



Cape to Cape Cleanup (South West Australia) 2008 Data Report



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Summary

Amount of Debris

A total of 26363 items were collected in the 2008 cleanup and this was 7300 items more than the 2007 total. This is partly accounted for by the increase in size of the cleanup area. However five out of seven areas on the cape to cape coast showed increases and this together with there now being cleanups conducted many times throughout the year on the capes coast indicates that overall debris has increased.

Areas/ Sites with Greatest Concentration of Items

Based on the statistic of number of items per metre of beach the highest levels of marine debris pollution in the cleanup data were found in Marmion, Cape Leeuwin to White Point, and Cape Clairault to Cape Naturalist, and East Augusta to cape Leeuwin, all being above the cleanup average of 0.24 items per metre of beach. Each of these areas reflects different aspects of the pollution problem.

- Marmion Marine Park in the metropolitan area experiences a combination of high beach usage and associated littering together with some offshore and near shore generated debris. (Hillarys had highest count)
- Cape Clairault to Cape Naturalist which includes some high usage tourist and recreation sites shows a combination of accrued offshore and longshore sourced debris together with sites affected by littering. (Windmills to lighthouse beach had highest count)
- Cape Leeuwin to White Point (Hamelin Bay) reflects accrued debris from offshore, especially Deepdene Beach, where nearly all the debris comes from offshore or longshore sources. (Deepdene South had highest count)
- East Augusta to cape Leeuwin covering part of Flinders Bay produced a combination of littering around Augusta and littering and offshore sourced debris on the beaches. (Colour Patch (Estuary) to Flinders Bay had highest count)

Debris Categories

Fragmentation of marine debris is a significant feature of the marine debris process on the capes coast. As seen in the remnants category in the graphs throughout the report it is usually the leading category of debris items collected. Remnants including pieces of plastic, rope and net fragments, lids and tops and polystyrene foam, represent an ever present and growing background feature on our coasts and beaches.

The next highest count of items was in the end user packaging category. Patterns emerging in the data suggest most of these items result from littering by beach and coastal facility users with the remainder coming from offshore. The highest ranking items were plastic drink bottles, food wrap, plastic wrap (non food) glass drink bottles, plastic containers and aluminium cans.

End user items also follow this pattern with cigarette butts, straws and stirrers, clothing and shoes, tissues and fishing floats frequently found.

Linear items showing up strongly are rope, plastic strapping band and fishing line. Rope was found to come ashore in both lengths of tens and hundreds of metres as well as in many small fragments and remnants. Its distribution was episodic with more rope found on the coasts away from Geographe Bay. This year's underwater cleanup participants at Busselton Jetty extracted 1.2KM of snagged fishing line. This quantity viewed against the background of a scattering of small quantities of line at other sites highlights the fact that much discarded or lost fishing line remains in the ocean.



Industrial and commercial sourced items (apart from obvious lobster fishing items) present a difficult set of items to positively connect to sources. The items that can be used are small in number and seasonal in appearance. Most items from this category were from commercial fishing and shipping sources.

- Commercial fishing items were the most frequently occurring item in this category with rock lobster fishing activity predominant over net and line fishing in the data.(1)
- Commercial shipping sourced data remains a problematic area for identifying items originating from this source. The items selected in the data to represent this subcategory do weakly reflect an offshore source.

Of the two remaining categories dumping of domestic items was low in the data while the dumping items showing up strongly were wood and rubber. Oil globules and tar balls were found in a small number of sites.

Two sites recorded the presence of plastic resin pellets with high numbers at Ellensbrook (found amongst the rocks beneath the lookout) and medium numbers at Deepdene South (Medium numbers in one small location with a scattering along the whole southern section). (2)

Items whose count exceeded 500 fell into four groups

- Items mainly sourced from littering were cigarette butts (1024), food wrap (884) plastic drink bottles (874), Glass drink bottles (602) and aluminium cans (569).
- Remnants – much of which result from past littering were pieces of plastic (6098) and broken glass (2256)
- Fishing line (1432) is usually not intentional discarded but its loss into the marine environment is a serious problem.
- Rope (1960) related to commercial especially fishing activities.

The addition of data from Capel, Mandurah and Perth has allowed for the beginnings of a characterisation of the marine debris pattern in the south west. The broad features of this are;

1. An ever present and high volume of remnant debris on the entire coast but not strongly expressed in Geographe Bay.
2. A growing beach/ coast littering problem especially at high visitation sites and in built up areas.
3. The migration of buoyant members of these debris items along the coast and thus polluting downstream sites.
4. Significant fragmentation of this migrating debris along the capes coast producing a cascade of small synthetic pieces and fragments which penetrate into all parts of the capes coastline.
5. An annual beaching of large amounts of debris from offshore activities and from remote regions.



Preface

Organisation of Data into Cleanup "Areas"

Cleanup sites are grouped into areas for ease of presentation. These groups are set out in Attachment 1.

Individual Site Data

Detailed data for individual sites is not given but is available on request from TBOCS

Data Reliability

Data for a small number of sites was recorded in a different way than usual and for these sites adjustments were made to show the types of items collected but not their quantities. Overall the data and information gives a true general reflection of the marine debris situation in the cleanup area.

Notes on the Analysis Method

- The analysis method used here is new. (3) The aim of the method being to identify basic patterns and processes indicated in the data and present these in a graphical form with the main aims of identifying debris origins and estimating the degree of the problem at a given site and in the area as a whole.
- The method concentrates on the qualitative information in the data by looking at proportions of different groups of items in and between different areas within the cleanup area as a whole.
- Linear items are counted in metres so that one metre of rope or strapping band etc is made equivalent to one item of debris.

Time of the Cleanup in the Seasonal Context

A number of conditions are worth noting for cleanup beaches in this part of the year on this coast.

1. Debris coming from offshore is tailing off as the prevailing wind direction becomes easterly.
2. Beaches dry out, and accrete (grow wider) and sand becomes mobile tending to bury debris in the process.
3. Vehicle and foot traffic in high usage areas also buries debris.
4. Beach visitation is in the early phase of building to higher seasonal levels.



Cleanup Data Summary

Details of Data Set

- Cleanup Code C2C2008
- Data gathered by approximately 600 volunteers
- Cleanup areas covered East Augusta through to Dallyellup, Tim's Thicket to Mandurah Estuary, Preston Beach and Marmion Marine Park.
- Cleanup Dates – centred around October 11 & 12, 2008
- Number of cleanups – One event including 81 individual cleanups
- Total Number of items collected – 26,363.

Total Items

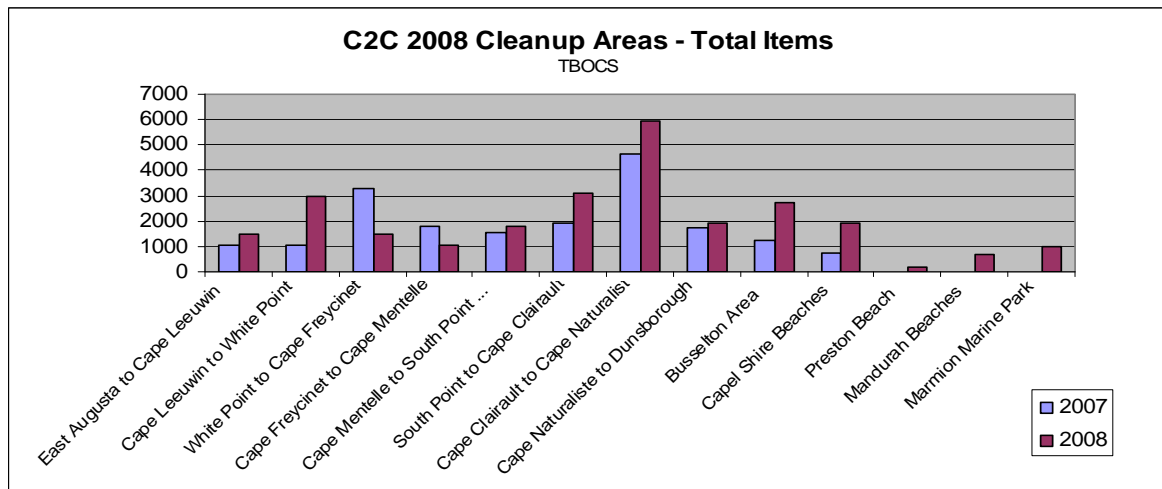


Figure 1

Several sites between White Point (Hamelin Bay) and Cape Mentelle were not cleaned in the 2008 event and apart from these two areas all other areas showed an increase in debris collected.

Items per Metre of Site

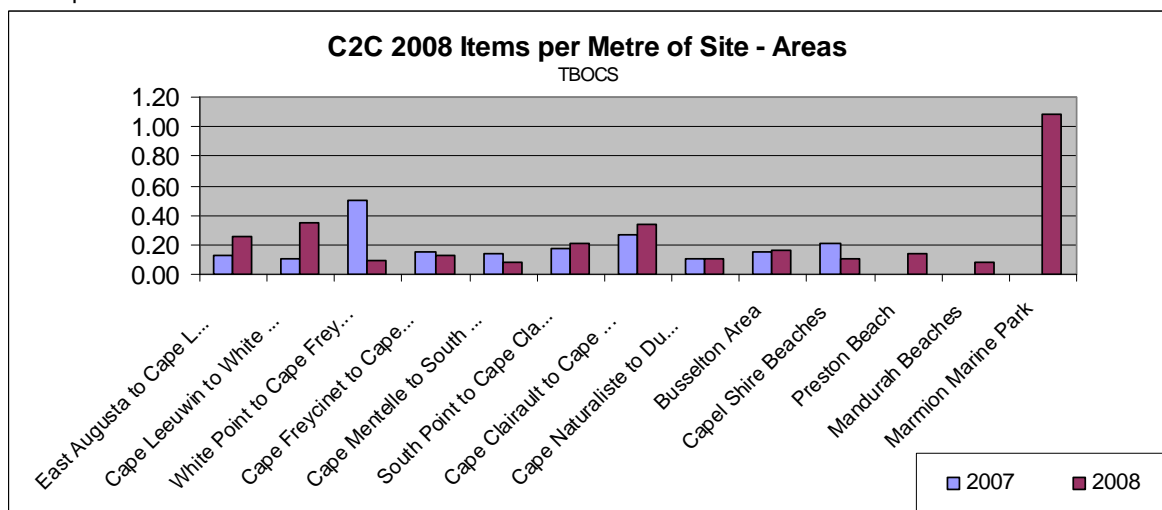


Figure 2

Using the items per metre of site measure it can be seen that four areas stand out – being above the median level of 0.24 items per metre of site. (4)



C2C 2008 Cleanup Signature

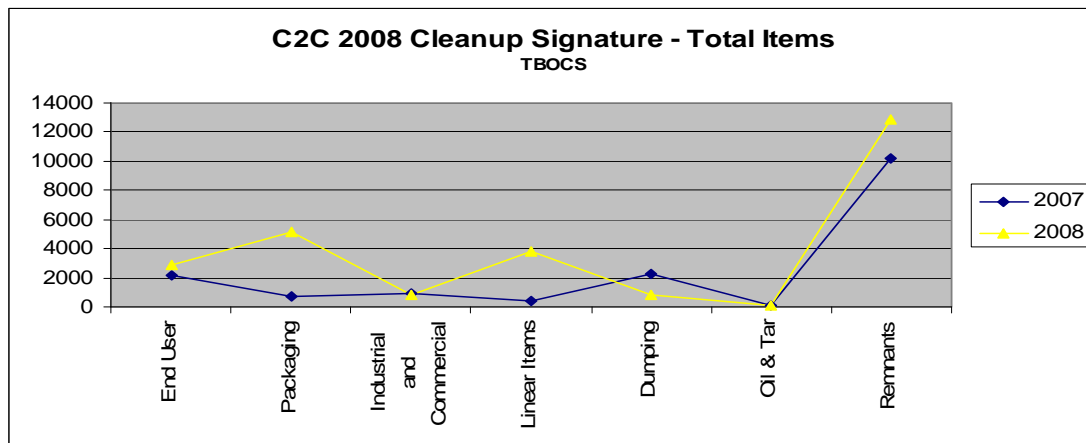


Figure 3

The cleanup signature shows the distribution of total items amongst the main item categories and shows three peaks which broadly reflect;

1. the high numbers of remnant items found especially on the capes coast proper,
2. high volumes of packaging found especially around high usage areas,
3. A large amount of linear items – the most notable being fishing line recovered from beneath the Busselton Jetty.

Debris Distribution Patterns

The following graphs, based on total items per category for each area, show the distribution pattern across the cleanup area moving from Augusta in the south (LHS) to Marmion Marine Park in the north.

The same pattern seen in each graph below can also be seen for each category when the items per metre of site stats are used although the latter curve (not included here) peaks sharply at the Marmion Marine Park end.

