

Potentially Useful Beach Nourishment and Associated Studies/Projects – References

Foreword: *The Coasts & Ports 2013 Organising Committee introduced a half-day Sand Nourishment Forum comprising a Questions and Answers format directed to an experienced Panel with audience participation to explore and promote the use of sand nourishment as a viable method for managing short term erosion and long term coastal recession. The Forum emanated from great interest in beach nourishment around Australia, with a long history of successful projects from Adelaide to Noosa and major projects on the Gold Coast.*

The 2013 Conference was launched with a keynote address from Dr Stefan Aarninkhof who was intricately involved in the Delfland Sand Engine project in the Netherlands, which has introduced 21.5M m³ of offshore sands to the Dutch coast to provide coastal protection and prevent coastal inundation.

As a precursor to the Beach Nourishment Forum at the Coast & Ports Conference 2013 in Sydney, A. D. Gordon (Forum Moderator) compiled the following list of reference material with contributions from J.T. Carley, E.D. Couriel, A. L. Jackson, A.R Jones, D.B. Lord, A.F. Nielsen, T.D. Shand, R.B. Tomlinson, T. Stul, R. Tucker. The list is intended to be a start on a “live “ document that can be added to, as further reference material becomes available/unearthed. The list has been compiled to assist those carrying out or contemplating beach nourishment, beach scraping and entrance by-passing or back-passing projects.

It is hoped that other special interest topics to the coastal and port engineering profession may be run in similar forums as part of the future Coasts & Ports Conference series.

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Updated from Coasts & Ports Conference, Sydney 2013

Please note:

- 1. In preparing such a list it is inevitable that there will be errors in transcription as the compilation has, in part, been based on reference lists in papers and reports. In doing so it was noted that some of the available references lists have incomplete details. Where possible this was further researched however there are still gaps and undoubtedly errors. In addition it is appreciated that important papers and reports may well have been missed. It would therefore be greatly appreciated if people are aware of errors or omissions they contact Angus Gordon: sandgus@optusnet.com.au with the necessary corrections/inclusions.*
- 2. References are, where known, in date order for each topic and then lead author alphabetical for the year.*
- 3. For ease of use, references for beach scraping (NABEing) are also repeated at the specific sites they apply to, if they are project related.*

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1. General Background Material on Nourishment and Beach processes of interest to Sand Nourishment Projects

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2. Beach Scraping (NABE – Nature Assisted Beach Enhancement) – references may be repeated at sites

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- Avoca (North)
- Bilgola
- Collaroy/Narrabeen
- Copacabana
- Curl Curl
- Dee Why
- Elouera
- Freshwater
- Maroubra
- Merewether/Dixon Park
- Mona Vale
- Newport
- Palm Beach
- Wanda
- Wollongong Beach
- Wollongong northern beaches from Towradgi to Belambi

Queensland:

- Burleigh Beach
- Broadbeach
- Mermaid Beach
- Surfers Paradise

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3.2 New Zealand

3.2.1 General

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3.2.2 Auckland

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3.2.3 Bay of Plenty

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3.2.4 Canterbury

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3.2.5 Hawke's Bay

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3.2.6 Wellington

Reinen-Hamill, R., Andrews, C., McDonald, F. (2005), *Oriental Bay Foreshore Development, Part 1: Design*, 17th Australasian Coasts and Ports Conference, incorporating the 10th Port and Harbour Conference, Institution of Engineers (Australia), Adelaide, September 2005.

3.2.7 Specific Projects List

In addition to the NZ references, the following project details have been provided:

Date	Where	Who	What
1984	Pilot Bay, Mt Maunganui	Waikato University, Bay of Plenty Harbour Board	Artificial beach created by placing 21,000m ³ dredge spoil
1984	Washdyke Beach, Timaru	Morris and Wilson Consulting Engineers, Timaru City Council	300 m long section of beach rebuilt using 660m ³ of storm wash over gravels and 9,800m ³ imported gravels from local river source
1987 - present	Westshore	Hawkes Bay Regional Council	Up to 40,000m ³ /yr. but typically 10,000-20,000m ³ /yr.

