.1 View north-east from Calliope River Road towards the NCL

Photo 15.2 Panorama view of NCL looking east from Gladstone-Mount Larcom Road

Mount Larcom township area

The main views of the project area within the Mount Larcom township area are from the following major viewpoints:

- Gladstone-Mount Larcom Road (local view)
- Bruce Highway, a major tourist route (local view)
- NCL (local view)

Photos 15.3 to 15.6 show local views of the project area from various locations.

Photo 15.3 Panorama view looking east from sensitive receptor 45 towards NCL

Photo 15.4 Panorama view looking south-east towards project area from sensitive receptor 42

Photo 15.5 Panorama view looking south-east towards project area from sensitive receptor 44

Photo 15.6 View southeast along the Bruce Highway where the proposed Moura Link will be located on northeast side

Dawson Highway area

The main views of the project area within the Dawson Highway area are from the Dawson Highway, a major tourist route (local view).

Photos 15.7 to 15.9 show local views of the project area from various locations.

Photo 15.7 View south to MSL from the Dawson Highway

Photo 15.8 Panorama view of Moura Link Western Option looking north from Dawson Highway

Photo 15.9 Panorama view of Moura Link Western Option looking south east from Calliope River, sensitive receptor 15

15.3.2 Existing landscape features

Landscape features that dominate the visual experience for residents and passers by (in order of significance):

- The forested hills surrounding the project area
- Grazing lands (open grasslands)
- Remnant/regrowth vegetation along creeks and road corridors

- Existing rail infrastructure along the Dawson Highway and Gladstone-Mount Larcom Road
- Calliope River, Larcom Creek and other watercourses

15.3.3 Landscape character

Although there is an existing rail infrastructure in the project area, the major visual landscape character is grazing land and forested hills and mountains.

The project area and its surrounds also consist of:

- *E. moluccana* (Gum-topped box) and *E. crebra* (Narrow-leaved ironbark) communities
- Vine thickets
- Riparian vegetation
- Small rural townships (Yarwun and Mount Larcom)
- Rural residential development

15.3.4 Visual absorption capability for the project area

The overall VAC was determined from the analysis of the four attributes for each sensitive receptor area within the project area.

Figure 15.3 shows the level of absorption capacity within each of the sensitive receptor areas.

15.4 Potential impacts

15.4.1 Construction

Facilities proposed for the Project include a rollingstock maintenance facility, provisioning facility, new rail corridor, expansion of the existing rail corridor and changes to the local access roads. This proposed infrastructure will change the character of the relatively untouched natural area, including *E. moluccana* (Gum-topped box) and *E. crebra* (Narrow-leaved ironbark) communities, vine thickets and riparian vegetation.

A reduction of visual amenity is expected particularly in areas where substantial vegetation is to be removed and dwellings now buffered from the existing carriageways will be proximate to the proposed new carriageways.

Figure 15.4 shows the sites that are likely to be impacted visually as a result of the Project.

Yarwun township area

In the Yarwun township area the major rail infrastructure proposed includes:

- Additional tracks to be added along NCL between the township of Mount Larcom and WICT rail infrastructure
- Aldoga Rail Yard including rail holding roads, rollingstock maintenance and provisioning facilities
- Supporting infrastructure, including the upgrade of Flynn Road to provide permanent access to the Aldoga Rail Yard

The construction activities will change the character from a generally untouched landscape to the north of Gladstone-Mount Larcom Road to that of a transport infrastructure hub with fragmented patches of remnant vegetation.

The majority of the proposed works will be visible to passengers travelling along the NCL and motorists using Gladstone-M ount Larcom Road. Some of the proposed works may be screened from users of the Gladstone-Mount Larcom Road by the intervening vegetation and topography. There will also be localised impacts to the rural lots along Flynn Road and within the north outskirts of Yarwun township.

The construction activities will consider the potential amenity impacts to nearby sensitive receptors. This will include, where possible, the scheduling of works during daylight hours for areas within close proximity to sensitive receptors. Where construction night works are necessary in close proximity to sensitive receptors, minimum lighting requirements will be assessed based on the type of works required and safety constraints. Appropriate mitigation measures will be implemented to minimise the potential impacts.

Construction activities for the Project within the Yarwun township area are likely be visible from the following major viewpoints:

- Northern outskirts of the Yarwun township
- Calliope River Road
- Rural properties along Flynn Road
- Gladstone-Mount Larcom Road
- Sensitive receptors 2 and 3
- NCL

The construction activities for the Project will be visible from the Euroa Homestead located within the GSDA, to the north of the Gladstone-Mount Larcom Road adjacent the EEBML. Euroa Homestead is currently managed by a caretaker and is also leased.