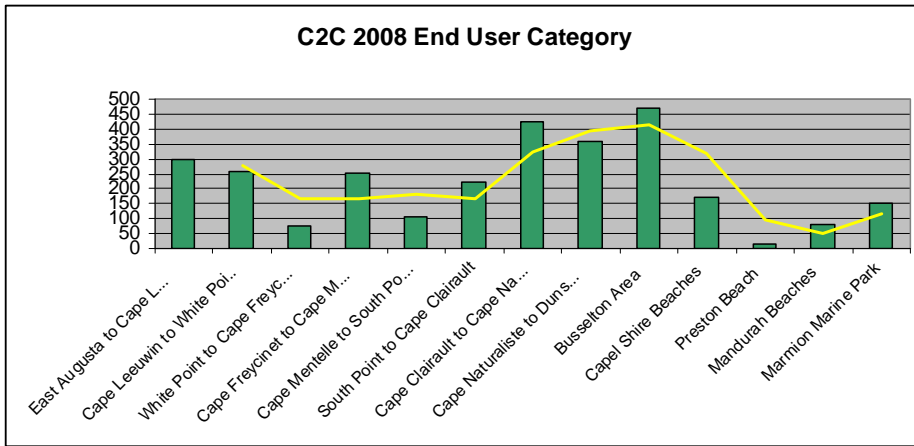


Figure 4

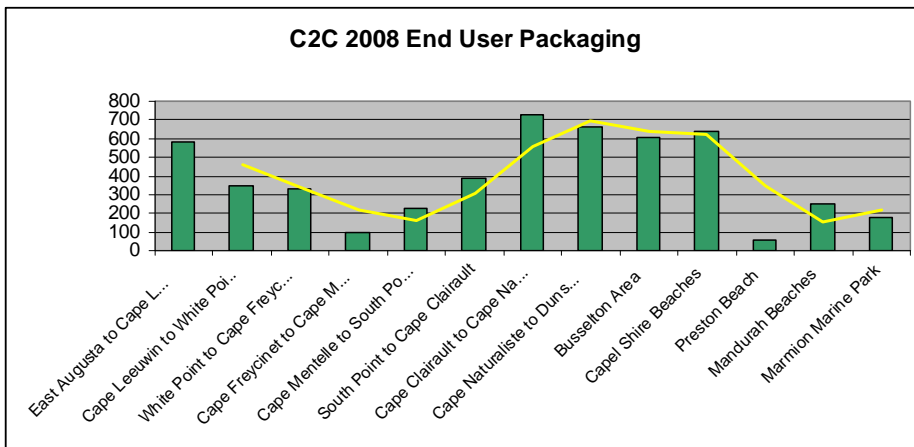


Figure 5

End user items and packaging clearly show the impact of beach and coastal facility users on numbers of these items in the cleanup area.

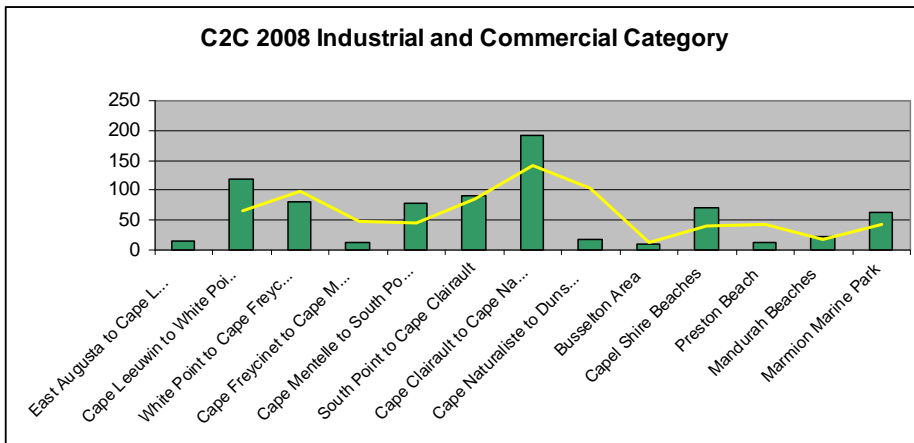


Figure 6

Industrial and commercial items mainly consisted of buoys and floats, bait container lids and clyume (chemical light) sticks associated with rock lobster fishing and net and line fishing. The pattern shows these items coming ashore strongly on the capes coast, tailing away in Geographe Bay then beginning to rise again from Capel and moving north.

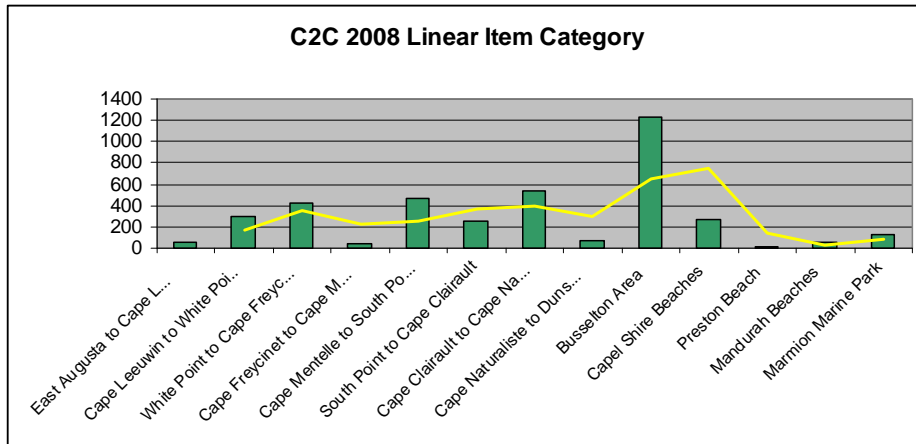


Figure 7

Rope is the major item in this category and washes ashore episodically. The pattern is also dominated by the 1.2 metres of fishing line recovered from beneath the Busselton Jetty.

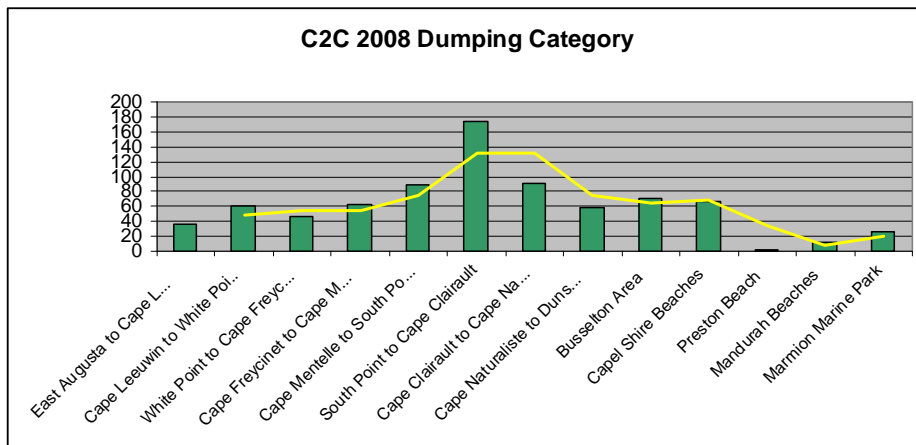


Figure 8

Dumping was dominated by the items of wood and rubber. Wood items are often timber and chocks lost from shipping Rubber items are often associated with boat parts such as protective rubber buffering from the sides of boats.

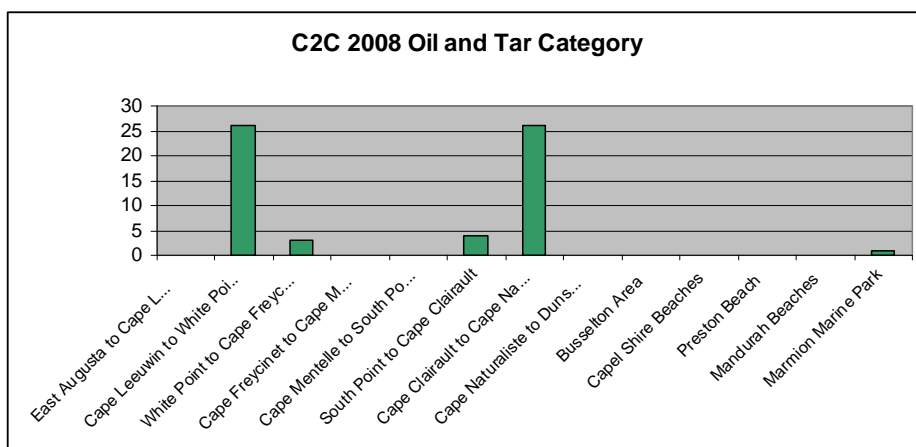


Figure 9

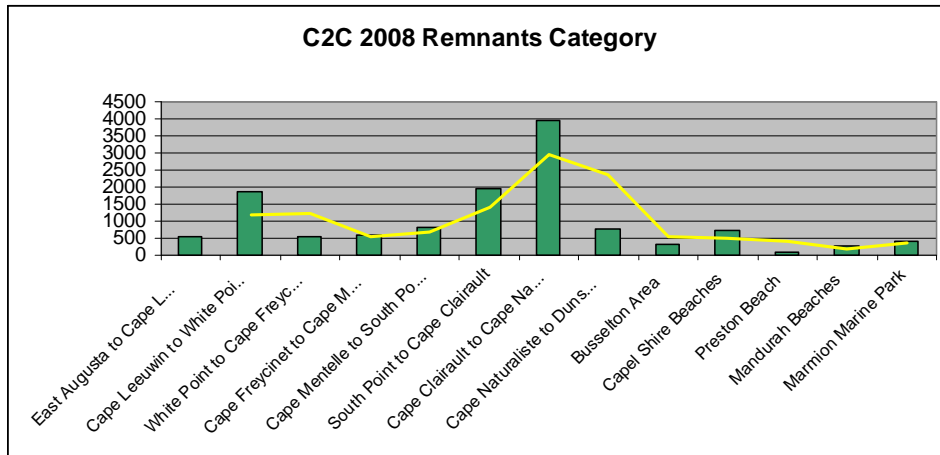


Figure 10

Pieces of plastic, plastic bag remnants and broken glass were the three items with the highest numbers. The curve shows higher numbers of remnants on the capes coast highlighting the “shredding” capacity of that coast.

Selected Items Used as Indicators of Debris Sources

Selected Industrial and commercial (Fishing and Shipping) Items

The graphs below are composed from data for selected items which can be strongly associated with a given activity.

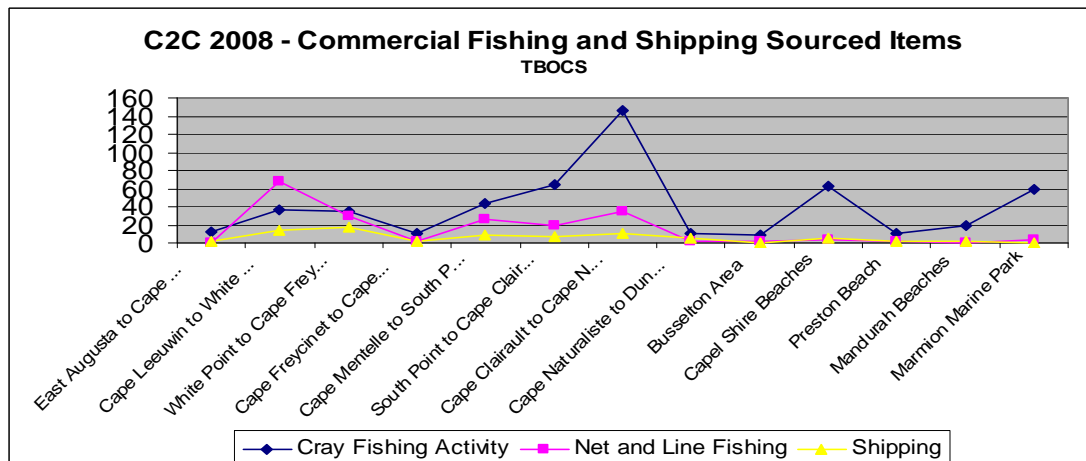


Figure 11

The commercial fishing and shipping sourced items include;

- Cray fishing - bait container lids, buoys and floats, float savers, crayfish traps, and crates
- Net and line fishing – drift net floats and cylume sticks,
- Shipping – paint brushes, light bulbs and tubes, cable ties and tags, and brooms (paintbrushes and brooms often associated with ship board painting).



The Cray fishing activity curve shows this debris coming ashore strongly along the capes coast, especially in the northern section, dropping back to low numbers in Geographe Bay and then re-establishing a strong appearance in the West Coast sites.

The Net and line fishing category follows a similar pattern and the low numbers away from the capes coast may be explained by seasonal factors which lead to the burying of clyume sticks on the open sandy beaches from Capel and heading north.

Items which can be directly associated with shipping sources are limited (especially in numbers of items coming ashore) in this type of cleanup but still weakly reflect the above pattern.

