Appendix 1: Background Information Summary

Knowledge of marine fauna, marine water quality and responses to environmental impacts in the Pilbara has developed more rapidly over the last 10 years with the proliferation of development projects related to iron ore mining and offshore gas projects. At a local level, the development of the mining, processing and export operations at Cape Preston has resulted in a series of relevant baseline environmental surveys and reports relevant to Cape Preston. This information is summarised in the table below.

Environmental data and reports relevant to the Proposal

<table>
<tr><th>Aspect</th><th>Data/Report</th><th>Extent/Scope</th><th>Main Outcomes</th><th>Relevance to the Proposal</th></tr>
<tr><td>General Environmental Review of Cape Preston</td><td>Strategen (2009)</td><td>Public Environmental Review document for expansion of mining, processing and export operations in the Cape Preston area.</td><td>Collates and reviews baseline environmental information relevant to the Mineralogy expansion. Identifies impacts associated with over 20,000 ha of vegetation clearing and over 100 GL of additional desalination water as well as other ancillary items.</td><td>Review document includes some areas of relevance to the Proposal – in particular:
Review of turtle nesting at Cape Preston beaches identifying the southern end of the eastern beaches as supporting most nesting activity east of the Cape, some activity around the location of the CPE Breakwater, and little activity between the CPE Breakwater and Cape Preston. Nesting activity at Cape Preston estimated at four animals per km.
Review and update to include additional bird survey. Bird site six includes the Proposal Area.
Modelling and assessment against the benthic habitat map for the proposed release of the brine to produce a total of 110 GL/year of desalinated water (in addition to the 44 GL/year of desalinated water approved for the Sino Iron Project and 40 GL/year for the Balmoral South Project.)
Update of vegetation maps to include additional surveyed areas to the east of Cape Preston.
Update of fauna habitat maps and assessment to include additional fauna survey work and habitat assessment.
Air emissions modelling for proposed expansion activities.
Noise modelling for proposed expansion activities.</td></tr>
<tr><td rowspan="4">Benthic Primary Producer Habitat (BPPH)</td><td>GHD (2013a)</td><td>Proposal footprint and immediate surrounds – detailed BPPH survey.</td><td>Revised BPPH map for Proposal Area shows:
No areas of dense coral (>10% cover) within the Proposal Area.
The trestle structure will traverse approximately 400 m of sparse/very sparse coral and dense/sparse macro-algae BPPH.
The barge berthing areas will be over sand/rubble with no BPPH.</td><td>Establishes detailed baseline condition for Proposal Area. Updates previous, broader scale benthic habitat mapping for the Proposal Area.</td></tr>
<tr><td>Austeel (2000)</td><td>Local - Cape Preston</td><td>Sampling of aquatic fauna was carried out for the original Sino Iron Project . The tip of Cape Preston is characteristic of benthic communities on rocky shores and in shallow waters with reasonably large water movements. Prawns, corals, sponges, ascidians and zoanthids comprise the diverse benthic fauna community.</td><td>Established first BPPH map specific to Cape Preston area.</td></tr>
<tr><td>CALM (2000)</td><td>Dampier Archipelago to Cape Preston</td><td>Marine habitat map covering Cape Lambert to Cape Preston.</td><td>Provides regional context for BPPH.</td></tr>
<tr><td>Le Provost (2008)</td><td>Local - Cape Preston. Entire area of Cape Preston. Mapping partly based on a review of prior mapping but included more recent field surveys and aerial inspections.</td><td>The seafloor and intertidal zone habitats around Cape Preston consist of:
Barren sand/rubble veneered limestone pavement;
Algal dominated limestone pavement;
Sand/mud flats to the east of Cape Preston;
Low to moderate percentage coral cover along a wide belt on the western side of the Cape Preston platform and a narrow band along the west and north side of Preston Island;
Mangrove system on the tidal flats that join Cape Preston with the mainland and on the western shoreline and embayments between the creek and the mouth of the Fortescue River; and
Algal mats - occurring predominantly on high tidal flats north of Mangrove Creek and in the upper reaches of Mangrove Creek.
