

# **Western Australian Shark Hazard Mitigation Drum Line Program 2014-2017**

## Attachments to the referral document

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Attachment 1: Metropolitan MMA Coordinates

Attachment 2: South West MMA Coordinates

Attachment 3: Extent of Metropolitan Drum Line Locations 2013-14

Attachment 4a: Extent of South West Drum Line Locations Phase 1 2013-14

Attachment 4b: Attachment Extent of South West Drum Line Locations Phase 2 2013-14

Attachment 5: Proposed Metropolitan Drum Line Deployment with Marine Protected Areas

Attachment 6: Proposed South West Drum Line Deployment with Marine Protected Areas

Attachment 7: Footprint area

Attachment 8: Catch Data for Shark Drum Line Deployment Western Australia: 25 January- 16 March 2014

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ID	Latitude (DDM)	Longitude (DDM)	Latitude (DMS)	Longitude (DMS)	Latitude (DD)	Longitude (DD)
1	-32° 2.130'	115° 43.891'	-32° 2' 7.780"	115° 43' 53.440"	-32.03549437	115.731511
2	-32° 2.038'	115° 43.990'	-32° 2' 2.280"	115° 43' 59.371"	-32.03396654	115.7331586
3	-32° 1.521'	115° 44.224'	-32° 1' 31.243"	115° 44' 13.470"	-32.0253453	115.737075
4	-32° 1.390'	115° 44.372'	-32° 1' 23.379"	115° 44' 22.341"	-32.02316082	115.7395392
5	-32° 1.062'	115° 44.426'	-32° 1' 3.727"	115° 44' 25.549"	-32.01770202	115.7404303
6	-32° 0.907'	115° 44.417'	-32° 0' 54.445"	115° 44' 24.993"	-32.01512358	115.7402758
7	-32° 0.763'	115° 44.455'	-32° 0' 45.799"	115° 44' 27.274"	-32.01272185	115.7409095
8	-32° 0.357'	115° 44.418'	-32° 0' 21.431"	115° 44' 25.064"	-32.00595313	115.7402955
9	-32° 0.098'	115° 44.409'	-32° 0' 5.855"	115° 44' 24.538"	-32.00162629	115.7401496
10	-31° 59.814'	115° 44.387'	-31° 59' 48.850"	115° 44' 23.244"	-31.99690283	115.7397901
11	-31° 59.521'	115° 44.407'	-31° 59' 31.281"	115° 44' 24.427"	-31.99202245	115.7401187
12	-31° 59.169'	115° 44.485'	-31° 59' 10.111"	115° 44' 29.073"	-31.98614181	115.7414091
13	-31° 58.918'	115° 44.492'	-31° 58' 55.055"	115° 44' 29.515"	-31.98195974	115.7415319
14	-31° 58.648'	115° 44.559'	-31° 58' 38.868"	115° 44' 33.554"	-31.97746342	115.7426538
15	-31° 58.520'	115° 44.569'	-31° 58' 31.172"	115° 44' 34.119"	-31.97532558	115.7428109
16	-31° 58.288'	115° 44.596'	-31° 58' 17.281"	115° 44' 35.738"	-31.97146706	115.7432604
17	-31° 57.623'	115° 44.594'	-31° 57' 37.393"	115° 44' 35.650"	-31.96038701	115.743236
18	-31° 57.342'	115° 44.602'	-31° 57' 20.502"	115° 44' 36.145"	-31.95569509	115.7433735
19	-31° 57.066'	115° 44.554'	-31° 57' 3.932"	115° 44' 33.265"	-31.95109209	115.7425736
20	-31° 56.721'	115° 44.564'	-31° 56' 43.258"	115° 44' 33.858"	-31.94534942	115.7427382
21	-31° 55.918'	115° 44.597'	-31° 55' 55.054"	115° 44' 35.790"	-31.93195956	115.743275
22	-31° 55.464'	115° 44.611'	-31° 55' 27.839"	115° 44' 36.651"	-31.9243997	115.7435142
23	-31° 54.381'	115° 44.649'	-31° 54' 22.835"	115° 44' 38.968"	-31.90634303	115.7441577
24	-31° 54.180'	115° 44.683'	-31° 54' 10.799"	115° 44' 40.996"	-31.90299981	115.744721
25	-31° 53.841'	115° 44.637'	-31° 53' 50.481"	115° 44' 38.237"	-31.89735573	115.7439547
26	-31° 53.264'	115° 44.596'	-31° 53' 15.835"	115° 44' 35.784"	-31.88773201	115.7432734
27	-31° 53.008'	115° 44.535'	-31° 53' 0.497"	115° 44' 32.076"	-31.88347137	115.7422434
28	-31° 52.807'	115° 44.474'	-31° 52' 48.446"	115° 44' 28.446"	-31.88012388	115.7412351
29	-31° 52.616'	115° 44.406'	-31° 52' 36.989"	115° 44' 24.375"	-31.87694137	115.7401041
30	-31° 52.418'	115° 44.424'	-31° 52' 25.052"	115° 44' 25.446"	-31.87362546	115.7404018
31	-31° 52.328'	115° 44.462'	-31° 52' 19.685"	115° 44' 27.742"	-31.87213464	115.7410395
32	-31° 51.808'	115° 44.448'	-31° 51' 48.489"	115° 44' 26.851"	-31.8634691	115.7407918

33	-31° 51.122'	115° 44.411'	-31° 51' 7.342"	115° 44' 24.663"	-31.85203956	115.7401842
34	-31° 50.667'	115° 44.369'	-31° 50' 40.018"	115° 44' 22.156"	-31.84444494	115.7394876
35	-31° 50.425'	115° 44.326'	-31° 50' 25.487"	115° 44' 19.566"	-31.84041314	115.7387682
36	-31° 50.261'	115° 44.263'	-31° 50' 15.674"	115° 44' 15.809"	-31.83768722	115.7377247
37	-31° 50.071'	115° 44.144'	-31° 50' 4.271"	115° 44' 8.630"	-31.83451969	115.7357304
38	-31° 49.856'	115° 43.980'	-31° 49' 51.348"	115° 43' 58.789"	-31.83093008	115.7329968
39	-31° 49.540'	115° 43.732'	-31° 49' 32.387"	115° 43' 43.918"	-31.82566307	115.7288661
40	-31° 49.196'	115° 43.440'	-31° 49' 11.765"	115° 43' 26.410"	-31.8199346	115.7240027
41	-31° 48.920'	115° 43.254'	-31° 48' 55.213"	115° 43' 15.251"	-31.8153369	115.7209032
42	-31° 48.686'	115° 43.112'	-31° 48' 41.139"	115° 43' 6.718"	-31.81142746	115.7185329
43	-31° 48.387'	115° 43.020'	-31° 48' 23.218"	115° 43' 1.207"	-31.8064494	115.717002
44	-31° 48.177'	115° 43.052'	-31° 48' 10.617"	115° 43' 3.120"	-31.80294909	115.7175335
45	-31° 48.000'	115° 43.131'	-31° 48' 0.002"	115° 43' 7.877"	-31.80000043	115.7188548
46	-31° 47.528'	115° 43.307'	-31° 47' 31.710"	115° 43' 18.395"	-31.79214153	115.7217764
47	-31° 46.843'	115° 43.313'	-31° 46' 50.591"	115° 43' 18.765"	-31.78071984	115.7218792
48	-31° 46.285'	115° 43.171'	-31° 46' 17.073"	115° 43' 10.284"	-31.77140916	115.7195234
49	-31° 45.757'	115° 43.037'	-31° 45' 45.444"	115° 43' 2.213"	-31.7626234	115.7172815
50	-31° 45.233'	115° 42.911'	-31° 45' 14.008"	115° 42' 54.668"	-31.75389111	115.7151854
51	-31° 45.015'	115° 42.864'	-31° 45' 0.901"	115° 42' 51.868"	-31.7502503	115.7144079
52	-31° 44.773'	115° 42.771'	-31° 44' 46.369"	115° 42' 46.271"	-31.74621359	115.7128529
53	-31° 44.604'	115° 43.373'	-31° 44' 36.226"	115° 43' 22.362"	-31.74339608	115.7228783
54	-31° 44.904'	115° 43.485'	-31° 44' 54.270"	115° 43' 29.075"	-31.74840831	115.724743
55	-31° 45.409'	115° 43.592'	-31° 45' 24.544"	115° 43' 35.544"	-31.75681787	115.7265399
56	-31° 45.926'	115° 43.750'	-31° 45' 55.584"	115° 43' 44.976"	-31.76544	115.72916
57	-31° 46.118'	115° 43.774'	-31° 46' 7.104"	115° 43' 46.452"	-31.76864	115.72957
58	-31° 46.447'	115° 43.898'	-31° 46' 26.832"	115° 43' 53.904"	-31.77412	115.73164
59	-31° 46.749'	115° 43.938'	-31° 46' 44.947"	115° 43' 56.253"	-31.77915183	115.7322926
60	-31° 46.903'	115° 43.976'	-31° 46' 54.192"	115° 43' 58.548"	-31.78172	115.73293
61	-31° 47.329'	115° 43.969'	-31° 47' 19.717"	115° 43' 58.152"	-31.78881033	115.7328199
62	-31° 47.688'	115° 43.924'	-31° 47' 41.280"	115° 43' 55.416"	-31.7948	115.73206
63	-31° 47.950'	115° 43.836'	-31° 47' 57.014"	115° 43' 50.179"	-31.79917055	115.7306053
64	-31° 48.093'	115° 43.811'	-31° 48' 5.580"	115° 43' 48.684"	-31.80155	115.73019
65	-31° 48.193'	115° 43.756'	-31° 48' 11.606"	115° 43' 45.368"	-31.80322398	115.7292689

66	-31° 48.271'	115° 43.680'	-31° 48' 16.236"	115° 43' 40.800"	-31.80451	115.728
67	-31° 48.352'	115° 43.652'	-31° 48' 21.096"	115° 43' 39.144"	-31.80586	115.72754
68	-31° 48.737'	115° 43.859'	-31° 48' 44.230"	115° 43' 51.511"	-31.81228622	115.7309753
69	-31° 48.857'	115° 43.934'	-31° 48' 51.444"	115° 43' 56.064"	-31.81429	115.73224
70	-31° 48.943'	115° 44.039'	-31° 48' 56.592"	115° 44' 2.364"	-31.81572	115.73399
74	-31° 49.447'	115° 44.443'	-31° 49' 26.832"	115° 44' 26.592"	-31.82412	115.74072
75	-31° 49.555'	115° 44.507'	-31° 49' 33.312"	115° 44' 30.408"	-31.82592	115.74178
76	-31° 49.657'	115° 44.615'	-31° 49' 39.396"	115° 44' 36.924"	-31.82761	115.74359
77	-31° 49.879'	115° 44.739'	-31° 49' 52.768"	115° 44' 44.323"	-31.83132449	115.7456454
78	-31° 50.095'	115° 44.884'	-31° 50' 5.676"	115° 44' 53.016"	-31.83491	115.74806
79	-31° 50.228'	115° 44.935'	-31° 50' 13.704"	115° 44' 56.112"	-31.83714	115.74892
80	-31° 50.329'	115° 44.956'	-31° 50' 19.737"	115° 44' 57.362"	-31.83881595	115.7492671
81	-31° 50.395'	115° 45.008'	-31° 50' 23.676"	115° 45' 0.504"	-31.83991	115.75014
82	-31° 50.547'	115° 45.019'	-31° 50' 32.820"	115° 45' 1.116"	-31.84245	115.75031
83	-31° 50.632'	115° 45.002'	-31° 50' 37.896"	115° 45' 0.108"	-31.84386	115.75003
84	-31° 50.700'	115° 45.036'	-31° 50' 42.027"	115° 45' 2.134"	-31.84500756	115.7505928
85	-31° 50.882'	115° 45.086'	-31° 50' 52.944"	115° 45' 5.148"	-31.84804	115.75143
86	-31° 50.989'	115° 45.046'	-31° 50' 59.352"	115° 45' 2.772"	-31.84982	115.75077
87	-31° 51.344'	115° 45.099'	-31° 51' 20.628"	115° 45' 5.940"	-31.85573	115.75165
88	-31° 51.670'	115° 45.108'	-31° 51' 40.194"	115° 45' 6.507"	-31.86116492	115.7518074
89	-31° 51.841'	115° 45.080'	-31° 51' 50.436"	115° 45' 4.824"	-31.86401	115.75134
90	-31° 52.058'	115° 45.108'	-31° 52' 3.504"	115° 45' 6.480"	-31.86764	115.7518
91	-31° 52.270'	115° 45.097'	-31° 52' 16.176"	115° 45' 5.832"	-31.87116	115.75162
93	-31° 52.429'	115° 45.107'	-31° 52' 25.716"	115° 45' 6.444"	-31.87381	115.75179
94	-31° 52.558'	115° 45.037'	-31° 52' 33.456"	115° 45' 2.196"	-31.87596	115.75061
95	-31° 52.614'	115° 45.104'	-31° 52' 36.840"	115° 45' 6.264"	-31.8769	115.75174
96	-31° 52.783'	115° 45.128'	-31° 52' 46.956"	115° 45' 7.704"	-31.87971	115.75214
97	-31° 52.871'	115° 45.166'	-31° 52' 52.248"	115° 45' 9.936"	-31.88118	115.75276
98	-31° 52.949'	115° 45.165'	-31° 52' 56.964"	115° 45' 9.900"	-31.88249	115.75275
99	-31° 53.024'	115° 45.198'	-31° 53' 1.428"	115° 45' 11.880"	-31.88373	115.7533
100	-31° 53.523'	115° 45.260'	-31° 53' 31.398"	115° 45' 15.578"	-31.89205486	115.7543272
101	-31° 54.188'	115° 45.323'	-31° 54' 11.268"	115° 45' 19.404"	-31.90313	115.75539
102	-31° 54.421'	115° 45.282'	-31° 54' 25.272"	115° 45' 16.920"	-31.90702	115.7547

<b>103</b>	-31° 54.827'	115° 45.299'	-31° 54' 49.608"	115° 45' 17.964"	-31.91378	115.75499
<b>104</b>	-31° 55.360'	115° 45.269'	-31° 55' 21.596"	115° 45' 16.163"	-31.92266564	115.7544896
<b>105</b>	-31° 55.719'	115° 45.250'	-31° 55' 43.150"	115° 45' 15.025"	-31.92865291	115.7541737
<b>106</b>	-31° 55.514'	115° 45.245'	-31° 55' 30.845"	115° 45' 14.703"	-31.92523464	115.7540841
<b>107</b>	-31° 56.035'	115° 45.231'	-31° 56' 2.094"	115° 45' 13.860"	-31.93391487	115.75385
<b>108</b>	-31° 56.518'	115° 45.228'	-31° 56' 31.083"	115° 45' 13.692"	-31.94196742	115.7538033
<b>109</b>	-31° 56.783'	115° 45.200'	-31° 56' 46.992"	115° 45' 12.017"	-31.94638674	115.7533381
<b>110</b>	-31° 56.893'	115° 45.216'	-31° 56' 53.596"	115° 45' 12.981"	-31.94822119	115.7536057
<b>111</b>	-31° 57.090'	115° 45.188'	-31° 57' 5.400"	115° 45' 11.304"	-31.9515	115.75314
<b>112</b>	-31° 57.269'	115° 45.239'	-31° 57' 16.128"	115° 45' 14.364"	-31.95448	115.75399
<b>113</b>	-31° 58.269'	115° 45.238'	-31° 58' 16.140"	115° 45' 14.256"	-31.97115	115.75396
<b>114</b>	-31° 58.493'	115° 45.206'	-31° 58' 29.574"	115° 45' 12.370"	-31.97488174	115.7534361
<b>115</b>	-31° 58.672'	115° 45.206'	-31° 58' 40.296"	115° 45' 12.348"	-31.97786	115.75343
<b>116</b>	-31° 58.953'	115° 45.125'	-31° 58' 57.180"	115° 45' 7.524"	-31.98255	115.75209
<b>117</b>	-31° 59.171'	115° 45.130'	-31° 59' 10.248"	115° 45' 7.812"	-31.98618	115.75217
<b>118</b>	-31° 59.608'	115° 45.038'	-31° 59' 36.472"	115° 45' 2.282"	-31.99346434	115.7506338
<b>119</b>	-31° 59.738'	115° 45.050'	-31° 59' 44.304"	115° 45' 2.988"	-31.99564	115.75083
<b>120</b>	-31° 59.826'	115° 45.022'	-31° 59' 49.560"	115° 45' 1.332"	-31.9971	115.75037
<b>121</b>	-31° 59.948'	115° 45.079'	-31° 59' 56.868"	115° 45' 4.716"	-31.99913	115.75131
<b>122</b>	-32° 0.086'	115° 45.044'	-32° 0' 5.148"	115° 45' 2.628"	-32.00143	115.75073
<b>123</b>	-32° 0.191'	115° 45.080'	-32° 0' 11.448"	115° 45' 4.788"	-32.00318	115.75133
<b>124</b>	-32° 0.397'	115° 45.051'	-32° 0' 23.832"	115° 45' 3.060"	-32.00662	115.75085
<b>125</b>	-32° 0.825'	115° 45.100'	-32° 0' 49.500"	115° 45' 5.976"	-32.01375	115.75166
<b>126</b>	-32° 0.955'	115° 45.049'	-32° 0' 57.276"	115° 45' 2.952"	-32.01591	115.75082
<b>127</b>	-32° 1.052'	115° 45.066'	-32° 1' 3.144"	115° 45' 3.960"	-32.01754	115.7511
<b>130</b>	-32° 1.234'	115° 45.043'	-32° 1' 14.016"	115° 45' 2.556"	-32.02056	115.75071
<b>131</b>	-32° 1.321'	115° 45.049'	-32° 1' 19.236"	115° 45' 2.916"	-32.02201	115.75081
<b>132</b>	-32° 1.576'	115° 44.988'	-32° 1' 34.572"	115° 44' 59.280"	-32.02627	115.7498
<b>133</b>	-32° 1.657'	115° 44.948'	-32° 1' 39.432"	115° 44' 56.868"	-32.02762	115.74913
<b>134</b>	-32° 1.799'	115° 44.793'	-32° 1' 47.928"	115° 44' 47.580"	-32.02998	115.74655
<b>135</b>	-32° 2.435'	115° 44.463'	-32° 2' 26.122"	115° 44' 27.782"	-32.04058941	115.7410507

ID	Latitude (DDM)	Longitude (DDM)	Latitude (DMS)	Longitude (DMS)	Latitude (DD)	Longitude (DD)
1	-33° 59.087'	114° 58.645'	-33° 59' 5.220"	114° 58' 38.688"	-33.98478323	114.9774134
2	-33° 58.801'	114° 58.511'	-33° 58' 48.083"	114° 58' 30.651"	-33.98002301	114.9751809
3	-33° 58.305'	114° 58.304'	-33° 58' 18.311"	114° 58' 18.235"	-33.97175301	114.9717319
4	-33° 57.799'	114° 58.185'	-33° 57' 47.946"	114° 58' 11.098"	-33.9633183	114.9697496
5	-33° 57.540'	114° 58.193'	-33° 57' 32.386"	114° 58' 11.566"	-33.95899621	114.9698796
6	-33° 57.260'	114° 58.356'	-33° 57' 15.604"	114° 58' 21.338"	-33.95433437	114.972594
7	-33° 57.078'	114° 58.799'	-33° 57' 4.673"	114° 58' 47.919"	-33.95129809	114.9799776
8	-33° 55.898'	114° 58.842'	-33° 55' 53.906"	114° 58' 50.538"	-33.9316405	114.9807051
9	-33° 55.478'	114° 58.604'	-33° 55' 28.658"	114° 58' 36.215"	-33.92462724	114.9767265
10	-33° 53.053'	114° 58.378'	-33° 53' 3.205"	114° 58' 22.692"	-33.88422355	114.9729699
11	-33° 51.878'	114° 57.920'	-33° 51' 52.708"	114° 57' 55.213"	-33.86464102	114.9653371
12	-33° 51.646'	114° 57.911'	-33° 51' 38.742"	114° 57' 54.683"	-33.8607616	114.9651897
13	-33° 51.454'	114° 58.087'	-33° 51' 27.248"	114° 58' 5.206"	-33.85756895	114.9681128
14	-33° 50.614'	114° 59.046'	-33° 50' 36.826"	114° 59' 2.786"	-33.84356264	114.9841072
15	-33° 49.707'	114° 59.013'	-33° 49' 42.424"	114° 59' 0.763"	-33.82845104	114.9835453
16	-33° 49.183'	114° 59.188'	-33° 49' 10.977"	114° 59' 11.263"	-33.8197159	114.9864621
17	-33° 48.641'	114° 59.173'	-33° 48' 38.475"	114° 59' 10.363"	-33.81068762	114.986212
18	-33° 48.387'	114° 59.211'	-33° 48' 23.246"	114° 59' 12.649"	-33.80645709	114.986847
19	-33° 47.632'	114° 59.338'	-33° 47' 37.943"	114° 59' 20.303"	-33.7938731	114.9889729
20	-33° 46.642'	114° 58.980'	-33° 46' 38.518"	114° 58' 58.823"	-33.7773662	114.9830064
21	-33° 46.309'	114° 58.738'	-33° 46' 18.542"	114° 58' 44.280"	-33.77181735	114.9789668
22	-33° 45.719'	114° 58.675'	-33° 45' 43.151"	114° 58' 40.498"	-33.76198627	114.977916
23	-33° 45.163'	114° 58.879'	-33° 45' 9.751"	114° 58' 52.725"	-33.75270869	114.9813125
24	-33° 44.868'	114° 58.662'	-33° 44' 52.094"	114° 58' 39.706"	-33.74780382	114.9776961
25	-33° 44.571'	114° 58.660'	-33° 44' 34.259"	114° 58' 39.629"	-33.74284979	114.9776747
26	-33° 42.785'	114° 58.111'	-33° 42' 47.070"	114° 58' 6.680"	-33.71307502	114.9685223
27	-33° 42.372'	114° 57.851'	-33° 42' 22.299"	114° 57' 51.059"	-33.70619419	114.9641832
28	-33° 42.000'	114° 57.858'	-33° 42' 0.010"	114° 57' 51.493"	-33.70000279	114.9643037
29	-33° 41.546'	114° 57.974'	-33° 41' 32.787"	114° 57' 58.426"	-33.69244091	114.9662295
30	-33° 41.293'	114° 58.348'	-33° 41' 17.597"	114° 58' 20.896"	-33.68822133	114.9724712
31	-33° 41.308'	114° 58.864'	-33° 41' 18.453"	114° 58' 51.841"	-33.68845928	114.981067
32	-33° 41.118'	114° 58.900'	-33° 41' 7.103"	114° 58' 53.983"	-33.68530649	114.9816619