Selected Linear Items

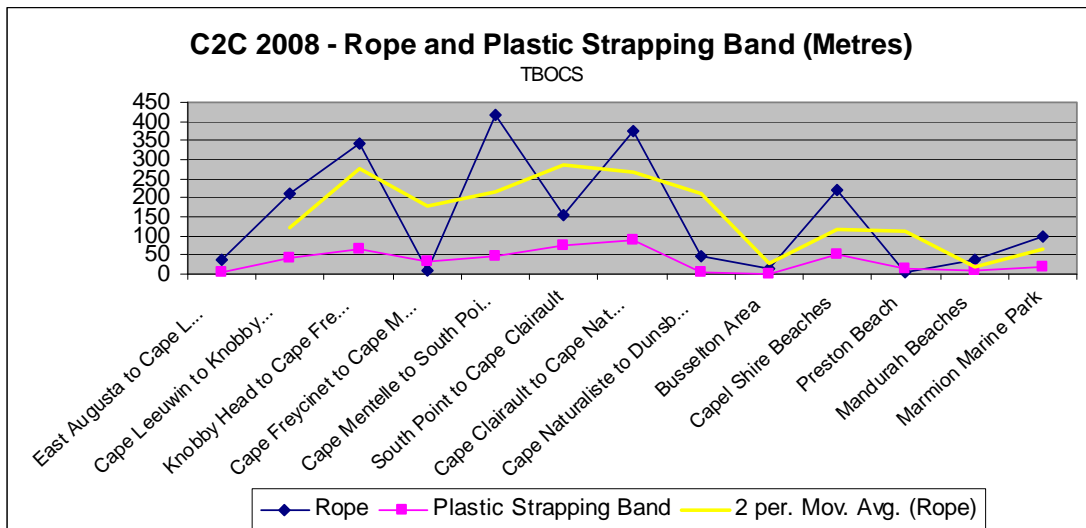


Figure 12

Rope and plastic strapping bands are ever present items in beach cleanups. The averaged curve above shows rope following the same generalised distribution pattern among the areas as other offshore items. Plastic strapping band also shows this pattern. (5)

Selected End User Items and Packaging

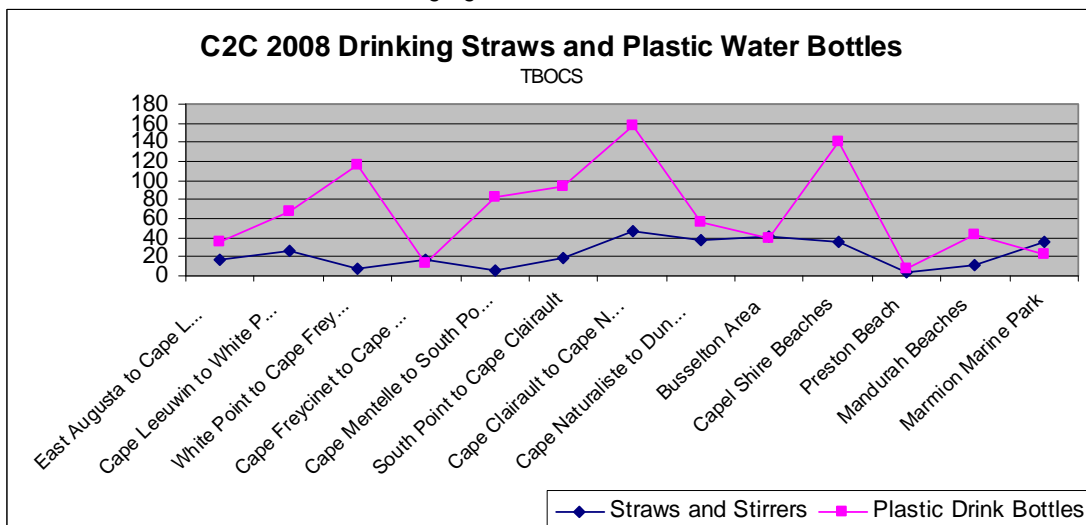


Figure 13



Drinking straws are very mobile and can indicate littering on high usage beaches. They can also indicate longshore movement of debris when found in high numbers at sites with little or no visitation. This pattern can be seen in the above graph.

Plastic drink bottles, usually capped, are one of the most mobile of debris items but they may not be discarded on beaches in the same numbers as items such as drinking straws. Many plastic drink bottles are identifiable from remote or offshore sources and many migrate in the long shore flow. The different distribution pattern of each item can be seen by comparing the two curves above.

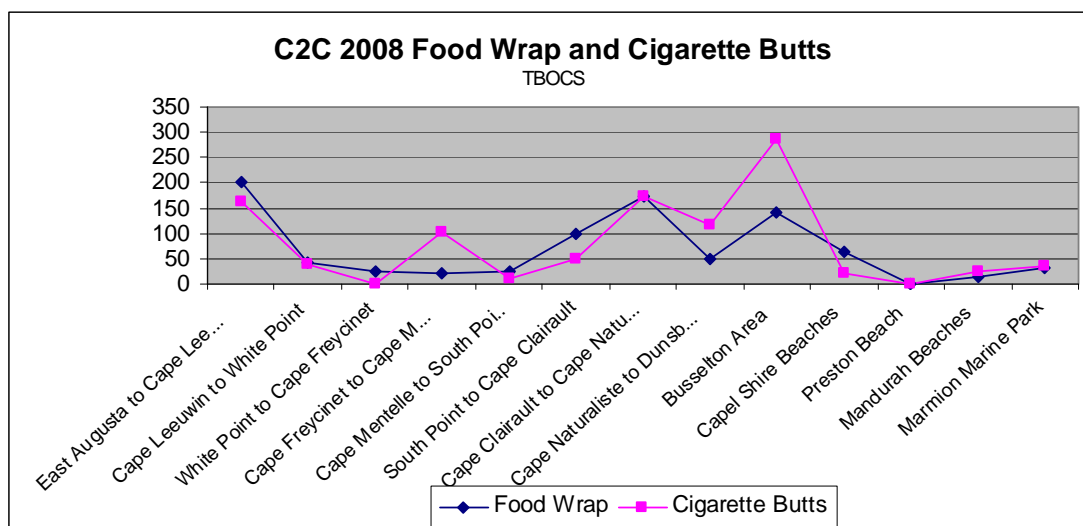


Figure 14

These two items are strong indicators of site littering. Many food wrap items tend to become burdened with sand or water and do not have strong buoyancy so do not migrate away from their original disposal site as easily as more buoyant items. High numbers of cigarette butts were found at the lookout near Cape Leeuwin, Gas Bay near Prevally, Smiths and Yallingup Beach, and Busselton Foreshore, all busy visitor areas.

List of All Items with Sorted by Totals

End User Items		All Packaging	
Cigarettes and Filters	1024	Food Wrappers	884
Straws/Stirrers	303	Plastic Drink Bottles	874
Cloth & Clothing	286	Glass Drink Bottles	602
Shoes	228	Aluminium Cans	569
Tissues	154	Paper, Newspaper, Cardboard	538
Binding Thread/String	149	Plastic Bags	407
Fishing Floats	111	Plastic Containers	343
Fishing Lures	86	Plastic Wrap - not food wrap	249
Cups, Plates, Cutlery	84	Bait Bags/Packaging	190
Cigarette Lighters	81	Skin Care Bottles/Tubes	80
Toys	78	Foil	70
Yellow Council bags for dog	34	Bleach/Cleaner Bottles	45
Wooden Ice Cream Sticks	30	Glass Jars	43
Balloons	28	Tobacco Packaging/Wraps	38
Cotton Bud Sticks	28	Aerosol Cans	33
Pens & Pencils	27	Pull Tabs	24
Hook	22	Oil / Lube Bottles	24



End User Items Continued

Toothbrushes	20
Band aid	10
Shotgun Shell	10
Tea Bag	9
Syringes	9
Surf Wax	8
Brushes & Combs	8
Nappies	8
Fishing Rod/Hand Reel	7
Ear Plug	7
Dummy	6
Drug Paraphernalia	6
Sinker	4
Lolly Sticks (e.g. Chubba Chup)	3
Sunglasses/glasses	3
Condoms	3
Tools	3
Tampons + Applicators	2
Candle	2
Torch	2
Sanitary Napkin	1
Razor	1
Asthma Inhalers	1
Mobile Phone	1
Money \$10	1

Linear Items

Rope - metres	1960.35
Fishing Line metres	1432.05
Strapping Bands - metres	453.25
Fishing Net (scraps)	26

Dumping

Wood	347
Rubber	137
Metal	98
Plastic Pipe	49
Building Materials	45
Boat Pieces	37
Electrical Cable/starters	24
Cars/Car Parts	16
Carpet	13
Batteries	8
Furniture	8
Marine Engine Parts	6
Tyres	3
Printer Cartridge	1
White Goods - Stoves/Fridges	1

Table 1

All Packaging Continued

20 Litre Drums	22
Tins	19
Plastic Sheeting / Tarps	18
Polyweave Bag	13
Bubble Wrap	9
Hessian Bag	3
55-Gal. Drums	3
Six Pack Holder	1
CO2 Canister	0

Ind.&Comm (Fishing and Shipping)

Buoys/Floats	226
Bait Container/Lids	166
Cylume Sticks	160
Crab/Lobster/Fish Traps	82
Crates	42
Light Bulbs / Tubes	31
Drift Net Floats	30
Broome	18
Cable Tie/Tags	16
Pallets	8
Float Grommets	2
Paintbrush	1

Oil and Tar

Oil Globules	60
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Remnants

Pieces of Plastic	6098
Broken Glass	2256
Plastic Bag Remnants	2131
Lids, Bottle Tops, Corks	1517
Polystyrene Foam	858
Fishing Nets	26



Cleanup Areas – Graphs and Tables

- The following section displays data in graph or table form, for each area. Only the three highest ranking categories of end user packaging, end user item subcategories and remnants are shown.
- Sites or locations within sites, with the highest concentration of items are also listed together with the most frequently occurring item/s.
- Graphs depicting the site “signature” give a quick view of what kind of debris is showing up from current or recent human activity seen on the Left hand side and middle of the graph contrasted with remnants on the right hand side representing older debris in the process of breaking down. Each category is represented as a percentage of the total items for that site or area in the signature graph.
- Graphs representing end user packaging are arranged with drink packaging on the left followed by food packaging and then the remaining types of packaging.



East Augusta to Cape Leeuwin

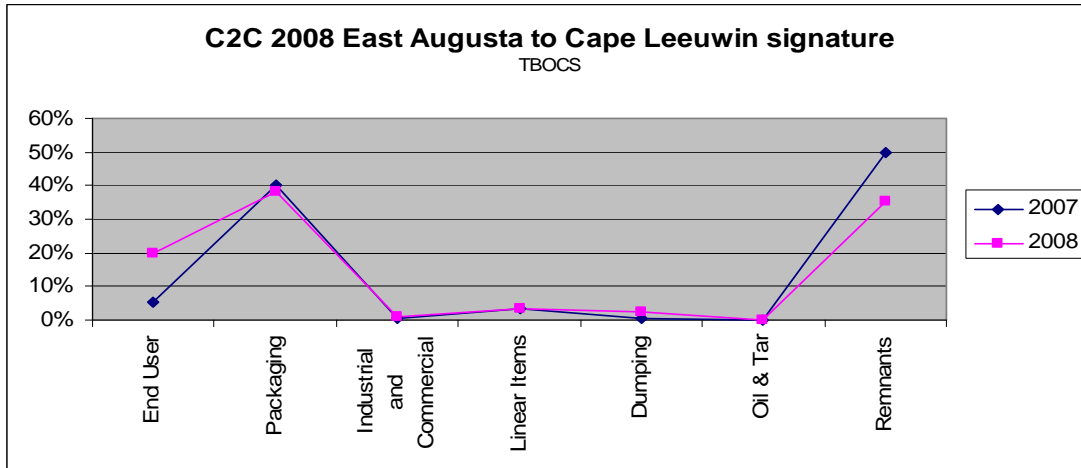


Figure 15

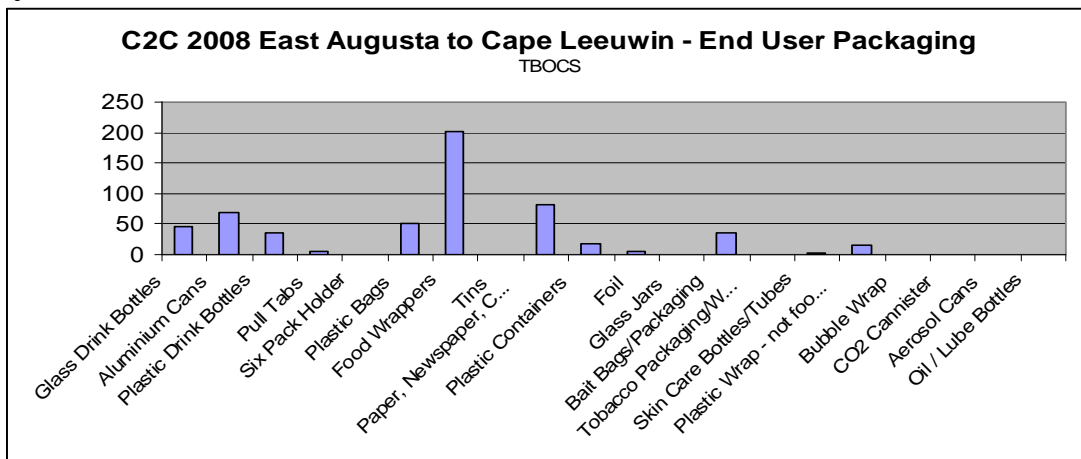


Figure 16

East Augusta to Cape Leeuwin – End User - Sub Categories	Total
Food & Drink	36
Clothing	22
Recreation	10
Medical/Personal/Hygiene	45
Smoking (Mainly cigarette butts)	164
Misc	21
East Augusta to Cape Leeuwin – Remnants - Items	Total
Pieces of Plastic	174
Polystyrene Foam	53
Plastic Bag Remnants	146
Lids, Bottle Tops, Corks	72
Broken Glass	87

Table 2

Sites/ Locations with High Numbers of Items

- East Augusta (plastic bags, bait bags, plastic bag remnants)
- Lookout between Dead Finish and Quarry Bay (many cigarette Butts)
- River mouth and estuary fore shore (many Food Wrappers)



