CHAPTER 1

History of Dredging in Cleveland Bay

The history of dredging in Cleveland Bay is closely linked to the development of the Port of Townsville. In 1864 (Department of Harbours & Marine Queensland,1986) J.M. Black, North Queensland Manager of the Sydney firm of Robert Towns and Company selected a site on Ross Creek for a harbour needed in the development of pastoral properties in the hinterland. However, a sand bar at the mouth of Ross Creek and a rock bar inside allowed only shallow draught vessels to enter at H.W. The amount of shipping in Cleveland Bay doubled between 1867 and 1868 with the opening up of the Cape River goldfield. It was subsequently proposed in 1876 that, in the absence of a suitable site on Ross Creek, a jetty should be built from Magazine Island to form the basis of a good harbour for Cleveland Bay and also to protect the entrance to Ross Creek. The difficult work on this progressed slowly in the late 1870's and early 1880's. At the same time a western breakwater was being constructed seaward to protect, and stop sand moving into, Ross Creek from that side. The extent of the harbour works in 1885 are shown on Nisbet's Plan (Taylor, 1980) (Figure 2).

1878-1890

Dredging was first proposed in 1878 (Annual Reports of the Engineer of Harbours and Rivers on Works, 1876-1928) to 15-16ft below L.W. along the inside of the jetty and seaward. In 1879 dredging was proposed in the Outer Harbour and also to 18ft below L.W. in an approach channel 3,000-4,000ft long aligned north to south. No silting was observed along the jetty between 1880 and 1883 but dredging to increase the water depth was again suggested. On 13 November 1883 the dredge 'Platypus' from Brisbane began cutting a channel into

for dredging at the port. A considerable amount of maintenance dredging was necessary during 1896-97, following Cyclone 'Sigma' in January 1896 and a subsequent flood down Ross Creek, which deposited much sediment in the harbour especially towards the outer end of the Eastern Breakwater (Department of Harbours and Marine Queensland, 1986).

In 1897, a scheme was put forward for harbour improvements (Taylor 1980) (Figure 3) and was approved the following year. By October 1899 the Platypus Channel had been dredged to 17ft below Low Water Ordinary Spring Tides (LWOST) and then the two bucket dredges 'Octopus' and 'Crocodile' were used inside the breakwaters and by 1900 had dredged 58 acres down to this depth, with 4 acres along the Eastern Breakwater wharves dredged to 26ft below LWOST. 656,000cu yards of spoil was removed during 1900. Excavation of the Inner Harbour in Ross Creek also began in 1900 with dredged material being tipped on the beach west of the Western Breakwater for later reclamation there.

The sources used for the preceding review of dredging in the 19th century give scattered information on quantities removed and dredged depths, some of which have been incorporated into the review. For easier reference and subsequent analysis, this data is presented in full in tables showing dredged depths in various parts of the Port of Townsville (Table 1) and quantities dredged (Table 2). Measurement of dredged depths were taken more systematically in the 20th century as shown in Table 1. Quantities dredged were recorded annually in the late 19th century, but no records could be found for the period 1901-1941 and only intermittent records could be found for the 1940's and 1950's (Table 2). From September 1965 detailed records were kept by the Townsville Harbour Board, later the Townsville Port Authority, relating to its own dredge, (Table 3) and by the Queensland Department of Harbours and Marine relating to its

dredges which were employed from time to time at Townsville (Tables 2 & 4). Before these tables are considered in detail, the history of dredging in Cleveland Bay in the 20th century will be reviewed generally.