33	-33° 40.733'	114° 58.786'	-33° 40' 43.975"	114° 58' 47.130"	-33.67888194	114.9797583
34	-33° 40.385'	114° 58.926'	-33° 40' 23.095"	114° 58' 55.589"	-33.67308201	114.9821081
35	-33° 39.924'	114° 58.923'	-33° 39' 55.470"	114° 58' 55.375"	-33.66540825	114.9820486
36	-33° 39.696'	114° 59.114'	-33° 39' 41.747"	114° 59' 6.833"	-33.66159651	114.9852315
37	-33° 39.623'	114° 59.167'	-33° 39' 37.374"	114° 59' 10.044"	-33.66038164	114.9861234
38	-33° 39.503'	114° 59.444'	-33° 39' 30.200"	114° 59' 26.641"	-33.65838884	114.9907336
39	-33° 39.464'	114° 59.742'	-33° 39' 27.844"	114° 59' 44.523"	-33.65773448	114.9957007
40	-33° 39.400'	114° 59.819'	-33° 39' 23.989"	114° 59' 49.127"	-33.65666373	114.9969797
41	-33° 39.132'	115° 0.015'	-33° 39' 7.928"	115° 0' 0.905"	-33.65220224	115.0002514
42	-33° 38.999'	115° 0.310'	-33° 38' 59.923"	115° 0' 18.598"	-33.64997863	115.0051662
43	-33° 38.971'	115° 0.564'	-33° 38' 58.278"	115° 0' 33.812"	-33.64952178	115.0093921
44	-33° 38.615'	115° 0.567'	-33° 38' 36.898"	115° 0' 34.017"	-33.64358264	115.0094493
45	-33° 38.176'	115° 0.707'	-33° 38' 10.583"	115° 0' 42.446"	-33.63627294	115.0117906
46	-33° 37.861'	115° 0.991'	-33° 37' 51.640"	115° 0' 59.463"	-33.63101106	115.0165175
48	-33° 33.734'	114° 59.619'	-33° 33' 44.068"	114° 59' 37.157"	-33.56224108	114.9936546
49	-33° 32.562'	114° 59.804'	-33° 32' 33.698"	114° 59' 48.252"	-33.54269394	114.9967366
50	-33° 31.808'	114° 59.469'	-33° 31' 48.463"	114° 59' 28.146"	-33.53012849	114.9911516
51	-33° 31.219'	115° 0.040'	-33° 31' 13.128"	115° 0' 2.410"	-33.52031321	115.0006694
52	-33° 31.376'	115° 1.800'	-33° 31' 22.550"	115° 1' 47.987"	-33.52293062	115.0299963
53	-33° 31.736'	115° 2.518'	-33° 31' 44.135"	115° 2' 31.069"	-33.52892625	115.0419637
54	-33° 32.099'	115° 2.672'	-33° 32' 5.927"	115° 2' 40.321"	-33.5349796	115.0445335
55	-33° 32.054'	115° 3.248'	-33° 32' 3.254"	115° 3' 14.859"	-33.53423721	115.0541275
56	-33° 32.134'	115° 3.491'	-33° 32' 8.048"	115° 3' 29.459"	-33.53556883	115.058183
57	-33° 32.339'	115° 4.002'	-33° 32' 20.321"	115° 4' 0.095"	-33.53897805	115.066693
58	-33° 32.712'	115° 4.248'	-33° 32' 42.730"	115° 4' 14.897"	-33.54520272	115.0708047
59	-33° 32.949'	115° 4.464'	-33° 32' 56.915"	115° 4' 27.849"	-33.54914311	115.0744024
60	-33° 33.113'	115° 4.529'	-33° 33' 6.783"	115° 4' 31.755"	-33.55188425	115.0754875
61	-33° 33.280'	115° 5.100'	-33° 33' 16.779"	115° 5' 5.997"	-33.55466093	115.084999
62	-33° 33.669'	115° 5.647'	-33° 33' 40.149"	115° 5' 38.820"	-33.56115242	115.0941167
63	-33° 34.844'	115° 6.673'	-33° 34' 50.637"	115° 6' 40.352"	-33.58073244	115.1112088
64	-33° 35.604'	115° 7.009'	-33° 35' 36.217"	115° 7' 0.512"	-33.59339355	115.116809
65	-33° 36.170'	115° 7.066'	-33° 36' 10.183"	115° 7' 3.943"	-33.60282851	115.1177619
66	-33° 36.759'	115° 7.520'	-33° 36' 45.534"	115° 7' 31.172"	-33.61264842	115.1253256



67	-33° 37.092'	115° 8.014'	-33° 37' 5.493"	115° 8' 0.824"	-33.61819239	115.1335621
68	-33° 37.172'	115° 8.565'	-33° 37' 10.316"	115° 8' 33.887"	-33.61953232	115.1427463
69	-33° 37.373'	115° 9.237'	-33° 37' 22.395"	115° 9' 14.194"	-33.62288742	115.1539427
70	-33° 37.857'	115° 8.947'	-33° 37' 51.416"	115° 8' 56.821"	-33.63094892	115.1491169
72	-33° 37.719'	115° 8.022'	-33° 37' 43.123"	115° 8' 1.296"	-33.62864531	115.1336935
73	-33° 37.319'	115° 7.151'	-33° 37' 19.138"	115° 7' 9.043"	-33.62198282	115.1191787
74	-33° 36.674'	115° 6.485'	-33° 36' 40.421"	115° 6' 29.079"	-33.611228	115.1080775
75	-33° 36.574'	115° 6.499'	-33° 36' 34.425"	115° 6' 29.936"	-33.60956238	115.1083155
76	-33° 36.360'	115° 6.226'	-33° 36' 21.575"	115° 6' 13.574"	-33.60599319	115.1037707
77	-33° 36.143'	115° 6.330'	-33° 36' 8.608"	115° 6' 19.817"	-33.60239104	115.1055047
78	-33° 35.231'	115° 6.092'	-33° 35' 13.835"	115° 6' 5.502"	-33.58717641	115.1015283
79	-33° 34.892'	115° 5.780'	-33° 34' 53.544"	115° 5' 46.821"	-33.58154009	115.0963391
80	-33° 34.552'	115° 5.419'	-33° 34' 33.132"	115° 5' 25.152"	-33.57587	115.09032
81	-33° 34.419'	115° 5.218'	-33° 34' 25.111"	115° 5' 13.078"	-33.57364204	115.086966
82	-33° 34.220'	115° 5.283'	-33° 34' 13.187"	115° 5' 16.984"	-33.57032983	115.088051
83	-33° 34.110'	115° 5.112'	-33° 34' 6.609"	115° 5' 6.704"	-33.5685024	115.0851957
84	-33° 33.970'	115° 5.026'	-33° 33' 58.180"	115° 5' 1.565"	-33.56616101	115.083768
85	-33° 33.895'	115° 4.891'	-33° 33' 53.712"	115° 4' 53.436"	-33.56492	115.08151
86	-33° 33.381'	115° 3.692'	-33° 33' 22.864"	115° 3' 41.501"	-33.55635103	115.061528
87	-33° 32.839'	115° 3.409'	-33° 32' 50.333"	115° 3' 24.522"	-33.54731473	115.0568116
88	-33° 32.698'	115° 3.080'	-33° 32' 41.904"	115° 3' 4.785"	-33.54497334	115.0513293
89	-33° 32.770'	115° 2.545'	-33° 32' 46.221"	115° 2' 32.714"	-33.54617259	115.0424206
90	-33° 32.580'	115° 1.969'	-33° 32' 34.800"	115° 1' 58.152"	-33.543	115.03282
91	-33° 32.147'	115° 1.829'	-33° 32' 8.805"	115° 1' 49.747"	-33.5357791	115.0304852
92	-33° 32.100'	115° 1.589'	-33° 32' 6.000"	115° 1' 35.328"	-33.535	115.02648
93	-33° 31.860'	115° 0.408'	-33° 31' 51.600"	115° 0' 24.480"	-33.531	115.0068
94	-33° 31.959'	115° 0.293'	-33° 31' 57.540"	115° 0' 17.604"	-33.53265	115.00489
95	-33° 32.260'	115° 0.457'	-33° 32' 15.612"	115° 0' 27.432"	-33.53767	115.00762
96	-33° 32.602'	115° 0.527'	-33° 32' 36.132"	115° 0' 31.608"	-33.54337	115.00878
97	-33° 32.971'	115° 0.642'	-33° 32' 58.236"	115° 0' 38.520"	-33.54951	115.0107
98	-33° 33.343'	115° 0.695'	-33° 33' 20.593"	115° 0' 41.694"	-33.55572026	115.0115815
99	-33° 33.549'	115° 0.601'	-33° 33' 32.966"	115° 0' 36.050"	-33.55915735	115.0100138
100	-33° 33.656'	115° 0.414'	-33° 33' 39.353"	115° 0' 24.837"	-33.56093138	115.0068992

101	-33° 33.860'	115° 0.459'	-33° 33' 51.624"	115° 0' 27.540"	-33.56434	115.00765
102	-33° 34.452'	115° 0.686'	-33° 34' 27.120"	115° 0' 41.184"	-33.5742	115.01144
103	-33° 34.917'	115° 0.778'	-33° 34' 55.037"	115° 0' 46.709"	-33.58195462	115.0129747
104	-33° 35.078'	115° 0.897'	-33° 35' 4.704"	115° 0' 53.820"	-33.58464	115.01495
105	-33° 35.804'	115° 1.095'	-33° 35' 48.229"	115° 1' 5.697"	-33.59673038	115.0182493
106	-33° 36.548'	115° 1.418'	-33° 36' 32.868"	115° 1' 25.068"	-33.60913	115.02363
107	-33° 37.977'	115° 1.703'	-33° 37' 58.620"	115° 1' 42.204"	-33.63295	115.02839
108	-33° 39.327'	115° 1.238'	-33° 39' 19.620"	115° 1' 14.268"	-33.65545	115.02063
109	-33° 39.676'	115° 0.779'	-33° 39' 40.572"	115° 0' 46.728"	-33.66127	115.01298
110	-33° 40.217'	114° 59.959'	-33° 40' 13.007"	114° 59' 57.519"	-33.67027962	114.9993107
111	-33° 40.489'	114° 59.825'	-33° 40' 29.316"	114° 59' 49.488"	-33.67481	114.99708
112	-33° 41.714'	114° 59.494'	-33° 41' 42.828"	114° 59' 29.616"	-33.69523	114.99156
113	-33° 42.044'	114° 59.174'	-33° 42' 2.610"	114° 59' 10.443"	-33.70072504	114.9862343
114	-33° 41.882'	114° 58.522'	-33° 41' 52.944"	114° 58' 31.332"	-33.69804	114.97537
115	-33° 42.536'	114° 58.802'	-33° 42' 32.184"	114° 58' 48.144"	-33.70894	114.98004
116	-33° 45.032'	114° 59.561'	-33° 45' 1.944"	114° 59' 33.648"	-33.75054	114.99268
117	-33° 45.337'	114° 59.552'	-33° 45' 20.232"	114° 59' 33.095"	-33.75562012	114.9925264
118	-33° 45.739'	114° 59.366'	-33° 45' 44.340"	114° 59' 21.933"	-33.76231664	114.9894259
119	-33° 45.941'	114° 59.496'	-33° 45' 56.439"	114° 59' 29.750"	-33.76567763	114.9915972
120	-33° 46.098'	114° 59.414'	-33° 46' 5.862"	114° 59' 24.824"	-33.76829504	114.990229
121	-33° 46.223'	114° 59.525'	-33° 46' 13.368"	114° 59' 31.488"	-33.77038	114.99208
122	-33° 47.560'	115° 0.038'	-33° 47' 33.576"	115° 0' 2.268"	-33.79266	115.00063
123	-33° 49.381'	114° 59.883'	-33° 49' 22.872"	114° 59' 52.980"	-33.82302	114.99805
124	-33° 49.934'	114° 59.694'	-33° 49' 56.061"	114° 59' 41.652"	-33.83223909	114.9949034
125	-33° 50.893'	114° 59.672'	-33° 50' 53.592"	114° 59' 40.344"	-33.84822	114.99454
126	-33° 51.440'	114° 59.111'	-33° 51' 26.388"	114° 59' 6.684"	-33.85733	114.98519
127	-33° 51.648'	114° 59.355'	-33° 51' 38.880"	114° 59' 21.300"	-33.8608	114.98925
128	-33° 51.876'	114° 59.183'	-33° 51' 52.560"	114° 59' 10.968"	-33.8646	114.98638
129	-33° 51.930'	114° 58.932'	-33° 51' 55.800"	114° 58' 55.920"	-33.8655	114.9822
130	-33° 51.869'	114° 58.672'	-33° 51' 52.135"	114° 58' 40.341"	-33.86448204	114.9778724
131	-33° 54.358'	114° 59.334'	-33° 54' 21.492"	114° 59' 20.040"	-33.90597	114.9889
132	-33° 54.725'	114° 59.170'	-33° 54' 43.524"	114° 59' 10.176"	-33.91209	114.98616
133	-33° 54.939'	114° 59.321'	-33° 54' 56.340"	114° 59' 19.248"	-33.91565	114.98868

<b>134</b>	-33° 55.616'	114° 59.437'	-33° 55' 36.948"	114° 59' 26.232"	-33.92693	114.99062
<b>135</b>	-33° 56.933'	114° 59.578'	-33° 56' 55.968"	114° 59' 34.656"	-33.94888	114.99296
<b>137</b>	-33° 57.269'	114° 59.503'	-33° 57' 16.164"	114° 59' 30.192"	-33.95449	114.99172
<b>138</b>	-33° 57.458'	114° 59.312'	-33° 57' 27.468"	114° 59' 18.708"	-33.95763	114.98853
<b>139</b>	-33° 57.562'	114° 59.138'	-33° 57' 33.732"	114° 59' 8.304"	-33.95937	114.98564
<b>140</b>	-33° 57.659'	114° 58.957'	-33° 57' 39.564"	114° 58' 57.396"	-33.96099	114.98261
<b>141</b>	-33° 57.680'	114° 58.820'	-33° 57' 40.788"	114° 58' 49.188"	-33.96133	114.98033
<b>142</b>	-33° 58.179'	114° 59.143'	-33° 58' 10.740"	114° 59' 8.592"	-33.96965	114.98572
<b>143</b>	-33° 58.678'	114° 59.326'	-33° 58' 40.692"	114° 59' 19.536"	-33.97797	114.98876
<b>144</b>	-33° 58.920'	114° 59.383'	-33° 58' 55.200"	114° 59' 23.002"	-33.982	114.9897227

115°40'0"E

115°50'0"E

31°50'0"S

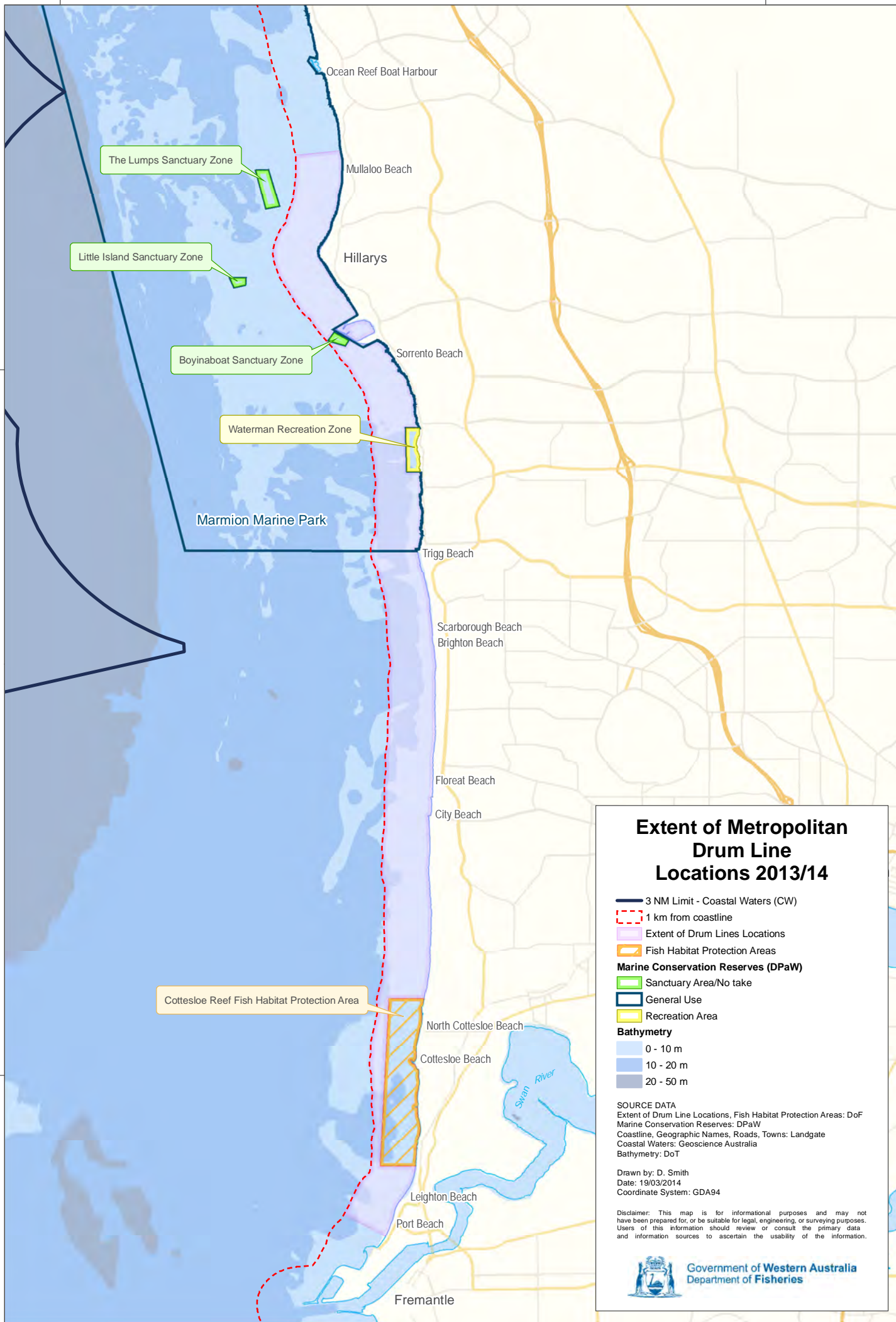
31°50'0"S

32°0'0"S

32°0'0"S

115°40'0"E

115°50'0"E



### Extent of Metropolitan Drum Line Locations 2013/14

- 3 NM Limit - Coastal Waters (CW)
- 1 km from coastline
- Extent of Drum Lines Locations
- Fish Habitat Protection Areas
- Marine Conservation Reserves (DPaW)**
- Sanctuary Area/No take
- General Use
- Recreation Area
- Bathymetry**
- 0 - 10 m
- 10 - 20 m
- 20 - 50 m

**SOURCE DATA**  
 Extent of Drum Line Locations, Fish Habitat Protection Areas: DoF  
 Marine Conservation Reserves: DPaW  
 Coastline, Geographic Names, Roads, Towns: Landgate  
 Coastal Waters: Geoscience Australia  
 Bathymetry: DoT

Drawn by: D. Smith  
 Date: 19/03/2014  
 Coordinate System: GDA94

Disclaimer: This map is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information.