Cape Leeuwin to Knobby Head

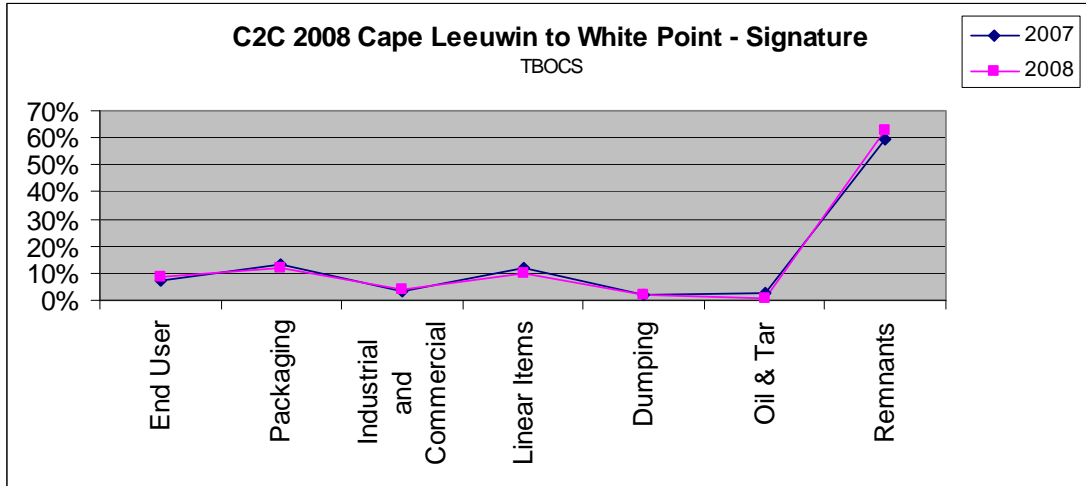


Figure 17

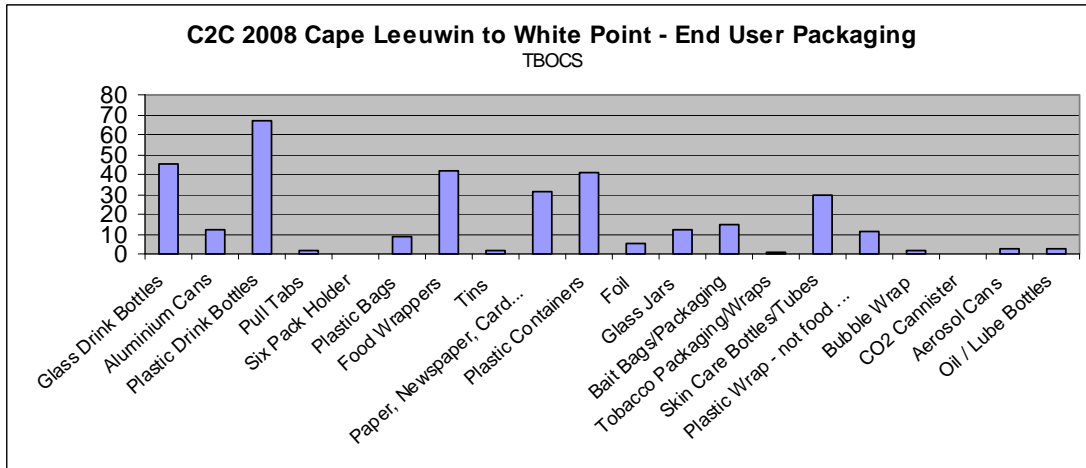


Figure 18

Cape Leeuwin to White Point – End User - Sub Categories		Totals
Food & Drink		39
Clothing		41
Recreation		55
Medical/Personal/Hygiene		52
Smoking		58
Misc		12
Cape Leeuwin to White Point – Remnants - Items		Totals
Pieces of Plastic		1266
Polystyrene Foam		175
Plastic Bag Remnants		46
Lids, Bottle Tops, Corks		267
Broken Glass		102

Table 3

Sites/ Locations with High Numbers of Items

- Deepdene South (fishing floats, shoes, plastic drink bottles, glass drink bottles, plastic containers and pieces of plastic).



Knobby Head to Cape Freycinet

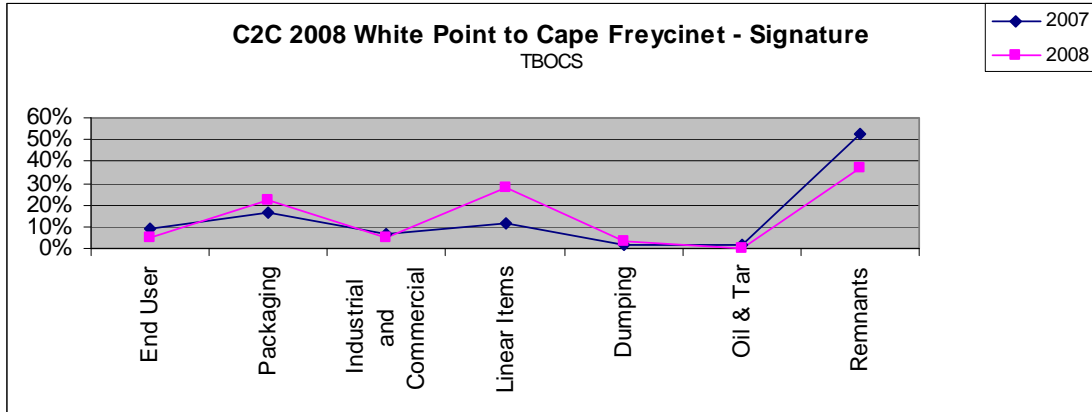


Figure 19

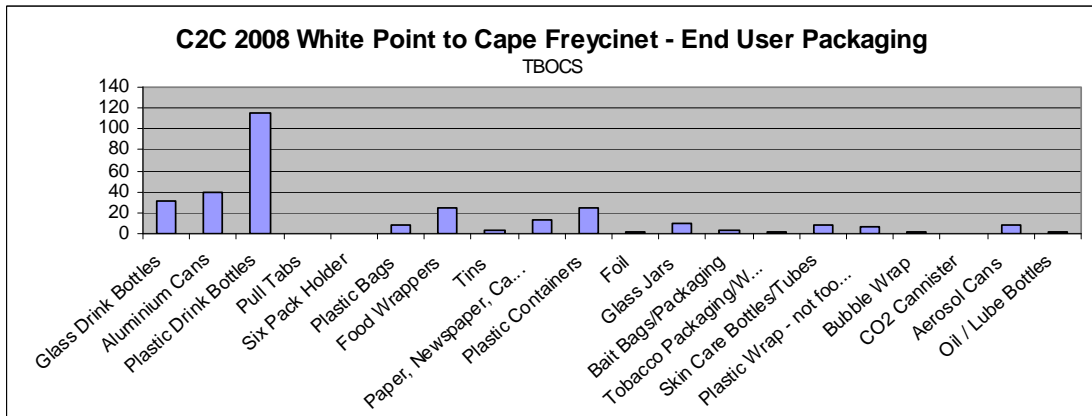


Figure 20

White Point to Cape Freycinet End User - Subcategories

Subcategory	Totals
Food & Drink	10
Clothing	24
Recreation	20
Medical/Personal/Hygiene	6
Smoking	6
Misc	9

White Point to Cape Freycinet Remnants - Items

Item	Totals
Pieces of Plastic	348
Polystyrene Foam	57
Plastic Bag Remnants	22
Lids, Bottle Tops, Corks	86
Broken Glass	43

Table 4

Sites/ Locations with High Numbers of Items

- Hamelin - Bobs Track to Grace Rd (plastic drink bottles, food wrap, plastic containers, and rope).
- Boranup Beach (plastic drink bottles, pieces of plastic)



Cape Freycinet to Cape Mentelle

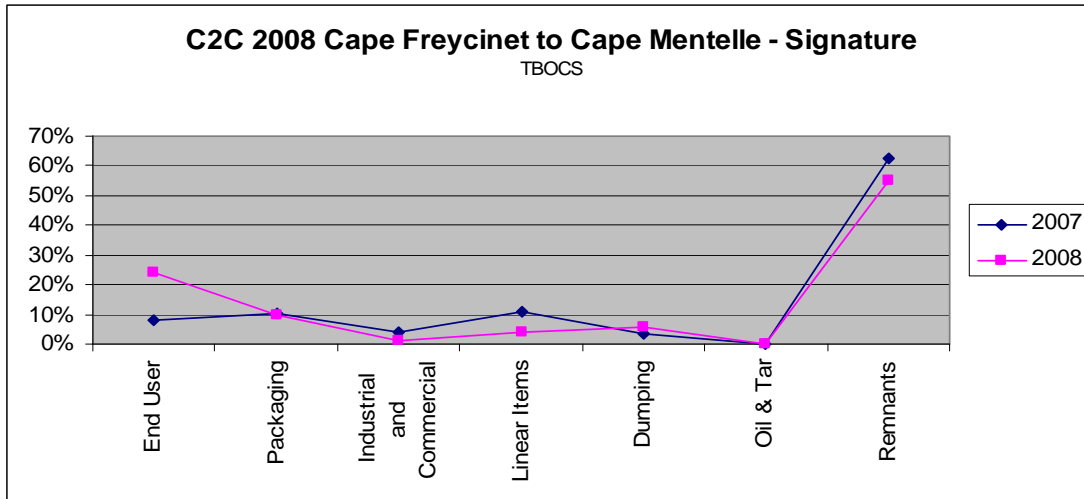


Figure 21

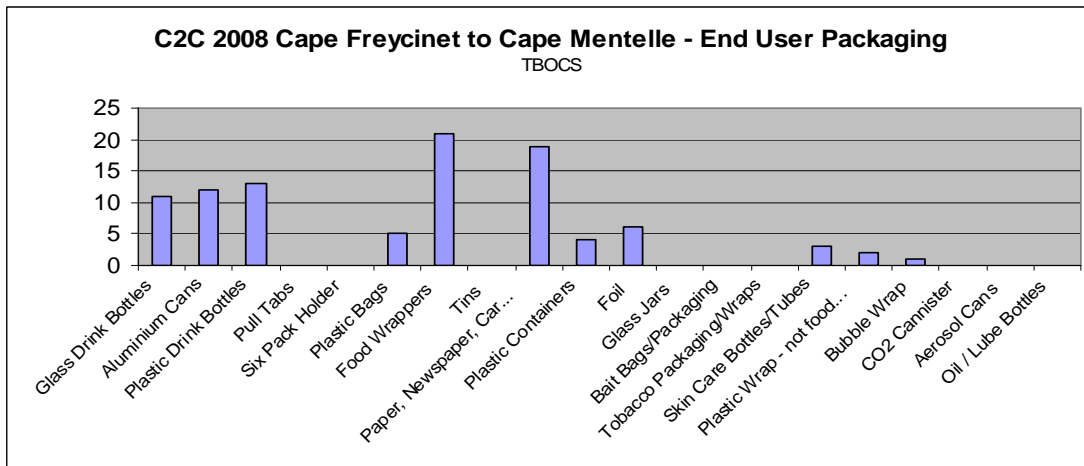


Figure 22

Cape Freycinet to Cape Mentelle – End User - Subcategories	totals
Food & Drink	22
Clothing	18
Recreation	17
Medical/Personal/Hygiene	32
Smoking	102
Misc	63
Cape Freycinet to Cape Mentelle – Remnants - Items	Totals
Pieces of Plastic	261
Polystyrene Foam	11
Plastic Bag Remnants	108
Lids, Bottle Tops, Corks	84
Broken Glass	107

Table 5

Sites/ Locations with High Numbers of Items

- Gnarabup (plastic bag remnants, paper/newspaper/cardboard).
- Gas Bay (smoking, pieces of plastic).
- Redgate (pieces of plastic, lids and tops).