Mount Larcom township area

In the Mount Larcom township area the major rail infrastructure proposed includes:

- Additional tracks along the NCL between the township of Mount Larcom and WICT rail infrastructure
- Bridges and turn angles linking the Moura Link to NCL and proposed Aldoga Rail Yard
- Aldoga Rail Yard including provisioning facilities and rollingstock maintenance facilities
- Supporting infrastructure including stabling and storage roads for rail facilities

There are likely to be changes as a result of the rail infrastructure to the existing landscape character in the Mount Larcom township area. There will be some localised impacts to the visual amenity for residents along The Narrows Road. This will be associated with the construction of an emergency access road and the Moura Link angles. However, overall the separation between the construction works and residents, the existing topography of the area and remnant vegetation should minimise the potential loss of visual amenity to residents along The Narrows Road.

The construction works will be visible from major roads including the Gladstone-Mount Larcom Road and the Bruce Highway. This is due the relatively flat topography adjoining the project area and the close proximity of the works to the roads. Remnant vegetation within the road corridors and in some areas the local topography should minimise the impact on visual amenity.

Construction activities for the Project within the Mount Larcom township area likely to be visible from the following major viewpoints:

- Sensitive receptors 42 and 44 (adjacent to The Narrows Road)
- Gladstone-Mount Larcom Road
- Bruce Highway
- NCL

The construction activities for the Project are also likely to be visible from Sensitive Receptor 30.

Dawson Highway

In the Dawson Highway area the major rail infrastructure proposed includes a new rail link between the existing MSL and the NCL near the township of Mount Larcom and via the EEMBL.

Some of the proposed rail infrastructure may be screened from users of the Dawson Highway due to the intervening vegetation and topography immediately to the north of the Dawson Highway, between the two Moura Link options. However, there are likely to be changes to the existing landscape character in the Dawson Highway area. This is a result of the relatively flat topography between the Calliope River area and the Bruce Highway.

A large linear area of remnant vegetation will need to be cleared in order to construct the rail link between the existing MSL and the Bruce Highway. The proposed infrastructure will change the rural character of the landscape from a relatively natural area to that of major transport infrastructure.

Construction activities for the Project within the Dawson Highway area are likely to be visible from the following major viewpoints:

- Dawson Highway
- Sensitive receptors 14, 15, 17, 21, 22, 23, 24, 25 and 47

The degree of impact on surrounding areas will be dependent on which Moura Link option is developed (eg the development of the Moura Link Western Option increases the separation distance between sensitive receptors 14 and 21 minimising the potential loss of visual amenity to these areas).

The construction activities will consider the potential amenity impacts to nearby sensitive receptors. This will include, where possible, the scheduling of works during daylight hours for areas within close proximity to sensitive receptors. Where construction night works are necessary in close proximity to sensitive receptors, minimum lighting requirements will be assessed based on the type of works required and safety constraints. Appropriate mitigation measures will be implemented to minimise the potential impacts.

15.4.2 Operation

The current landscape character is a relatively natural area with the Gladstone-Mount Larcom Road, Bruce Highway, the NCL and the existing EEMBL as the only transport infrastructure present. The proposed facilities for the Project will change the visual character of the relatively untouched area to that of transport infrastructure.

A reduction in visual amenity is expected, particularly in areas where there was little/no existing infrastructure. The Project is however, consistent with the intent of the GSDAs proposed industrial landscape

Figure 15.4 shows the sites that are likely to be impacted visually as a result of the Project.

Yarwun township area

The operational impacts on visual amenity and landscape character include an increase in rail traffic due to the quadruplication of the existing NCL and the lighting requirements at the Aldoga Rail Yard.

Most of the additional tracks will be visible to traffic using Gladstone-Mount Larcom Road, Calliope River and the NCL. Within the township of Yarwun the Project aims to duplicate the existing rail infrastructure (refer Photo 15.1) and is unlikely to significantly alter the visual characteristics of the area. Other localised impacts will occur, including the impact associated with the duplication of the road over rail bridge (NCL/Gladstone-Mount Larcom Road) and upgrade of Flynn Road

Lighting sources will be in most cases intermittent directional point sources. However, the lighting requirements of the Aldoga Rail Yard may have an impact on the surrounding areas as there are currently little or no existing light sources (ie the yard will require sufficient lighting to operate 24-hours a day, and consequently meet relevant health and safety standards and legislation). Lighting requirements will be investigated during detailed design, including the use of energy efficient solutions (eg solar power lighting) and measures to minimise lighting spillage.