115°0'0"E

115°5'0"E

33°30'0"S

33°30'0"S











33°35'0"S

33°35'0"S

115°0'0"E

115°5'0"E

# Extent of South West Drum Line Locations - Phase 1 2013/14

-  1 km from coastline
-  Extent of Drum Line Locations
- Ngari Capes Marine Park - Proposed internal zones**
-  Ngari Capes Marine Park Boundary
-  Sanctuary Zone
-  Special Purpose Zone (Shore-Based Activities)
-  Special Purpose Zone (Surfing)
- Bathymetry**
-  0 - 10 m
-  10 - 20 m
-  20 - 50 m
-  50 - 100 m

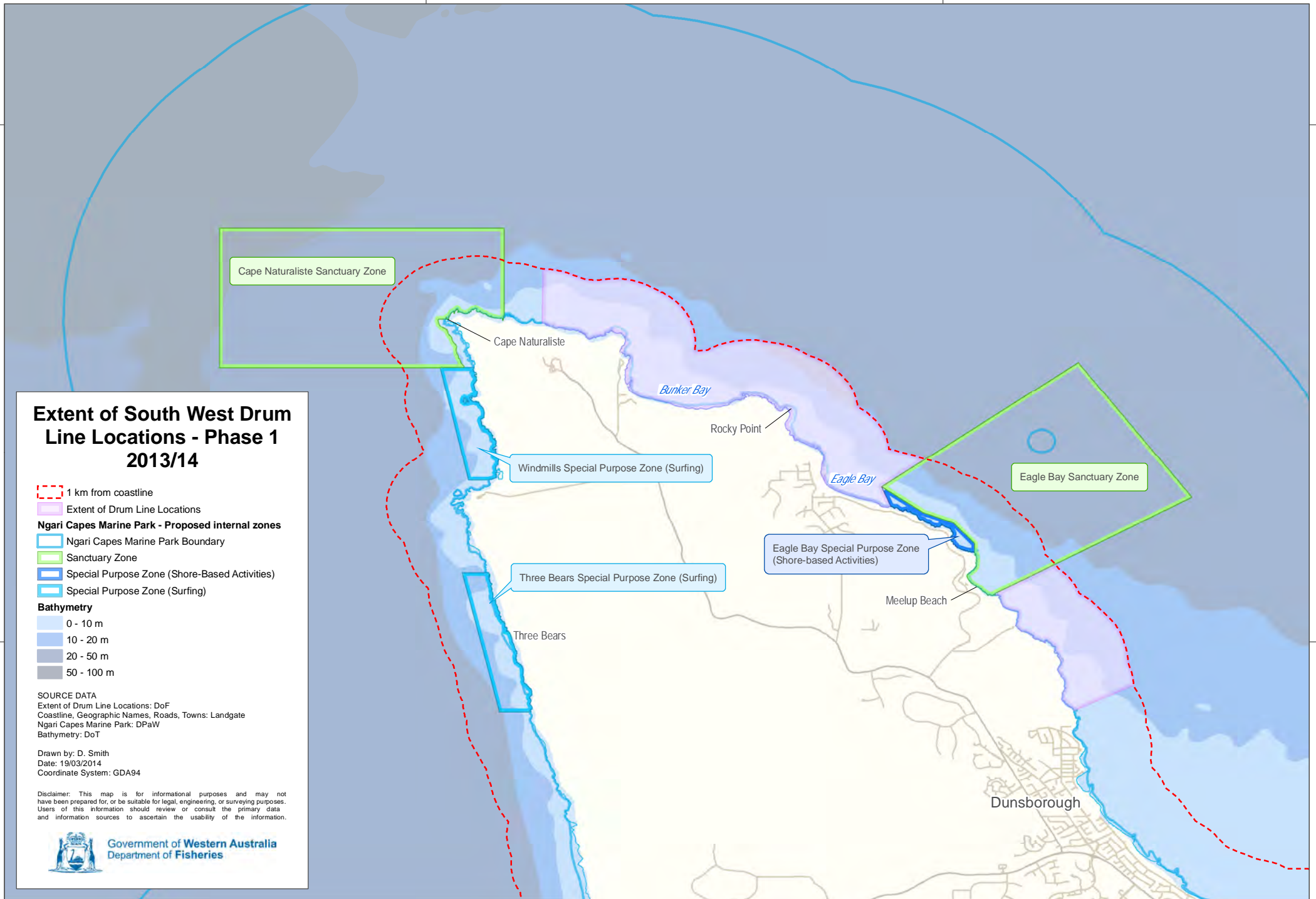
SOURCE DATA  
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 Coastline, Geographic Names, Roads, Towns: Landgate  
 Ngari Capes Marine Park: DPaW  
 Bathymetry: DoT

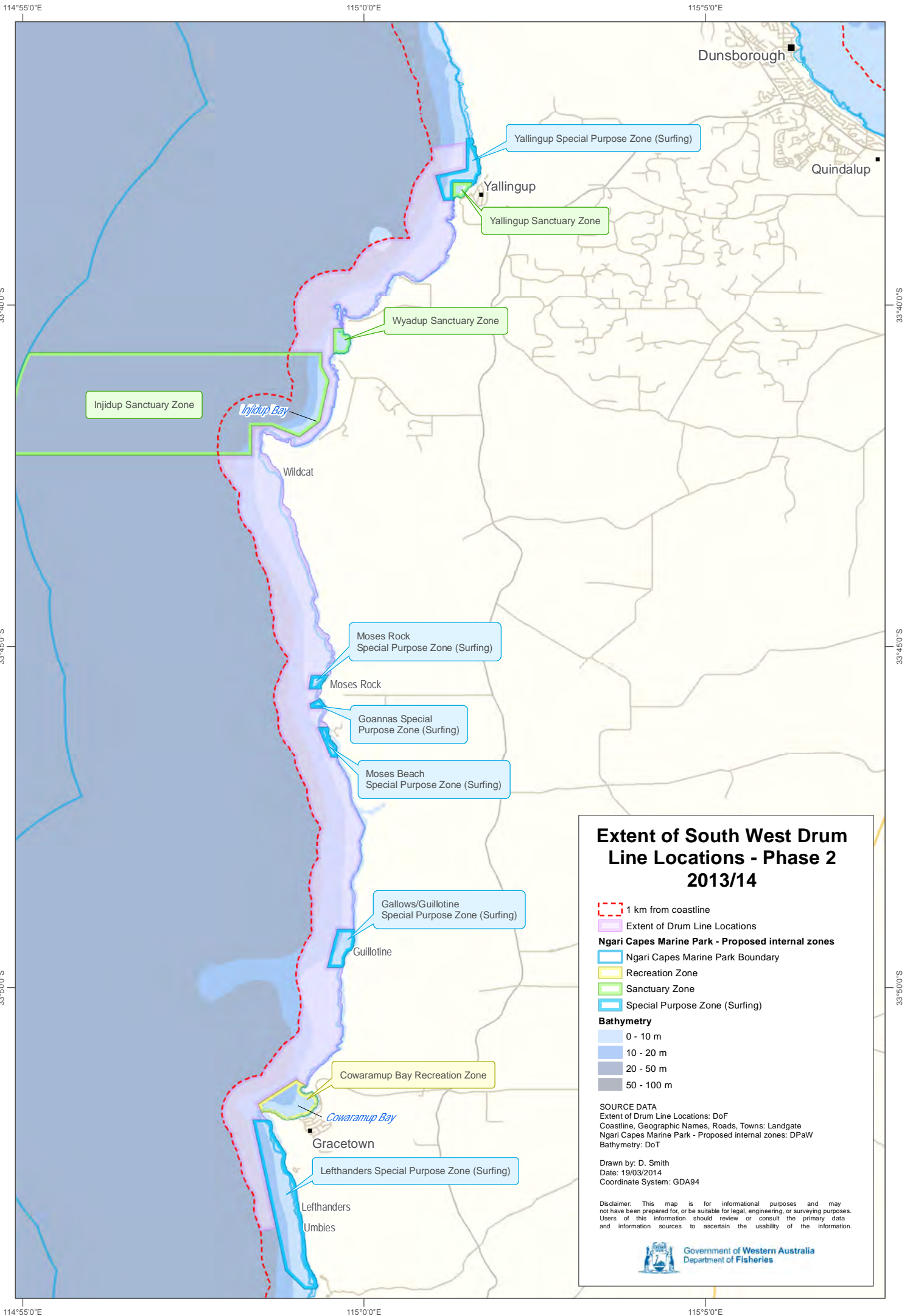
Drawn by: D. Smith  
 Date: 19/03/2014  
 Coordinate System: GDA94

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Government of Western Australia  
 Department of Fisheries





### Extent of South West Drum Line Locations - Phase 2 2013/14

- - - 1 km from coastline
- Extent of Drum Line Locations
- Ngari Capes Marine Park - Proposed internal zones**
- Ngari Capes Marine Park Boundary
- Recreation Zone
- Sanctuary Zone
- Special Purpose Zone (Surfing)
- Bathymetry**
- 0 - 10 m
- 10 - 20 m
- 20 - 50 m
- 50 - 100 m

**SOURCE DATA**  
 Extent of Drum Line Locations: DoF  
 Coastline, Geographic Names, Roads, Towns: Landgate  
 Ngari Capes Marine Park - Proposed internal zones: DPaW  
 Bathymetry: DoT

Drawn by: D. Smith  
 Date: 19/03/2014  
 Coordinate System: GDA94

Disclaimer: This map is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information.



115°40'0"E

115°50'0"E

31°50'0"S

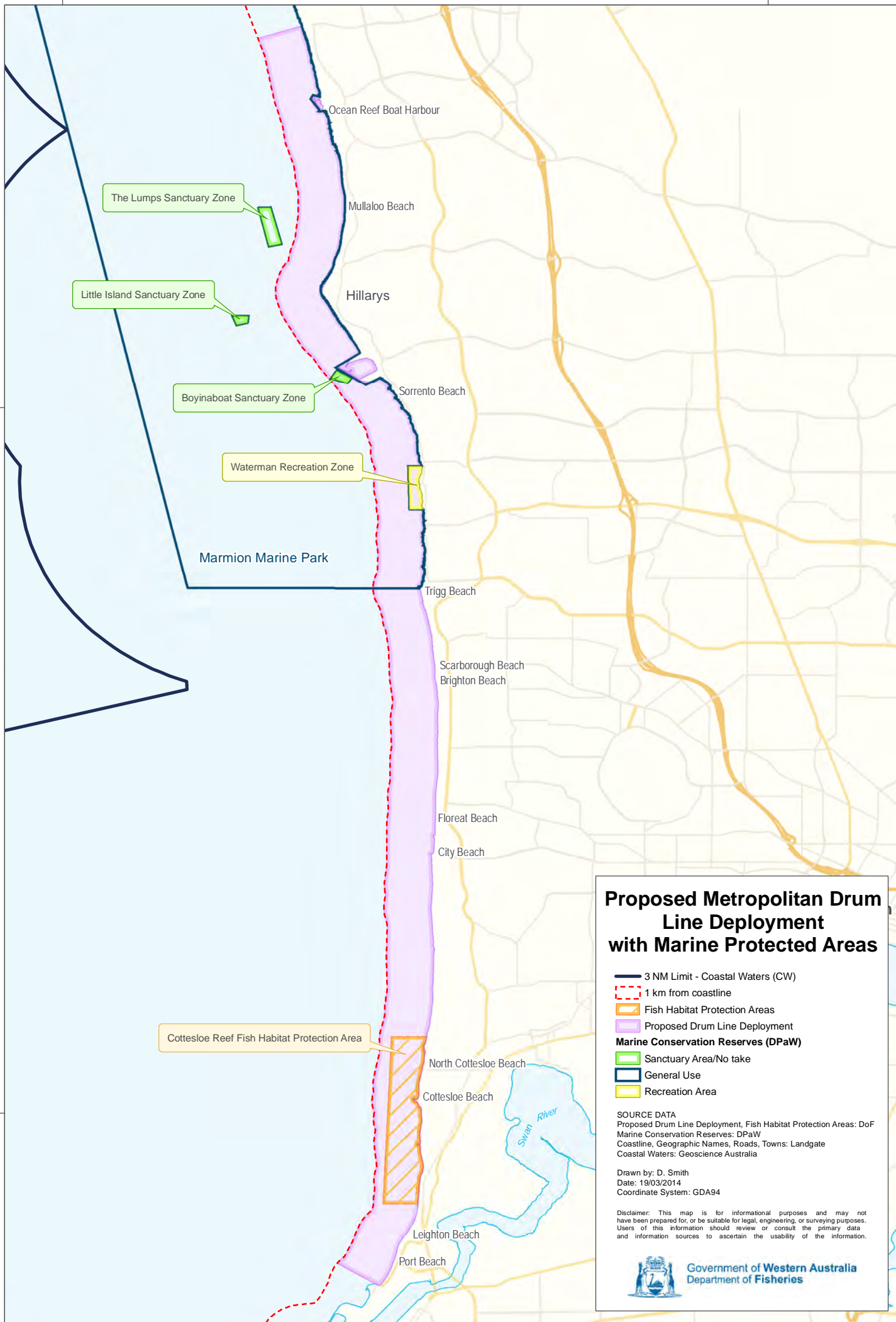
31°50'0"S

32°0'0"S

32°0'0"S

115°40'0"E

115°50'0"E



### Proposed Metropolitan Drum Line Deployment with Marine Protected Areas

- 3 NM Limit - Coastal Waters (CW)
- 1 km from coastline
- Fish Habitat Protection Areas
- Proposed Drum Line Deployment
- Marine Conservation Reserves (DPaW)**
- Sanctuary Area/No take
- General Use
- Recreation Area

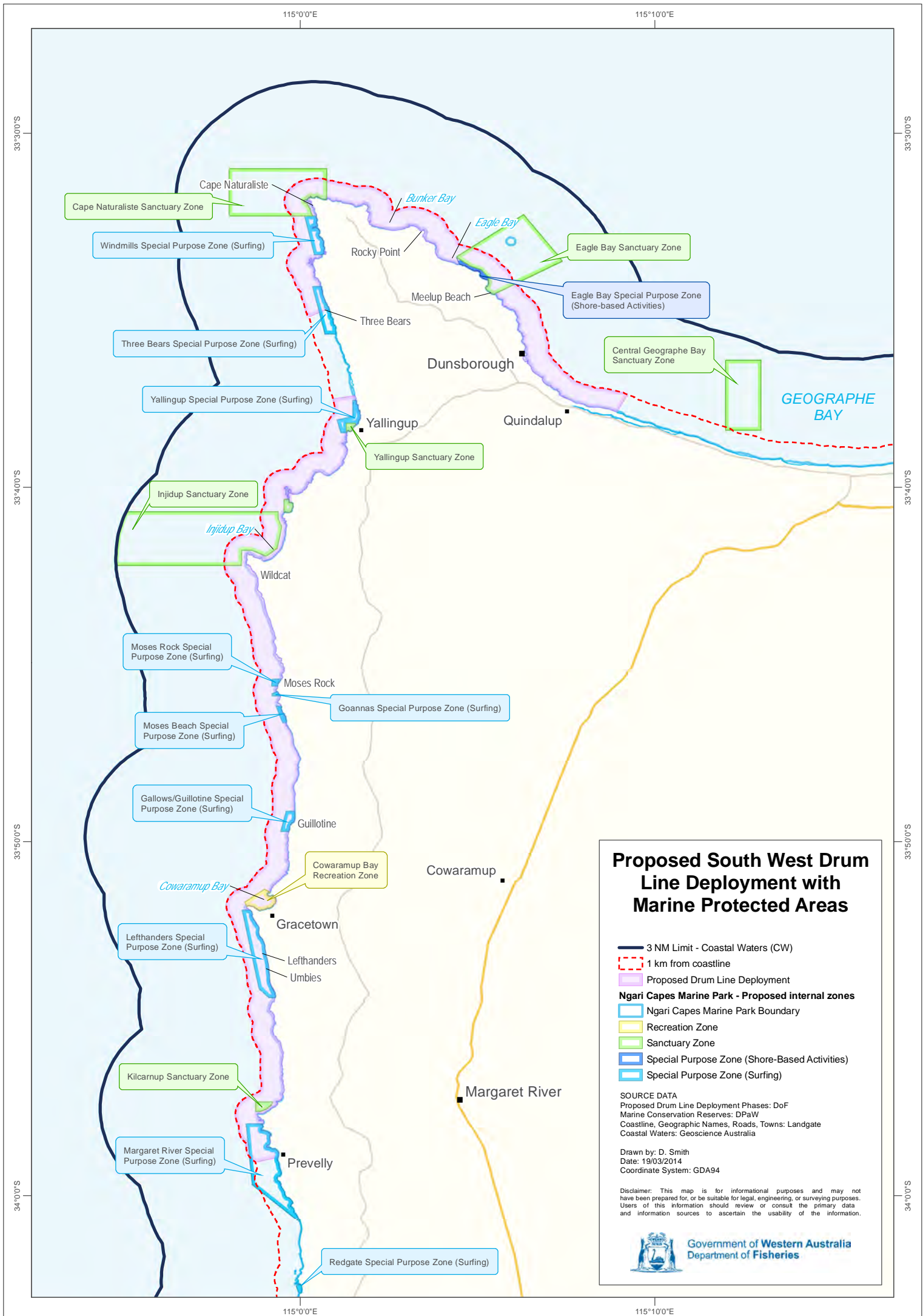
**SOURCE DATA**  
 Proposed Drum Line Deployment, Fish Habitat Protection Areas: DoF  
 Marine Conservation Reserves: DPaW  
 Coastline, Geographic Names, Roads, Towns: Landgate  
 Coastal Waters: Geoscience Australia

Drawn by: D. Smith  
 Date: 19/03/2014  
 Coordinate System: GDA94

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### Proposed South West Drum Line Deployment with Marine Protected Areas

- 3 NM Limit - Coastal Waters (CW)
- - - 1 km from coastline
- Proposed Drum Line Deployment
- Ngari Capes Marine Park - Proposed internal zones**
- Ngari Capes Marine Park Boundary
- Recreation Zone
- Sanctuary Zone
- Special Purpose Zone (Shore-Based Activities)
- Special Purpose Zone (Surfing)

**SOURCE DATA**  
 Proposed Drum Line Deployment Phases: DoF  
 Marine Conservation Reserves: DPaW  
 Coastline, Geographic Names, Roads, Towns: Landgate  
 Coastal Waters: Geoscience Australia

Drawn by: D. Smith  
 Date: 19/03/2014  
 Coordinate System: GDA94

Disclaimer: This map is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information.

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## Area

	km <sup>2</sup>	% of WA Waters covered by MMAs	Formula	Unrounded values
<b>WA Waters (Area)</b>	116000			
<b>Metropolitan Marine Monitored Area</b>	34	0.03	(34/116000 * 100)	0.029310345
<b>Proposed South West Drum Line Deployment - Phase 2</b>	28	0.02	(28/116000 * 100)	0.024137931
<b>Proposed South West Drum Line Deployment - Phase 3 (includes Phase 1 area)</b>	48	0.04	(48/116000 * 100)	0.04137931
<b>Total</b>		<b>0.05 - 0.07</b>		

## Distance

	km	% of WA coastline covered by MMAs	Formula	Unrounded values
<b>WA Mainland Coastline</b>	12895			
<b>Coastline covered by the Metropolitan Marine Monitored Area</b>	35	0.3	(35/12895*100)	0.271423032
<b>Proposed South West Drum Line Deployment - Phase 2</b>	29	0.2	(29/12895 * 100)	0.22489337
<b>Proposed South West Drum Line Deployment - Phase 3 (includes Phase 1 distance)</b>	52	0.4	(52/12895 * 100)	0.403257076
<b>Total</b>		<b>0.5 - 0.7</b>		

Percentage of WA Waters covered by the MMAs: **0.05%-0.07%**

Percentage of WA coastline covered by MMAs: **0.5-0.7%**

Distance calculations for Western Australia's coastline are taken from Geoscience Australia's GEODATA Coast 100K 2004. This is a topographic representation primarily based on the mean high water mark.

Area of Western Australia waters were calculated using Geoscience Australia's (GA) 3 nautical mile layer from the Australian Maritime Boundaries dataset and the GA GEODATA Coast 100K 2004 (mean high water mark representation).