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1990-1995	Mission Bay, Auckland	Beca	Two headlands and imported 35,000m ³ of sand. Performed well to date with little loss of sand. Very popular recreational beach.
mid 1990's to present	Orewa Beach, Hibiscus Coast	Rodney Council, Auckland Regional Council, Tonkin & Taylor	Transportation of 10,000 - 20,000m ³ of beach sediments up drift annually
mid 1990's - ongoing	Mount Maunganui	University of Waikato, Port of Tauranga	Placement of dredged material offshore to nourish Mt Maunganui Beach
2000	Sulphur Point, Tauranga	Beca	Reconstructed groyne and built off shore island to retain about 3,000m ³ of sand on small pocket beach.
2001-2002	Manukau	Beca	Project Manukau: restoration of 13km of beaches with shell/sand cover over original volcanic gravel, contained by headland structures.
2000-2004	Oriental Bay, Wellington	Tonkin & Taylor	Enlargement of two existing beaches and creation of a new beach. Use of unobtrusive control structures such as a submerged reef, groynes and seabed contouring to significantly reduce sand migration and loss from the beach system. Design of an unobtrusive stormwater outfall
2002	Amberly Beach, Canterbury	Dtec Consulting	Beach re-nourishment along 250 m length using 8000m ³ of imported river gravels
2001-2003	Eastern Beach	Tonkin & Taylor	Nourishment of Eastern Beach using 15,000 m ³ of imported sand delivered to site by slurry pump from barge. Extension of stormwater outlet to beach toe. Some alongshore movement requiring periodic transportation back up beach
2003-2004	Kohimarama, Auckland	Beca	Built two headlands, diverted major stormwater coastal outfalls, and imported 45,000m ³ of sand. Performed reasonably well to date with little loss of sand but requires period re-distribution. Popular recreational beach.
2004-2005	Piha	Tonkin & Taylor	Beach Scraping of approximately 400 m length, in-filling blowout

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			and dune building/planting. Approximately 8500m ³ of sand moved
2005	Kawakawa Bay	Tonkin & Taylor	Creation of gravel beach at Kawakawa Bay
2005-2006	St Heliers, Auckland	Beca	Built two headlands, diverted major stormwater coastal outfalls, and imported 30,000m ³ of sand. Performed well to date with little loss of sand. Popular recreational beach.
2004-2008	Point Chevalier	Tonkin & Taylor	Nourishment of Point Chevalier beach with 16,000m ³ of externally sourced sand. Performed well without the need for control structures
2004-2008	Manukau Beaches	Tonkin & Taylor	Restoration of Taylors Reserve beach with 1200 m ³ of imported sand controlled by an artificial reef headland structure
2005-2008	Herne Bay Beaches	Tonkin & Taylor	Beach nourishment at Herne Bay using 1,500 m ³ of imported sand.
2006-2008	Torpedo Beach	Tonkin & Taylor	Beach re-nourishment with 4200m ³ of sand from a consented source, including two shore-detached groyne structures that combine stormwater outlets with shoreline control
2008 - 2010	Judges Bay	Tonkin & Taylor	Excavation of 20,000m ³ of material to form an all-tide beach, followed by up to 6000m ³ of sand placed at 10:1 slope.
2005-2006, 2010-2011	Point England	Tonkin & Taylor	Restoration of Point England Beach with 3,500m ³ of sand controlled by an artificial reef headland structure
2013-2014	Onehunga	Tonkin & Taylor, Auckland Council	Creation of four new sandy beaches and three gravel/cobble beaches within a series of artificial headlands in the Manukau Harbour replicating the natural lava flows of the Auckland volcanic field

3.3 Northern Territory

Nothing available to date

3.4 Queensland

3.4.1 Gold Coast

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Jackson, A.L, McGrath J. and Tomlinson R. (1997), *Strategy for Protection of Northern Gold Coast Beaches*. 13th Australasian Conf. on Coastal and Ocean Engineering, Auckland.