Established a BPPH management unit at Cape Preston of approximately 65 km^2. Identified BPPH habitat types within the management unit presented below.
<table>
<tr><th>Habitat Type</th><th>Loss (ha)</th><th>Area in Unit (ha)</th><th>% of Unit</th></tr>
<tr><td>Intertidal sand and rubble veneered pavement</td><td>15.1</td><td>944</td><td>1.6</td></tr>
<tr><td>Subtidal algae dominated pavement</td><td>3.7</td><td>695</td><td>0.5</td></tr>
<tr><td>Subtidal deep sand/silt (beneath trestle jetty and breakwater)</td><td>62.2</td><td>1689</td><td>0.9</td></tr>
<tr><td>Low to moderate coral cover (10-25%)</td><td>1.4</td><td>188</td><td>0.7</td></tr>
<tr><td>Moderate to high coral cover (>25%)</td><td>1.8</td><td>73</td><td>2.4</td></tr>
</table>
(modified from Le Provost 2008. Areas include areas identified as direct impact and “at risk over long term”)</td><td>BPPH types identified at Cape Preston include:
Macro algal dominated fringing limestone reef;
Macro algal dominated fringing limestone reefs with sparse (<5%) coral cover;
Low density coral, sponge and soft coral communities;
Large isolated coral bommies with moderate (10 to 25%) coral cover and turf algae;
Island fringing coral communities with high (25 to 50%) coral cover;
Small isolated seagrass patches (i.e. Predominantly Halophila sp.); and
Mangrove communities.
Within the Proposal Area the shallow intertidal areas are dominated by ‘Sand / rubble veneered limestone pavement’ and ‘Algae dominated limestone pavement’. Whilst, in the sub-tidal areas, ‘Sand veneered limestone pavement’ occurs over the majority of the Proposal Area with some smaller inshore areas of ‘Algae dominated limestone pavement (including low % coral and sponge cover)’.
Marine management unit able to be used to assess cumulative impacts of proposals at Cape Preston. Note that marine habitat is dynamic and habitat mapped and reported in 2008 may have changed.</td></tr>
<tr><td rowspan="5">Turtles</td><td>Imbricata (2013)</td><td>North east beach at Cape Preston</td><td>2012/2013 data confirms previous data suggesting this beach is used by low numbers of marine turtles for nesting.</td><td>Provides current data specific to Proposal Area.</td></tr>
<tr><td>Pendoley (2009)</td><td>Cape Preston Beaches</td><td>The Cape Preston beaches are not expected to be highly significant for nesting marine turtles. Forty five occurrences of nesting activity over entire Cape in 2009.
The survey information available indicates that the different turtle species show some preference for different nesting beaches despite the low numbers. The northern end of the western beach is a favoured nesting area for hawksbill turtles (Eretmochelys imbricate), the south-eastern beaches are favoured by the green turtle (Chelonia mydas) and south western beaches by flatback turtles (Natator depressus) (Pendoley 2009).</td><td>Provides data on turtle nesting activity for the northern and eastern beaches within the Proposal Area. Numbers of turtles nesting were not regionally or nationally significant compared with other flatback turtle rookeries in the Pilbara region (for example, over 1,700 flatback turtles nest annually at Mundabullangana.</td></tr>
<tr><td>CALM (2000)</td><td>Cape Preston Beaches</td><td>The overall incidence of nesting activity (tracks and body holes) for all species was 34 occurrences in 2000.</td><td rowspan="3">Provides further evidence that Cape Preston beaches are not significant turtle nesting habitat.</td></tr>
<tr><td>Maunsell (2004)</td><td>Cape Preston Beaches</td><td>40 nesting occurrences in 2002/2003</td></tr>
<tr><td>CALM 2005</td><td>Cape Preston Beaches</td><td>0 nesting occurrences in 2004</td></tr>
</table>

Aspect	Data/Report	Extent/Scope	Main Outcomes	Relevance to the Proposal
	DEC (2006)	Cape Preston Beaches	31 nesting occurrences in 2006	
Whales and Dolphins	Salgado Kent et al (2009) – Appendix B9 in BHPB (2011)	Underwater noise impacts for Port Hedland Outer Harbour Development including review of noise sensitivity and responses of whales, dugongs and dolphins	This document reviews in detail the data and literature applicable to whales, dolphins, dugong and fish relevant to the BHPB Port Hedland Outer Harbour Proposal. Permanent deafness (PTS), temporary deafness (TTS) and behavioural change thresholds are identified in terms of marine sound levels and distances from pile driving activity.	The same range of species can be expected to be encountered at CPE. Piles being driven at CPE will be smaller in diameter and likely to emit lower sound pressure levels than for the Outer Harbour. The results and recommendations are therefore expected to be generally applicable tocpe.