**Catch Data for Shark Drum Line Deployment Western Australia: 25 January- 16 March 2014**

METRO						
DATE	TIME	LOCATION	SPECIES	SIZE	SEX	ACTION STATUS
31-01-2014	11:00	North Cottesloe	Tiger	1.8m	F	Alive/Released
31-01-2014	11:25	Cottesloe	Tiger	2.6m	F	Alive/Released
01-02-2014	06:45	Leighton	Tiger	2.6m	F	Dead
01-02-2014	10:30	Scarborough	Tiger	2.34m	F	Alive/Released
04-02-2014	06:35	North Cottesloe	Tiger	1.73m	F	Alive/Released
04-02-2014	12:35	Mullaloo	Tiger	2.51m	F	Alive/Released
04-02-2014	16:49	City Beach	Tiger	2.91m	F	Alive/Released
05-02-2014	06:30	Leighton	Tiger	2.0m	F	Dead
05-02-2014	07:30	Scarborough	Tiger	2.3m	F	Alive/Released
07-02-2014	07:07	Scarborough	Tiger	Approx. 2.0m	Undetermined	Dead
07-02-2014	14:51	Floreat	Tiger	2.37m	F	Alive/Released
08-02-2014	06:23	City Beach	Tiger	2.2m	F	Alive/Released
08-02-2014	07:39	Mullaloo	Tiger	2.5m	Undetermined	Alive/Released
08-02-2014	07:53	Mullaloo	Tiger	Approx. 2.2m	Undetermined	Dead
08-02-2014	12:55	Leighton Beach	Tiger	1.93m	M	Alive/Released
08-02-2013	16:26	Port Beach	Tiger	2.16m	F	Alive/Released
10-02-2014	06:13	Leighton Beach	Tiger	2.8m	F	Alive/Released
10-02-2014	06:38	Leighton Beach	Tiger	2.5m	F	Alive/Released
10-02-2014	07:30	City Beach	Tiger	2.7m	F	Alive/Released
10-02-2014	07:41	City Beach	Tiger	2.8m	M	Alive/Released
10-02-2014	15:16	Mullaloo	Tiger	2.79m	F	Alive/Released
11-02-2014	06:30	Leighton Beach	Tiger	3.73m	F	Alive/Destroyed
11-02-2014	14:06	Scarborough	Tiger	3.7m	F	Alive/Destroyed
12-02-2014	06:13	Leighton Beach	Tiger	3.5m	F	Alive/Destroyed
13-02-2014	06:37	Leighton Beach	Tiger	2.12m	F	Alive/Released
13-02-2014	07:36	Floreat	Tiger	2.36m	F	Alive/Released
13-02-2014	08:03	Floreat	Tiger	2.36m	M	Alive/Released
13-02-2014	09:07	Mullaloo	Tiger	2.2m	M	Alive/Released
13-02-2014	09:30	Mullaloo	Tiger	3.47m	M	Alive/Destroyed
13-02-2014	16:30	Floreat	Tiger	Approx. 2.8m	F	Alive/Released
14-02-2014	06:45	Leighton Beach	Tiger	2.4m	F	Alive/Released
14-02-2014	07:32	North Cottesloe	Tiger	2.33m	F	Alive/Released

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14-02-2014	07:56	Floreat	Tiger	Unknown	F	Alive/Self-Released
14-02-2014	09:38	North Cottesloe	Tiger	1.82m	F	Alive/Released
14-02-2014	14:26	Trigg	Tiger	2.85m	M	Dead
14-02-2014	16:13	Scarborough	Tiger	2.31m	F	Alive/Released
14-02-2014	16:46	Floreat	Tiger	2.2m	F	Alive/Released
14-02-2014	17:04	Floreat	Tiger	2.25m	F	Alive/Released
14-02-2014	17:20	Floreat	Tiger	1.53m	F	Alive/Released
15-02-2014	06:11	Leighton Beach	Tiger	1.55m	M	Alive/Released
15-02-2014	07:00	Floreat	Tiger	2.5m	M	Alive/Released
15-02-2014	07:35	Scarborough	Tiger	2.8m	M	Alive/Released
16-02-2014	06:45	Floreat	Tiger	2.4m	F	Alive/Released
17-02-2014	06:48	Scarborough	Tiger	2.0m	M	Alive/Released
17-02-2014	07:08	Scarborough	Tiger	2.72m	F	Alive/Released
17-02-2014	13:03	Floreat	Tiger	2.36m	F	Alive/Released
18-02-2014	07:10	Trigg	Tiger	2.48m	F	Alive/Released
18-02-2014	06:37	Floreat	Northwest Blowfish	-	-	Alive/Released
19-02-2014	06:57	Floreat	Tiger	2.25m	F	Alive/Released
19-02-2014	07:41	Trigg	Tiger	2.71m	F	Alive/Released
20-02-2014	06:40	Leighton Beach	Tiger	2.3m	F	Dead
20-02-2014	11:20	Floreat	Tiger	2.07m	F	Alive/Released
20-02-2014	12:19	Leighton Beach	Tiger	1.83m	F	Dead
21-02-2014	06:51	Floreat	Tiger	4.5m	F	Alive/Destroyed
21-02-2014	10:00	Mullaloo	Tiger	2.8m	M	Alive/Released
24-02-2014	07:48	Mullaloo	Tiger	2.56m	Unknown	Alive/Released
25-02-2014	15:02	Trigg	Tiger	1.88m	M	Alive/Released
25-02-2014	15:47	Mullaloo	Tiger	3.18m	F	Alive/Destroyed
25-02-2014	17:35	Mullaloo	Tiger	4.2m	F	Alive/Destroyed
26-02-2014	07:15	Floreat	Tiger	3.06m	F	Dead
26-02-2014	14:10	Port Beach	Tiger	2.99m	F	Alive/Released
27-02-2014	06:23	Leighton Beach	Tiger	2.2m	M	Alive/Released
27-02-2014	07:15	North Cottesloe	Tiger	Unknown	Unknown	Alive/Self-Released
04-03-2014	07:12	Floreat	Tiger	2.43m	F	Alive/Released
06-03-2014	13:43	Mullaloo	Tiger	3.73m	F	Alive/Destroyed
07-03-2014	13:55	Scarborough	Tiger	1.65m	F	Alive/Released
08-03-2014	15:47	Floreat	Tiger	3.8m	F	Alive/Destroyed
09-03-2014	12:50	Port Beach	Tiger	3.75m	F	Alive/Destroyed

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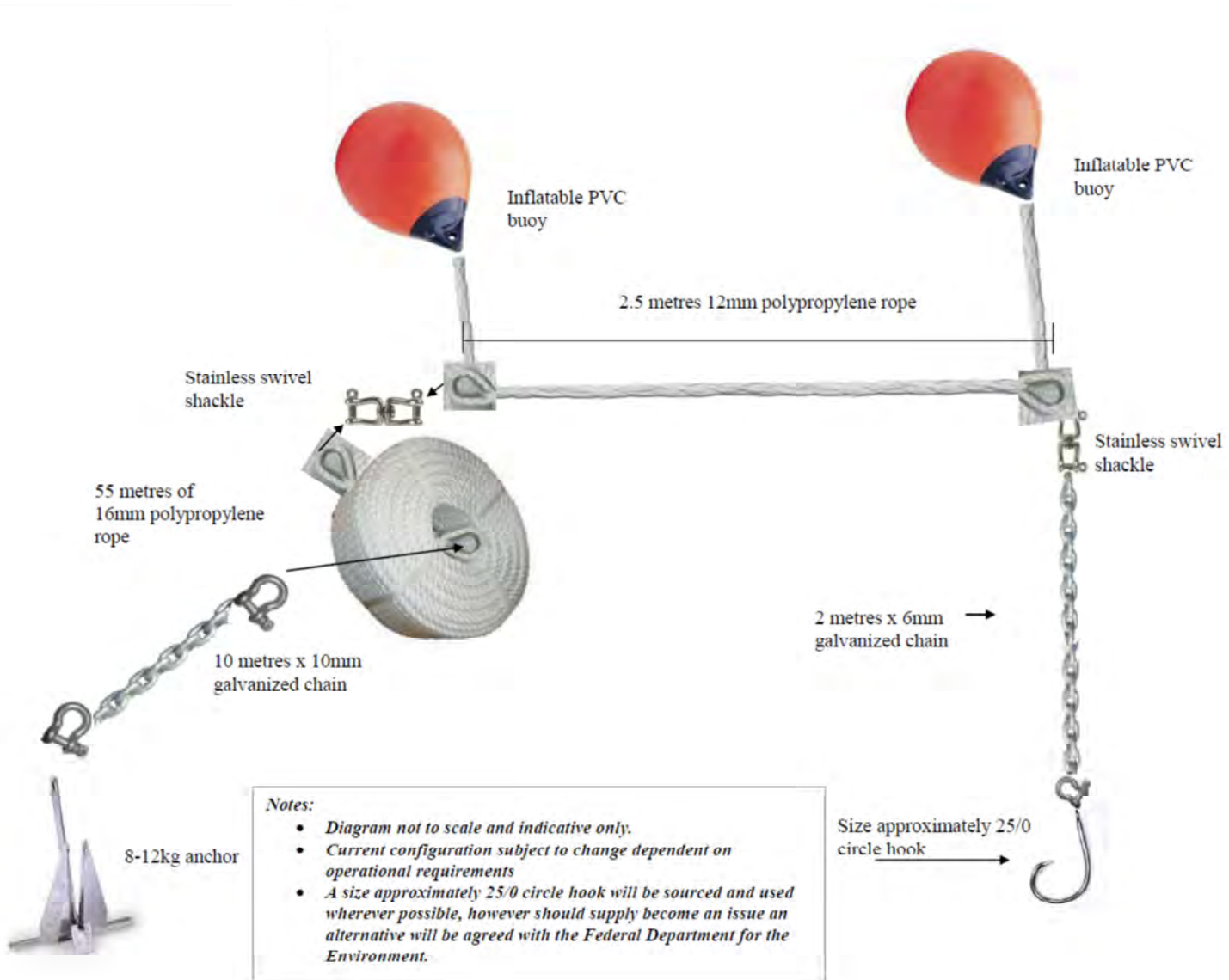
10-03-2014	07:45	Floreat	Dusky Whaler	2.9m	F	Alive/Released
11-03-2014	08:15	Mullaloo	Tiger	2.22m	F	Alive/Released
13-03-2014	07:50	Floreat	Tiger	1.94	F	Alive/Released
13-03-2014	09:03	Mullaloo	Tiger	3.7m	F	Alive/Destroyed
15-03-2014	07:51	Mullaloo	Tiger	3.71m	F	Alive/Destroyed
15-03-2014	09:57	Floreat	Tiger	3.9m	F	Alive/Destroyed

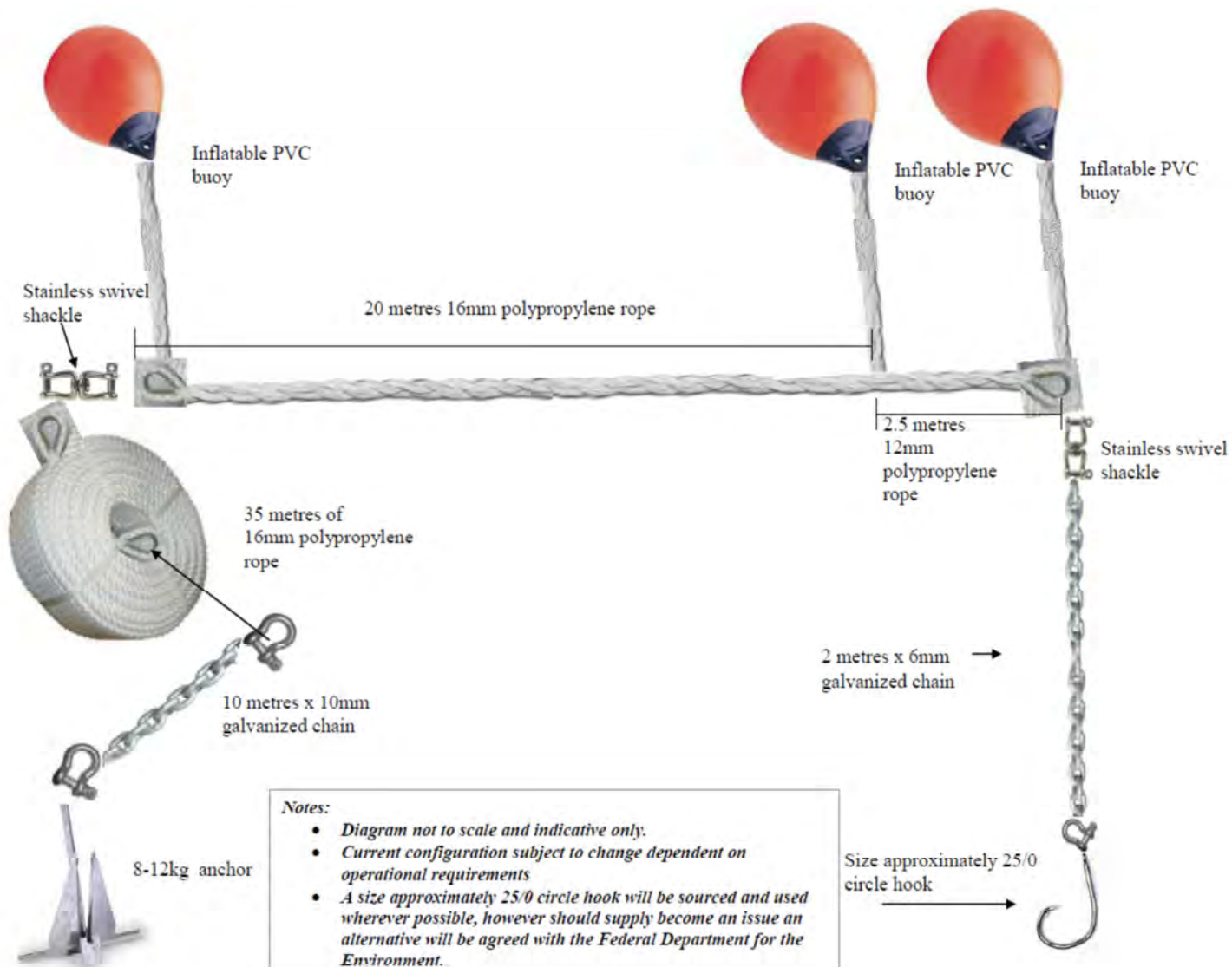
SOUTH WEST						
DATE	TIME	LOCATION	SPECIES	SIZE	SEX	STATUS
26-01-2014	08:30	Meelup Beach	Tiger	3.3m	F	Alive/Destroyed
29-01-2014	11:30	Rocky Point	Mako	2.0m	M	Dead
01-02-2014	07:15	Eagle Bay	Mako	1.7m	Undetermined	Dead
01-02-2014	11:30	Eagle Bay	Tiger	3.5m	F	Alive/Destroyed
01-02-2014	17:15	Rocky Point	Tiger	3.2m	F	Alive/Destroyed
02-02-2014	06:30	Old Dunsborough	Tiger	2.7m	F	Alive/Released
02-02-2014	07:45	Castle Rock	Tiger	3.5m	F	Alive/Destroyed
03-02-2014	07:15	Castle Rock	Tiger	3.0m	M	Alive/Destroyed
03-02-2014	14:00	Castle Rock	Tiger	3.0m	M	Alive/Destroyed
04-02-2014	07:00	Castle Rock	Tiger	3.1m	M	Alive/Destroyed
05-02-2014	06:30	Old Dunsborough	Tiger	2.5m	F	Alive/Released
05-02-2014	07:45	Old Dunsborough	Tiger	3.0m	M	Alive/Destroyed
05-02-2014	11:15	Castle Rock	Tiger	2.3m	F	Alive/Released
06-02-2014	11:45	Cape Naturaliste	Spinner*	1.8m	F	Alive/Released
06-02-2014	17:10	Old Dunsborough	Tiger	2.1m	F	Alive/Released
07-02-2014	07:00	Castle Rock	Tiger	3.3m	M	Alive/Destroyed
07-02-2014	09:30	Rocky Point	Tiger	Approx. 3.0m	M	Dead
07-02-2014	17:30	Old Dunsborough	Tiger	3.3m	M	Alive/Destroyed
08-02-2014	06:30	Castle Rock	Tiger	2.75m	F	Dead
08-02-2014	08:02	Eagle Bay	Tiger	2.75m	F	Dead
09-02-2014	07:00	Castle Rock	Tiger	2.5m	M	Alive/Released
11-02-2014	08:30	Rocky Point	Tiger	3.1m	F	Alive/Destroyed
11-02-2014	09:20	Bunker Bay	Tiger	4.1m	F	Alive/Destroyed
20-02-2014	07:00	Yallingup	Tiger	2.4m	F	Alive/Released
22-02-2014	07:45	Moses Rocks	Tiger	3.2m	M	Alive/Destroyed
22-02-2014	09:45	Cowaramup Point	Tiger	2.5m	F	Alive/Released

17 March. 14

24-02-2014	08:30	North Point Cowaramup	Tiger	2.66m	M	Alive/Released
26-02-2014	07:25	South Injidup Point	Tiger	3.0m	M	Alive/Destroyed
26-02-2014	10:20	Lefthanders	Tiger	2.66m	F	Alive/Released
27-02-2014	15:00	North Point Cowaramup	Tiger	3.0m	F	Alive/Destroyed
28-02-2014	08:15	Moses Rocks	Tiger	3.8m	F	Alive/Destroyed
28-02-2014	10:00	Guillotine	Tiger	3.1m	F	Alive/Destroyed
2-03-2014	09:00	Cowaramup	Tiger	2.5m	M	Alive/Released
2-03-2014	09:35	Cowaramup Point	Tiger	2.7m	F	Dead
5-03-2014	17:00	Injidup Point	Undetermined	Approx. 3m	Undetermined	Alive/Self-Released
08-03-2014	07:40	Injidup Point	Tiger	2.68m	F	Alive/Released
09-03-2014	08:00	Moses Rocks	Tiger	3.2m	M	Alive/Destroyed

\*Note: Previously reported as a Blacktip shark (common name), but now referred to more appropriately as Spinner shark.





**Notes:**

- *Diagram not to scale and indicative only.*
- *Current configuration subject to change dependent on operational requirements*
- *A size approximately 25/0 circle hook will be sourced and used wherever possible, however should supply become an issue an alternative will be agreed with the Federal Department for the Environment.*

Surf Life Saving WA Beach Attendance Statistics							
Surf Life Saving Patrolled Beach	2012/2013	2011/2012	2010/2011	2009/2010	2008/2009	2007/2008	2006/2007
Albany (Middleton Beach)**	44,160	47,492	44,938	53,995	280,015	21,741	8,492
Binningup*	5,572	6,901	17,153	15,370	15,612	4,718	3,215
Broome (Cable Beach)*	17,200	18,388	14,066	11,424	14,285	4,678	34,721
Busselton*	1,658	525	2,757	1,149	978	NA	NA
Champion Bay*	8,314	8,537	7,419	6,956	1,988	4,725	2,707
Bunbury*	20,749	19,777	14,761	15,902	20,509	16,739	7,652
City Beach**	566,856	300,207	343,551	404,556	236,977	227,299	207,090
Coogee*	33,820	53,175	51,201	51,366	44,497	34,916	29,645
Cottesloe**	602,683	800,041	1,032,618	737,771	603,862	352,547	329,538
Dalyellup*	3,307	4,311	2,951	19,178	1,677	101	NA
Denmark*	6,849	5,220	6,790	5,283	3,340	3,631	7,126
Dongara Denison*	10,706	10,393	8,331	14,162	5,183	12,169	932
Esperance*	5,517	5,538	4,051	5,168	2,930	3,972	2,603
Floreat**	131,253	46,635	54,236	41,165	29,491	19,884	15,419
Leighton*	158,414	144,868	117,429	193,828	266,227	241,371	80,422
Geraldton**	26,759	32,000	22,463	23,166	25,885	14,668	9,103
Mandurah (San Remo Beach)*	4,033	3,854	5,701	3,498	4,091	3,812	1,380
Mullaloo**	363,269	349,741	306,579	293,069	293,933	152,218	107,860
North Cottesloe*	50,354	39,905	41,274	35,764	51,065	39,260	25,435
Port Bouvard*	7,658	9,949	8,515	8,003	8,945	7,900	4,248
Quinns Mindarie**	62,162	51,120	61,188	48,415	41,756	21,952	9,242
Scarborough*	190,624	192,959	126,528	164,665	122,055	274,726	15,035
Secret Harbour**	290,947	195,783	175,090	128,873	99,126	73,263	23,242
Smiths Beach^	127,960	80,855	95,364	138,168	173,779	29,566	55,941
Sorrento**	154,661	114,629	135,729	121,270	143,567	50,015	40,223
Swanbourne*	14,253	7,769	18,428	3,878	3,224	4,886	4,863
Trigg Beach*	98,209	113,637	89,516	94,273	77,914	99,594	45,851
Yanchep**	110,343	110,652	141,700	123,797	108,195	25,963	19,551
Rottne Island (The Basin)**	46,364	74,643	NA	NA	NA	NA	NA
Bunker Bay**	119,947	89,783	NA	NA	NA	NA	NA
Meelup**	175,789	135,290	NA	NA	NA	NA	NA
Yallingup**	112,409	151,109	136,059	144,398	208,510	33,282	67,731
Penguin Island^	61,143	15,663	NA	NA	NA	NA	NA
Hillary's^	227,993	107,276	124,289	131,414	79,134	39,392	49,064
Margaret River (Rivermouth)**	NA	NA	140,047	73,592	NA	NA	49,051
<b>TOTAL</b>	<b>3,861,935</b>	<b>3,348,625</b>	<b>3,210,675</b>	<b>3,039,924</b>	<b>2,968,750</b>	<b>1,818,988</b>	<b>1,208,331</b>
<b>Key</b>							
* weekends only							
** seven day a week patrols							
^ weekday patrols only							



## **Western Australian Shark Hazard Mitigation Policy – Criteria for Drum Line Placement for 2013/14 trial**

### **1. Beach use**

Surf Life Saving WA (SLSWA) Beach Attendance Statistics for the 2012/13 season were used to guide the beaches at which drum lines were to be set. Beaches with seven day a week SLSWA patrols were prioritised for drum line placement.

Surfing WA and local recreational water users were consulted to identify popular surfing spots between Cape Naturaliste and Prevelly.

### **2. Distance offshore and water depth**

Advice was sought from SLSWA and Surfing WA as to the maximum distance offshore of water based activities. At approximately 1km distance from shore interactions with surfers, swimmers and other water users should be mostly avoided. 1km offshore also correlates with the extent patrolled by SLSWA.

Shark control equipment in Queensland, including nets and drum lines, is set approximately 350m from shore and sits approximately along the 10m depth contour.

At 1km offshore, in the metropolitan region water depth was found to be between 9-13m and between 5-30m in the south west region.

### **3. Benthic habitat**

Sea bed habitat was considered to ensure no drum lines were placed over reef structures or other fragile benthic habitat.

### **4. Marine Protected Areas**

The following Department of Parks and Wildlife and Department of Fisheries Marine Protected Areas were identified–

- Cottesloe Reef Fish Habitat Protection Area (FHPA)
- Waterman's Reef Observation Area
- Marmion Marine Park
- The Ngari Capes Marine Park

The Cottesloe FHPA, Waterman's Reef Observation Area and all sanctuary and recreation zones within the Marmion Marine Park were excluded for permanent drum line placement. All proposed and gazetted sanctuary and recreation zones within the Ngari Capes Marine Park were excluded for permanent drum line placement.

### **5. Shark activity**

Data on shark activity from the Department of Fisheries and the SLSWA Twitter feed was used to identify areas of high densities of shark sightings.

