WATER

**Estuaries**
Boyne Island is surrounded by the arms of the bifurcated mouth of the Boyne River to the west, and Port Curtis to the east. Port Curtis is a relatively sheltered embayment, with a deep water channel connecting Gladstone Harbour to the sea. The western branch of the Boyne River is known as South Trees Inlet. Water flows in the Boyne River are controlled by Awoonga Dam, located approximately 20km upstream of the river mouth.

**Water Supplies**
*Groundwater supplies* can be obtained from alluvial and from fractured rock, aquifers within the Boyne catchment area.

**Groundwater**
*Groundwater* at Boyne Island is associated with two separate aquifers. Firstly is the deep, confined aquifer of the fractured *sandstone/claystone* strata of the Shoalwater and Wandilla Formations: which underlay most of the island; and secondly the shallow, unconfined aquifer of the *Quaternary deposits*, within the island's narrow coastal area.

**Confined Aquifer:** The fractured, sedimentary aquifer is encountered generally at 8 - 15m depth below surface level on lower areas and at 15 - 25m depth within the Lilly Hills area. Recharge to the aquifer is concentrated within the Lilly Hills area, while the discharge is associated with the Shoalwater Formation's weathered zone adjacent to the coastal wetlands.

**Unconfined Aquifer:** The ground table in the unconfined aquifer within the narrow coastal plain is encountered generally at 1-3m below ground level. Recharge to the aquifer occurs either via direct infiltration, or, via discharge from the confined aquifer. Groundwater in the unconfined aquifer flows to the east and discharges into Port Curtis.

Pumping rates available in the fractured rock aquifers are generally lower than is considered adequate for irrigation purposes. However, in the alluvial aquifers associated with the Boyne River, pumping rates of five litres per second and above have been recorded between Boyndale and Ubobo. This rate, in combination with good water quality, provides a useable irrigation supply in this area.

It is estimated that groundwater quality is good, and is generally below 3,000 milligrams per litre Total Dissolved Salt.

The only major *water conservation* undertaking in the catchment area is the Awoonga High Dam. The dam, with a capacity of some 270,000 megalitres and a catchment area of 2,230 square kilometres, is situated on the Boyne River, 22.7 kilometres from it's mouth.

Total demand from this resource in 1997 was about 41000 megalitres per annum.

If all the industrial and urban development proposed for the Gladstone region extending south to Agnes Waters were completed before 2010, and should all water demand for such development be met from Awoonga High Dam, the total demand for supplies will be some 100,000 megalitres per annum.

**Hydrology**
The Boyne River, from its *source* at an elevation of approximately 640 metres in the Dawes Ranges in central Queensland, flows north for a distance of approximately 120 kilometres to its mouth at Boyne Island Tannum Sands.
The total area of the Boyne Catchment Area is some 2,547 square kilometres. To the north of the Boyne Catchment Area are the catchments of the Calliope River and Auckland Creek; to the south, that of Baffle Creek; and to the west, the catchment of the Dawson River. Major tributaries of the Boyne include Diglum, Dgalgil and Glassford Creeks, and the Eastern Boyne River.

The dominant aspect of the marine environment within the Port Curtis region is the Gladstone Harbour. This harbour is a natural deepwater anchorage ranking amongst the top seven in Australia.
WATER

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Rainfall
Mean annual rainfall is similar across much of the catchment area. Most areas experience an average of 1,000 millimetres of rainfall per annum; whilst in higher country, which forms the boundary of the catchment area, this rises to some 1,400 millimetres per annum.

Shoreline Stability
Wave activity along the Boyne Island coastline can be described as slight. The Gladstone Harbour is a natural area, and, as such, is protected by coastal reefs and headlands from the heavy northward movement of sand that is experienced on the State's southern beaches. Closer to Boyne Island, Entrance Ledge, a rock platform, lies about 400 metres offshore and extends for about 900 metres along the coast of the island. This rocky platform further reduces effects of severe wave action from damaging the Boyne Island shoreline.

What was not so impressive, however, was the evidence of tremendous flooding all along the river. One report stated that debris was noted in the trees 20 metres above the water level, whilst another provided a more modest figure of 6 metres.

Oxley presented a biased and exaggerated report to Governor Brisbane in support of his low opinion of Port Curtis as a possible site for a convict settlement. Thus the original recommendation lodged in 1822 was forgotten until 1839 when the project was revived by Gladstone.

Surface Water
It is estimated that the mean annual discharge for the Boyne catchment area is 385,000 megalitres; which amounts to runoff of 160 millimetres per year on average.

The highest instantaneous flow recorded (River Bend stream gauging station) is 8,202 cubic metres per second in February 1947; which was before the Awoonga High Dam was constructed.

Surface waters at BITS are largely tidal estuarine/marine waters. Water bodies found within the saltmarshes/claypans are relatively saline and only a small number of freshwater bodies exist on Boyne Island itself.

Tides
Tidal effects approach the Port Curtis coastline from the edge of the continental shelf, some 115km to the east. Flood tidal streams flow westward, until deflected locally, by coastal physiographic features. Tidal waters approaching Port Curtis through South Channel are deflected into the estuary, and enter Gladstone Harbour from the south-south-east. The tides are semi-diurnal with considerable diurnal variation.

Tidal Characteristics -

- Mean high water springs: 3.8 m
- Mean high water neaps: 3.0 m
- Mean low water springs: 0.6 m
- Mean low water neaps: 1.4 m
- Highest astronomical tide: 4.8 m
- Lowest astronomical tide: 0.1 m

Due to the large tidal range in the harbour, tidal currents flowing through the estuarine channels during flood and ebb tides may approach 2-3 knots. The presence of these strong tidal water movements within the harbour suggest that the marine water circulation is very good.

Turbidity and Transparency

Generally, for estuarine and marine areas, water transparency is affected by tidal activity, turbulence and inorganic sediment suspension, rather than the presence of planktonic materials or other animal and plant biomass. During the dry/cooler months (e.g., July/August) when sea conditions are generally calm, water transparency tends to be higher. The only observed changes in turbidity/transparency values tend to be due to heavy rain events.

Waves and Surges

Most of the Gladstone Harbour is sheltered from ocean swells. Waves within the harbour are generated by the wind blowing across the fetch lengths available in each direction within the harbour. The wave climate is dependent, therefore, on the wind direction, magnitude and duration; as well as, the fetch lengths and depth of water over these fetch lengths.