



# QNI Yabulu Refinery

Integrated Water and Ecological Management within a  
Certified Management System.

Presentation to: PECC Noumea  
November 2002



## Our Vision

We are in business for the long term as a robust,  
world class nickel and cobalt producer.



*Safety First*

# Overview

- QNI Yabulu
- Environmental Management Systems
- Waste Water Management
- Ecological Management
- The Outcome



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# Overview - Yabulu Refinery

- Commenced operations in 1974, ore from Greenvale nickel deposit.
- Mine exhausted in 1992; other domestic supplies in 1995.
- Imported ore since 1986
- 3.5 M tpa of imported ore produces 29 000T Ni and 2000T Co
- Efficient refining process (Caron)
- Billiton finalised purchase in Dec 1998
- Billiton merged with BHP in July 2001.
- Largest private employer in the region.



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# Ore Sources

- Yabulu is located on the coast near the city of Townsville in North Queensland, Australia

- Ores are imported from New Caledonia, Indonesia and the Philippines

- Ore is railed 25km from the port to the refinery



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# Yabulu Refinery - Setting

- Dry Tropics - 1131mm annual rainfall
- 2464 ha site
- Tailings Storage Facility positive water balance



- Adjacent to Great Barrier Reef World Heritage Area
- Wetland Areas of Conservation Significance



# Independent Certification

- In August 1999, Yabulu became first Nickel Refinery in the world to attain ISO 14001 certification for its Environmental Management System
- 6 monthly surveillance audits
- Full Re-certification September 2002

**Provides Consistency, Transparency,  
Continuous Improvement.**



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# Ocean Discharge History

- Irregularly used since plant constructed in 1974.
- Discharge under license
- Discharge 15ML/day
- 20+ years of marine sampling data indicates no significant impact on the marine environment
- Frequency of ocean discharge increased due to upgraded containment of stormwater runoff
- 1998 QNI sets objective to cease routine discharge
- Water chemistry - TDS (7000mg/L), Ammonia (700mg/L), Magnesium (600mg/L), Sulphate (4000mg/L), low metals





# Water Recycling Facility (WRF)



- \$25million WRF a sustainable, long term solution to water management at Yabulu.
- Benefits:
  - replaces the practice of routine release of excess water to sea as a water management strategy
  - allows a significant reduction in demand from external water supplies
  - approximately 10 ML per day recycled. = 40% of daily water requirements

# WRF - Features

- Predictive spill risk model for the Tailings Storage Facility - must maintain spill risk less than 1%
- Reverse osmosis and micro filtration.
- Pressure vessels 400mm - double normal RO units.
- No chemical anti-scalants - use electromagnetic fields to prevent membrane scaling
- Untied Utilities Australian - design, build, operate contract.



# WRF- Construction & Commissioning

- Construction completed in 6 months and within a year of the completion of the pilot testing.
- Commissioned in December 2000. Fully operational December 2001.
- Variable feed water quality required installation of pre-treatment circuit.
- Ocean Discharge ceased September 2001.



# WRF - Brine Ponds

- The brine stream from the WRF is stored in a HDPE lined evaporation dam.
- Utilise a previously rehabilitated Tailings Storage Facility.
- 10 year life at a design discharge rate of 1.2ML/day and 1% spill risk.
- Investigating possibility of converting brine to fertilizer.



# WRF - Issues Addressed

- Ocean discharge ceased
- Eliminate negative perception of ocean discharge
- Staying ahead of regulatory changes
- QNI worked with EPA to adopt new technology and redraft site environmental license.
- Meeting community expectation with respect to
  - Perceived Environmental Impact
  - Great Barrier Reef
  - Water Consumption
- Costs:
  - \$25million capital
  - 5 times operating cost for WRF water compared to new water.