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Noriega, R. (2008), *Environmental Impacts of Beach Nourishment at Palm Beach*,

Research Report No. 83, Griffith Centre for Coastal Management, Griffith University, Queensland.

3.4.2 Great Keppel Island

Ballantine, D., Tomlinson, R., (1997), *Coastal processes and beach erosion management on Great Keppel Island, Queensland*, Pacific Coasts and Ports '97. Proceedings Vol. 1, Centre for Advanced Engineering, University of Canterbury, pp255-260.

3.4.3 Noosa

Sunshine Coast Regional Council (2008), *Noosa Beach Sand Recycling Project*, Sunshine Regional Council Information Sheet, July 2008.

Sunshine Coast Council (2013), *Noosa Beach Erosion and Sand Recycling*. Sunshine Coast Council website, August 2013.

3.4.4 Townsville

Muller, J., Wust, R. A., & Hearty, P. J. (2006), *Sediment transport along an artificial shoreline: "The Strand", Townsville, NE-Queensland, Australia*. Estuarine, Coastal and Shelf Science 66, (pp. 204-210).

Riedel, P., O'Brien, P., Smith, R. & Macfarlane, B. (1999), *Beach Renourishment at The Strand, Townsville*, 14th Australasian Coastal and Ocean Engineering Conference, Perth.

3.4.5 Weipa

Foster, D N (1974), *Feasibility Study of Sand Barrage, Jessica Point (Weipa Port)*, WRL Technical Report 1974/04, Water Research Laboratory, University of New South Wales.

3.5 South Australia

3.5.1 Adelaide

Culver, R (1970), *Final Summary Report on Beach Erosion Studies*, University of Adelaide report to the Seaside Councils Committee and the State Government of South Australia, Adelaide.

Lange, Dames and Campbell & Pickands, Mather and Co. (1982), *Replenishment of Adelaide Beaches from Offshore Sand Sources - Feasibility Study*, report to the Coast Protection Board, Adelaide.

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Coastal Management Section (1995), *Semaphore Park and Tennyson Foreshore: Options for Protection*, technical report 94/2, Department of Environment and Natural Resources, Adelaide.

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Department of Environment and Natural Resources (1997), *Report of the Review of the Management of Adelaide Metropolitan Beaches*, prepared by the reference group appointed by the Minister for Environment and Natural Resources, Hon. David Wotton, MP.

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Fotheringham, D (2002), *Offshore sediment, bedforms and seabed stability along the Adelaide coast*, in S Seddon and S Murray-Jones (Eds.), *Proceedings of the Seagrass Restoration Workshop for Gulf St Vincent*, 15-16 May 2001, Department for Environment and Heritage, and SARDI Aquatic Sciences, Adelaide, pp. 45-65.

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Carley, J T and A Mariani (2007), *Technical Review of the Semaphore Park Trial Breakwater, South Australia*, WRL Technical Report 2007/14, Water Research Laboratory, University of New South Wales.

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3.6 Tasmania

3.6.1 Clarence City

Foster, D.N. and Pitt & Sherry Pty Ltd (1988), *Report on Coast Protection Study Roches Beach, Lauderdale*, Lands Department, Tasmania.

Byrne, G (2006), *Roches Beach Lauderdale Coastal Erosion Study*, Vantree Pty Ltd for Clarence City Council.

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Shand, T.D. and Carley, J.T. (2011), *Investigation of Trial Groyne Structures for Roches Beach WRL*, Technical Report 2011/06, Water Research Laboratory, University of New South Wales.

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Drummond, C.D., Mariani, A. and Carley, J.T. (2013), *Trial Groyne Design at Bambra Reef Roches Beach Tasmania*, Technical Report 2013/20, Water Research Laboratory, University of New South Wales.

3.7 Victoria

3.7.1 Port Phillip Bay

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Wood, M. (1994), *An Assessment of the Port Phillip Bay Beach Renourishment Program*, Report prepared for the Victorian Institute of Marine Science.

Port of Melbourne Authority (undated pamphlet), *Beach Renourishment*.