1901-1910

During the first decade of the 20th century developmental and maintenance dredging occurred simultaneously. The development of the Inner Harbour in Ross Creek took 10 years, including the blasting of the rock bar near the entrance to Ross Creek, the removal of the rubble by dredge, and the dredging of the swing basin and berths (Taylor, 1980). The Platypus Channel was steadily extended and improved and the Outer Harbour swing basin and berths were deepened. Maintenance dredging was vital to maintain the depths of the cuttings. A cyclone in March 1903 led to 1-3ft of silting in the Platypus Channel and wharf approaches. Another cyclone in 1908 caused siltation problems and two floods in Ross Creek early in 1910 caused deposition of large quantities of silt in the recently dredged entrance to the Inner Harbour and in the Outer Harbour (Department of Harbours and Marine Queensland, 1986). The dredges 'Octopus' (Plate 1) and 'Crocodile', aided by a Priestman grab dredge from 1904 onwards, were working at near full capacity during this decade and in 1910 a new dredge was ordered. In 1906 quarterly soundings were instigated in the Platypus Channel and the Outer Harbour and the annual June data is given in Table 1.

1911-1920

On 7 July 1911 the new dredge 'Cleveland Bay' arrived in Townsville from Paisley, Scotland, where it had been designed and built with the capability of dredging to 38ft and raising 500 tons of stiff clay per hour (Taylor, 1980). The

'Crocodile' and 'Octopus' were in poor condition and the latter was disposed of; the 'Crocodile' however was repaired and refitted to upgrade it between 1913 and June 1914. In 1911 and 1912 the 'Cleveland Bay' which had electric light worked two shifts in an 18 hour day to deepen berths in the Outer Harbour. Developmental dredging in this part of the port and in the Platypus Channel continued until 1919, with "hard sandstone and stiff clay" making dredging difficult in the Channel. Both dredges were involved in the developmental and maintenance dredging the latter of which continued to be important in retaining depths. In April 1919 all the dredging plant was laid up due to the low revenue received by the port, but in September the 'Cleveland Bay' was recommissioned and undertook maintenance dredging in the Platypus Channel until July 1920, aided by the 'Crocodile' in the harbour approach channel in July 1919.

1921-1930

By 1921 the two bucket dredges had dredged the Platypus Channel to 25.5ft, the swing basin and approach channel to 26ft and the berths in the Outer Harbour to 30ft below LWOST (Taylor, 1980). However in June 1921 the 'Crocodile' was finally taken out of commission due to the financially depressed times. As Taylor observed "Dredging has always been and forever will be the most essential of maintenance works required at Townsville Harbour" yet for the following 30 years the 'Cleveland Bay' with its attendant barges and tug was the one major plant to undertake this. Maintenance dredging became of prime importance as the channel and berths deteriorated due to silting. The Platypus Channel, especially its inner east side, was subject to more siltation than the rest of the harbour. Taylor argues that this was because of the prevailing south-east winds and the discharge of several creeks into Cleveland Bay on the east and south-east side of the constructed harbour. Maintenance

dredging was therefore concentrated in the Platypus Channel. The dredge's operations were limited during the summer cyclone season and the policy was adopted of the plant being laid up for overhaul, or operating inside the harbour, at this time of year. Some developmental dredging was carried out during the 1920's. The Outer Harbour swing basin was extended and deepened although the dredging was described as the hardest undertaken at Townsville because of the "stiff clay, sandstone and boulder clay, impregnated with granite boulders". Between 1923 and 1925 the dredging plant worked to capacity on this and widening the Platypus Channel. Between 1926 and 1929 the only new work involved dredging an approach channel and berth for the Jetty Wharf extension. The Inner Harbour was dredged for 3 months in 1926-27. Up to 1925 there was some confusion over the declared depths in various parts of the Port of Townsville, with some being maximum, some minimum and some being between the two. From 1925 onwards only minimum depths were declared and these are listed in Table 1.

1931-1940

During most of the 1930's the 'Cleveland Bay' was employed in maintenance dredging, primarily in the Platypus Channel but also in the swing basin and berths of the Outer Harbour. For 4 months in 1936 dredging was carried out in the Inner Harbour to remove large silt deposits from the channel into Ross Creek and in the swing basin and slipway approach (Taylor, 1980). In 1938 the 'Cleveland Bay' operated two shifts in the Platypus Channel, berths and west of the channel and undertook some developmental dredging in the Outer Harbour for the Empire Flying Boat moorings (Annual Reports of Queensland Department of Harbours and Marine 1934-1987). Two cyclones affected Cleveland Bay in 1940, on 18 February and a less severe one on 7 April. Considerable damage was caused on Magnetic Island to bathing enclosures, ferry landings and approaches especially at Alma and Nelly

Bays and to a slightly lesser degree at Picnic Bay and Arcadia. Depths in the Platypus Channel were reduced to a minimum of 22ft below LWOST on 18 April and 20 ft on 13 June, with 20.5 ft being the minimum elsewhere in the dredged areas of the Outer Harbour on 18 April (Taylor, 1980).