Marine Noise	GHD (2013)	CPE. Considers a range of species exposure to marine noise.	Reviews potential impacts on dolphins, whales, dugong, turtles, sharks and sea snakes. PTS distance estimated at <40 m from pile driving. TTS risk threshold is expected to be an order of magnitude greater (> 400 m from pile driving). Masking impacts on communication and bio-sonar may occur at up to 5 km from the source of the piling.	Noise modelling is specific to CPE location. Bathymetry of site means that received sound energy at 2 km may be 10 Db lower at low tide.
Humpback whales, dugong, dolphins, turtles	Jenner and Jenner (2009) in API (2010)	Anketell/Nickol Bay area – 22 aerial surveys over 2009-2010	Humpback whale numbers in Population D (the population that migrates up the west coast of WA to breed in the Kimberley) is estimated to be 30,000 to 35,000 individuals in 2010. Report summary (Jenner and Jenner, 2009): • Humpback whales were present in the study area during June to November. • Near shore waters (< 35m depth) during the southern migration period had higher densities of humpback whales than offshore waters. • Humpback whales do not use the near shore Nickol Bay area during the northern migratory period (June/July). • It is likely that a large component of the northern migratory body passed further off-shore than the northern extent of these aerial surveys. • Peak numbers of northbound whales passed outside Nickol Bay during mid-July. • Peak numbers of southbound whales arrived, or passed by, during late August and were found both inside and outside Nickol Bay. • Cow/calf humpback whale pods were in highest numbers inside Nickol Bay during the early September to mid-October period. • There was a distinct Transition from the northern migration phase to the southern migration phase in late July. • Swim direction data suggests that humpback whales, particularly cow/calf pods, may use western Nickol Bay to rest for an as yet undetermined periods of time. • The Burrup Peninsula may form a natural barrier to the southern migration of humpback whales along the Pilbara coastline and therefore increase the likelihood of whales stopping migration before navigating out of the embayment. • Bryde's whales may be feeding off-shore of Nickol Bay during summer months. • Dugongs were not present in significant numbers in the study area at any time of year. • Dolphins and manta rays are found widely dispersed off-shore to at least the 50m contour (off-shore extent of the survey) with detection rates likely linked to sea state. • Turtles are present in significant numbers in the study area and detection rates are also tied to sea state.	No quantitative data exists for Cape Preston for Humpback whales, dugong or dolphins. Cape Preston is located approximately 100 km west of the survey area and is not as significant a feature as the Burrup Peninsula and associated islands. It can be expected that: • Humpback whales are more likely to be located near shore as they pass Cape Preston on the southern migration (August-October). During the northern migration they are more likely to travel further offshore. • Dugongs will be present around Cape Preston in low densities • Dolphins will be widely dispersed around Cape Preston
Humpback whales	Jenner and Jenner (2009) (in API, 2010).	Anketell/Nickol Bay area – marine surveys over in August 2010	Report summary (Jenner and Jenner, 2009): • Humpback whales use Nickol Bay in peak numbers during mid-late August • The large majority of whales, including cow/calf pods, sighted Inshore near Nickol Bay were Passive, with Active pods sighted more commonly during Offshore transects • The large majority of pods sighted both Inshore and Offshore near Nickol Bay were Migrating (swimming) rather than Milling or Resting at Medium speeds. • The majority of Active whales are located at the eastern and northern entrances to the Bay • Low numbers of cow/calf pods use Nickol Bay during the peak of season • Overall densities of whales in Nickol Bay are substantially lower than Exmouth Gulf • Residency periods for whales in Nickol Bay are unlikely to be longer than 24 hours.	Residence periods of less than 24 hours are considered likely to be similar should any whales pass in close proximity to the CPE Proposal Area. Such visits are most likely to occur in late August. Confirms Exmouth is a more significant "resting" area than Nickol Bay for humpback whales on southern migrations.
