6.1 Existing conditions

A storm surge is an onshore rush of water associated with a low pressure weather system. Minor surges may be associated with most storm events, but around the northern coast of Australia significant storm surge is generally associated with the passage of tropical cyclones. Records of cyclones in the Northern Territory (Table 3.2) show some 20 cyclones affecting the Tiwi Islands over the period 1964 to 2005, or an average of one every two years.

The extent to which a given portion of the coast may be affected by storm surge resulting from the passage of a tropical cyclone is influenced by the strength and direction of the wind, nearshore bathymetry, coastal morphology and onshore topography.

Observations on storm surges affecting settled parts of the coastline have been relatively well documented, however, while the effects on more sparsely settled areas, including the Tiwi Islands, are less well documented, observations of storm surges and their effects are recorded. For example, the Tiwi Islands Natural Resource Management Strategy (2004) notes the destructive effects of the storm surge associated with a category 4 cyclone in 1919.

Thus although the frequency of cyclones is on average, one every two years, it would appear that the last recorded significant storm surge event in the area associated with a storm surge occurred in 1919. Cyclone Ingrid which hit the Tiwi Islands during the 2004/05 cyclone season was a category five. This cyclone did not create a detectable storm surge at Andranangoo or Lethbridge. However, it did cause substantial tree damage in both areas.

The predicted increases in cyclone intensity and higher sea levels will increase storm surge frequency and severity. This represents a significant risk to coastal areas in the Tiwi Islands, and to vegetative cover and built infrastructure, particularly coastal infrastructure including port facilities. Some specific environmental impacts may include mangrove recession and increased coastal erosion. Although there have been no NT studies, research done for Cairns found that a 1-in-100 storm surge under current climatic events became a 1-in-40 year event in 2050, when projected increases in cyclone intensity and sea level rise were incorporated (Hennessy *et al.* 2004). The management of storm surge risk is addressed in the main report (Section 6).

The proposed mining operations will not impact on the occurrence or magnitude of storm surges affecting northern Melville Island. However, being located on the low-lying beach ridge system, the crests of which occur typically less than 5 m above sea level, and adjacent to an area of shallow bathymetry, the mining areas would be considered potentially susceptible to storm surge effects. Activities associated with mining (clearing, excavations and the presence of stockpiles) may have a localised impact on the penetration of the surge inland from the shoreline and on the direction of flow.

6.2 Objectives and standards

Given the potential occurrence of storm surge in the region, and of the susceptibility of the mining area to storm surge, the objectives during and post-mining are:

- to minimise the risk of any increase in potential impact of storm surge to mine personnel, and to traditional owners and other persons that may visit the area from time to time;
- to minimise the potential for increased penetration of storm waves as a result of mining activities, particularly in regard to clearing and the positioning of stockpiles.

6.3 Definition of issues and impacts

As noted above, mining will not impact on the generation of storm surges, however in the event of a storm surge overtopping the beach and coastal dune system, in the immediate mining area there will be less resistance to the progress of the water as it passes through this area, including roads and tracks, that have been cleared of vegetation or excavated.

Impacts on Tiwi Islanders and Island infrastructure

The proposed minesites at Andranangoo and Lethbridge are remote from existing settlements and island infrastructure, and as such the mining operations will not increase the risk of storm surge impacts on existing settlements.

Risk to mining personnel and other persons in the vicinity

There is a risk to mine personnel, particularly those engaged in operations in the pit, which would be susceptible to flooding, in the event of a storm surge. This risk will be managed through Matilda's Imminent Storms and Flooding, and Cyclone Procedures.

To mitigate the risk to mine personnel, the camp and processing area, including fuel storage, will be located on the plateau above the deposit (Figures 2.1 and 2.2). During cyclone alerts, mining activities would be suspended, equipment moved to higher grounds and no personnel will be permitted on the beach and coastal dune areas.

Increased accessibility of the area will result from the construction of mine roads post mining, as these roads will provide access to landowners and other short-term visitors. As part of the RMCP , Matilda will consult with the TLC, the Traditional Owners and the NT Government in regard to mine closure and relinquishment.

Impacts on the natural environment

The major potential impacts on the natural environment from storm surge are erosion of shorelines, destruction of vegetation and fauna habitat, and temporary salinisation of surface waterbodies and shallow groundwater.

Clearing for mining, including access roads, tracks etc, will reduce the resistance to storm surge, potentially allowing for erosion around the mine area and greater impact on the vegetation and habitats of the localised area inland of the mining operation. These areas will be progressively rehabilitated over the life of the mine.

6.4 Management

During operations

As mining will run parallel to the shoreline, the effect on storm surge will be less than that occasioned by clearing areas perpendicular to the shoreline, as a direct path for water movement will not be created. Construction of roads perpendicular to the shoreline that would provide a path for the inland movement of water will be avoided where possible. It is also noted that:

- The mining area is relatively narrow, typically a strip of about 80 m wide. Thus the overall impact of the mining operations will be comparatively minor;
- There will be a minimum buffer distance of 200 m from the beach areas to the mining areas (for turtle protection), and 50 m from inland water areas to mining areas; and
- The topsoil and vegetation stockpiles would be sited parallel to and on the seaward side of the pit, providing some barrier to water movement.

Detailed procedures will be described in the RMCP Section (21) on rehabilitating the mining areas. The key matters in relation to potential storm surge events include minimising clearing, returning the land surface to closer to the original contour and undertaking rehabilitation works as soon as possible following mining.

Procedures for the evacuation of mine personnel and other persons in the mine area will be developed as part of the cyclone procedures. This will include accounting for all persons entering and leaving the area via the mine access road and for closure of the mine roads and erection of appropriate warning signs during periods of potential storm surge. During cyclone alerts, mining activities would be suspended, and there will be no personnel in the beach and coastal dune areas.

Post mining

The post-mining reduction in ground surface level over the mineralised area, estimated to be approximately 150 mm, will not appreciably increase the storm surge risk to areas inland of the mine site. However, there will be slightly less attenuation of potential storm surge as the water passes through the mining area, until such time as the vegetation cover is returned to pre-mining height and density.

In the event of a storm surge during the rehabilitation period, there may be damage to revegetated areas that may subsequently require further remedial works. This will be addressed as part of the RMCP. Management of the mined areas post relinquishment will also be addressed in the RMCP.

6.5 Commitments

Matilda commits to implementing evacuation procedures in the event of a cyclone to ensure employee safety (Section 6.3).

Matilda commits to maintaining a 200-m buffer zone from mining activities to the Spring High Water Mark, to mitigate impacts on sea turtle nesting behaviours on adjacent beaches. This will also reduce the risk of inundation of mining areas if a storm surge is experienced (Section 6.4).

Matilda commits to minimising the area of land disturbed and to minimise the area of land that is cleared at any one time (Section 6.4).

Matilda commits to progressively rehabilitating mined areas as soon as practically possible (Section 6.4).