Foran, A.T., Byrne, G. and Riedel, H.P. (2001), *Framework for Beach Renourishment, Port Phillip Bay*, 15th Australasian Conference on Coastal and Ocean Engineering, incorporating the 8th Australasian Port and Harbour Conference, Institution of Engineers (Australia), Gold Coast, Queensland, September 2001.

3.8 West Australia

3.8.1 Bremer Bay

DPI (2007), *Bremer Bay: Investigation into the Stabilisation of Fishery Beach*, Department of Planning and Infrastructure, Technical Report 471.

GHD (2008), *Report for Bremer Bay Harbour - Groyne and Beach Nourishment Technical Specification*. Department for Planning and Infrastructure. Perth, Western Australia.

3.8.2 Busselton

History of any previous works were in:

Oceanica (2006), *Geographe Bay Shoreline Scoping Study Stage 1: Compilation of Existing Studies and Data*, Oceanica Consulting Pty Ltd, report prepared for the Department for Planning & Infrastructure and Shire of Busselton.

GHD (2008), *Report for Busselton Groynes and Seawall. Replacement Groynes Detailed Design Report*. Prepared for Department for Planning and Infrastructure. **Note**, included 15,000m³ of beach renourishment.

Also sand and seagrass wrack bypassing each year at Port Geographe.

3.8.3 Bunbury Koombana Bay

Some previous dredge material from the creation of Bunbury Port was used to reclaim and realign the Bunbury foreshore. Material from Collie River mouth

dredging was used to increase the size of Bar Island and for other reclamation for recreational land use.

Drawing DMH 539-1-1 (1990), *Bunbury – Koombana Bay. North Shore Beach Development Line. Layout Plan and Cross Sections*. Department of Marine and Harbours WA. (5,000m³).

Oceanica (2006), *Collie River Maintenance Dredging, Environmental Impact Assessment*, Oceanica Consulting Pty Ltd, prepared for Department for Planning & Infrastructure.

3.8.4 Carnarvon

Reclamation, construction of levees and closure of the Fascine. Most recently maintenance dredging of the Teggs navigation channel and boat harbour since 1976.

3.8.5 Cockburn Sound – Owen Anchorage

Significant previous renourishments described in numerous reports. There is haulage throughout the area associated with material impounded on structures and boat ramps.

Summary documents:

MP Rogers & Associates: MRA. (2000), *Owen Anchorage Shoreline Monitoring (1994–1999)*, report prepared for Cockburn Cement Ltd by M.P. Rogers & Associates Pty Ltd, Report no. R076.

MP Rogers & Associates: MRA. (2005b), *Owen Anchorage Shoreline Monitoring (1999–2003)*. Report prepared for Cockburn Cement Ltd by M.P. Rogers & Associates Pty Ltd, Report no. R133 Rev0.

Oceanica Pty Ltd. (2010a) *Cockburn Cement's Environmental Management Programme: Shoreline Monitoring Plan. Owen Anchorage Synthesis Report, 2006-2009*. Prepared for Cockburn Cement Limited by Oceanica Consulting Pty Ltd, Report No. 334_342/12. November 2010.

Oceanica Pty Ltd. (2010b) *Cockburn Cement's Environmental Management Programme: Shoreline Monitoring Plan. Cockburn Sound Synthesis Report, 2006-2009*. Prepared for Cockburn Cement Limited by Oceanica Consulting Pty Ltd, Report No. 334_342/9. September 2010.

3.8.6 Cottesloe

Incidental scraping following erosion events. Renourishment programs not readily recorded, but have been conducted.

Kempin, E. (1953), *Beach sand movements at Cottesloe, Western Australia*, Journal of the Royal Society of Western Australia 37: pp35-58.

3.8.7 Dawesville & Mandurah Bypassing

DPI (2006), *Review of Sand Bypassing at Dawesville and Mandurah – Coastal Engineering Investigation*, Department of Planning and Infrastructure, Technical Report 446.

