2 *CLIMATE AND CLIMATE CHANGE*

Chapter 2 provides an overview of the existing climate and predictions of climate change in the area of the Pipeline Component of the Queensland Curtis LNG (QCLNG) Project.

In particular, the chapter describes the potential impacts of climate change on the Pipeline Component. It does not describe the impact on climate change from the production of greenhouse gases by Pipeline development. Greenhouse gas emissions, and their impacts and mitigation strategies, are discussed in detail in *Volume 7* of this Environmental Impact Statement (EIS).

2.1 CLIMATE

2.1.1 *Project Environmental Objective and Values*

The Project environmental objective for climate and climate change is to ensure that Project infrastructure design and proposed management strategies incorporate consideration for climatic extremes and future climate change.

The sections that follow outline the existing environmental values or climate characteristics of the Project area.

The proposed routes of pipelines comprising the Pipeline Component of the Project are through subtropical climate zones of Queensland. The coastal area is characterised by hot summers and mild-to-warm winters, while the inland areas are characterised by hot summers with dry-to-moderately dry winters.

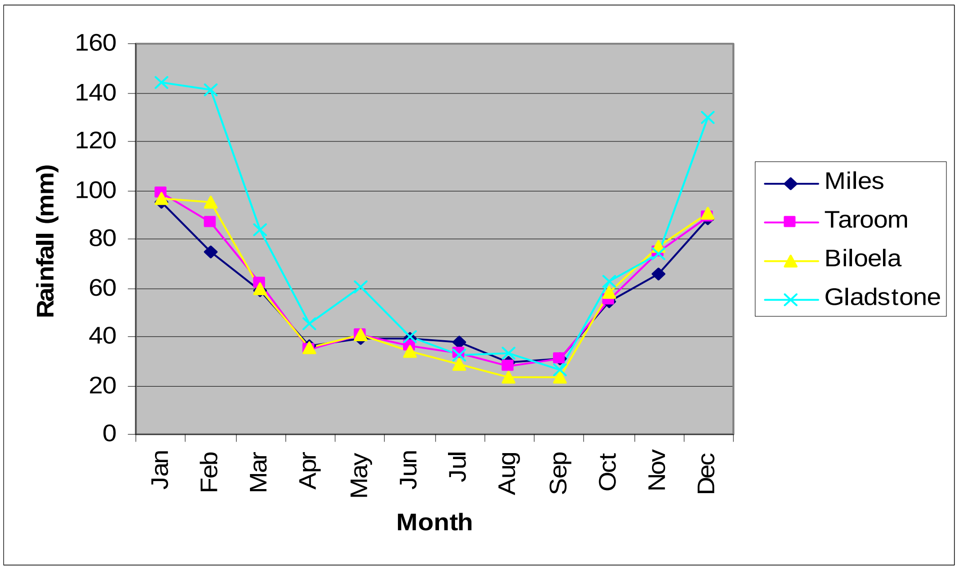
The climate for the area through which pipelines will pass has been summarised from data gathered at the meteorological stations at Miles, Taroom, Biloela and Gladstone. These sites were chosen so that the variability of local climate and weather patterns experienced both on the coastal area and further inland could be defined and impacts identified.

2.1.2 *Rainfall*

The highest rainfall in the area occurs during the summer months. The regional average rainfall for these months is 103 mm, although this generally varies between inland and coastal areas. The average rainfall over the wet season in the inland region is approximately 91 mm while on the coast at Gladstone it is 139 mm. Coastal areas also tend to retain more humidity throughout the day.

Further inland (Miles, Taroom and Biloela) climatic conditions in proximity to proposed pipeline routes are relatively dry, illustrated in *Figure 4.2.1*

Figure 4.2.1 Mean Monthly Rainfall for Miles, Taroom, Biloela and Gladstone areas



2.1.3 Temperature

Temperatures experienced in the region are relatively constant within the coastal region. Inland areas have the largest variation in annual temperature. The mean maximum monthly temperatures recorded range from 19.3 (July) to 33.7°C (January) as demonstrated in *Figure 4.2.2.* The mean minimum monthly temperatures range from 3.6°C to 22.5°C as demonstrated in *Figure 4.2.3.*