Cape Mentelle to South Point (Gracetown)

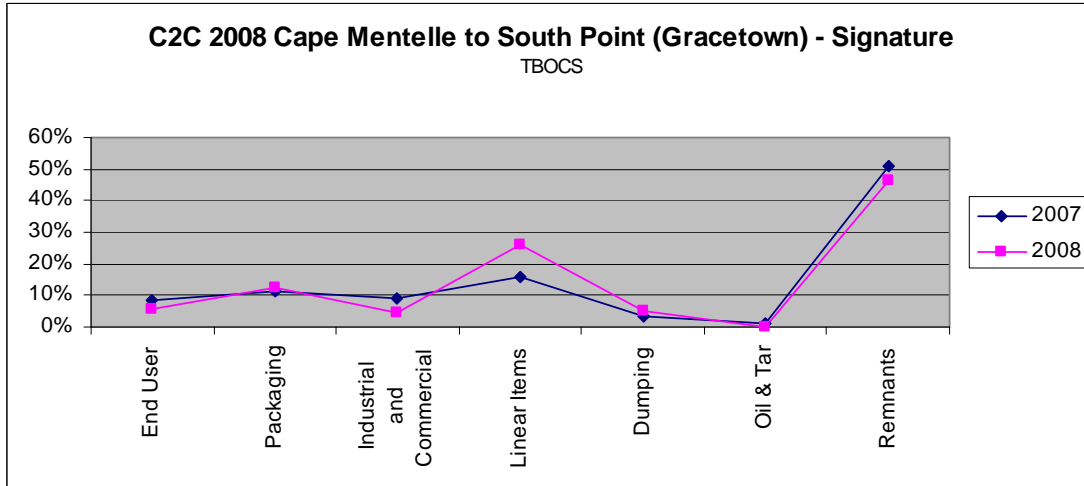


Figure 23

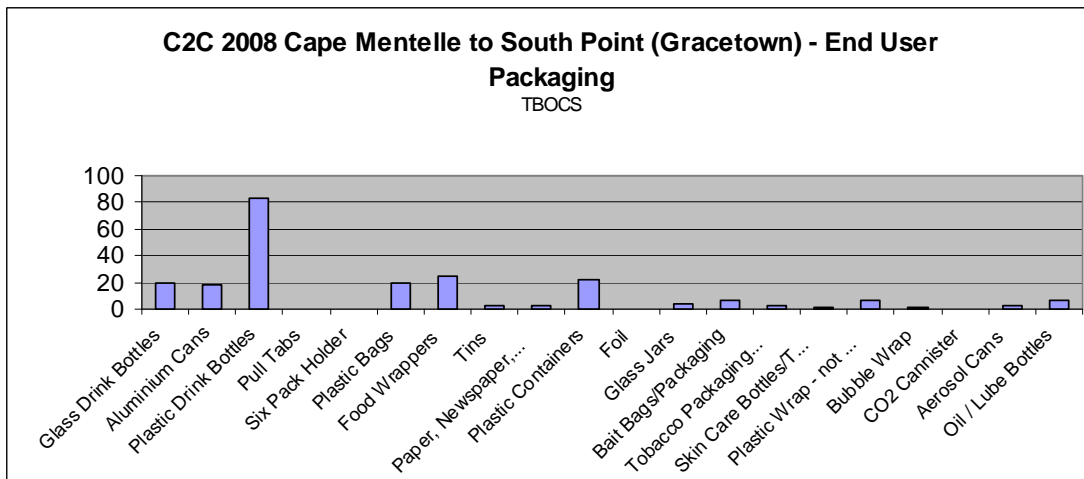


Figure 24

Cape Mentelle to South Point (Gracetown) End User - Sub Categories		Total
Food & Drink		10
Clothing		25
Recreation		30
Medical/Personal/Hygiene		7
Smoking		23
Misc		11
Cape Mentelle to South Point (Gracetown) Remnants - Items		Total
Pieces of Plastic		416
Polystyrene Foam		76
Plastic Bag Remnants		88
Lids, Bottle Tops, Corks		154
Broken Glass		92

Table 6

Sites/ Locations with High Numbers of Items

- Ellensbrook South (Plastic drink bottles, glass drink bottles, rope, wood and pieces of plastic).
- Ellensbrook under Lookout (pieces of plastic and rope).
- Joeys Nose to Gnoocardup (plastic drink bottles, pieces of plastic and fishing floats).



South Point to Cape Clairault

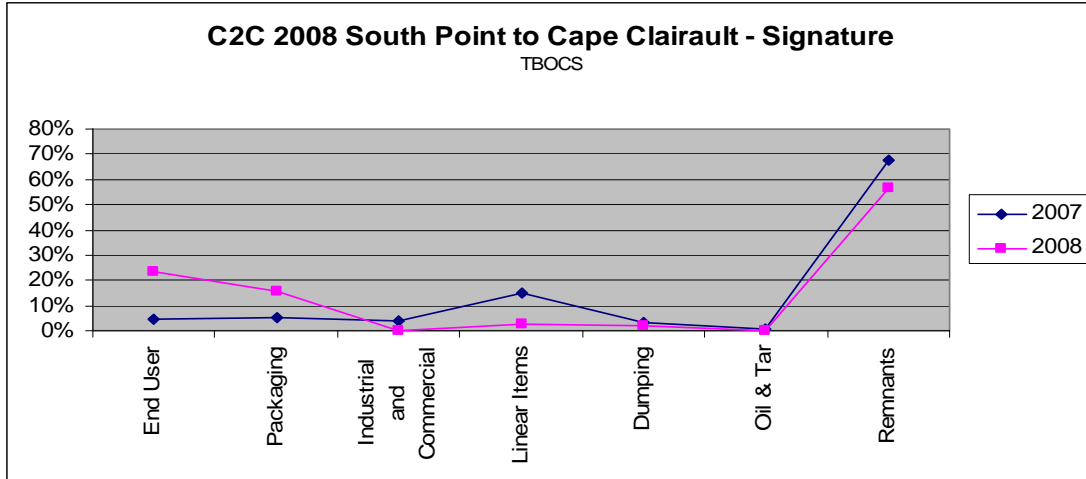


Figure 25

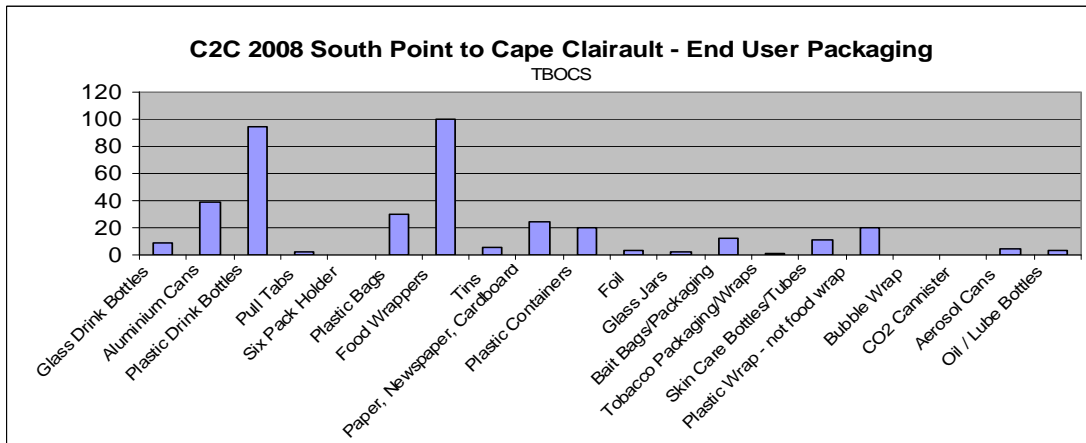


Figure 26

South Point to Cape Clairault - End User - Sub Categories	Total
Food & Drink	29
Clothing	56
Recreation	36
Medical/Personal/Hygiene	14
Smoking	55
Misc	33
South Point to Cape Clairault Remnants - Items	Total
Pieces of Plastic	832
Polystyrene Foam	161
Plastic Bag Remnants	143
Lids, Bottle Tops, Corks	144
Broken Glass	693

Table 7

Sites/ Locations with High Numbers of Items

- Wyadup (plastic drink bottles, rope, broken glass and pieces of plastic).
- Cowaramup Bay Gracetown (pieces of plastic, plastic wrap, plastic bags and food wrap).
- Gallows (food wrap, pieces of plastic and rope).



Cape Clairault to Cape Naturalist

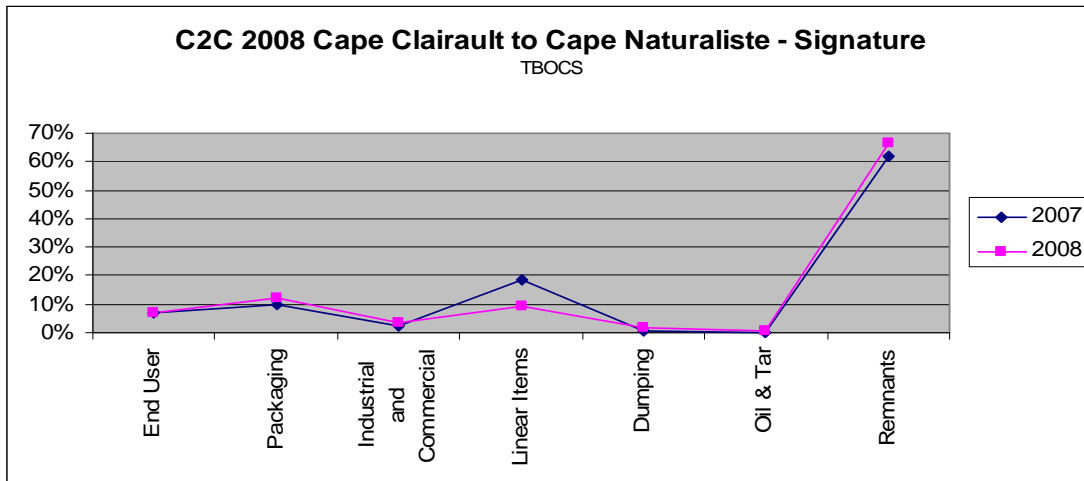


Figure 27

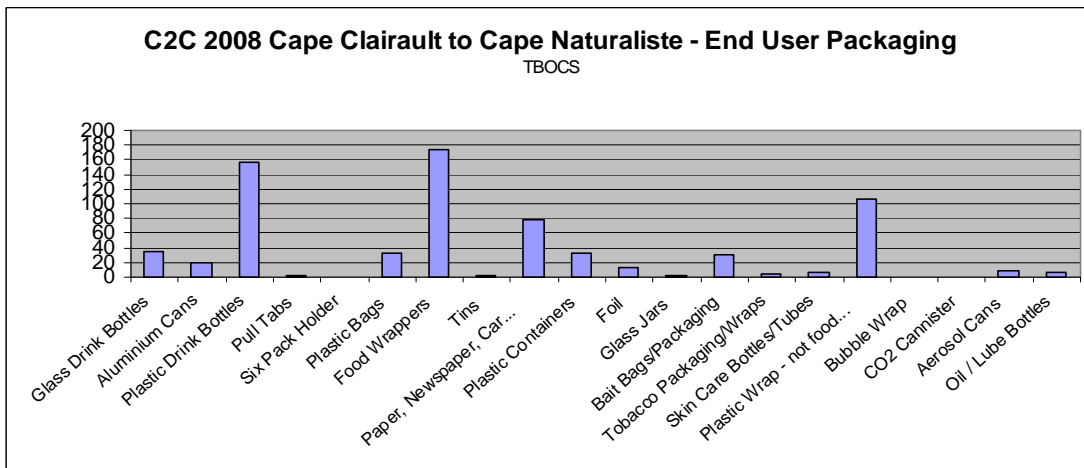


Figure 28

Cape Clairault to Cape Naturalist End User - Subcategories	Total
Food & Drink	57
Clothing	68
Recreation	40
Medical/Personal/Hygiene	52
Smoking	191
Misc	18
Cape Clairault to Cape Naturalist Remnants - Items	Total
Pieces of Plastic	1923
Polystyrene Foam	181
Plastic Bag Remnants	1202
Lids, Bottle Tops, Corks	240
Broken Glass	408

Table 8

Sites/ Locations with High Numbers of Items

- Windmills to Cape Naturalist (Plastic Drink Bottles, Glass Drink Bottles, fishing floats, pieces of plastic and plastic bag remnants).
- Canal Rocks (plastic drink bottles, rope, pieces of plastic and broken glass).
- Three Bears (plastic wrap, food wrap and pieces of plastic).
- Yallingup Beach (cigarette butts, food wrap and pieces of plastic).



Cape Naturaliste to Dunsborough

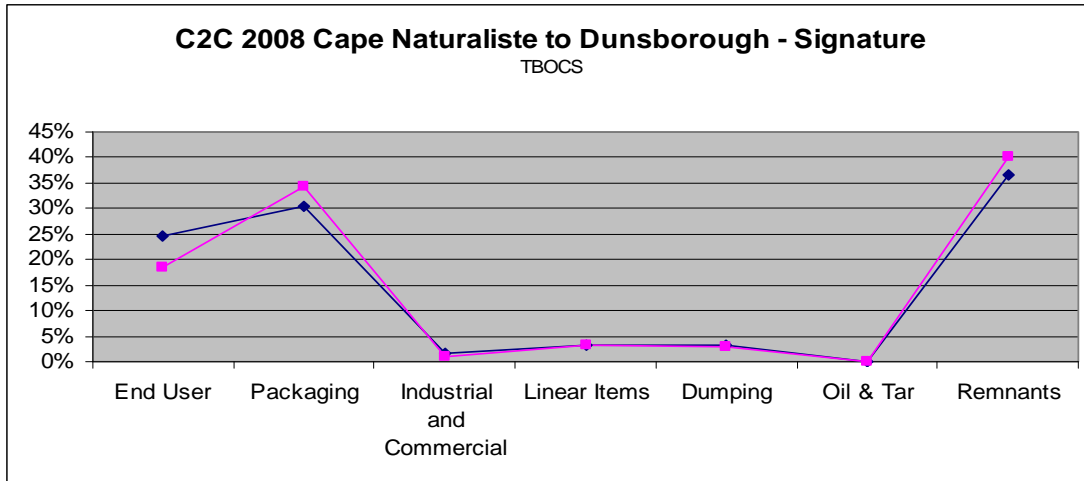


Figure 29

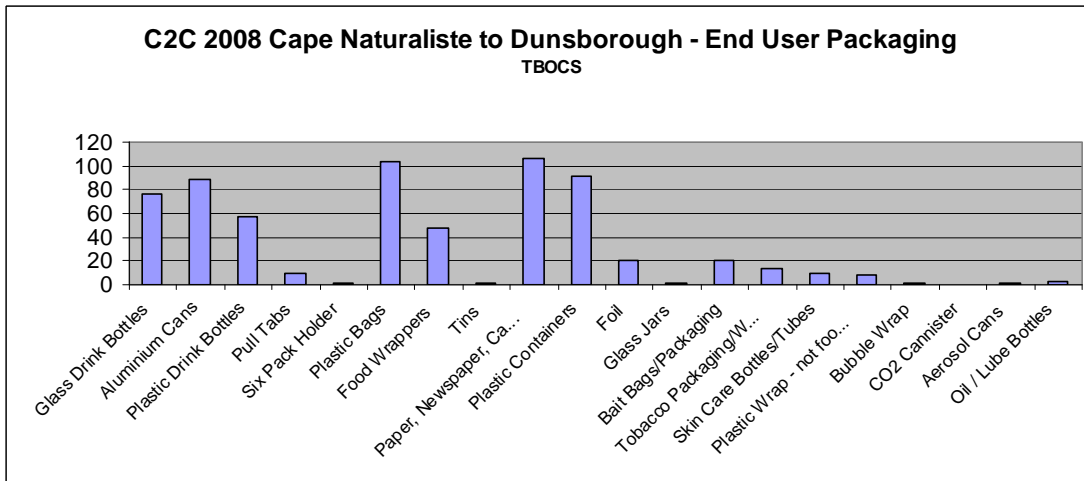


Figure 30

Cape Naturaliste to Dunsborough - End User - Sub Categories	Totals
Food & Drink	62
Clothing	112
Recreation	33
Medical/Personal/Hygiene	27
Smoking	119
Misc	6
Cape Naturaliste to Dunsborough - Remnants - Items	Totals
Pieces of Plastic	203
Polystyrene Foam	35
Plastic Bag Remnants	108
Lids, Bottle Tops, Corks	150
Broken Glass	277

Table 9

Sites/ Locations with High Numbers of Items

- Dunsborough - Boat Ramp to Beach Road (cigarette butts, paper/ newspaper/ cardboard, food wrap, broken glass, pieces of plastic.
- Meelup Beach (straws and stirrers, plastic containers, plastic bags, paper/ newspaper/ cardboard, lids and tops, plastic bag remnants.