1941-1950

During World War II, Townsville was a very busy port. The bucket dredge 'Cleveland Bay' operated two shifts of maintenance dredging in 1941 in an attempt to obtain and maintain the Platypus Channel and swing basin to 28ft below LWOST, dredge the berths and keep the entrance channel to Ross Creek open (Department of Harbours and Marine Queensland, 1986). During part of 1941, the suction dredge 'Trinity Bay' owned by the Cairns Harbour Board assisted in dredging the Platypus Channel. Between February and May 1942 an Allied Works Council Scheme was commenced to provide extensive improvements to Townsville Harbour and the Platypus Channel, but this was abandoned before completion. Between 1942 and 1945 the 'Cleveland Bay' continued maintenance dredging as well as developmental dredging for a proposed naval and lighter wharf. The Queensland Department of Harbours and Marine's suction dredge 'Morwong' assisted with maintenance dredging in the Platypus Channel and Outer Harbour in November and December 1943 and raised 135,000 barge yards of material (Table 2). On 28 March 1944 the port was affected by a cyclone, resulting in subsequent siltation problems, but by 11 June 1945 the minimum LWOST depths were reported as Platypus Channel 22ft, Outer Harbour swing basin 23ft and berths 1-7, 28.5-29ft.

Between September 1945 and March 1948 the 'Cleveland Bay' was out of commission for major repairs including fitting a new boiler and bucket ladder. Another cyclone and major flood occurred in March 1946 and produced considerable silting in

pier. In December 1952 the new suction dredge 'Townsville' (Plate 3) built in Newcastle, N.S.W. arrived in the port and joined the 'Cleveland Bay' in dredging work of all types. By 1954 it was claimed that "dredging is no longer a problem to this port" (Annual Reports of the Queensland Department of Harbours and Marine, 1934-1987). Maintenance dredging was undertaken by both dredges, but the 'Cleveland Bay' was used mainly for developmental work. Cyclone 'Agnes' affected Townsville on 6 March 1956 but with the two dredges the siltation effects in the harbour were soon removed. Developmental dredging for the new Bulk Sugar Terminal was a huge task for the 'Cleveland Bay' which worked 3 shifts from November 1957, and due to its overhaul in 1958, the Queensland Department of Harbours and Marine bucket dredge 'Platypus II' with two barges 'Dugong' and 'Seal' was loaned from November 1958 to May 1959. The 'Cleveland Bay' then resumed 3 shift working so that the terminal was able to handle its first sugar in June 1959 although it was not fully completed until December 1962.

1961-1970

During the 1960's maintenance dredging was carried out mainly by the 'Townsville' in the Platypus Channel, the various parts of the Outer Harbour and for shorter periods in the Inner Harbour. The 'Cleveland Bay' continued developmental dredging to deepen the Outer Harbour, and prepare for the proposed tanker berth, whilst the Queensland Department of Harbours and Marine's clam dredge 'Mourilyan' dredged the Ross Creek boat harbour in 1964 and 1965 to provide a basin and berths. Dredging the oil and tanker berth between March and November 1964 was the final assignment for the 'Cleveland Bay' (Plate 4). Between 1968 and 1970, 150 acres of industrial land was reclaimed on the left bank of the Ross River estuary by pumping ashore