115°40'0"E

115°50'0"E

31°50'0"S

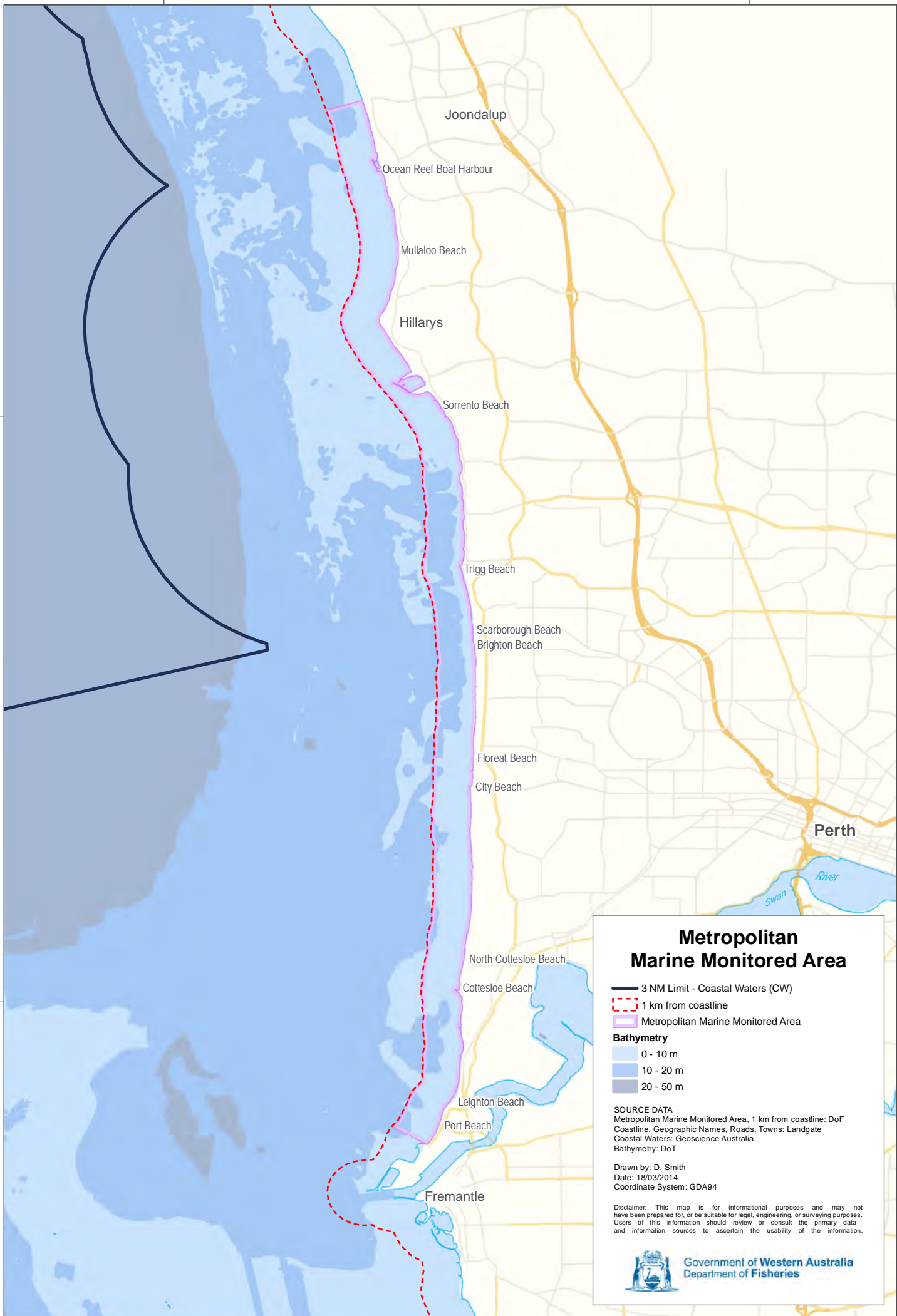
31°50'0"S

32°0'0"S

32°0'0"S

115°40'0"E

115°50'0"E



## Metropolitan Marine Monitored Area

- 3 NM Limit - Coastal Waters (CW)
- 1 km from coastline
- Metropolitan Marine Monitored Area

### Bathymetry

- 0 - 10 m
- 10 - 20 m
- 20 - 50 m

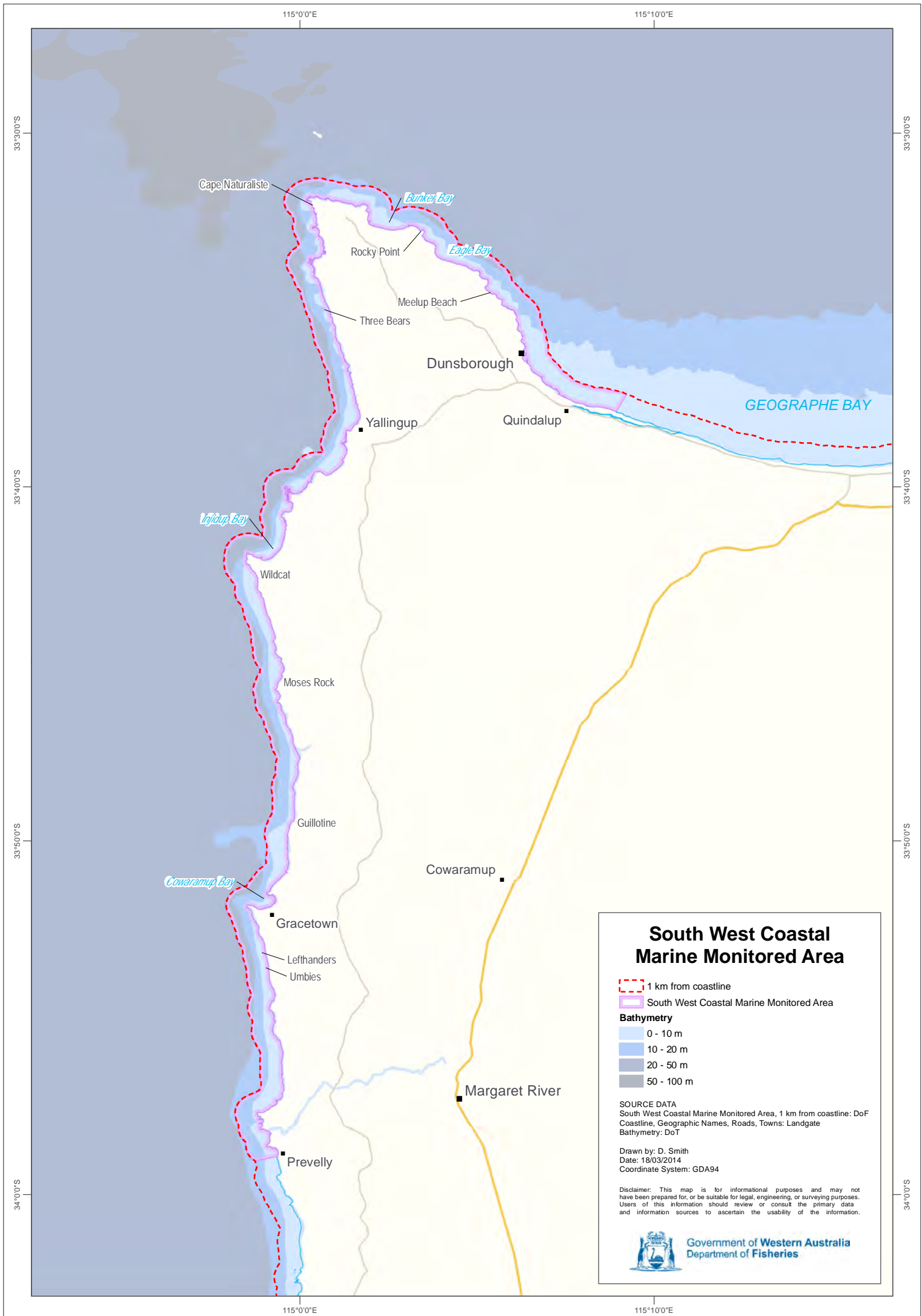
**SOURCE DATA**  
 Metropolitan Marine Monitored Area, 1 km from coastline: DoF  
 Coastline, Geographic Names, Roads, Towns: Landgate  
 Coastal Waters: Geoscience Australia  
 Bathymetry: DoT

Drawn by: D. Smith  
 Date: 18/03/2014  
 Coordinate System: GDA94

Disclaimer: This map is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information.



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## South West Coastal Marine Monitored Area

- 1 km from coastline
  - South West Coastal Marine Monitored Area
- Bathymetry**
- 0 - 10 m
  - 10 - 20 m
  - 20 - 50 m
  - 50 - 100 m

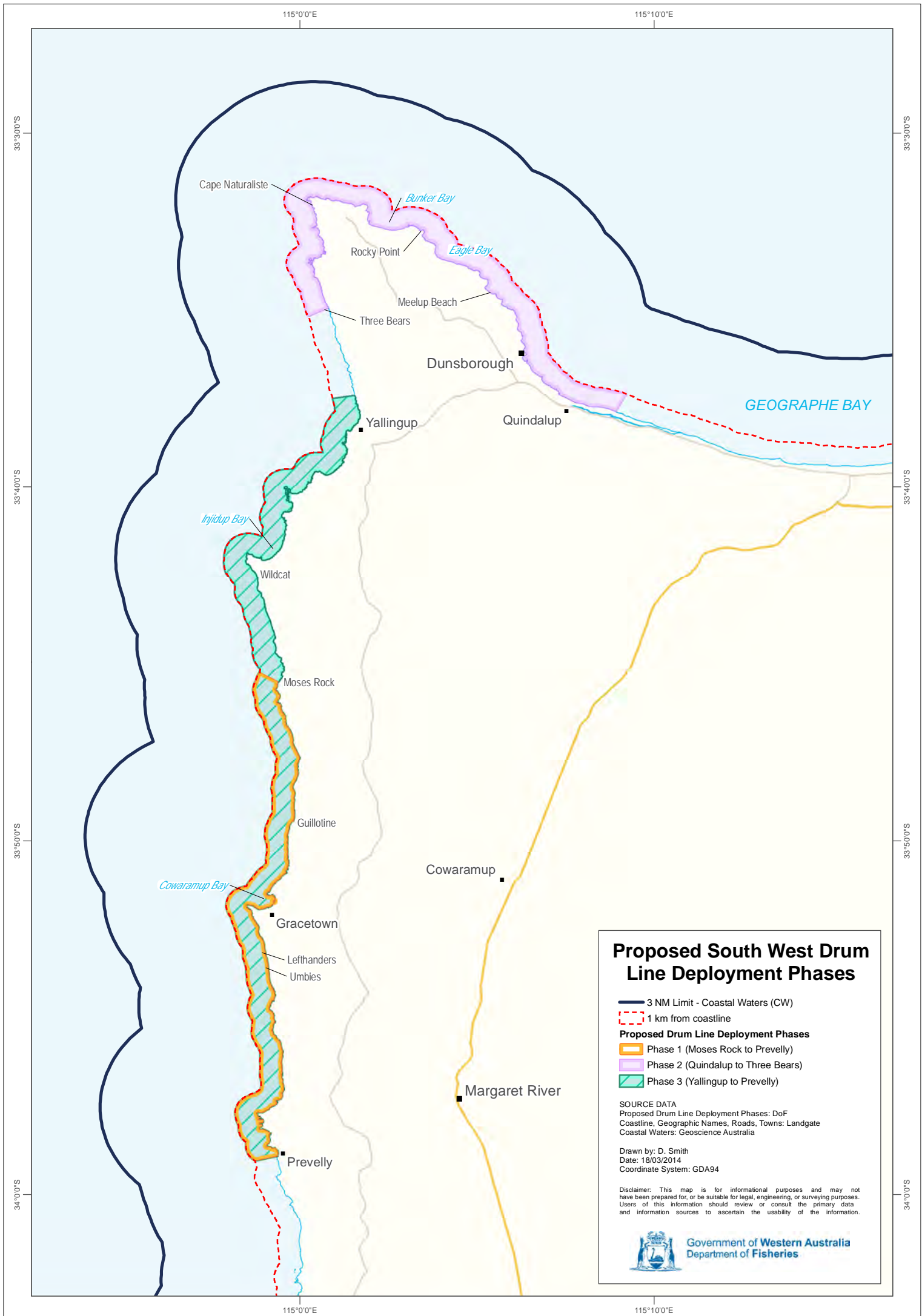
**SOURCE DATA**  
 South West Coastal Marine Monitored Area, 1 km from coastline: DoF  
 Coastline, Geographic Names, Roads, Towns: Landgate  
 Bathymetry: DoT

Drawn by: D. Smith  
 Date: 18/03/2014  
 Coordinate System: GDA94

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 Department of Fisheries



### Proposed South West Drum Line Deployment Phases

- 3 NM Limit - Coastal Waters (CW)
- 1 km from coastline


**Proposed Drum Line Deployment Phases**

- Phase 1 (Moses Rock to Prevelly)
- Phase 2 (Quindalup to Three Bears)
- Phase 3 (Yallingup to Prevelly)

**SOURCE DATA**  
 Proposed Drum Line Deployment Phases: DoF  
 Coastline, Geographic Names, Roads, Towns: Landgate  
 Coastal Waters: Geoscience Australia

Drawn by: D. Smith  
 Date: 18/03/2014  
 Coordinate System: GDA94

Disclaimer: This map is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information.



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 Department of Fisheries

12001



1936

05/02/2014 07:22AM



### **Shark Drum Line Observer Trips**

<b>Date</b>	<b>Location/Vessel</b>	<b>Participant/s</b>
29-01-2014	Quindalup (South West)	DPC Officer
31-01-2014	Quindalup (South West)	DoF Officer
04-02-2014	Quindalup (South West)	Construction, Regional & Primary Industries Branch WorkSafe
06-02-2014	Quindalup (South West)	DPC Officer
13-02-2014	Gracetown (South West)	DPC Officers
18-02-2014	Fremantle (Metro)	DPC Officer
20-02-2014	Canal Rocks (South West)	DoF Officer
21-02-2014	Canal Rocks (South West)	DoF Officer
08-03-2014	Fremantle (Metro)	DPC Officer
18-03-2014	Fremantle (Metro)	DPaW Officer
20-03-2014	Fremantle (Metro)	DoF Officer

DPC – Department of the Premier and Cabinet

DoF – Department of Fisheries

DPaW - Department of Parks and Wildlife



## SW CONTRACTOR OBSERVER TRIP

31-1-14

06:00-09:45

Regional Fisheries Management Officer, South

A pre-trip safety inspection was conducted by the contractor advising of location of life raft, lifejackets, radio, EPIRB, flares and process in the event of an emergency.

### **Required Documentation**

All required forms were complete and up to date in Excel format on the contractors on board computer. This included the first deployment worksheet, vessel inspection log book, drum line maintenance log book (refer below), and the catch and research log book. The rapid response worksheet and final retrieval worksheet had not been required to date.

The contractor advised he had not been recording the GPS location of each drum line deployment every drop. He said with only one deckhand it was impractical to type these into the computer each drop as he often had wet hands and it would take too much time. He had been recording GPS locations manually on a note pad and marked each drop location on his GPS plotter. He advised that the drum lines were re-set each day within 50m of the same location so recording the GPS locations for each drop was unnecessary. If there was a requirement to move the gear then the new location was recorded manually and on the plotter.

The contractor advised he would be happy for the Department to download his GPS plotter tracks and marks of each drop. He understood the Vessel Monitoring System may also allow for this.

The contractor suggested that if the Excel spreadsheets could be linked to his GPS plotter then the exact location of each drop could be recorded every drop.

### **GPS Software**

The vessel uses Microplot 7 chart display and Seafarer (Australian Hydrographic Office National Charts). A Separate Furuno GPS is being used.

Both are in WGS 84 datum. I advised that all Sanctuary coordinates and Departmental GPS data are in the GDA 94 datum so he would need to change to GDS 94. The contractor advised he would change the datum to GDA 94.

### **Sanctuary Zones**

The contractor is aware he cannot set gear in the Ngari Capes Sanctuary Zones. The coordinates provided to him electronically are in decimal degrees format and his GPS plotter is in degrees- minutes- seconds format. He requested assistance converting the formats so he could put the exact locations in his plotter. Fisheries and Marine Officers have been contacted to assist with this but until it occurs, he was staying well away from the Sanctuary Zone borders.

### **Bait**

Imported blue mackerel (three per hook) were being used. The tail of each mackerel was wired to the hook and the hook set through the head/gills of each fish. The mackerel are approximately 250gm each and 30cm long. The contractor advised he was trying to source gummy shark heads and fish heads from a Margaret River fish processor.

## **Gear**

Fifteen lines were set each day and seven spares were on board. The gear was spaced 500m apart and the contractor did not think any more lines could be set in the area without them being very close together. He believed he had good coverage of the area and any more lines could pose issues with recreational boaters on busy days. The sanctuary zone areas he was required to stay out of reduced the number of lines that could be set and one commercial purse seine operator had requested he space his gear a bit further apart off Bunker Bay, so his purse seine fishing operations were not adversely affected.

I reiterated that no more than 31 drum lines could ever be in the water at any one time and five spares must be on board in case a rapid response deployment was required (total of 36 lines for the South West MMA). The contractor understood this was a requirement of the Commonwealth Exemption.

One of the 25'0 circle hooks had straightened while a 3m shark was under tow to the disposal site. A large swell had caused the boat to jerk and the pressure straightened the hook. The shark was still secured by a tail rope and taken to the disposal site. The vessel was towing at 7 knots.

## **Rapid Response**

The contractor's phone is always on charge in the wheel house but vessel engine noise and the contractor being on deck assisting with the gear means his phone will not always be heard. If the contractor does not pick up his phone immediately and a rapid response is required, he recommended contacting Dunsborough Sea Rescue (7am to 7 pm) and advising them to call F.V. Boranup Beach on Channel 16 VHF requesting he pick up his mobile phone. The contractor will also monitor 2183 HF radio.

## **Destroying Sharks**

The operator is currently using a .22 calibre rifle with 40gn subsonic ammunition. I advised that Departmental staff used a smokey with a solid shotgun cartridge for destroying sharks. The contractor owns a shot gun and would try to source similar shotgun shells for destroying large sharks.

## **Shark Disposal**

Sharks were being disposed of at Wright Bank 1.4 nautical miles offshore. This was the closest, deepest site in 52m of water. The first two sharks had not been tagged as the contractor had not been provided with tags to date. I provided him with four bags of tags and he would tag all sharks being disposed of through the dorsal fin in future.

## **Western Australian Shark Threat or Incident: Response Criteria**

The following must be confirmed before initiating a response -

1. Report made within one hour of sighting and response able to be in place within one hour of report being made.
2. Location is clear (e.g. land or ocean marker or GPS waypoint).
3. The sighting is credible. This assessment can include the source of the report (Surf Life Saving WA, commercial fisher, Government Agency vessel) or by contacting the individual reporting the sighting.
4. The shark is believed to have a length of three metres or greater and be within 1km of the shore.
5. Where possible the shark species is identified as a target species under the Western Australian shark hazard mitigation policy.
6. The Operations Manager is satisfied that public safety is of concern (beach is occupied, shark remains in the vicinity, shark is close to shore etc.).
7. The Land Manager (or delegated authority) must agree to, and have capacity to give effect to, beach closure for the period of deployment and removal of shark hazard.
8. In the event that the Land Manager will not agree to beach closures the deployed vessel will still attend and place drum lines 1km off shore.

Clarification on the following will assist in the confirmation and initiation of a response -

- Person reporting the sighting can explain how they determined the length of the shark and the detail is plausible.
- Length can be gauged in comparison to an object i.e. the reporter's water vessel or other visual marker.
- Person can explain how they determined distance from beach and the detail is plausible.
- Person can describe any patterns or particular features of the shark's body, assisting in species identification.
- Environmental conditions are favourable to water visibility.
- Sighting can be verified by another person.

A decision on the deployment of resources in the event of a shark threat or attack will be made by the Operations Manager at the Department of Fisheries.

### **Procedure To Be Followed to Initiate a Response**

- Identify resources to support deployment operation (e.g. vessel availability, beach closures, aerial support).
- Obtain verification that beaches have been cleared as appropriate
- The deployed vessel attends the site and sets up to five baited drum lines.
- In responding to a sighting, the drum lines must be moved back out to approximately 1km offshore within one hour of arrival at the site, and/or removed from the water no more than one hour after arrival at site.
- In responding to an attack, up to five drum lines may be set in the vicinity of the attack zone. Drum lines will be moved out to no further than 1km offshore and maintained and monitored for a maximum of seven days.

## ***GUIDELINES FOR FISHING FOR SHARKS POSING AN IMMINENT THREAT TO PUBLIC SAFETY***

### **Background**

Following five fatal shark attacks in Western Australia over the twelve months to September 2012, the Government announced additional policies to mitigate the risk of further attack.

One of the policies created the potential for a protected shark species to be taken before a fatal attack where it is deemed to be posing an imminent threat to public safety.

This policy only applies in State waters, (typically within three nautical miles of shore) where the relevant Minister has issued an appropriate exemption for this purpose. The policy does not apply in Commonwealth waters where a similar exemption would be required from the Federal Environment Minister.

An exemption had previously been issued by the Minister for Fisheries allowing authorised Department of Fisheries, (Department) officers to take certain sharks considered to be posing an imminent threat to public safety in State waters. Imminent threat had been interpreted under that exemption as applying to situations where:

- a fatal shark attack had already occurred;
- the relevant shark appeared to be remaining in surrounding waters; and
- there was a reasonable likelihood of people also being in those waters.

The following guidelines have been developed to assist decision makers<sup>1</sup>, in applying the new exemption and Government policy. The guidelines are not definitive as it is recognized that every situation where they are applied is likely to be different. Decision makers will, therefore, need to exercise judgment based on the available information which may be limited.

### **Confirmed Sightings**

Experience has shown that the identification of sharks can be difficult, with various reported sightings subsequently being attributed to sea mammals and fish. Accordingly, sightings should be verified before consideration is given to the threat of imminent attack.

Verification of a sighting should have regard to:

- the experience of the person making the sighting. (For example, sightings from experienced commercial fishers, Surf Life Saving WA representatives and officers from the Department and other relevant government agencies have tended to be more reliable than reports from the general public);

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<sup>1</sup> In most instances it is expected that the decision maker will be the Director General of the Department of Fisheries

- the amount of detail the informant is able to provide on the shark and its' behaviour; and
- whether the sighting is supported by photographic evidence or corroborated by other reported sightings.