Busselton Area

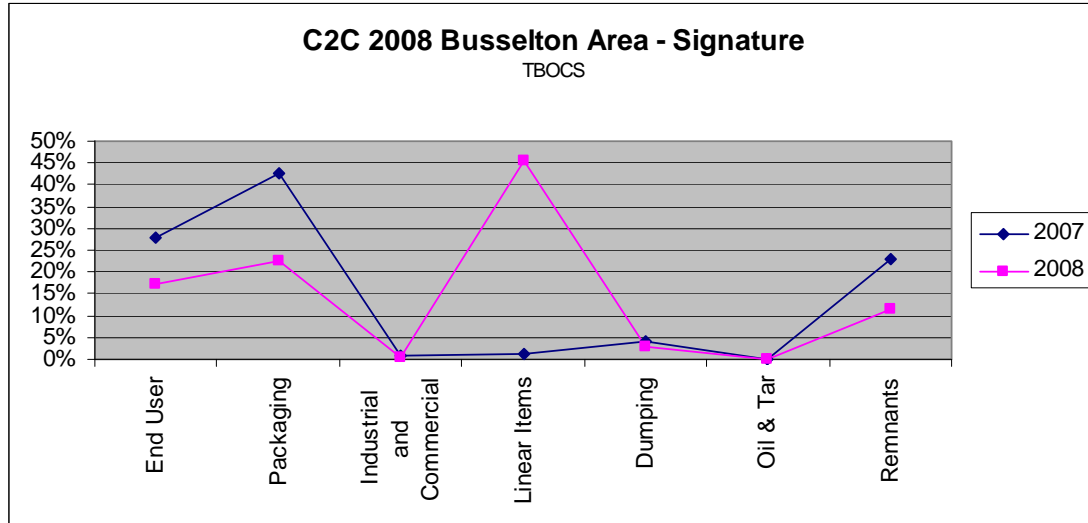


Figure 31

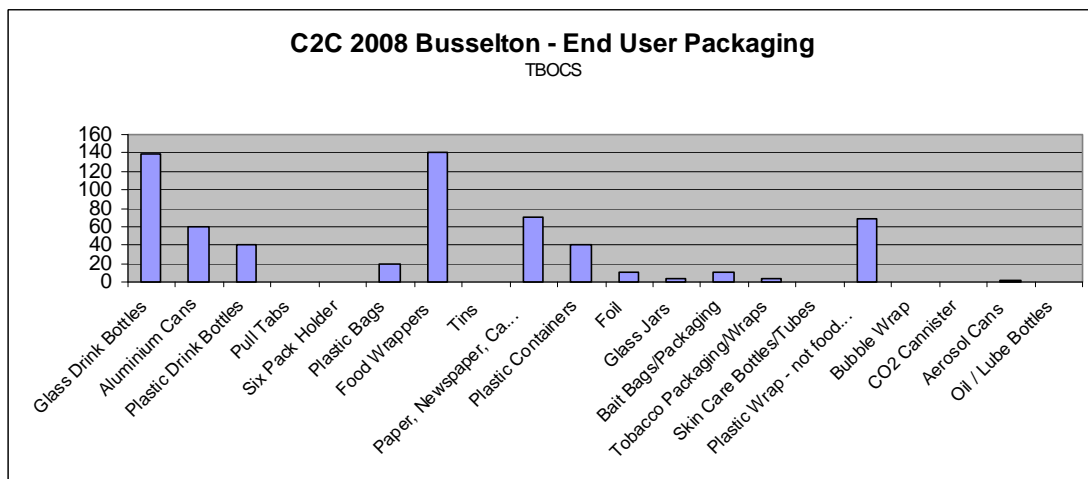


Figure 32

Busselton Area - End User Items (Subcategories)

Subcategory	Total
Food & Drink	63
Clothing	25
Recreation	82
Medical/Personal/Hygiene	8
Smoking	288
Misc	5

Busselton Area Remnants (Items)

Item	Total
Pieces of Plastic	84
Polystyrene Foam	41
Plastic Bag Remnants	13
Lids, Bottle Tops, Corks	75
Broken Glass	100

Table 10

Sites/ Locations with High Numbers of Items

- Busselton Jetty Underwater Cleanup (fishing line, fishing lures, glass drink bottles).
- Jetty to Siesta Park (straws/ stirrers, cigarette butts, food wrappers, plastic and glass drink bottles, aluminium cans, fishing line, pieces of plastic and lids and tops).



Capel Shire Beaches

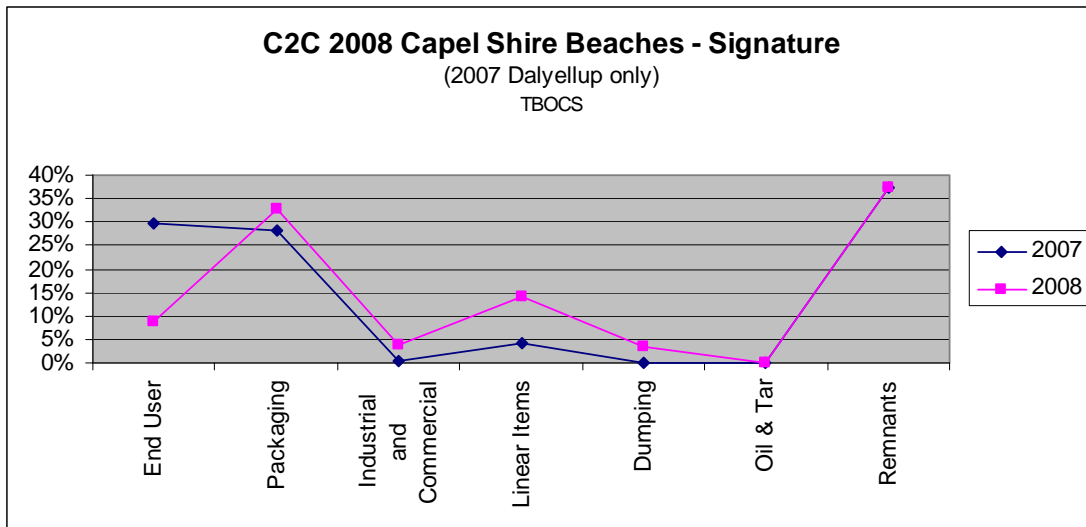


Figure 33

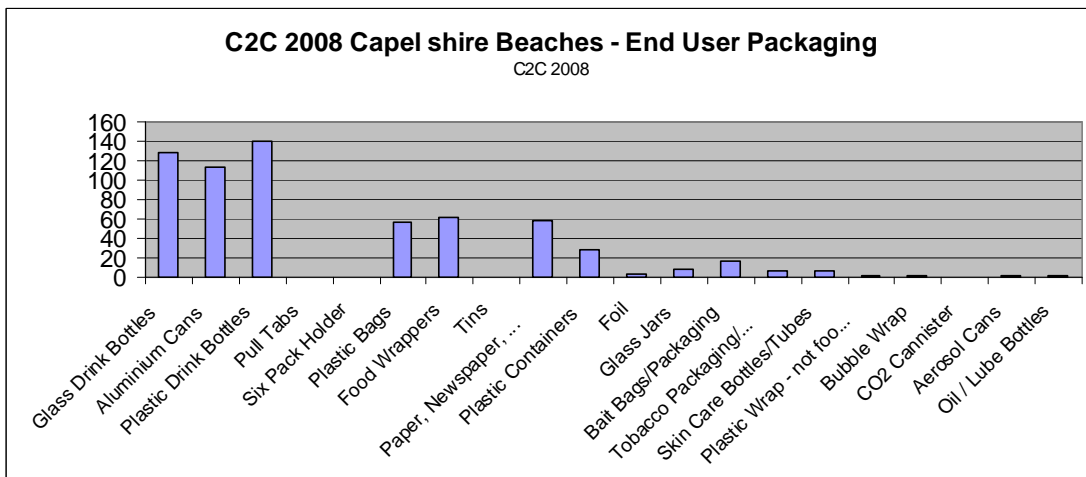


Figure 34

Capel Shire Beaches End User Items (Subcategories)

Subcategory	Total
Food & Drink	43
Clothing	58
Recreation	21
Medical/Personal/Hygiene	3
Smoking	34
Misc	11

Capel Shire Beaches - Remnants (Items)

Item	Total
Pieces of Plastic	359
Polystyrene Foam	48
Plastic Bag Remnants	63
Lids, Bottle Tops, Corks	50
Broken Glass	202

Table 11

Sites/ Locations with High Numbers of Items

- Minnip Beach (straws/ stirrers, food wrap, plastic and glass drink bottles, aluminium cans, rope, pieces of plastic and broken glass).
- Stirling Beach (plastic drink bottles, rope, pieces of plastic, broken glass).



Preston Beach

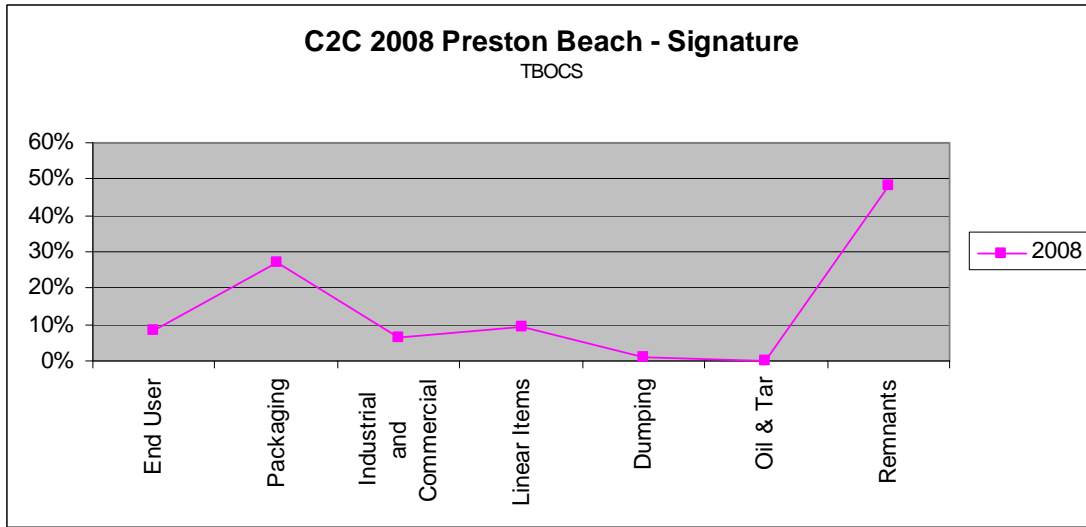


Figure 35

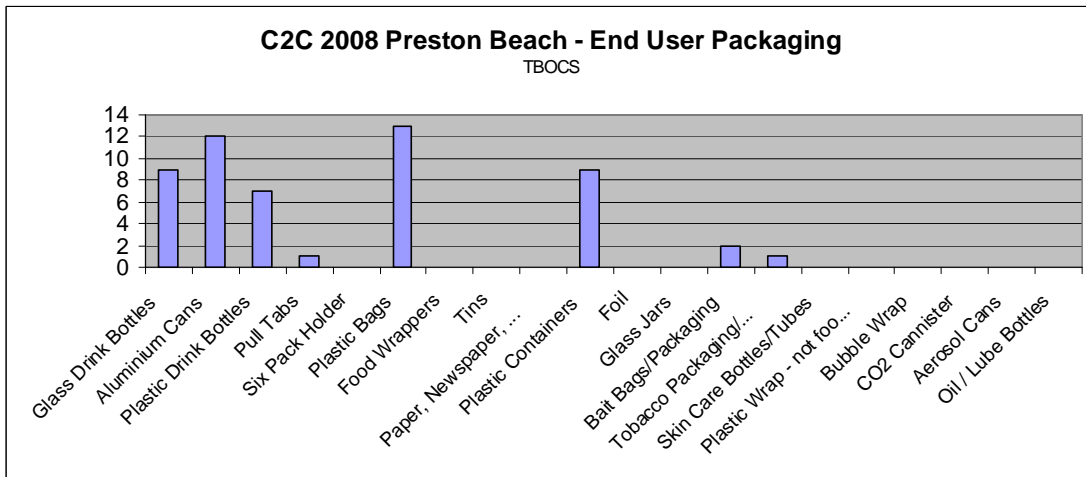


Figure 36

Preston Beach - End User Items (Subcategories)

Subcategory	Count
Food & Drink	5
Clothing	7
Recreation	1
Medical/Personal/Hygiene	0
Smoking	2
Misc	2

Preston Beach - Remnants (Items)

Item	Count
Pieces of Plastic	10
Polystyrene Foam	0
Plastic Bag Remnants	68
Lids, Bottle Tops, Corks	20
Broken Glass	1

Table 12

High Numbers of Items

Plastic bag remnants, lids and tops and plastic strapping band featured strongly.