Dubczuk, L.T. (2007), *Annual Mechanical Sand Bypassing at the Mandurah Ocean Entrance and Dawesville Channel*. In: Proceedings of 18th Australasian Coastal and Ocean Engineering Conference and 11th Australasian Port and Harbour Conference, Melbourne, Victoria.

JFA (2006), *Dawesville Sand Bypassing Regime – Installation of a Fixed Pumping System Business Case Document*, Report prepared for Department of Planning and Infrastructure.

Moloney, B., Shand, S. and Paul M.J. (1999), *Dawesville Channel and Mandurah Ocean Entrance Sand Bypassing and Monitoring*, In Proceedings of: 14th Australasian Coastal and Ocean Engineering Conference and 7th Australasian Port and Harbour Conference, Perth, 14-16 April, pp444-449.

3.8.8 Denham

JFA (2004). *Denham Maintenance Dredging Works - 2004: Contract Close-Out Report*. Contract No 0220/03, Department for Planning & Infrastructure. Perth, Western Australia.

Eliot *et al.* (2012), *Known reclamation seaward and further northeast on the foreshore coincided with dredging in approximately 1980, 1986, 1990, 1997 for capital dredging for harbour and channel deepening, and in 2004*, JFA & Oceanica 2011.

JFA. (2004), *Maintenance Dredging of Teggs Channel and Entrance Channel and Harbour Basin of Carnarvon Fishing Boat Harbour - Contract Close-out Report - Contract No 0310/02*, for Department for Planning & Infrastructure.

3.8.9 Dongara/Port Denison

See BMT JFA & Oceanica database

3.8.10 Esperance (includes Bandy Creek Harbour)

Dredge spoil from Esperance Port Harbour and Bandy Creek harbour has been used to renourish the foreshore beaches. Intervention has been required in Esperance since 1914. Material from Bandy Creek has also been deposited adjacent to the harbour rather than in Esperance itself.

This is reported in many management reports and documents a few of which are listed below. This list is far from exhaustive.

JFA. (2000), *Bandy Creek Boat Harbour Esperance Maintenance Dredging 1999 - Contract Close-Out Report - Contract No E 196*. Prepared for Department of Transport Maritime Division Coastal and Facilities Management.

JFA. (2006), *Bandy Creek Boat Harbour - Esperance: Maintenance Dredging 2005-2009 - Contract Closeout Report 2005 Session*. Contract No 0275/04. Prepared for Department for Planning & Infrastructure.

JFA. (2007), *Bandy Creek Boat Harbour, Esperance Maintenance Dredging 2005-2009 - Contract Closeout Report 2007*. Prepared for Department for Planning & Infrastructure.

Jones R.C., Bicknell, C. and Ilich, K. (2009), *The Reinstatement of Bandy Creek Boat Harbour, Esperance*. In *Proceedings of Coast & Ports 2009*. Wellington, New Zealand.

MP Rogers & Associates, TABEC, Benchmark, EPCAD and GHD. (2005), *Esperance Townsite Foreshore Redevelopment - Masterplan Report Volume 1*. Perth, Western Australia.

Oceanica (2005). *Determination of Setback Line for Physical Processes: Esperance Bay (Flinders to Wylie Head)*, Oceanica Consulting Pty Ltd, application of Statement of Planning Policy 2.6. Shire of Esperance.

PWD (1978), *Esperance Beach Investigations - Report on Coastal Erosion and Possible Shore Protection Works*, Public Works Department of WA.

3.8.11 Exmouth

DPI (2007), *Removal of Sand from the Southern Sand Trap at Exmouth Boat Harbour - Contract Closeout Report 2006 Session* for the Department of Planning & Infrastructure.

3.8.12 Geraldton

Bailey, J. (2005), *Geraldton Northern Beaches Stabilisation Program*. Report on coastal sand migration 2004 - 2005 associated with Southern Transport Corridor sand placement in September 2004. Prepared for City of Geraldton.

MP Rogers & Associates.(1996), *Geraldton Region Coastal Engineering Study*.

3.8.13 Jurien Bay

See BMT JFA & Oceanica database for dredging of harbour.