The separation distance from the yard to sensitive receptors, along with the natural landscape of the area should assist in minimising potential impacts. There may also be some localise impacts on road and rail traffic within this area (ie vehicles using Gladstone-Mount Larcom Road and trains utilising the NCL).

Operational activities for the Project within the Yarwun township area are likely to be visible from the following major viewpoints:

- Northern outskirts of the Yarwun township
- Calliope River Road (local view), similar to existing views of the NCL
- NCL
- Gladstone-Mount Larcom Road
- Sensitive receptors 2 and 3

The Project will be visible from the Euroa Homestead located within the GSDA.

Mount Larcom township area

The operational impacts on visual amenity and landscape character include an increase in rail traffic in the area due to the construction of the connecting line between the MSL and the EEMBL. Changes in landscape character are also anticipated due to an increase in the use of external lighting.

Remnant vegetation within the Bruce Highway corridor in addition to design measures (eg Moura Link located away from the Bruce Highway), should minimise the loss of visual amenity to motorists using the Bruce Highway. There will be localised impacts to views associated with road/rail crossings.

Lighting sources will be in most cases intermittent directional point sources. However, the lighting requirements of Aldoga Rail Yard may impact the surrounding areas where there is currently little or no existing light source. The separation distance from the yard to sensitive receptors, along with the natural landscape of the area should assist in minimising potential impacts.

Operational activities for the Project within the Mount Larcom township area are likely to be visible from the following major viewpoints:

- Sensitive receptors 42 and 44 (adjacent to The Narrows Road)
- Gladstone-Mount Larcom Road, including localised views of bridge structures
- Bruce Highway, including localised views of bridge structures
- NCL

The Project may also be visible from Sensitive Receptor 30. This will depend on the design of the embankments during detailed design. The retention of vegetation, the areas local topography and current design (ie separation from the Moura Link) should minimise the potential loss of visual amenity.

Dawson Highway

An increase in rail traffic along the MSL up to the proposed Moura Link/MSL junction is expected as a result of the operational activities of the Project. Furthermore, there will be a change in landscape character in this area as a result of the completion of the Moura Link between the existing MSL and the EEMBL. There will be localised impacts to views associated with road/rail crossings.

External lighting associated with train movement may impact the surrounding areas where there were little or no existing light sources. However, lighting sources will be intermittent directional point sources.

Operational activities for the Project within the Dawson Highway area are likely to be visible from the following major viewpoints:

- Dawson Highway, including localised views of bridge structures
- Sensitive receptors 14, 15, 17, 21, 22, 23, 24, 25 and 47

The degree of impact on the sensitive receptors will also be dependent on which Moura Link option is developed (eg the development of the Moura Link Eastern Option increases the separation distance between sensitive receptors 15, 17 and 47 minimising the potential loss of visual amenity to these areas).

15.5 Mitigation measures

Mitigation measures will be implemented to reduce the impact on visual amenity and landscape character of the project area. It is recommended that for the areas that are likely to be impacted visually, revegetation works are carried out.

The measures proposed to mitigate potential visual and lighting impacts on for the Project are discussed in Section 20.

15.6 Conclusion

Due to the nature and scale of the proposed development, the Project will be visible from a number of locations in the surrounding area, including the Gladstone-Mount Larcom Road, Bruce Highway, Dawson Highway and the NCL. The majority of the views will be localised and associated with existing linear disturbances.

There will be some degree of impact to the visual amenity of some local landowners not previously impacted by rail infrastructure. However, overall the separation between the construction works and residents, the existing topography of the area and remnant vegetation should minimise the potential loss of visual amenity to residents. The degree of impact to local landowners will also be dependent on which Moura Link option is developed.

The Project is however, consistent with the intent of the GSDAs proposed industrial landscape.

15.7 Commitments

The visual amenity commitments relevant to the Project include:

- Clearing of remnant vegetation will be restricted to the minimum required to enable the safe construction, operation and maintenance of the project area.
- Vegetation will only be removed when necessary for the Project works.
- Construction and operational lighting design will be consider further in the detailed design subject to safety constraints.
- Where vegetation is removed these areas will be progressively rehabilitated.
- Vegetation rehabilitation works will be conducted in accordance with the Vegetation Rehabilitation and Management Sub Plan (VRMSP).