Figure 4.2.2 Mean Maximum Temperatures

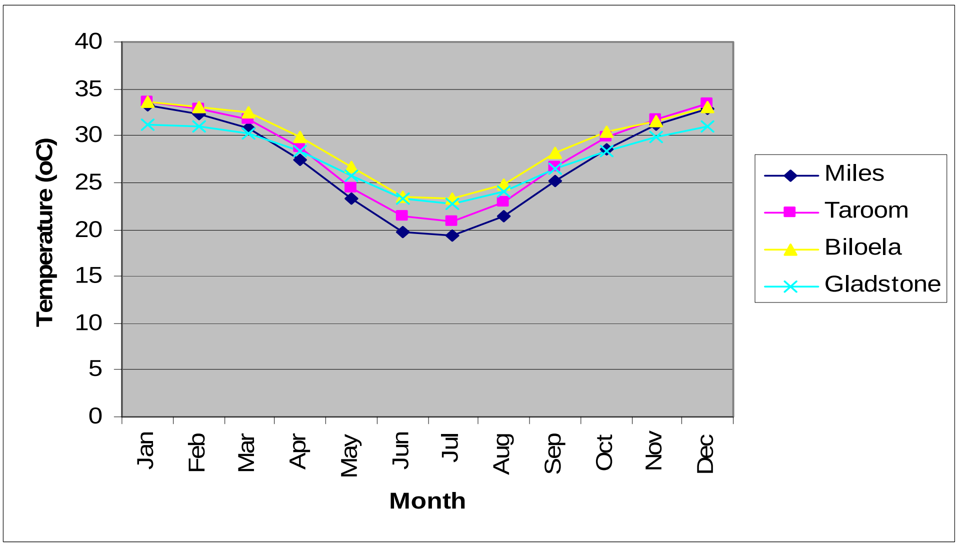
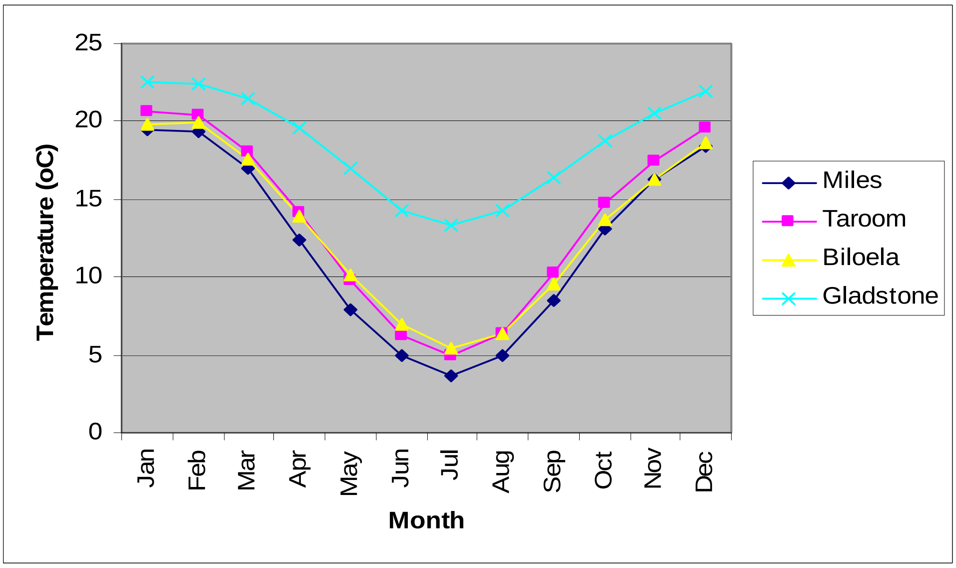


Figure 4.2.3 Mean Minimum Temperatures



2.1.4 Winds

As shown in *Figure 4.2.4* and *Figure 4.2.5* , the greatest wind speeds throughout the year are experienced at Gladstone due to its proximity to the coast.

Wind speeds in coastal locations increase in the afternoon throughout the year. However, the more inland areas of Taroom and Miles only experience an increase in afternoon wind speeds during the winter months. Summer wind speeds in the inland areas are reasonably consistent between 9am and 3pm particularly around Biloela. Taroom and Miles experience a small decrease in wind speed during summer afternoons.

2.1.5 Extreme Events

Seasonal cyclonic activity occurs within the northern pipeline region, with the primary impacts to the coastal areas between December and April and the majority of activity between January and March. The number of cyclonic events varies from year to year, with an average of one to two cyclones passing off the coast each year.

High winds and heavy rainfall accompany cyclones. These have the potential to cause significant damage when cyclones travel in close proximity to land and/or upon landfall. This damage may extend to low-lying inland areas which may be affected by flooding (refer to *Volume 4 Chapter 9.*).

Figure 4.2.4 Mean 9am Wind Speed (km/hr)