# Environmental Assessment & Management (EA&M) Program

## Objectives

- **Establish a model for the various ecosystems**
- **Monitor environmental conditions**
- **Establish key environmental 'health' indicators**
- **Assess the health of the various ecosystems**
- **Recommend remedial actions where required**
- **Develop a scientifically defensible environmental monitoring data set**



# External Organisations

- Central Queensland University - Centre for Environmental Management
- James Cook University - Australian Centre for Tropical Freshwater Research
- The University of Queensland - Marine Botany Group
- Lloyd Consulting Environmental Project Management
- Commencing 5th year in 2002/03



# Environmental Management Zones

- Industrial Zone
- Infrastructure Zone
- Buffer Zone
  - Freshwater
  - Estuarine
  - Terrestrial
- Marine Zone - Halifax Bay





# Marine Zone Monitoring

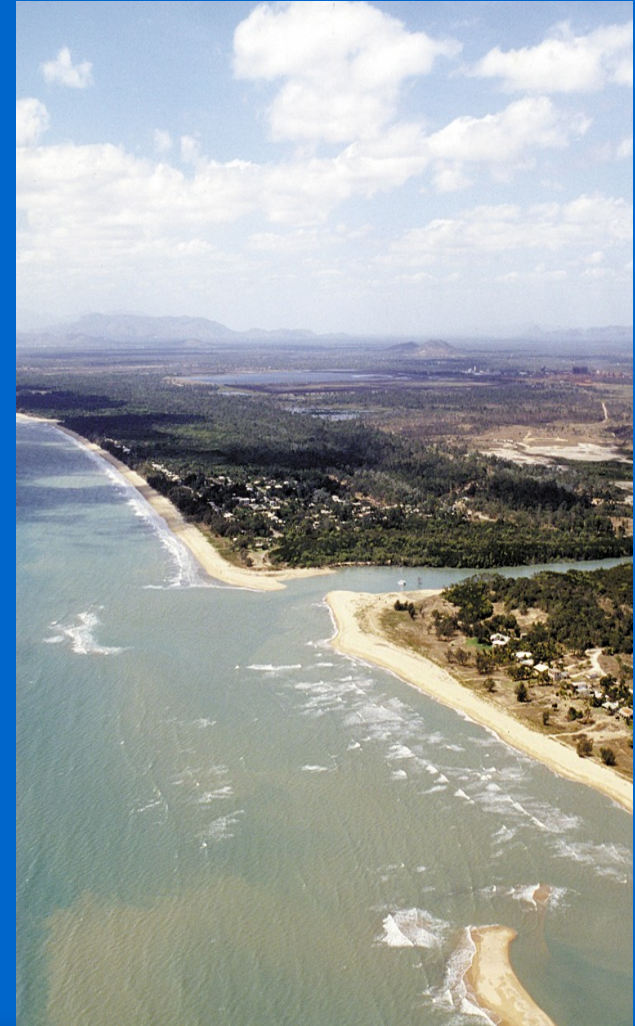
- Physico-chemical (temperature, pH, conductivity, DO, turbidity)
- Macro-benthic, seagrass, beach fauna and benthic micro-algae
- Biodiversity of pylon assemblages
- Industrial nitrogen tracking (ratio of  $^{15}\text{N}$  to  $^{14}\text{N}$ )
- Phytoplankton assays



# Marine Ecosystems

- Majority of water quality parameters close to background even within mixing zone.
- No evidence of metals exceeding national sediment quality guidelines in benthic sediments
- Industrial N predominates around discharge. Chlorophyll *a* concentrations not affected by discharge.