Introduced Marine Pests	URS, 2009	Cape Preston Waters	URS conducted an introduced marine pests (IMP) survey at Cape Preston in 2009 and found no marine pest species listed by the National IMP Coordination Group.	Report is not publically available.
Coastal Processes	GHD 2013c	Proposal – solid breakwater	Sediment expected to build up on western side of breakwater over 10 – 20 year period	Updates coastal process information specific to the Proposal.
Coastal Processes	GEMS 2008a GEMS 2008b	Cape Preston waters. In: Marine Management Plan for the Sino Iron Project (Cape Preston)	Combination of strong tidal currents, episodically strong winds and relatively shallow bathymetry at Cape Preston which results in a well flushed marine environment (GEMS, 2008a). A basalt outcrop occurs at the Cape and anchors the coastline which is further protected by a shallow shelving rock platform offshore. The major source of energy responsible for distribution of sediment in the region is cyclone induced storm waves. The Cape itself is an erosional area whilst sediment is transported down both the eastern and western coastlines of the Cape. On the western side it accumulates in the lee of Preston Spit to form aggrading sand dunes. During non-storm periods, there is a low volume northerly sediment transport along the west coast of the Cape in summer driven by prevailing westerly winds. This coast is protected during the winter from the easterly winds which prevail at this time of year and little to no sediment transport occurs (GEMS, 2008b).	On the eastern side of the Cape, the beach has been shown to have been relatively stable over the last 40 years and acts purely as a sediment transport corridor to the tidal flats which occur further east (GEMS, 2008b). Low volumes of sediment transport may occur along the eastern side of the Cape during winter, and a similar reversal probably occurs during the summer sea breezes from the northwest quarter (Strategen, 2009).
Marine monitoring	Le Provost 2008	Marine Management Plan for the Sino Iron Project (Cape Preston)	Establishes marine monitoring programmes for coral and coastal stability for the Sino Iron Project at Cape Preston.	Monitoring will have established baseline conditions prior to the Proposal. Potential to utilise common monitoring data in future.
Cetaceans and marine mammals	Hodgson et al 2012	Browse LNG area – review of environmental impacts associated with proposal. Public submission to EPA.	The submission offers the following quotes in relation to vessel strike: "Boat strikes are a significant cause of dugong mortality in Australia (Greenland and Limpus 2006), and can also cause serious injuries and mortalities to coastal dolphins (Wells and Scott 1997; Parsons and Jefferson 2000). The delayed response of dugongs to boats makes them particularly vulnerable to large and/or high speed vessels (Groom et al. 2004; Hodgson 2004). Shallow waters represent particularly high risk areas for dugongs as they cannot dive deep to avoid vessels (Hodgson 2004) and in Australia they have been crushed between boats and the seabed (Yeates and Limpus 2003)." The submission also reviews the incidence of recorded dugong deaths in response to oil spills: "The Nowruz oil spill in 1983 led to the death of an estimated 60 dugongs and several times as many dolphins along the Saudi Arabian coast (Preen 1989; Sadiq and McCain 1993). A further 93 marine mammals died during the Gulf War in 1991, including 14 dugongs, 57	Dugong and dolphins are expected to occupy the waters surrounding the Proposal. The Proposal will increase the numbers of vessels in the area and increase the risk of oil spill.