base for commercial and industrial craft. Maintenance dredging of Ross River channel has involved some sidecasting of material by cutter suction dredge, but most of the material has been pumped ashore. In addition the Townsville Port Authority's grab dredge has removed small quantities of material which has been disposed of mainly in the shallow draft dump site. Until February 1983 dredging elsewhere in the port was carried out by the S.D. 'Townsville' on a regular basis throughout the year. Subsequently however the Queensland Department of Harbours and Marine 'Sir Thomas Hiley' has undertaken dredging at the Port of Townsville on a contract basis for a few weeks each year, usually in two periods, during the winter months (Plate 6). Details of this dredging are given in Table 4 and will be examined further below. All this has been maintenance dredging except for some developmental dredging of the berths in 1988. In 1986, the split hopper barge 'Eric Netterfield' was completed for carrying dredge spoil from the harbour and dumping it at various disposal and reclamation sites. This design of barge allows unloading of spoil in shallower depths than is possible with a bottom door barge.

In 1981, the Environment Protection (Sea Dumping) Act was passed by the Federal Government. The Minister of State for the Arts, Sport, the Environment, Tourism and Territories is empowered under the Act to issue dredging and dumping permits. A copy of the General Permit, Appendix 1 and Annexes A and B, issued on 31 May 1988 for the Port of Townsville, forms Appendix 1 of this report. It:

1) grants a general permit to the Townsville Port Authority "... for a period of twelve months ... to load and to dump up to 350,000 tonnes of dredge spoil ... arising from the dredging of Townsville Harbour and approaches ..."

2) grants a general permit to the Townsville Port Authority "... for a period of thirty-six months ... to load and to dump up to 53,000 tonnes of dredge spoil per annum comprising uncontaminated siltation material and spillage arising from small scale maintenance dredging in Townsville Harbour and approaches".

The dump sites relating to each of these permits are clearly defined (Figure 1). The first permit refers to the deep draft dump site which has been in use since the early 1970's. The second permit which was subsequently modified with reference to the area, relates to a site close to and overlapping with the shallow draft dump site which has been used since the mid 1960's.

The co-ordinates for these sites are now as follows:

Permit 1 for large scale dredging operation

Corners of 4 sided figure -	NW	19° 08' 09"S	146° 56' 29"E
	NE	19° 08' 43"S	146° 57' 28"E
	SW	19° 10' 39"S	146° 54' 53"E
	SE	19° 11' 13"S	146° 55' 51"E

Permit 2 for small scale maintenance dredging operation

Corners of 4 sided figure -	NW	19° 12' 48"S	146° 52' 36"E
	NE	19° 13' 24"S	146° 53' 36"E
	SW	19° 14' 30"S	146° 51' 30"E
	SE	19° 15' 00"S	146° 52' 36"E

Dredged Depths at the Port of Townsville and Earlier Dredging Records

Recorded dredged depths at the port have been compiled into Table 1 covering the period 1884 to 1987. As indicated above, the records up to 1906 were taken at random intervals, but from 1906 onwards quarterly soundings were taken and the

annual June data are shown in the Table. From 1925 onwards minimum depths only were declared for the safety of shipping. When considered overall, this table shows the steadily increased depths to which dredging was taken as the port developed and ships became larger, but it also reveals how quickly depths deteriorated when dredging was reduced or stopped.

Records of amounts of sediment dredged are scanty and intermittent up to 1965, but Table 2 has been drawn up from all available sources. The use of different units, the precise definition of some of which is unknown, results in comparisons being difficult within this table and between this and Tables 3 and 4, in which the data are given in tonnes. (At the end of Table 2, the dredging records are listed for the 'Sir Thomas Hiley' for the years 1973-4 to 1975-6 when she was contracted to Townsville for several months annually). The only reference to dump sites before 1965 were those referred to in 1883 and 1893 near Cockle Bay, Magnetic Island.

Detailed Dredging Records September 1965 to August 1988

As indicated in the above review of the history of dredging in Cleveland Bay detailed systematic records are available only for the last 23 years. Table 3 has been compiled from records of each load dredged by the S.D.'Townsville' for the period September 1965 to February 1983. The data are presented as monthly and annual totals dredged from the Platypus Channel, and the Outer Harbour swing basin and berths for the whole period, and in addition from the Ross River channel from 1979-80 to 1982-83. The 'dredging year' is defined as the 12 month period ending on 30 June of each calendar year.