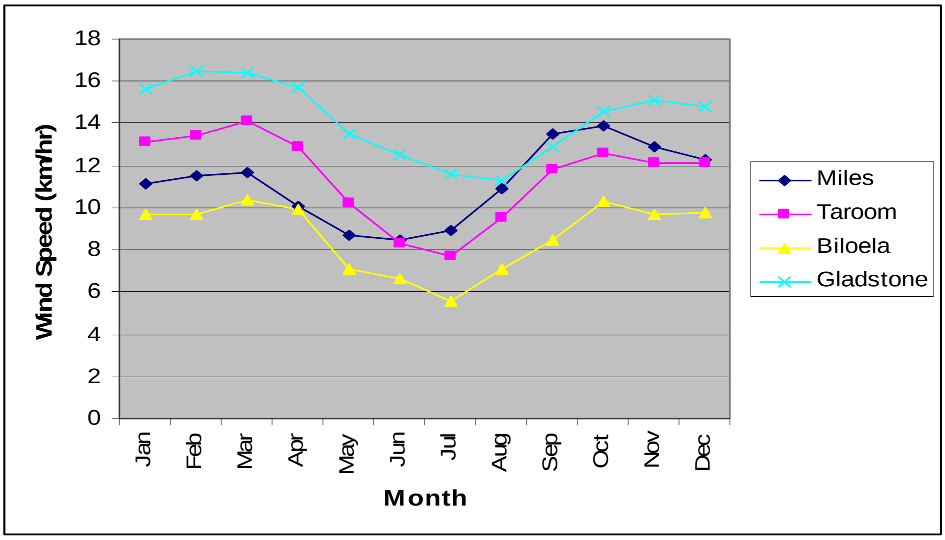
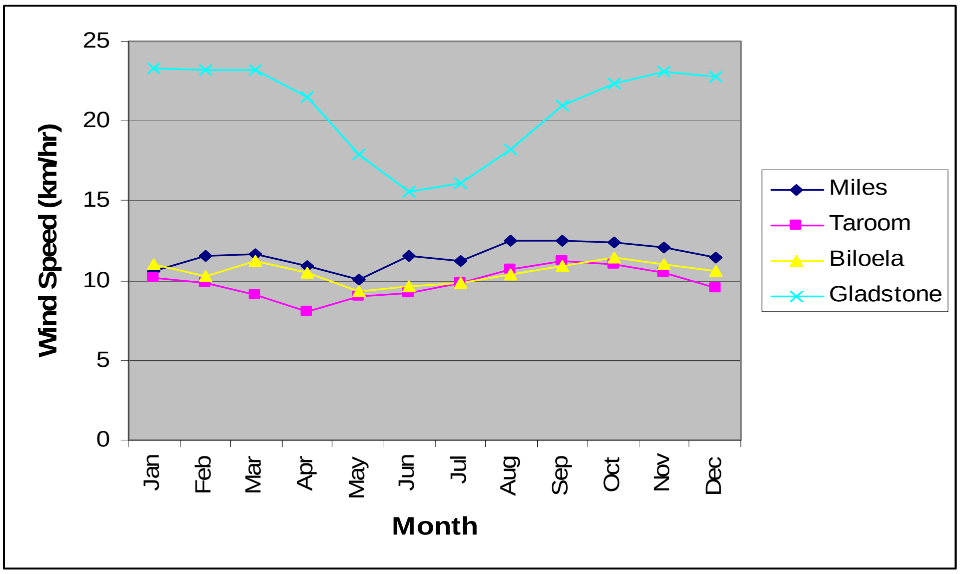


Figure 4.2.5 Mean 3pm Wind Speed (km/hr)



2.1.6 Climate Change

The climate change potential of areas associated with the Pipeline Component has been largely described in *Volume 3, Chapter 2* (Gas Field) and *Volume 5, Chapter 2* (LNG Facility). The most significant potential impact of climate change associated with the pipelines is the risk of pipeline exposure from major storm and flooding events.

These issues will be taken into consideration during the pipeline design to ensure that the pipelines are buried deep enough and adequately weighted down to prevent exposure during flood events or damage as a result of surface erosion from flooding. In addition, during the operational phase, the pipeline routes will be subject to a visual inspection following significant rainfall or floods to ensure that the pipeline cover and any associated infrastructure is intact and has not been damaged.

2.2 *POTENTIAL IMPACTS AND MITIGATION METHODS*

The key potential effects of the prevailing climatic conditions on pipeline construction and operation are:

- flooding of worksites leading to the collapse of the trench and risk to workers
- subsidence due to water ingress
- erosion due to wind or water
- difficulties with construction access and vehicle operation due to wet-weather conditions
- dust due to dry windy conditions.

Potential mitigation strategies to avoid environmental impacts, delays during construction and process delays during the operational phase as a result of climate include:

- providing wet weather access to all construction sites
- reduction, where appropriate, of construction activities during wet weather
- sediment and erosion controls will be designed and implemented to cope with high rainfall events
- ensuring adequate dust and erosion management as described in *Volume 10* the Draft EMP
- monitoring short-term and long-term weather predictions
- ensuring pipeline is buried deep enough to not be affected during flooding events
- developing and implementing emergency response plans for cyclones, fire and flooding
- ensuring all personnel are aware of and have rehearsed emergency response measures in the event of flooding, fire and cyclones
- consideration of trenchless techniques, such as directional drilling, at major river crossings to avoid risks associated with flood waters and to maintain

stability of crossing area.

2.3 CONCLUSION

Infrastructure for the Pipeline Component of the QCLNG Project will be designed and constructed in consideration of the existing climate and potential climate change.

Climate change impacts within the lifespan of the Project are not anticipated to significantly affect construction, operation and decommissioning of the Pipeline Component. A summary of the impacts outlined in this chapter is provided in *Table 4.2.1.*

Table 4.2.1 Summary of Impacts for Climate

Impact assessment criteria	**Assessment outcome**
Impact assessment	Negative
Impact type	Cumulative
Impact duration	Short term
Impact extent	Local
Impact likelihood	Unlikely

Overall assessment of impact significance: negligible.