### **Determining Imminent Threat**

Where a shark attack has been confirmed, consideration should be given to whether the shark continues to pose an imminent threat of further attack. Factors to be considered in this assessment should include:

- the veracity of the report;
- whether a shark has been sighted in the vicinity of the attack. (These sightings should typically be reported within hours of the attack to be relevant, though further sightings may be considered relevant in certain circumstances, particularly where the sightings are consistent with known facts about the shark that conducted the attack);
- the likelihood that the subsequent sighting is the same shark involved in the original attack; and
- the likelihood of people entering or remaining in the water without knowing the imminent threat posed by the shark.

In any event, an order to set capture gear may be warranted following a fatal attack in an effort to recover coronial evidence.

In the absence of an attack having taken place, a confirmed shark sighting may still be considered to pose an imminent threat in circumstances where there is considered to be a High Hazard and a High Risk.

#### *High Hazard*

Circumstances may be considered a high hazard when the confirmed sighting relates to a shark that is likely to be a species with a history of attacking people.

#### *High Risk*

Circumstances may be considered a high risk where the confirmed sighting occurs:

- within proximity of popular beaches. (Guidance may be taken in this regard to the Surf Life Saving WA beach closure protocol which relates to sightings within one kilometre);
- during daylight hours;
- in conditions that are likely to be conducive to people using the water; and
- measures to clear people from the water and keep them out for a reasonable period are unlikely to be effective in removing the imminent threat. (Guidance may be taken in this regard to the Surf Life Saving WA beach closure protocol which provides for beaches to be closed for 24hours following the last sighting after a fatal attack and one hour where a beach is closed in the absence of an attack).

Any assessment of the circumstances should consider whether there is a plausible explanation(s) for the shark sighting that is likely to be temporary. In some circumstances there may be prevailing conditions, such as the presence of a whale carcass, or seasonal fish aggregations which explain the presence of a shark. These circumstances may be consistent with high hazard and high risk but conducive to management without an order to set capture gear being required, (bearing in mind that an order to set capture gear should be predicated on public safety grounds, rather than public amenity).

Assessment of the circumstances should also recognise that an order to set capture gear may heighten the risk of attack. For example:

- the setting of capture gear may attract additional sharks to the proximity of popular beaches; and
- capturing a tagged shark may eliminate a key indicator of a temporary high hazard in the proximity of a popular beach.

Any consideration of the circumstances should be predicated on the expectation that people will exercise a reasonable level of responsibility for their own actions, including abiding by instructions from authorities to remain out of the water.

#### **Negating an Imminent Threat**

Where a shark is found to be posing an imminent threat of attack, consideration should initially be given to options for negating the threat.

Reasonable efforts should be made to inform people, (including relevant authorities) about the imminent threat. Standard shark hazard response procedures should also be implemented, such as:

- closing adjacent beaches to the public;
- ordering people from the water;
- re-tasking the shark surveillance helicopter(s) operated by Surf Life Saving WA;
- post sighting or incident details on social media services; and
- using additional media to warn people of the threat.

#### **Feasibility and Capability**

Where a shark is considered to be posing an imminent threat of attack and reasonable efforts to negate the imminent threat have failed, the feasibility and capability of taking the shark should be assessed. This assessment should have regard to whether:

- a commercial fisher, who has been contracted and authorised for the purpose, can respond to the location within one hour of the sighting;
- a suitable rigid hulled vessel with appropriately trained personnel, capture equipment and bait can respond to the location within one hour of the last confirmed sighting if a contracted commercial fisher is not available;

- the master of the vessel has deemed current and forecast marine conditions as safe working conditions for the deployment and retrieval of the capture gear, (with or without a hooked shark);
- the relevant authorities (such as local Government, land manager or surf lifesaving clubs) have agreed to administer beach closures in waters within proximity of areas where capture gear is set;
- the setting of capture gear could attract additional sharks to the area or pose an unreasonable risk of capture/entanglement of other wildlife;
- the setting of capture gear and potential taking of a shark will pose an unreasonable risk to the health and safety of relevant staff, contractors and the community; and
- the long-term benefit to public safety of tagging the shark (which will add to the knowledge of shark behaviours), might outweigh the arguments for destroying a captured shark.

### **Consultation**

Where the decision maker believes it may be appropriate to issue an order for a shark(s) be taken due to an imminent threat to public safety, it is desirable that he/she first consult with the Director General of the Department of Environment and Conservation (DEC) and the Director General of the Department of the Premier and Cabinet, (DPC) unless he/she considers the threat so imminent that action must be taken immediately.

Where possible, the Directors General of DEC and DPC should be provided with a copy of the proposed decision sheet, (**Attachment A**) to assist their consideration. In the event that either, or both, of the Directors General are unavailable, the decision maker is authorised to proceed.

### **Managing the carcass**

If a shark is subsequently captured and destroyed, consideration also needs to be given to whether the shark carcass should be retained or disposed of at sea.

Where the shark is suspected of having been involved in a fatal attack the carcass should be retained if possible and surrendered as potential coronial evidence.

In other instances, efforts should be made to maximize the research value from the carcass as such work could potentially provide insights into alternative methods to deter sharks away from humans. The carcass should be retained for research by the Department or other research providers where practical. However, it is recognized that circumstances may not be conducive to retaining the carcass. For example, many locations around the State do not have suitable coastal facilities for unloading a one or two tonne shark carcass and then transporting it to appropriate research centres.

Where retention of the shark carcass is not practical, efforts should still be made to maximize the research value through options such as the securing of tissue samples before the carcass is disposed of at sea.

Advice should also be provided to the relevant State and Federal government authorities where the order to set capture gear results in a protected species being destroyed.

### **Rescinding an order**

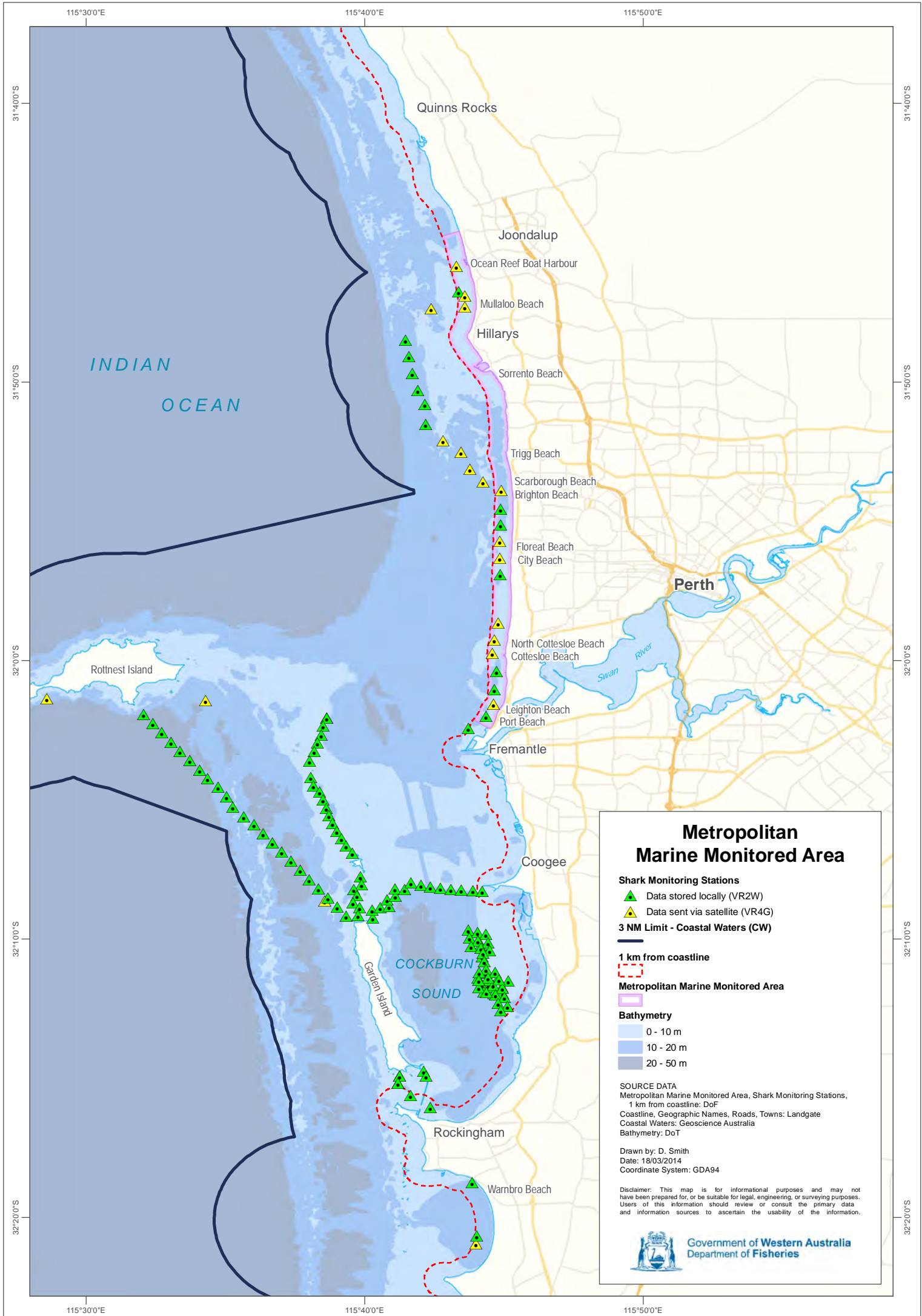
The order to take a shark is only expected to remain in place while there continues to be an imminent threat of attack, (refer above). A decision to rescind the order should have regard to whether:

- there have been any further sightings of a shark in the vicinity;
- reasonable period has elapsed to significantly diminish the likelihood of a shark being captured that poses an imminent threat. (Guidance may be taken in this regard to the Surf Life Saving WA beach closure protocol mentioned above);
- continued bait in the water may unnecessarily attract other sharks to the area; and
- reasonable and adequate steps have been undertaken to inform people of the reported hazard.

A decision maker specified in the exemption, (typically the Director General of the Department) may rescind an order to set gear and take a shark if he/she is satisfied that the imminent threat has passed. Information regarding the decision should then be conveyed to the public.

*Last updated 23 November*





### Metropolitan Marine Monitored Area

**Shark Monitoring Stations**

- ▲ Data stored locally (VR2W)
- ▲ Data sent via satellite (VR4G)

**3 NM Limit - Coastal Waters (CW)**

**1 km from coastline**

**Metropolitan Marine Monitored Area**


**Bathymetry**

- 0 - 10 m
- 10 - 20 m
- 20 - 50 m

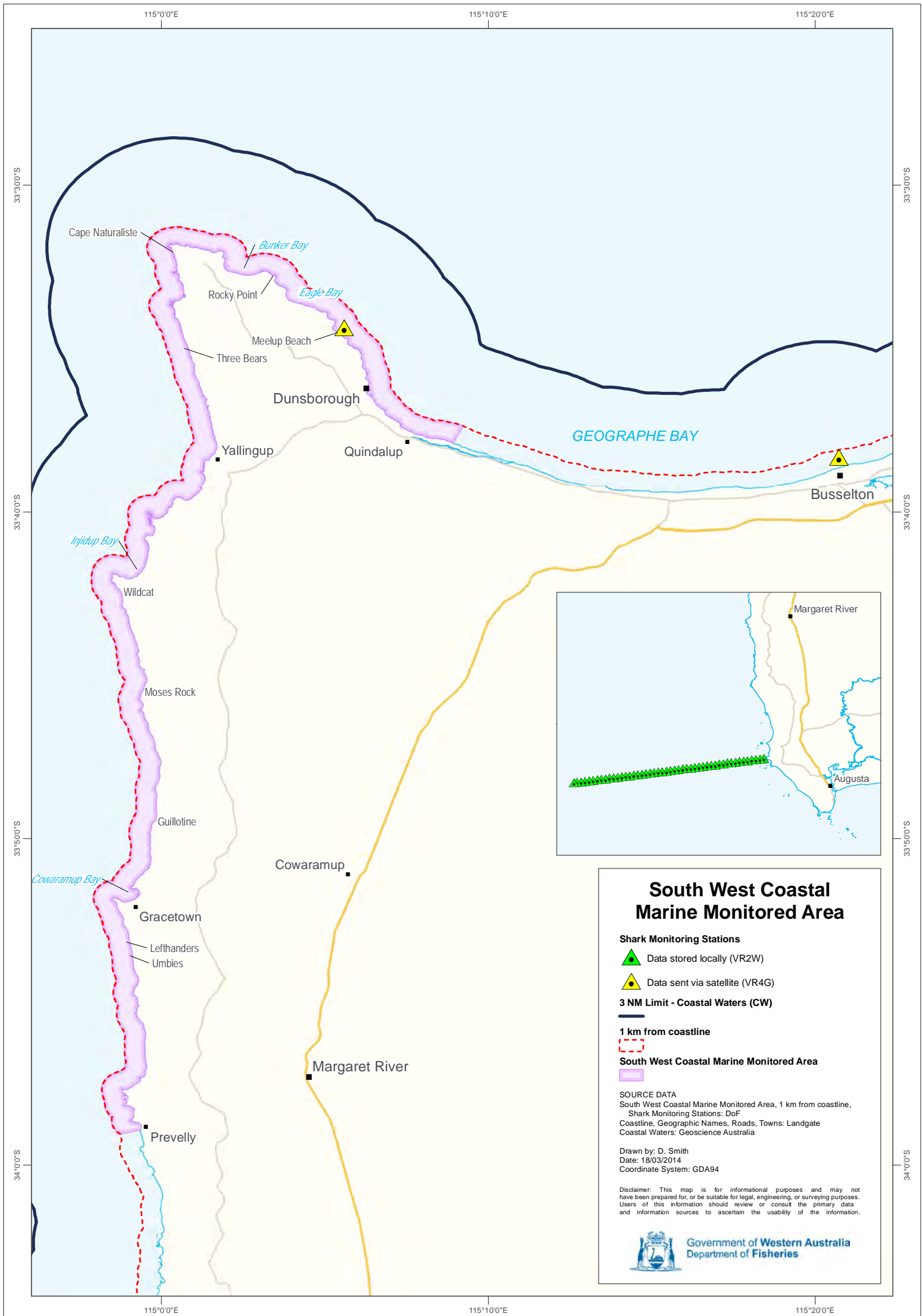
**SOURCE DATA**  
 Metropolitan Marine Monitored Area, Shark Monitoring Stations,  
 1 km from coastline: DoF  
 Coastline, Geographic Names, Roads, Towns: Landgate  
 Coastal Waters: Geoscience Australia  
 Bathymetry: DoT

Drawn by: D. Smith  
 Date: 18/03/2014  
 Coordinate System: GDA94

Disclaimer: This map is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information.





**Government of Western Australia**  
Department of Fisheries



## South West Coastal Marine Monitored Area

### Shark Monitoring Stations

-  Data stored locally (VR2W)
-  Data sent via satellite (VR4G)

### 3 NM Limit - Coastal Waters (CW)

### 1 km from coastline

### South West Coastal Marine Monitored Area

**SOURCE DATA**  
 South West Coastal Marine Monitored Area, 1 km from coastline,  
 Shark Monitoring Stations: DoF  
 Coastline, Geographic Names, Roads, Towns: Landgate  
 Coastal Waters: Geoscience Australia

Drawn by: D. Smith  
 Date: 18/03/2014  
 Coordinate System: GDA94

Disclaimer: This map is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information.



**Government of Western Australia**  
 Department of Fisheries

### Applied Research Program

- The Government has invested \$2 million in an applied research program.
- Grants of up to \$300,000 over a period of up three years were provided to Western Australian-based organisations, including universities, research institutes and industry.
- The funded research focuses on systems to detect hazardous sharks and deter attacks on ocean users.

### Research grants to detect hazardous sharks

Project	Researcher	Funding	Description
Sonar imaging and detection of sharks	Curtin University Centre for Marine Science and Technology (Dr Miles Parsons)	\$273,468	Evaluate the effectiveness of imaging sonar for underwater detection of sharks, identify the most likely detection method and create a framework for producing commercially viable shark detection.
Advanced vision system for automatic shark detection and tracking	University of Western Australia School of Computer Science and Software Engineering (Professor Mohammed Bennamoun)	\$203,234	Develop an advanced vision system for real-time automatic shark detection and tracking, by developing a novel set of advanced image processing algorithms.
Development and testing of a low impact acoustic-based shark detection system	University of Western Australia School of Physics (Dr Shane Chambers)	\$252,417	Develop and test a low impact acoustic-based shark detection system.

### Research grants to deter shark attack

<b>Project</b>	<b>Researcher</b>	<b>Funding</b>	<b>Description</b>
Development and testing of novel shark deterrents	University of Western Australia Oceans Institute (Assoc Professor Nathan Hart)	\$222,221	Develop and test novel shark deterrents including bubble curtains, underwater sounds and strobe lights.
Testing and enhancement of existing shark deterrents	University of Western Australia Oceans Institute (Professor Shaun Collin)	\$220,573	Independently test and possibly enhance existing shark deterrents including electric devices, acoustic repellents and chemical repellents.
Integrated surfboard electronic shark deterrent to protect surfers	Shark Shield Pty Ltd (Lindsay Lyon CEO)	\$300,000	Develop and test an integrated surfboard electronic shark deterrent to protect surfers.
Characterisation and masking of acoustic signatures of beach-goers that may attract sharks	Curtin Uni – Centre for Marine Science and Technology (Professor Christine Erbe)	\$130,124	Characterise and mask acoustic signatures of beach-goers that may attract sharks.
A case of a mistaken identity? Discovering the sensory cues that trigger shark attacks	University of Western Australia Oceans Institute (Assoc Professor Nathan Hart)	\$284,620	Discover the visual, electrical and hydrodynamic cues that trigger shark attack and develop specific design criteria for shark repellent or masking devices.

Director General  
Department of the Premier and Cabinet  
Dumas House  
2 Havelock Street  
WEST PERTH WA 6005

Our Ref 14-522310

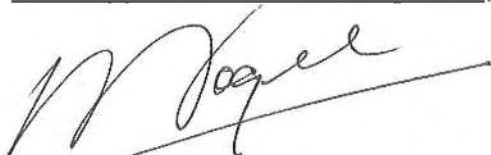
**NOTICE UNDER SECTION 39A(3)**  
***Environmental Protection Act 1986***

**PROPOSAL:** Shark Drum Line Deployment, Management and Associated Services  
**LOCATION:** Within defined marine monitoring areas in the Metropolitan and South West regions  
**PROPONENT:** Director General of the Department of the Premier and Cabinet on behalf of the State of Western Australia  
**DECISION:** Not Assessed – Public Advice Given

The Environmental Protection Authority (EPA) understands that you are undertaking the above proposal which has been referred to the Authority for consideration of its potential environmental impact.

This proposal raises a number of environmental issues. However, the EPA has decided not to subject this proposal to the environmental impact assessment process and the subsequent setting of formal conditions by the Minister for Environment under Part IV of the *Environmental Protection Act 1986* (EP Act). Nevertheless, the EPA provides the attached advice to you as the proponent, and other relevant authorities on the environmental aspects of the proposal.

The EPA's decision to not assess the proposal is open to appeal. There is a 14-day period, closing 26 March 2014. Information on the appeals process is available through the Office of the Appeals Convenor's website, [www.appealsconvenor.wa.gov.au](http://www.appealsconvenor.wa.gov.au), or by telephoning 6467 5190.



**Dr Paul Vogel**  
CHAIRMAN

For the Environmental Protection Authority  
Under Notice of Delegation No. 30 dated 24 January 2013

12 March 2014

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## **PUBLIC ADVICE UNDER SECTION 39A(7) ENVIRONMENTAL PROTECTION ACT 1986**

### **Background**

As part of a broader program of shark hazard mitigation (see details below), the Government of Western Australia is implementing a shark hazard mitigation strategy which involves the deployment of baited drum lines to capture target species of large sharks (the proposal).

The proposal involves the deployment of up to 72 baited drum lines and rapid response within marine monitoring areas (MMA) in the metropolitan and the South West regions until 30 April 2014. The proposal commenced on 25 January 2014 in the South West and 31 January 2014 in the metropolitan region.

The target species include white sharks (*Carcharodon carcharias*), tiger sharks (*Galeocerdo cuvier*) and bull sharks (*Carcharhinus leucas*) over three metres in length. The non-target species caught, including all sharks less than three metres are to be released alive if possible.

The proposal was referred to the Environmental Protection Authority (EPA) under section 38 of the *Environmental Protection Act 1986* on 14 January 2014.

The EPA received a considerable number of public comments during the seven day public comment period about the proposal. The comments and issues raised have been considered by the EPA in its decision and the advice and recommendation detailed below.

The EPA has considered the proposal in accordance with the requirements of the *Environmental Protection Act 1986* (EP Act) and the *Environmental Impact Assessment Administrative Procedures 2012*. In making its decision on whether to assess the proposal, the EPA considered the 10 principles of the significance test as detailed in clause 7 of the *Environmental Impact Assessment Administrative Procedures 2012*, including:

- values, sensitivity and quality of the environment which is likely to be impacted;
- extent (intensity, duration, magnitude and geographic footprint) of the likely impacts;
- consequence of the likely impacts (or change);
- resilience of the environment to cope with the impacts or change;
- cumulative impacts with other projects;
- level of confidence in the prediction of impacts and the success of proposed mitigation;
- objects of the Act, policies, guidelines, procedures and standards against which a proposal can be assessed;
- presence of strategic planning policy framework;

- presence of other statutory decision-making processes which regulate the mitigation of the potential effects on the environment to meet the EPA's objectives and principles for EIA; and
- public concern about the likely effects of the proposal, if implemented, on the environment.