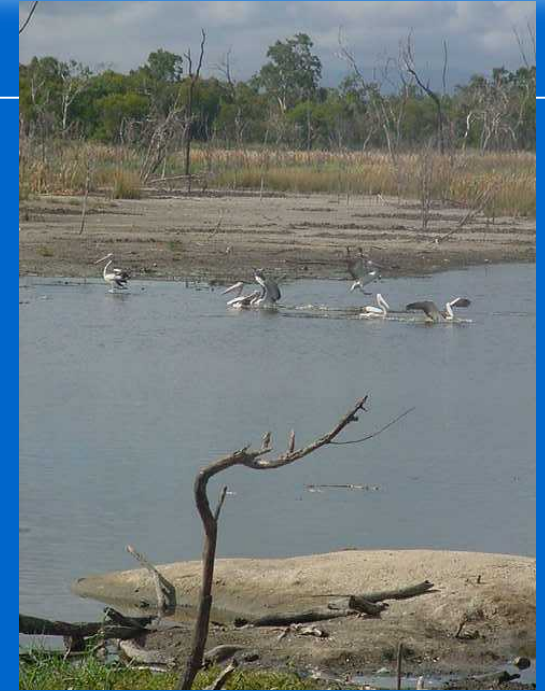
**No unacceptable impacts have been identified. Marine and beach ecosystems healthy and consistent with other near shore tropical ecosystems.**



# Buffer Zone - Aquatic Monitoring

## Freshwater and Estuarine Ecosystems

- Physico-chemical
- Macro-invertebrates, macrophytes
- Fish communities and waterbirds
- Mangrove functional health
- Estuarine health functionality
- Hydrologic functionality



# Buffer Zone - Estuarine Ecosystems

- Mangroves and estuary downstream of sand blockage are healthy and typical of similar tropical ecosystems in Queensland.
- Mangroves and estuary upstream of sand blockage are degraded due to impoundment effects (poor flushing, low oxygen).
- Initial remedial works resulted in some recovery of ecosystem processes. Additional works have been undertaken.



# Buffer Zone - Terrestrial Ecosystems

- Terrestrial ecosystem healthy and typical of same ecosystems elsewhere in Queensland.
- Plant and animal community structure and composition maintained over four years and no evidence of unacceptable industrial influences.
- Weeds, fire, feral animals and disturbance are key management issues.



# Ecological Assessment -The Future

- Last 4 years - Characterised ecosystem and developed tools for future site management.
- Next 2 to 4 years - Develop ecological health-based compliance criteria for ongoing regulation of refinery.
- Guide ongoing activities to remediate & preserve natural lands and waters surrounding refinery.
- Provides transparent information base for community.



# Yabulu Refinery - The Future

- 27 year old refinery
- Last 4 years high capital investment
  - Human
  - Financial
  - Systems
  - Knowledge
  - Technology

**Positioning the refinery to be in business for the long term as a robust, world class nickel and cobalt producer.**

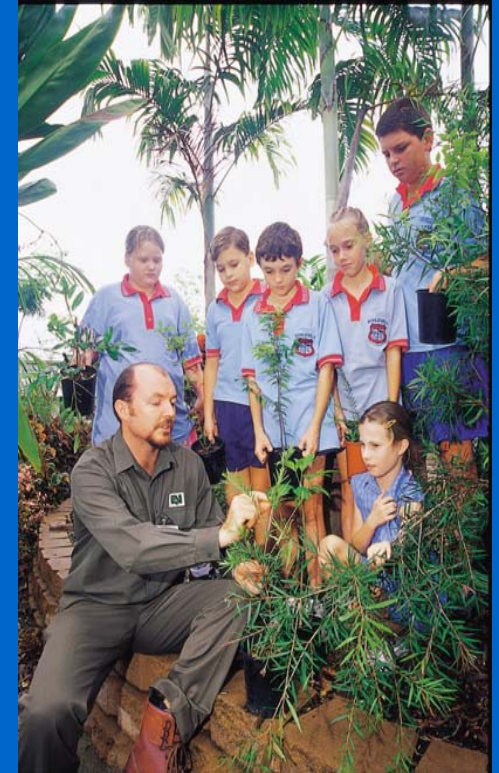


# QNI Yabulu Refinery - The Triple Bottom Line

## Environment



## Community



## Business