3.8.14 Kalbarri

JFA (2007). *Kalbarri - Murchison River Mouth Annual Maintenance Dredging 2004-2006: Contract Closeout Report 2006 Session*. Contract No 0210/04. Department for Planning & Infrastructure. Perth, Western Australia.

3.8.15 Kwinana Beach

DPI (2004), *Kwinana Beach: Erosion Protection and Ongoing Management Works*. Department of Planning and Infrastructure Report No. 419, New Coastal Assets Branch, Department of Planning and Infrastructure, Perth.

3.8.16 Lancelin

JFA. (2009), *2008 Sand Excavation from Lancelin Public Jetty Foreshore: Close out Report*, for Department for Planning & Infrastructure.

Oceanica & JFA. (2005), *Maintenance Dredging Lancelin Maritime Facility - Environmental Impact Assessment*, report for Department for Planning & Infrastructure.

3.8.17 Ocean Reef

Oceanica and JFA. (2009) *Maintenance Dredging Ocean Reef Boating Facility Sediment Bypassing - Environmental Impact Assessment*, for Department of Transport.

3.8.18 Onslow

JFA. (2004), *Onslow-Beadon Creek Maintenance Dredging Works - 2003. Contract Close-Out Report*, Contract No 0220/03, for the Department of Planning & Infrastructure.

3.8.19 Penguin Island

Carey, M. and Hegge, B. (2009) *Management options for shoreline erosion mitigation on an inshore island, Penguin Island, Western Australia*. In Proceedings of 19th Australasian Coastal and Ocean Engineering Conference and 12th Australasian Port and Harbour Conference, Wellington, New Zealand.

JFA (2008), *Penguin Island South Beach Renourishment Project - Contract Closeout Report*, Prepared for Department for Conservation and Environment.

Oceanica (2005), *Penguin Island Beach Rehabilitation. Options for Shoreline Management of South Beach*. Report No. 422/1, Oceanica Consulting Pty Ltd, prepared for Department of Conservation and Land Management & Resolve FM.

Oceanica (2008), *Penguin Island Rehabilitation - Environmental Monitoring Close-out Report*, Oceanica Consulting Pty Ltd for Department for Planning and Infrastructure.

3.8.20 Port Beach

History of previous renourishment and reclamation in:

DPI (2004), *Port Beach Coastal Erosion Study*, Department of Planning and Infrastructure, Technical Report No 427.

3.8.21 Port Hedland

Nourishment known to have occurred as a by-product of channel dredging but no references available at this time

3.8.22 Quinns Rocks

Renourishment undertaken in 1996-2000, with further renourishment and groynes in 2002-2003. With subsequent renourishment annually 2004, 2005 and 2006.

MP Rogers & Associates: MRA. (2000), *Quinns Beach Erosion and Coastal Protection Report*, prepared for the City of Wanneroo.

Tremarfon (1997), *Quinns Coastal Processes Study*. Tremarfon Pty Ltd.

3.8.23 Secret Harbour

Foster, D.N., Miller, C.A. and Wallace, B.C. (1982) *Assessment of Sand Bypassing, Secret Harbour, Western Australia*, WRL Technical Report 1982/07, Water Research Laboratory, University of New South Wales.

3.8.24 South Beach Fremantle

CRMG (1992), *South Beach Redevelopment Strategy*, City of Fremantle, Perth, Western Australia.

Oceanica, Damara, W. and Coastal Zone Management (2008), *Cockburn Coast District Structure Plan: Coastal Processes Assessment*, Western Australian Planning Commission and Department for Planning & Infrastructure.

3.8.25 Swan and Canning Rivers

Numerous reports and renourishment projects. At least 44M m³ dredged. Renourishment with hauled sand commenced in 1976. Two summaries included below:

Damara WA, BMT JFA Consultants, Oceanica Consulting, Range to Reef Consultants and Bebbcart Cartographics. (Draft - 2013) *Feasibility Study of Options for Beach Renourishment – Swan and Canning Rivers*. Prepared for the Swan River Trust.

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