## **1. Environmental Factor**

The EPA identified **Marine Fauna** to be the preliminary environmental factor relevant to this proposal. The EPA's objective for this environmental factor is to maintain the diversity, geographic distribution and viability of fauna at the species and population levels.

No other preliminary environmental factors were identified as relevant to the EPA's decision as to whether or not to assess this proposal.

The EPA considers that, based on information:

- provided with the referral of the proposal under section 38A of the EP Act;
- derived from its own inquiries; and,
- derived from comments received from the public,

and having regard to the objects and principles set out in Part 4A of the EP Act, the proposal does not warrant formal environmental impact assessment under the EP Act.

## **2. Advice and Recommendations regarding Environmental Issues**

The EPA received a considerable number of public comments during the seven day public comment about the proposal. In total the EPA received in the order of 10,000 comments through the EPA's consultation hub, 450 emails (half of which were pro forma) and approximately 12,000 comments forwarded from the Conservation Council of Western Australia.

The majority of the comments received were opposed to the proposal and requested the EPA undertake a formal assessment. Specifically, comments were of the view that the EPA should set the level of assessment at Assessment on Proponent Information (API), Category B (environmentally unacceptable) or at Public Environmental Review (PER) to provide for the opportunity for public submissions to be submitted on the proposal.

The majority of public comments focused on the following issues:

- the use of science based evidence to support the use and effectiveness of the program to reduce shark attacks;
- the need to evaluate non-lethal alternatives such as early detection, alarm systems and community education;

- the need for public engagement in the development and implementation of a broader program; and
- the potential ecological impacts associated with the program such as loss of apex predators on ecosystem processes, impacts to the white shark population and impacts to other marine fauna through by-catch (environmental issues detailed further below).

The majority of the public comments received were about the activity of deploying drum lines for catching and destroying sharks regardless of the duration and timing of deployment (as defined in this proposal).

In considering the potential impacts of the proposal on marine fauna, the EPA has had particular regard to:

- the findings and conclusions set out in the Department of Fisheries (DoF)'s *Research Advice on the Proposed Shark Mitigation Strategy using drum lines for January to April 2014*, which was published on the EPA's website along with the referral information on 12 February 2014. The advice concluded that the proposal posed a negligible risk to the target species of sharks, most of the non-target species of marine fauna and the broader ecosystem. The Dusky whaler was the only species identified as potentially requiring additional management interventions resulting from the strategy but this was considered to be unlikely;
- the mitigation strategies to reduce impacts to non-target species including the use of significantly large hooks, the use of no more than 36 drum lines in each marine monitoring area, and the daily monitoring and maintenance of drum lines from 6:00am to 6:00pm, seven days a week,
- the most up to date catch data which shows that it is mostly tiger sharks caught and the most recent advice received from the DoF which reiterated its advice that the proposal is still unlikely to have a measurable impact on the total tiger shark population in WA and therefore still represents a negligible risk; and
- the fact that there have been no by-catch of marine mammals and turtles, which increases the confidence in the DoF's predictions in its Research Advice.

As such, the EPA has concluded that the EPA's objectives for Marine fauna can be met with a high level of confidence because of the limited extent of the proposal in terms of the duration and geographic footprint. The EPA also considers that impacts to target and non-target species can be regulated under the *Fish Resources Management Act 1994* and the *Wildlife Conservation Act 1950*. Accordingly the EPA considers that the proposal is unlikely to have a significant effect on the environment and does not warrant formal environmental impact assessment under the EP Act.

### **3. Other advice**

#### **Broader shark hazard mitigation program**

The EPA notes that the current proposal for shark drum line deployment, management and associated services is a proposal within a broader shark hazard mitigation program.



The Government's shark hazard mitigation program includes:

- aerial and beach shark patrols;
- research into shark hazard mitigation strategies including the use of non-lethal alternatives;
- improved monitoring of tagged sharks for short term response and longer term research;
- improved coordination with respect to shark sightings and warning systems; and
- community awareness and engagement.

The EPA supports the continuation and further development of a broader program to monitor and research shark behaviour and investigate non-lethal alternatives in order to further minimise the potential environmental impacts to marine fauna.

Should there be intentions to implement a new proposal to deploy baited drum lines on an ongoing basis after 30 April 2014, then the EPA recommends that this new proposal be referred to the Authority in the context of the Government's broader shark hazard mitigation program. The referral should be accompanied by information and results from this current proposal and its environmental impacts, including the type, size, sex and number of species caught.

### **Stakeholders engaged in review of imminent threat policy in early December 2013**

All meetings took place in the Office of the Minister for Fisheries, unless otherwise stated.

Former Director General; Department of Fisheries  
Current Director General; Department of Fisheries  
Shark Response Unit; Department of Fisheries  
Research Division; Department of Fisheries  
Margaret River Board Riders and Yallingup Board Riders  
Surf Life Saving WA  
Recfishwest  
WAFIC  
Surfing WA  
Mullaloo Surf Club  
Former chair of Fisheries Research and Development Corporation (FRDC)  
Scientist from the University of Western Australia  
Scientist from Bond University  
West Australians for Shark Conservation  
Recreational water users  
WA Abalone Industry Association (external meeting)  
Fisheries Research and Development Corporation (FRDC) (external meeting)  
Scientist from the Marine Conservation Science Institute, USA (telephone)  
Scientist from James Cook University, Qld (telephone)  
Scientist from the University of Sydney (telephone)  
Commercial fisher (telephone)  
Manager of the Qld Shark Control Program (telephone)  
Department of Fire and Emergency Services (telephone)  
Director General; Department of Parks and Wildlife (telephone)  
WA Water Police (written correspondence)  
PADI Aware (written correspondence)  
CSIRO (written correspondence)



# EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 03/04/14 14:41:22

[Summary](#)

[Details](#)

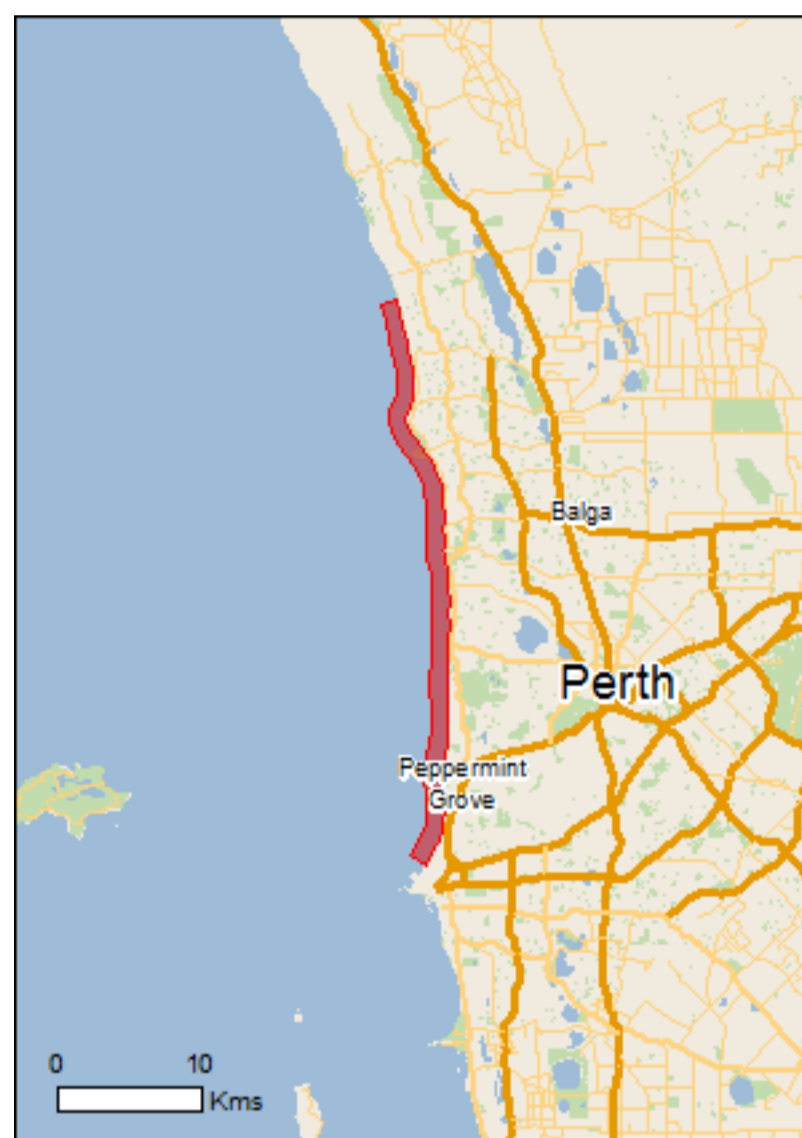
[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

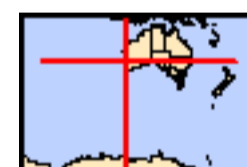
[Acknowledgements](#)



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

[Coordinates](#)

Buffer: 0.0Km



# Summary

## Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

<a href="#">World Heritage Properties:</a>	None
<a href="#">National Heritage Places:</a>	None
<a href="#">Wetlands of International Importance:</a>	None
<a href="#">Great Barrier Reef Marine Park:</a>	None
<a href="#">Commonwealth Marine Areas:</a>	None
<a href="#">Listed Threatened Ecological Communities:</a>	None
<a href="#">Listed Threatened Species:</a>	38
<a href="#">Listed Migratory Species:</a>	36

## Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As [heritage values](#) of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate.

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

<a href="#">Commonwealth Land:</a>	None
<a href="#">Commonwealth Heritage Places:</a>	None
<a href="#">Listed Marine Species:</a>	60
<a href="#">Whales and Other Cetaceans:</a>	13
<a href="#">Critical Habitats:</a>	None
<a href="#">Commonwealth Reserves Terrestrial:</a>	None
<a href="#">Commonwealth Reserves Marine</a>	None

## Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

<a href="#">Place on the RNE:</a>	3
<a href="#">State and Territory Reserves:</a>	None
<a href="#">Regional Forest Agreements:</a>	None
<a href="#">Invasive Species:</a>	42
<a href="#">Nationally Important Wetlands:</a>	None
<a href="#">Key Ecological Features (Marine)</a>	None

## Details

### Matters of National Environmental Significance

Listed Threatened Species		[ Resource Information ]
Name	Status	Type of Presence
<b>Birds</b>		
<a href="#">Anous tenuirostris melanops</a> Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
<a href="#">Botaurus poiciloptilus</a> Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
<a href="#">Calyptorhynchus banksii naso</a> Forest Red-tailed Black-Cockatoo [67034]	Vulnerable	Species or species habitat may occur within area
<a href="#">Calyptorhynchus latirostris</a> Carnaby's Black-Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat likely to occur within area
<a href="#">Diomedea epomophora epomophora</a> Southern Royal Albatross [25996]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea epomophora sanfordi</a> Northern Royal Albatross [82331]	Endangered	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea exulans amsterdamensis</a> Amsterdam Albatross [82330]	Endangered	Species or species habitat may occur within area
<a href="#">Diomedea exulans exulans</a> Tristan Albatross [82337]	Endangered	Species or species habitat may occur within area
<a href="#">Diomedea exulans (sensu lato)</a> Wandering Albatross [1073]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Name	Status	Type of Presence
<a href="#">Leipoa ocellata</a> Malleefowl [934]	Vulnerable	Species or species habitat may occur within area
<a href="#">Macronectes giganteus</a> Southern Giant-Petrel [1060]	Endangered	Species or species habitat may occur within area
<a href="#">Macronectes halli</a> Northern Giant-Petrel [1061]	Vulnerable	Species or species habitat may occur within area
<a href="#">Rostratula australis</a> Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
<a href="#">Sternula nereis nereis</a> Australian Fairy Tern [82950]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Thalassarche cauta cauta</a> Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thalassarche cauta steadi</a> White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thalassarche melanophris</a> Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche melanophris impavida</a> Campbell Albatross [82449]	Vulnerable	Species or species habitat may occur within area
<b>Mammals</b>		
<a href="#">Balaenoptera musculus</a> Blue Whale [36]	Endangered	Species or species habitat may occur within area
<a href="#">Dasyurus geoffroii</a> Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Eubalaena australis</a> Southern Right Whale [40]	Endangered	Breeding known to occur within area
<a href="#">Megaptera novaeangliae</a> Humpback Whale [38]	Vulnerable	Congregation or aggregation known to occur within area
<a href="#">Neophoca cinerea</a> Australian Sea-lion [22]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Pseudocheirus occidentalis</a> Western Ringtail Possum, Ngwayir [25911]	Vulnerable	Species or species habitat likely to occur within area
<b>Plants</b>		
<a href="#">Caladenia huegelii</a> King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat likely to occur within area
<a href="#">Centrolepis caespitosa</a> [6393]	Endangered	Species or species habitat likely to occur within area
<a href="#">Diuris micrantha</a> Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
<a href="#">Diuris purdiei</a> Purdie's Donkey-orchid [12950]	Endangered	Species or species habitat may occur within area
<a href="#">Drakaea elastica</a> Glossy-leaved Hammer-orchid, Praying Virgin [16753]	Endangered	Species or species habitat likely to occur within area
<a href="#">Drakaea micrantha</a> Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat may occur within area
<a href="#">Lepidosperma rostratum</a> Beaked Lepidosperma [14152]	Endangered	Species or species habitat likely to occur within area

## Reptiles

<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
<a href="#">Natator depressus</a> Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

## Sharks

<a href="#">Carcharias taurus (west coast population)</a> Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat may occur within area
<a href="#">Carcharodon carcharias</a> Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
<a href="#">Rhincodon typus</a> Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

## Listed Migratory Species

[ [Resource Information](#) ]

\* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
<b>Migratory Marine Birds</b>		
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<a href="#">Diomedea amsterdamensis</a> Amsterdam Albatross [64405]	Endangered*	Species or species habitat may occur within area
<a href="#">Diomedea dabbenena</a> Tristan Albatross [66471]	Endangered*	Species or species habitat may occur within area
<a href="#">Diomedea epomophora (sensu stricto)</a> Southern Royal Albatross [1072]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea exulans (sensu lato)</a> Wandering Albatross [1073]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Name	Threatened	Type of Presence
<a href="#">Diomedea sanfordi</a> Northern Royal Albatross [64456]	Endangered*	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Macronectes giganteus</a> Southern Giant-Petrel [1060]	Endangered	Species or species habitat may occur within area
<a href="#">Macronectes halli</a> Northern Giant-Petrel [1061]	Vulnerable	Species or species habitat may occur within area
<a href="#">Puffinus carneipes</a> Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Foraging, feeding or related behaviour likely to occur within area
<a href="#">Sterna anaethetus</a> Bridled Tern [814]		Foraging, feeding or related behaviour likely to occur within area
<a href="#">Sterna caspia</a> Caspian Tern [59467]		Foraging, feeding or related behaviour known to occur within area
<a href="#">Sterna dougallii</a> Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thalassarche cauta (sensu stricto)</a> Shy Albatross, Tasmanian Shy Albatross [64697]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thalassarche impavida</a> Campbell Albatross [64459]	Vulnerable*	Species or species habitat may occur within area
<a href="#">Thalassarche melanophris</a> Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche steadi</a> White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
<b>Migratory Marine Species</b>		
<a href="#">Balaenoptera edeni</a> Bryde's Whale [35]		Species or species habitat may occur within area
<a href="#">Balaenoptera musculus</a> Blue Whale [36]	Endangered	Species or species habitat may occur within area
<a href="#">Caperea marginata</a> Pygmy Right Whale [39]		Species or species habitat may occur within area
<a href="#">Carcharodon carcharias</a> Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area



Name	Threatened	Type of Presence
<a href="#">Eubalaena australis</a> Southern Right Whale [40]	Endangered	Breeding known to occur within area
<a href="#">Lagenorhynchus obscurus</a> Dusky Dolphin [43]		Species or species habitat may occur within area
<a href="#">Lamna nasus</a> Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
<a href="#">Manta birostris</a> Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
<a href="#">Megaptera novaeangliae</a> Humpback Whale [38]	Vulnerable	Congregation or aggregation known to occur within area
<a href="#">Natator depressus</a> Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<a href="#">Orcinus orca</a> Killer Whale, Orca [46]		Species or species habitat may occur within area
<a href="#">Rhincodon typus</a> Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

#### Migratory Terrestrial Species

<a href="#">Haliaeetus leucogaster</a> White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
<a href="#">Merops ornatus</a> Rainbow Bee-eater [670]		Species or species habitat may occur within area

#### Migratory Wetlands Species

<a href="#">Ardea alba</a> Great Egret, White Egret [59541]		Breeding known to occur within area
<a href="#">Ardea ibis</a> Cattle Egret [59542]		Species or species habitat likely to occur within area
<a href="#">Rostratula benghalensis (sensu lato)</a> Painted Snipe [889]	Endangered*	Species or species habitat may occur within area

#### Other Matters Protected by the EPBC Act

##### Listed Marine Species [\[ Resource Information \]](#)

\* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
<b>Birds</b>		
<a href="#">Anous tenuirostris melanops</a> Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
<a href="#">Ardea alba</a> Great Egret, White Egret [59541]		Breeding known to occur within area
<a href="#">Ardea ibis</a> Cattle Egret [59542]		Species or species habitat likely to occur within area
<a href="#">Diomedea amsterdamensis</a> Amsterdam Albatross [64405]	Endangered*	Species or species habitat may occur within area
<a href="#">Diomedea dabbenena</a> Tristan Albatross [66471]	Endangered*	Species or species habitat may occur within area
<a href="#">Diomedea epomophora (sensu stricto)</a> Southern Royal Albatross [1072]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea exulans (sensu lato)</a> Wandering Albatross [1073]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea sanfordi</a> Northern Royal Albatross [64456]	Endangered*	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Haliaeetus leucogaster</a> White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
<a href="#">Larus pacificus</a> Pacific Gull [811]		Foraging, feeding or related behaviour may occur within area
<a href="#">Macronectes giganteus</a> Southern Giant-Petrel [1060]	Endangered	Species or species habitat may occur within area
<a href="#">Macronectes halli</a> Northern Giant-Petrel [1061]	Vulnerable	Species or species habitat may occur within area
<a href="#">Merops ornatus</a> Rainbow Bee-eater [670]		Species or species habitat may occur within area
<a href="#">Pandion haliaetus</a> Osprey [952]		Species or species habitat known to occur within area
<a href="#">Puffinus assimilis</a> Little Shearwater [59363]		Foraging, feeding or related behaviour known to occur within area
<a href="#">Puffinus carneipes</a> Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Foraging, feeding or related behaviour likely to occur within area
<a href="#">Rostratula benghalensis (sensu lato)</a> Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
<a href="#">Sterna anaethetus</a> Bridled Tern [814]		Foraging, feeding or related behaviour likely to occur within area
<a href="#">Sterna caspia</a> Caspian Tern [59467]		Foraging, feeding or related behaviour known to occur within area
<a href="#">Sterna dougallii</a> Roseate Tern [817]		Foraging, feeding or

Name	Threatened	Type of Presence
<a href="#">Thalassarche cauta (sensu stricto)</a> Shy Albatross, Tasmanian Shy Albatross [64697]	Vulnerable*	related behaviour likely to occur within area Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thalassarche impavida</a> Campbell Albatross [64459]	Vulnerable*	Species or species habitat may occur within area
<a href="#">Thalassarche melanophris</a> Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche steadi</a> White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
<b>Fish</b>		
<a href="#">Acentronura australe</a> Southern Pygmy Pipehorse [66185]		Species or species habitat may occur within area
<a href="#">Campichthys galei</a> Gale's Pipefish [66191]		Species or species habitat may occur within area
<a href="#">Choeroichthys suillus</a> Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
<a href="#">Halicampus brocki</a> Brock's Pipefish [66219]		Species or species habitat may occur within area
<a href="#">Heraldia nocturna</a> Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
<a href="#">Hippocampus angustus</a> Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
<a href="#">Hippocampus breviceps</a> Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area
<a href="#">Hippocampus subelongatus</a> West Australian Seahorse [66722]		Species or species habitat may occur within area
<a href="#">Histiogamphelus cristatus</a> Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area
<a href="#">Lissocampus caudalis</a> Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area
<a href="#">Lissocampus fatiloquus</a> Prophet's Pipefish [66250]		Species or species habitat may occur within area
<a href="#">Lissocampus runa</a> Javelin Pipefish [66251]		Species or species habitat may occur within area
<a href="#">Maroubra perserrata</a> Sawtooth Pipefish [66252]		Species or species habitat may occur within area
<a href="#">Mitotichthys meraculus</a> Western Crested Pipefish [66259]		Species or species

Name	Threatened	Type of Presence
<a href="#">Nannocampus subosseus</a> Bonyhead Pipefish, Bony-headed Pipefish [66264]		habitat may occur within area  Species or species habitat may occur within area
<a href="#">Phycodurus eques</a> Leafy Seadragon [66267]		Species or species habitat may occur within area
<a href="#">Phyllopteryx taeniolatus</a> Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
<a href="#">Pugnaso curtirostris</a> Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area
<a href="#">Solegnathus lettiensis</a> Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
<a href="#">Stigmatopora argus</a> Spotted Pipefish, Gulf Pipefish [66276]		Species or species habitat may occur within area
<a href="#">Stigmatopora nigra</a> Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
<a href="#">Syngnathoides biaculeatus</a> Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
<a href="#">Urocampus carinirostris</a> Hairy Pipefish [66282]		Species or species habitat may occur within area
<a href="#">Vanacampus margaritifer</a> Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
<a href="#">Vanacampus phillipi</a> Port Phillip Pipefish [66284]		Species or species habitat may occur within area
<a href="#">Vanacampus poecilolaemus</a> Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
<b>Mammals</b>		
<a href="#">Arctocephalus forsteri</a> New Zealand Fur-seal [20]		Species or species habitat may occur within area
<a href="#">Neophoca cinerea</a> Australian Sea-lion [22]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<b>Reptiles</b>		
<a href="#">Aipysurus pooleorum</a> Shark Bay Seasnake [66061]		Species or species habitat may occur within area
<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Name	Threatened	Type of Presence
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
<a href="#">Disteira kingii</a> Spectacled Seasnake [1123]		Species or species habitat may occur within area
<a href="#">Natator depressus</a> Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<a href="#">Pelamis platurus</a> Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

## Whales and other Cetaceans [ Resource Information ]

Name	Status	Type of Presence
<b>Mammals</b>		
<a href="#">Balaenoptera acutorostrata</a> Minke Whale [33]		Species or species habitat may occur within area
<a href="#">Balaenoptera edeni</a> Bryde's Whale [35]		Species or species habitat may occur within area
<a href="#">Balaenoptera musculus</a> Blue Whale [36]	Endangered	Species or species habitat may occur within area
<a href="#">Caperea marginata</a> Pygmy Right Whale [39]		Species or species habitat may occur within area
<a href="#">Delphinus delphis</a> Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
<a href="#">Eubalaena australis</a> Southern Right Whale [40]	Endangered	Breeding known to occur within area
<a href="#">Grampus griseus</a> Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
<a href="#">Lagenorhynchus obscurus</a> Dusky Dolphin [43]		Species or species habitat may occur within area
<a href="#">Megaptera novaeangliae</a> Humpback Whale [38]	Vulnerable	Congregation or aggregation known to occur within area
<a href="#">Orcinus orca</a> Killer Whale, Orca [46]		Species or species habitat may occur within area
<a href="#">Stenella attenuata</a> Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
<a href="#">Tursiops aduncus</a> Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
<a href="#">Tursiops truncatus s. str.</a> Bottlenose Dolphin [68417]		Species or species habitat may occur within area

## Extra Information

### Places on the RNE [\[ Resource Information \]](#)

Note that not all Indigenous sites may be listed.