Mandurah Beaches

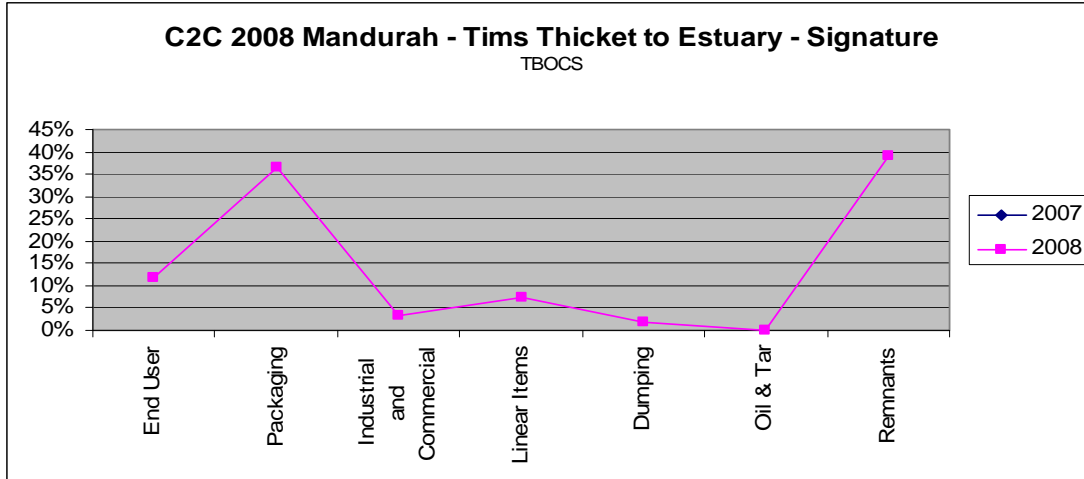


Figure 37

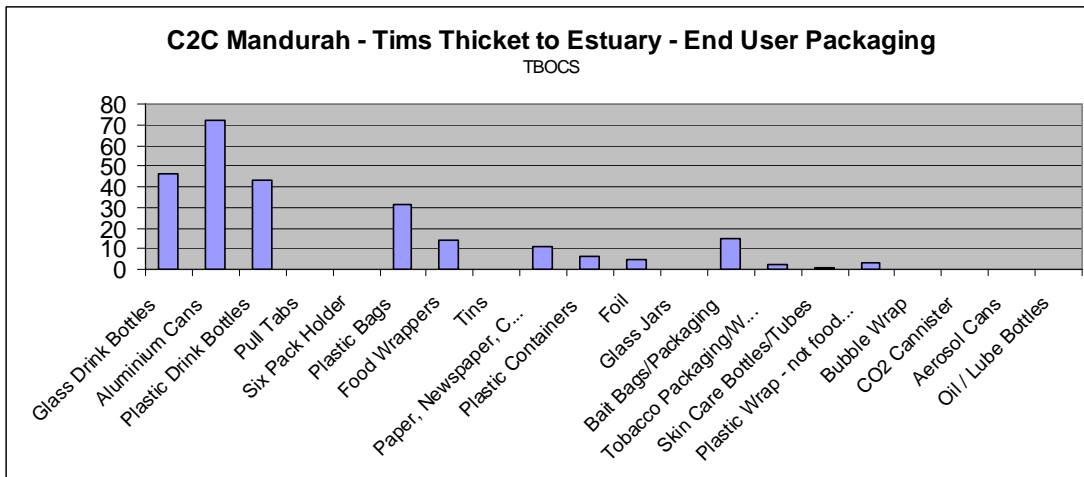


Figure 38

Mandurah Beaches - End User Items (Subcategories)	Totals
Food & Drink	13
Clothing	21
Recreation	6
Medical/Personal/Hygiene	12
Smoking	26
Misc	4
Mandurah Beaches – Remnants (Items)	Totals
Pieces of Plastic	40
Polystyrene Foam	7
Plastic Bag Remnants	61
Lids, Bottle Tops, Corks	23
Broken Glass	137

Table 13

Sites/ Locations with High Numbers of Items

- Tim's Thicket to Melros Beach (aluminium cans, plastic and glass drink bottles, plastic bags, broken glass).
- Seascapes Beach to Halls Head (aluminium cans, broken glass, pieces of plastic).



Marmion Marine Park

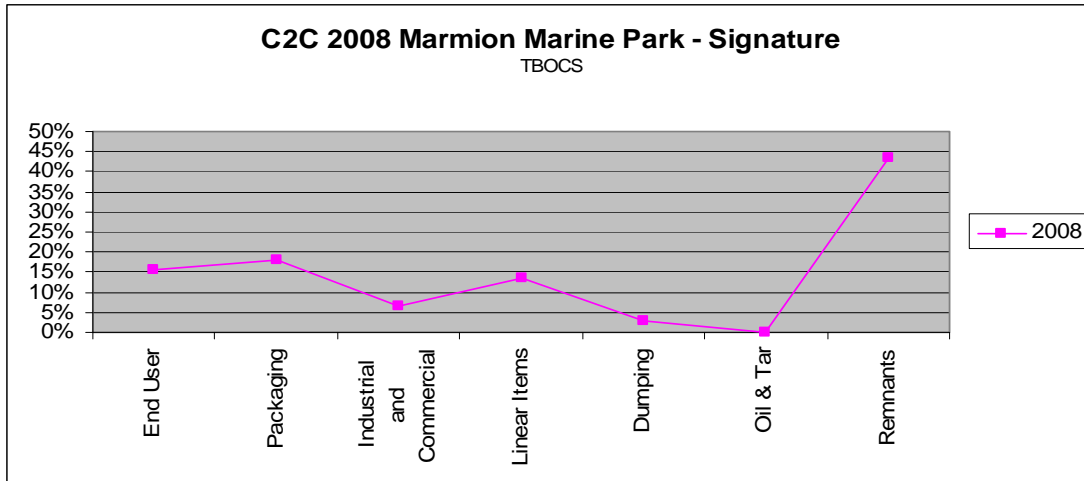


Figure 39

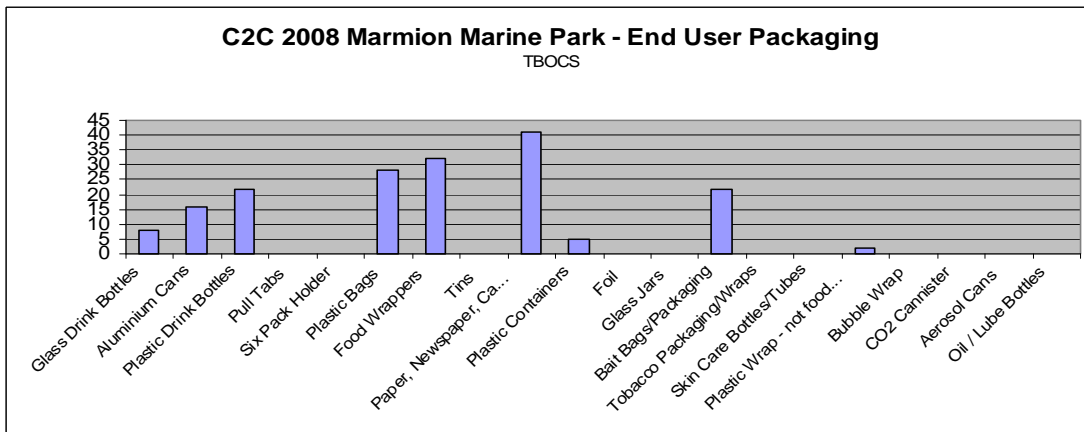


Figure 40

Marmion Marine Park- End User Items (Subcategories)	Totals
Food & Drink	40
Clothing	40
Recreation	27
Medical/Personal/Hygiene	0
Smoking	43
Misc	0
Marmion Marine Park – Remnants (Items)	Totals
Pieces of Plastic	182
Polystyrene Foam	20
Plastic Bag Remnants	63
Lids, Bottle Tops, Corks	152
Broken Glass	7

Table 14

High Numbers of Items

Straws/ stirrers, cloth/ clothing, cigarette butts, paper/ newspaper/ cardboard, plastic bags, bait container lids, rope, pieces of plastic and lids and tops featured strongly.

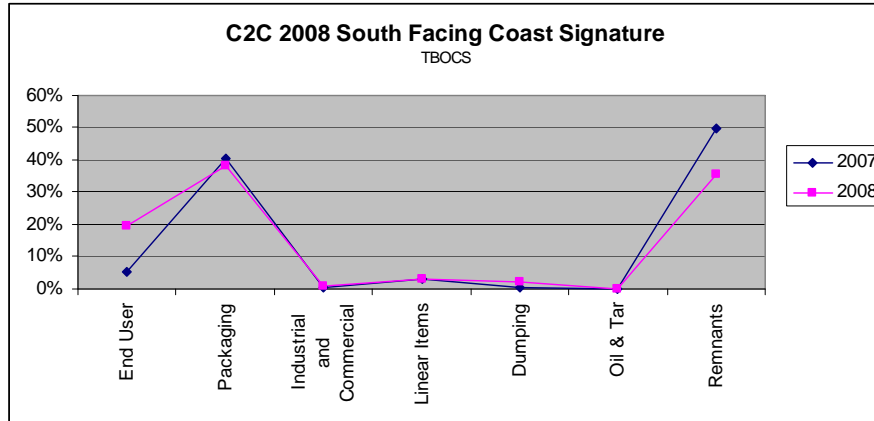
The Friends of Marmion Marine Park conducted this cleanup which included ten sites. A detailed report was produced by the group.



Debris Signatures for Differing Coastal Sections

The following signatures show the general pattern of marine debris for the different coastal sections.

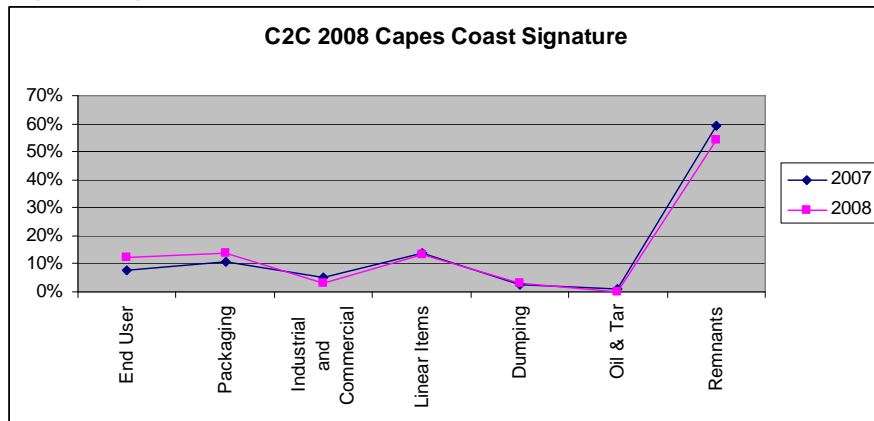
South Facing Coast



Starting at East Augusta the data reflects littering in the high usage areas in and around Augusta together with high remnant items.

Figure 41

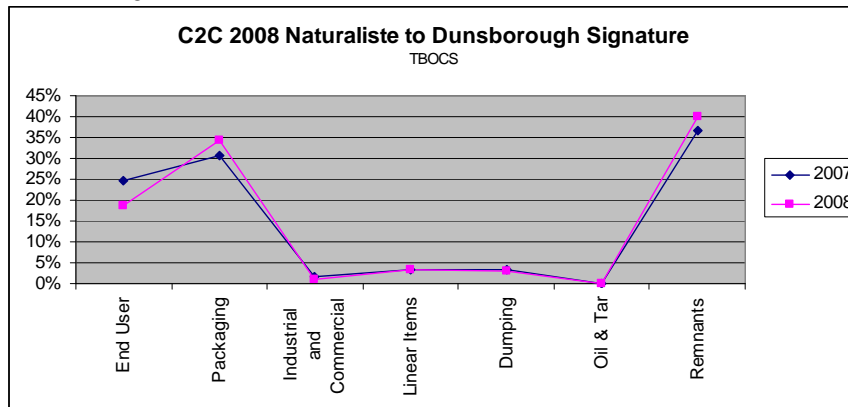
Cape to Cape Coast



Moving around Cape Leeuwin to the west facing cape to cape coast the strong tendency for debris to fragment in this environment is evident in the high remnant numbers.