Aspect	Data/Report	Extent/Scope	Main Outcomes	Relevance to the Proposal
			bottlenose dolphins, 13 humpback dolphins, 1 finless porpoise, and 8 unidentified dolphins (Preen 1989). Oil can harm dugongs or dolphins by covering nostrils, congesting or damaging the respiratory system, or inhaling droplets of oil or oil fumes (Krupp and Abuzinada 2008). In dugongs it could also be ingested with seagrass or sediments or cause starvation due to seagrass death (Preen 1989). The degradation of seagrass beds through oil pollution also affects dolphins by destroying their prey fish nursery habitat." The submission presents data suggesting that the incidence of cetacean strandings increased markedly following the Texas Gulf oil spill. The submission also provides the following on behavioural changes to dolphins in response to marine noise: "disruptions of the behavioural activities of dolphins leads to displacement from their preferred habitat and reduced fitness and fecundity, which can potentially result in population declines (Bejder et al. 2006a; Bejder et al. 2006b; Williams et al. 2006; Stensland and Berggren 2007). Boats can prevent dolphins from accessing particular areas within their home range (Allen and Read 2000) and alter their behaviour (Lusseau 2003; Constantine et al. 2004). Acoustic communication between humpback dolphins and their ability to maintain cohesive groups is also impaired by boat traffic and noise (Van Parijs and Corkeron 2001)."	
Dugong	Le Provost (2008)	Regional - including East Lewis Island, Cape Preston, Regnard Bay, Nickol Bay and west of Keast Island.	In the Dampier Archipelago/Cape Preston region, small numbers of dugongs (*Dugong dugon*) have been sighted in the shallow, warm waters in bays.	Regional information suggests dugong will occur in low numbers and be dependent upon seagrass areas for feeding. No specific dugong survey completed at Cape Preston.
Dugong	Salgado Kent et al (2009)	Underwater noise impacts for Port Hedland Outer Harbour Development including a review of noise sensitivity of dugong.	Hearing range of 4 to 32 kHz. More information on (related) manatees showing hearing range from 150 Hz to 46 kHz with greatest sensitivity in 6-20 kHz range.	Establishes likely hearing range and sensitivity to frequencies for dugong.
Oil spill	Pelagico (2013)	Oil spill specific to Proposal	For a large diesel spill (500 L) in the vicinity of the Cape Preston breakwater, modelling indicates that the spill will spread radially within a few hundred metres from the spill source. The diesel slick will spread rapidly and form a rainbow and silver sheen within a few hours. Evaporation is generally rapid, especially if there is a high wind. Under normal conditions it will be difficult to see any remaining diesel in the water 24 hours after the spill. As a result of this, the environmental impacts resulting from a 500 L diesel spill are likely to be very localised.	Identifies key risk being spillage of diesel from vessel refuelling/fuel transfer and spillage from vessel grounding or collision.
Oil Spill	Xodus (2009) in Port EMP Stage 1 Port Operational Activities (CITIC Pacific Mining Management Pty Ltd November 2011)	Procedural response to oil spill incidents in the marine environment resulting from activities within Project Port limits at Cape Preston: • at the trestle jetty • inside the breakwater area; and • at the transhipment location.	The following scenarios were modelled for four seasonal conditions: • 500 L Diesel spill inside the Breakwater • 10 tonnes HFO spill inside the Breakwater • 10 tonnes HFO spill at the jetty • 500 tonnes HFO spill at the jetty • 10 tonnes HFO spill at the Transhipper • 100 tonnes HFO spill at the Transhipper • 5000 L diesel spill at the Transhipper • 100,000 L diesel spill at the Transhipper. Sensitive locations are identified. Control and cleanup strategies are identified.	Spillage scenarios include the likely range of type and quantity of hydrocarbon spillage. Emergency response equipment and management procedures are applicable to CPE. Sensitive locations are same as for CPE. Used as the basis for CPE specific Oil Spill Contingency Plan.
Marine Water quality	Le Provost (2008)	Brief review of marine water quality relevant to Cape Preston	Marine water is well mixed, with generally good quality. Water quality sampling undertaken by URS shows little evidence of stratification even at neap tides, with high levels of dissolved oxygen at all times. The turbidity in the region is at times high, due to the episodic high volume river flows, dominant marine sediment types, strong local winds, large tides and common occurrences of cyanobacterial blooms. Nutrient concentrations have been found to be slightly above ANZECC & ARMCANZ (2000) guideline values.	Establishes baseline marine water quality relevant to the Proposal Area.