Figure 42

Dunsborough Area



Once around Cape Naturaliste and into the sheltered area of Geopraphe Bay packaging and end user items begin to take over as the dominant feature.

Figure 43



Busselton Area

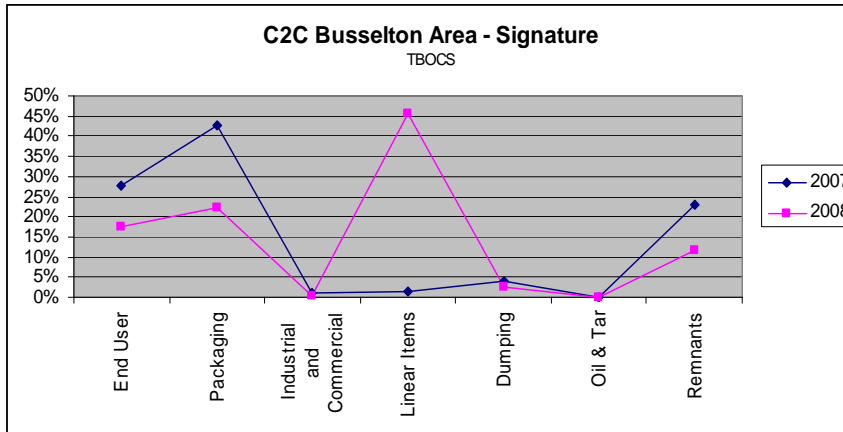


Figure 44

In the Busselton area the impact of beach and jetty users predominates in the data. The linear data shows 1.2km of fishing line recovered from beneath the jetty in the underwater part of the cleanup. Remnants included items such as lids and tops and broken glass which are litter related items in the context of this site.

Capel Shire Beaches

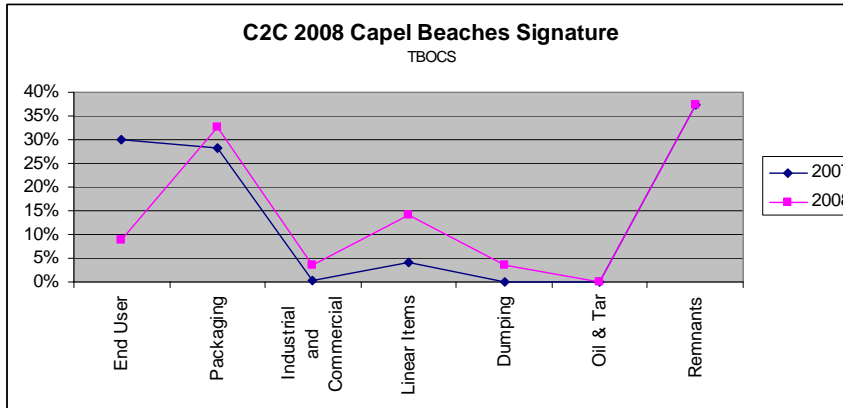


Figure 45

Moving North along Geographe Bay the Capel shire beaches show continuing high packaging numbers but the context of the overall data suggests some of this debris is from offshore or has accumulated over time. Remnants are also reasserting their background presence.

West Coast

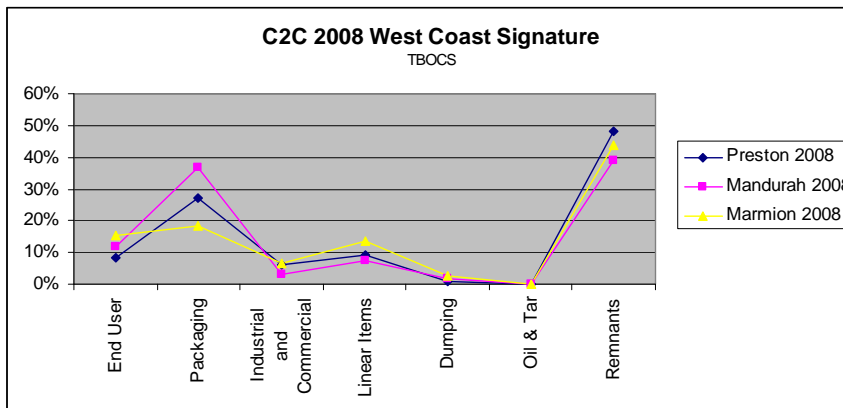


Figure 46

Along the west coast the packaging data from the high usage areas of Mandurah and Marmion reflect littering while the Preston data likely reflects a makeup of local and offshore debris with a lesser amount of littering.



Table of Areas and Sites

Area/Site	Total Items	Length M	Items/Metre
Augusta East	329	1	0.33
Augusta Primary School - Blackwood River foreshore	215	1	0.22
Augusta Colour Patch to Flinders Bay	398.75	2.2	0.18
Augusta Flinders Bay to Dead Finish	102	0.5	0.20
Augusta Dead Finish	94.25	0.5	0.19
Augusta Dead Finish to Lookout	331	0.5	0.66
Augusta Ringbolt Bay tp Lighthouse	42	0.3	0.14
East Augusta to Cape Leeuwin	1512	6	0.25
Augusta Lighthouse to Quarry Bay	190	1	0.19
Skippy Rock	175	0.6	0.29
Deepdene South	290	2.5	0.19
Deepdene North	1917	1.5	0.77
Cosy Corner	227	1	0.23
Foul Bay South	88	1	0.09
Foul Bay North	79	1	0.08
Stinkies	78	2.5	0.03
Cape Leeuwin to White Point	2966	11.1	0.34
Hamelin Bay - Bob's Track - Grace Rd	555	8	0.07
Boranup Beach	878	6	0.15
White Point to Cape Freycinet	1433	14	0.09
Conto's	110	1	0.11
Redgate Beach	144	1	0.14
Boodjidup Beach	72.2	1.5	0.05
Gas Bay	317	2	0.16
Gnarabup Boat Ramp & Beach	349	2	0.17
Prevelly – Surf Pt – Georgette Rd	54.75	0.75	0.07
Cape Freycinet to Cape Mentelle	1046.95	8.25	0.13
Margaret River mouth to Joey's Nose	67	12	0.01
Joey's Nose to Gnoocardup	264	1	0.26
Ellensbrook South	604	2	0.30
Ellensbrook – 19.10.08	54	1.5	0.04
Ellensbrook Under Lookout	383	1	0.38
Ellensbrook to Lefties	230	3	0.08
Gracetown Sth Point to Lefties	195	2	0.10
Cape Mentelle to South Point (Gracetown)	1797	22.5	0.08
Gracetown Cowaramup Bay 17.10.08 CPS	539	1	0.54
Gracetown South Point to North Point	216.95	1.5	0.14
Gracetown North Point to Veryiuca Creek	136	3.5	0.04
Guillotines	191.25	1	0.19
Gallows	432.5	2	0.22
Wyadup	1022	1	1.02
Willyabrup Nth	121	1	0.12
Moses Rock	221	1	0.22
Quinninup	234.3	3	0.08



South Point to Cape Clairault	3114	15	0.21
Injidup	315	6.5	0.05
Injidup	137.5	1	0.14
Canal Rocks South	725	2	0.36
Smiths Beach	564	1.5	0.38
Yallingup Beach	672	1.5	0.45
3 Bears	688	1.2	1.38
Sugarloaf Rock North	586	0.8	0.73
Windmills to Lighthouse Beach	2276	3	0.76
Cape Clairault to Cape Naturalist	5963.5	17.5	0.35
Bunker Bay	126	1.5	0.08
Eagle Bay Dog Beach	77.7	1.25	0.06
Pt Piquet to Eagle Bay & Gannet Rock	23	2.5	0.01
Meelup Beach	572	2	0.29
Castle Rock	174	1.5	0.12
Quindalup Boat Ramp	200	1	0.20
Dunsborough – Old Dunsborough	84	2	0.04
Dunsborough	61	5	0.01
Dunsb. Prim. School 23.11.08 Boat Ramp – Beach Rd	578	2	0.29
Dunsborough Beach to Elmore St to Whalers Cove	40	0.5	0.08
Cape Naturaliste to Dunsborough	1935.7	19.25	0.10
Busselton Jetty to Siesta Park	602	2	0.30
Busselton Foreshore Queen Elizabeth Rd – Jetty	553	3	0.18
Busselton Jetty Foreshore	73	10	0.01
Busselton Jetty Underwater Clean Up	1479	1.2	1.23
Busselton Area	2707	16.2	0.17
Capel - Forrest Beach	246	3	0.08
Capel - Peppermint Grove Beach	360	2	0.18
Capel - Stirling Beach	444	2	0.22
Capel - Minninup	678	2	0.34
Dallyellup Beach	216	10	0.02
Capel Shire Beaches	1944	19	0.10
Preston Beach	206	1.5	0.14
Preston Beach	206	1.5	0.14
Tim's Thicket to Melros Beach	324	5	0.06
Mandurah - Dodies Beach to Blue Bay Halls Head	32	1.5	0.02
Mandurah Seascapes Beach Halls Head	195.5	1	0.20
Mandurah Soldiers Cove	136	1	0.14
Mandurah Beaches	687.5	8.5	0.07
Marmion Marine Park	972	0.9	1.08
Marmion Marine Park	972	0.9	1.08
72 Sites Totalling/ Averaging	26284.65	159.5	0.24

Table 15



Notes

1. Debris from Lobster fishing activities is prominent due to its proximity to the coast. Debris from long line fishing activity may also be significant but being located well off the coast only part of this will reach the local coast.
2. Plastic resin pellets, generally disappear from view at this time of year due to burial in the warmer and dry conditions.
3. For further information about the categories and methods used in this report please refer to "Tangaroa Blue Ocean Care Society – Marine Debris Analysis System" available on request from TBOCS. Also see Appendix 1 for a list of items for each category.
4. While the items per metre of site stats are to an extent an approximate measure it does provide a cross reference with which to assess the amount of debris at a given site or across an area. Site length measurement is usually recorded as estimation by the cleanup participant, sometimes measured off a map and sometimes accurately measured. Whether the cleanup participants remain within or go beyond the area they have defined also comes into play. Generally, however, the lengths are reasonably accurate.
5. TBOCS has been lobbying for safer forms of packing tape to be used for a number of years. We are currently researching ways of monitoring the beaching of strapping bands. An initial report is available on request.

Appendix 1 - Grouping Items of Marine Debris

Main Categories

Marine debris items are initially grouped into categories which help home in on the information required. Categories used in our analysis system are shown in table 1 and differ slightly to cleanup data sheet categories.

Category	Description	Unit
End User	All items intended for personal use in any activity	Single Item or item group
Packaging	All packaging but not accessory items such as straps, binding etc.	Single Item or item group
Industrial & Commercial	All items used in all production and service activities.	Single Item or item group
Linear	Rope, net, fishing line 1 metre or greater and intact cut and uncut strapping band.	1 Metre of item
Dumping	All obvious dumped items	Single Item or item group
Oil	Oil and tar.	Single Item
Remnants	All fragmented synthetic remains	Single Item



Sub Categories

The above main categories are next given subcategories. New sub categories can be created where the analysis requires them. Table 2 shows the subcategories currently used.

Category/Sub-category	Items included in sub category
End User Items	
• Food & Drink	Plates, cutlery, straws, confection sticks etc.
• Clothing & Footwear	Cloth, clothing, shoes, socks, hats etc.
• Recreation	Balloons, surf wax, rec fishing gear, toys etc.
• Medical Personal & Hygiene	Toothbrushes, combs, nappies, band aids, tissues etc.
• Smoking	Cigarette butts, lighters etc.
• Misc	Pens, pencils, candles, thread, string etc.
Packaging Items	
• End User Packaging	Bags, packets, wrappers, bottles, jars, cans etc.
• End User Brand Specific	e.g. Coke, McDonalds KFC etc
• Industrial & Commercial Packaging	Hessian bags, poly-weave bags, 20 litre drums, tarps etc.
• Foreign Source Packaging	Any packaging with foreign writing.
• Rural & Farming Activities	Farm chemical containers etc.

Industrial, Commercial & Rural Items	
• Cray Fishing	Bait containers, fish nets, traps, buoys, floats,
• Net & Long line Fishing	Net floats, net runners, cylume sticks etc.
• Shipping	Pallets, plastic tags, timber, pallets, etc.
• Shore based Industrial Activity	Items clearly related to shore based industry.
• Offshore Industrial /activity	Oil rigs, drilling, dredging etc
• Rural & Farming Activities	Ear tags, stock care items etc
• Other	EG oceanography, meteorology items.
Linear Items	
• Set Group of Items	Rope, Strapping Band, Fishing Line, Fishing net.
Dumping Items	
• Individual Items	Boat parts, marine engine parts, building materials, whitegoods, tyres, car parts etc.
Oil & Tar	
• Set Group of Items	Tar Balls & Oil Globules
Remnants	
• End User Remnants	Pieces of plastic, polystyrene, lids & tops, broken glass,
• Ind. & Comm. Remnants	Rope scrap <0.5m, fishing net pieces, strapping band remnants, buoy & float remnants.

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