Name	State	Status
<b>Natural</b>		
<a href="#">Marmion Marine Park</a>	WA	Indicative Place
<a href="#">Whitfords Coastal Strip</a>	WA	Indicative Place
<b>Historic</b>		
<a href="#">Elizabeth Shipwreck</a>	WA	Registered

### Invasive Species [\[ Resource Information \]](#)

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resources Audit, 2001.

Name	Status	Type of Presence
<b>Birds</b>		
<a href="#">Acridotheres tristis</a> Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
<a href="#">Anas platyrhynchos</a> Mallard [974]		Species or species habitat likely to occur within area
<a href="#">Carduelis carduelis</a> European Goldfinch [403]		Species or species habitat likely to occur within area
<a href="#">Columba livia</a> Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
<a href="#">Passer domesticus</a> House Sparrow [405]		Species or species habitat likely to occur within area
<a href="#">Passer montanus</a> Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
<a href="#">Streptopelia chinensis</a> Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
<a href="#">Streptopelia senegalensis</a> Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
<a href="#">Sturnus vulgaris</a> Common Starling [389]		within area  Species or species habitat likely to occur within area
<a href="#">Turdus merula</a> Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
<b>Mammals</b>		
<a href="#">Bos taurus</a> Domestic Cattle [16]		Species or species habitat likely to occur within area
<a href="#">Canis lupus familiaris</a> Domestic Dog [82654]		Species or species habitat likely to occur within area
<a href="#">Felis catus</a> Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
<a href="#">Funambulus pennantii</a> Northern Palm Squirrel, Five-striped Palm Squirrel [129]		Species or species habitat likely to occur within area
<a href="#">Mus musculus</a> House Mouse [120]		Species or species habitat likely to occur within area
<a href="#">Oryctolagus cuniculus</a> Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
<a href="#">Rattus norvegicus</a> Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
<a href="#">Rattus rattus</a> Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
<a href="#">Vulpes vulpes</a> Red Fox, Fox [18]		Species or species habitat likely to occur within area
<b>Plants</b>		
<a href="#">Anredera cordifolia</a> Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
<a href="#">Asparagus aethiopicus</a> Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
<a href="#">Asparagus asparagoides</a> Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
<a href="#">Asparagus declinatus</a> Bridal Veil, Bridal Veil Creeper, Pale Berry Asparagus Fern, Asparagus Fern, South African Creeper [66908]		Species or species habitat likely to occur within area
<a href="#">Asparagus plumosus</a> Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
<a href="#">Brachiaria mutica</a> Para Grass [5879]		Species or species habitat may occur within area
<a href="#">Cenchrus ciliaris</a> Buffel-grass, Black Buffel-grass [20213]		Species or species

Name	Status	Type of Presence
<a href="#">Chrysanthemoides monilifera</a> Bitou Bush, Boneseed [18983]		habitat may occur within area  Species or species habitat may occur within area
<a href="#">Chrysanthemoides monilifera subsp. monilifera</a> Boneseed [16905]		Species or species habitat likely to occur within area
<a href="#">Genista sp. X Genista monspessulana</a> Broom [67538]		Species or species habitat may occur within area
<a href="#">Lantana camara</a> Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
<a href="#">Lycium ferocissimum</a> African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
<a href="#">Olea europaea</a> Olive, Common Olive [9160]		Species or species habitat may occur within area
<a href="#">Opuntia spp.</a> Prickly Pears [82753]		Species or species habitat likely to occur within area
<a href="#">Pinus radiata</a> Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
<a href="#">Protasparagus plumosus</a> Climbing Asparagus-fern, Ferny Asparagus [11747]		Species or species habitat likely to occur within area
<a href="#">Rubus fruticosus aggregate</a> Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
<a href="#">Sagittaria platyphylla</a> Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
<a href="#">Salix spp. except S.babylonica, S.x calodendron &amp; S.x reichardtii</a> Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
<a href="#">Salvinia molesta</a> Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
<a href="#">Tamarix aphylla</a> Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area
<b>Reptiles</b>		
<a href="#">Hemidactylus frenatus</a> Asian House Gecko [1708]		Species or species habitat likely to occur within area
<a href="#">Ramphotyphlops braminus</a> Flowerpot Blind Snake, Brahminy Blind Snake, Cacing Besi [1258]		Species or species habitat likely to occur within area



# Coordinates

-32.03549437 115.731511,-32.03396654 115.7331586,-32.0253453 115.737075,-32.02316082  
115.7395392,-32.01770202 115.7404303,-32.01512358 115.7402758,-32.01272185  
115.7409095,-32.00595313 115.7402955,-32.00162629 115.7401496,-31.99690283  
115.7397901,-31.99202245 115.7401187,-31.98614181 115.7414091,-31.98195974  
115.7413319,-31.97746342 115.7426538,-31.97532558 115.7428109,-31.97146706

## Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in the identification of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World Heritage and Ramsar sites, National Heritage places, and International

Important Commonwealth, and State Territory reserves, listed threatened and marine species and listed threatened ecological communities. Mapping of Commonwealth and State Territory maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distribution is well known maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under type of presence. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic

distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and  
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

115.75133,-32.00662 115.75085,-32.01375 115.75166,-32.01591 115.75082,-32.01754  
115.75133,-32.00662 115.75085,-32.01375 115.75166,-32.01591 115.75082,-32.01754  
115.74913,-32.02998 115.74655,-32.04058 115.74105,-32.03549 115.731511

- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.



# Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [-Department of Environment, Climate Change and Water, New South Wales](#)
- [-Department of Sustainability and Environment, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment and Natural Resources, South Australia](#)
- [-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts](#)
- [-Environmental and Resource Management, Queensland](#)
- [-Department of Environment and Conservation, Western Australia](#)
- [-Department of the Environment, Climate Change, Energy and Water](#)
- [-Birds Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- Natural history museums of Australia
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-SA Museum](#)
- [-Queensland Museum](#)
- [-Online Zoological Collections of Australian Museums](#)
- [-Queensland Herbarium](#)
- [-National Herbarium of NSW](#)
- [-Royal Botanic Gardens and National Herbarium of Victoria](#)
- [-Tasmanian Herbarium](#)
- [-State Herbarium of South Australia](#)
- [-Northern Territory Herbarium](#)
- [-Western Australian Herbarium](#)
- [-Australian National Herbarium, Atherton and Canberra](#)
- [-University of New England](#)
- [-Ocean Biogeographic Information System](#)
- [-Australian Government, Department of Defence](#)
- [-State Forests of NSW](#)
- [-Geoscience Australia](#)
- [-CSIRO](#)
- Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact Us](#) page.



# EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 03/04/14 14:19:21

[Summary](#)

[Details](#)

[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

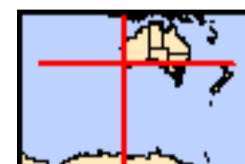
[Acknowledgements](#)



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

[Coordinates](#)

[Buffer: 0.0Km](#)



# Summary

## Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

<a href="#">World Heritage Properties:</a>	None
<a href="#">National Heritage Places:</a>	None
<a href="#">Wetlands of International Importance:</a>	None
<a href="#">Great Barrier Reef Marine Park:</a>	None
<a href="#">Commonwealth Marine Areas:</a>	None
<a href="#">Listed Threatened Ecological Communities:</a>	None
<a href="#">Listed Threatened Species:</a>	45
<a href="#">Listed Migratory Species:</a>	34

## Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As [heritage values](#) of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate.

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

<a href="#">Commonwealth Land:</a>	None
<a href="#">Commonwealth Heritage Places:</a>	None
<a href="#">Listed Marine Species:</a>	55
<a href="#">Whales and Other Cetaceans:</a>	13
<a href="#">Critical Habitats:</a>	None
<a href="#">Commonwealth Reserves Terrestrial:</a>	None
<a href="#">Commonwealth Reserves Marine</a>	None

## Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

<a href="#">Place on the RNE:</a>	2
<a href="#">State and Territory Reserves:</a>	2
<a href="#">Regional Forest Agreements:</a>	1
<a href="#">Invasive Species:</a>	26
<a href="#">Nationally Important Wetlands:</a>	None
<a href="#">Key Ecological Features (Marine)</a>	None

## Details

### Matters of National Environmental Significance

Listed Threatened Species		[ Resource Information ]
Name	Status	Type of Presence
<b>Birds</b>		
<a href="#">Anous tenuirostris melanops</a> Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
<a href="#">Botaurus poiciloptilus</a> Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area
<a href="#">Calyptorhynchus banksii naso</a> Forest Red-tailed Black-Cockatoo [67034]	Vulnerable	Species or species habitat may occur within area
<a href="#">Calyptorhynchus baudinii</a> Baudin's Black-Cockatoo, Long-billed Black-Cockatoo [769]	Vulnerable	Breeding known to occur within area
<a href="#">Calyptorhynchus latirostris</a> Carnaby's Black-Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Breeding likely to occur within area
<a href="#">Diomedea epomophora epomophora</a> Southern Royal Albatross [25996]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea epomophora sanfordi</a> Northern Royal Albatross [82331]	Endangered	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea exulans amsterdamensis</a> Amsterdam Albatross [82330]	Endangered	Species or species habitat may occur within area
<a href="#">Diomedea exulans exulans</a> Tristan Albatross [82337]	Endangered	Species or species habitat may occur within area
<a href="#">Diomedea exulans (sensu lato)</a> Wandering Albatross [1073]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Name	Status	Type of Presence
<a href="#">Macronectes giganteus</a> Southern Giant-Petrel [1060]	Endangered	Species or species habitat may occur within area
<a href="#">Macronectes halli</a> Northern Giant-Petrel [1061]	Vulnerable	Species or species habitat may occur within area
<a href="#">Sternula nereis nereis</a> Australian Fairy Tern [82950]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche cauta cauta</a> Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thalassarche cauta steadi</a> White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thalassarche melanophris</a> Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche melanophris impavida</a> Campbell Albatross [82449]	Vulnerable	Species or species habitat may occur within area
<b>Mammals</b>		
<a href="#">Balaenoptera musculus</a> Blue Whale [36]	Endangered	Congregation or aggregation known to occur within area
<a href="#">Dasyurus geoffroii</a> Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Eubalaena australis</a> Southern Right Whale [40]	Endangered	Breeding known to occur within area
<a href="#">Megaptera novaeangliae</a> Humpback Whale [38]	Vulnerable	Congregation or aggregation known to occur within area
<a href="#">Neophoca cinerea</a> Australian Sea-lion [22]	Vulnerable	Species or species habitat may occur within area
<a href="#">Pseudocheirus occidentalis</a> Western Ringtail Possum, Ngwayir [25911]	Vulnerable	Breeding known to occur within area
<b>Plants</b>		
<a href="#">Banksia nivea subsp. uliginosa</a> Swamp Honeypot [82766]	Endangered	Species or species habitat likely to occur within area
<a href="#">Banksia squarrosa subsp. argillacea</a> Whicher Range Dryandra [82769]	Vulnerable	Species or species habitat may occur within area
<a href="#">Caladenia caesarea subsp. maritima</a> Cape Spider-orchid [64856]	Endangered	Species or species habitat likely to occur within area
<a href="#">Caladenia huegelii</a> King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat known to occur within area
<a href="#">Caladenia viridescens</a> Dunsborough Spider-orchid [56776]	Endangered	Species or species habitat likely to occur within area

Name	Status	Type of Presence
<a href="#">Calectasia cyanea</a> Blue Tinsel Lily [7669]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Centrolepis caespitosa</a> [6393]	Endangered	Species or species habitat likely to occur within area
<a href="#">Chamelaucium sp. C Coast Plain (R.D.Royce 4872)</a> Royce's Waxflower [82023]	Vulnerable	Species or species habitat may occur within area
<a href="#">Darwinia foetida</a> Mucheas Bell [83190]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Drakaea elastica</a> Glossy-leafed Hammer-orchid, Praying Virgin [16753]	Endangered	Species or species habitat may occur within area
<a href="#">Drakaea micrantha</a> Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Eucalyptus phylacis</a> Meelup Mallee [56422]	Endangered	Species or species habitat known to occur within area
<a href="#">Gastrolobium papilio</a> Butterfly-leaved Gastrolobium [78415]	Endangered	Species or species habitat may occur within area
<a href="#">Sphenotoma drummondii</a> Mountain Paper-heath [21160]	Endangered	Species or species habitat may occur within area
<a href="#">Wurmbea calcicola</a> Naturaliste Nancy [64691]	Endangered	Species or species habitat known to occur within area
<b>Reptiles</b>		
<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
<a href="#">Natator depressus</a> Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<b>Sharks</b>		
<a href="#">Carcharias taurus (west coast population)</a> Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat may occur within area
<a href="#">Carcharodon carcharias</a> Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
<a href="#">Rhincodon typus</a> Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
<b>Listed Migratory Species</b>		<b>[ Resource Information ]</b>
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence



Name	Threatened	Type of Presence
<b>Migratory Marine Birds</b>		
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<a href="#">Diomedea amsterdamensis</a> Amsterdam Albatross [64405]	Endangered*	Species or species habitat may occur within area
<a href="#">Diomedea dabbenena</a> Tristan Albatross [66471]	Endangered*	Species or species habitat may occur within area
<a href="#">Diomedea epomophora (sensu stricto)</a> Southern Royal Albatross [1072]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea exulans (sensu lato)</a> Wandering Albatross [1073]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea sanfordi</a> Northern Royal Albatross [64456]	Endangered*	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Macronectes giganteus</a> Southern Giant-Petrel [1060]	Endangered	Species or species habitat may occur within area
<a href="#">Macronectes halli</a> Northern Giant-Petrel [1061]	Vulnerable	Species or species habitat may occur within area
<a href="#">Puffinus carneipes</a> Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat likely to occur within area
<a href="#">Sterna anaethetus</a> Bridled Tern [814]		Foraging, feeding or related behaviour likely to occur within area
<a href="#">Sterna caspia</a> Caspian Tern [59467]		Foraging, feeding or related behaviour known to occur within area
<a href="#">Thalassarche cauta (sensu stricto)</a> Shy Albatross, Tasmanian Shy Albatross [64697]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thalassarche impavida</a> Campbell Albatross [64459]	Vulnerable*	Species or species habitat may occur within area
<a href="#">Thalassarche melanophris</a> Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche steadi</a> White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
<b>Migratory Marine Species</b>		
<a href="#">Balaenoptera edeni</a> Bryde's Whale [35]		Species or species habitat may occur within area
<a href="#">Balaenoptera musculus</a> Blue Whale [36]	Endangered	Congregation or aggregation known to occur within area
<a href="#">Caperea marginata</a> Pygmy Right Whale [39]		Species or species habitat may occur within

Name	Threatened	Type of Presence area
<a href="#">Carcharodon carcharias</a> Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
<a href="#">Eubalaena australis</a> Southern Right Whale [40]	Endangered	Breeding known to occur within area
<a href="#">Lagenorhynchus obscurus</a> Dusky Dolphin [43]		Species or species habitat may occur within area
<a href="#">Lamna nasus</a> Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
<a href="#">Manta birostris</a> Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
<a href="#">Megaptera novaeangliae</a> Humpback Whale [38]	Vulnerable	Congregation or aggregation known to occur within area
<a href="#">Natator depressus</a> Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<a href="#">Orcinus orca</a> Killer Whale, Orca [46]		Species or species habitat may occur within area
<a href="#">Rhincodon typus</a> Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
<b>Migratory Terrestrial Species</b>		
<a href="#">Haliaeetus leucogaster</a> White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
<a href="#">Merops ornatus</a> Rainbow Bee-eater [670]		Species or species habitat may occur within area
<b>Migratory Wetlands Species</b>		
<a href="#">Ardea alba</a> Great Egret, White Egret [59541]		Species or species habitat known to occur within area
<a href="#">Ardea ibis</a> Cattle Egret [59542]		Species or species habitat likely to occur within area

## Other Matters Protected by the EPBC Act

### Listed Marine Species [ [Resource Information](#) ]

\* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
<b>Birds</b>		
<a href="#">Anous tenuirostris melanops</a> Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<a href="#">Ardea alba</a> Great Egret, White Egret [59541]		Species or species habitat known to occur within area
<a href="#">Ardea ibis</a> Cattle Egret [59542]		Species or species habitat likely to occur within area
<a href="#">Diomedea amsterdamensis</a> Amsterdam Albatross [64405]	Endangered*	Species or species habitat may occur within area
<a href="#">Diomedea dabbenena</a> Tristan Albatross [66471]	Endangered*	Species or species habitat may occur within area
<a href="#">Diomedea epomophora (sensu stricto)</a> Southern Royal Albatross [1072]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea exulans (sensu lato)</a> Wandering Albatross [1073]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea sanfordi</a> Northern Royal Albatross [64456]	Endangered*	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Haliaeetus leucogaster</a> White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
<a href="#">Larus novaehollandiae</a> Silver Gull [810]		Breeding known to occur within area
<a href="#">Larus pacificus</a> Pacific Gull [811]		Foraging, feeding or related behaviour may occur within area
<a href="#">Macronectes giganteus</a> Southern Giant-Petrel [1060]	Endangered	Species or species habitat may occur within area
<a href="#">Macronectes halli</a> Northern Giant-Petrel [1061]	Vulnerable	Species or species habitat may occur within area
<a href="#">Merops ornatus</a> Rainbow Bee-eater [670]		Species or species habitat may occur within area
<a href="#">Pandion haliaetus</a> Osprey [952]		Breeding known to occur within area

Name	Threatened	Type of Presence
<a href="#">Phaethon rubricauda</a> Red-tailed Tropicbird [994]		Breeding known to occur within area
<a href="#">Puffinus assimilis</a> Little Shearwater [59363]		Foraging, feeding or related behaviour known to occur within area
<a href="#">Puffinus carneipes</a> Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat likely to occur within area
<a href="#">Sterna anaethetus</a> Bridled Tern [814]		Foraging, feeding or related behaviour likely to occur within area
<a href="#">Sterna bergii</a> Crested Tern [816]		Breeding known to occur within area
<a href="#">Sterna caspia</a> Caspian Tern [59467]		Foraging, feeding or related behaviour known to occur within area
<a href="#">Thalassarche cauta (sensu stricto)</a> Shy Albatross, Tasmanian Shy Albatross [64697]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thalassarche impavida</a> Campbell Albatross [64459]	Vulnerable*	Species or species habitat may occur within area
<a href="#">Thalassarche melanophris</a> Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche steadi</a> White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
<b>Fish</b>		
<a href="#">Acentronura australe</a> Southern Pygmy Pipehorse [66185]		Species or species habitat may occur within area
<a href="#">Campichthys galei</a> Gale's Pipefish [66191]		Species or species habitat may occur within area
<a href="#">Heraldia nocturna</a> Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
<a href="#">Hippocampus angustus</a> Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
<a href="#">Hippocampus breviceps</a> Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area
<a href="#">Hippocampus subelongatus</a> West Australian Seahorse [66722]		Species or species habitat may occur within area
<a href="#">Histiogamphelus cristatus</a> Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area
<a href="#">Lissocampus caudalis</a> Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area
<a href="#">Lissocampus fatiloquus</a> Prophet's Pipefish [66250]		Species or species

Name	Threatened	Type of Presence
<a href="#">Lissocampus runa</a> Javelin Pipefish [66251]		habitat may occur within area  Species or species habitat may occur within area
<a href="#">Maroubra perserrata</a> Sawtooth Pipefish [66252]		Species or species habitat may occur within area
<a href="#">Mitotichthys meraculus</a> Western Crested Pipefish [66259]		Species or species habitat may occur within area
<a href="#">Nannocampus subosseus</a> Bonyhead Pipefish, Bony-headed Pipefish [66264]		Species or species habitat may occur within area
<a href="#">Phycodurus eques</a> Leafy Seadragon [66267]		Species or species habitat may occur within area
<a href="#">Phyllopteryx taeniolatus</a> Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
<a href="#">Pugnaso curtirostris</a> Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area
<a href="#">Solegnathus lettiensis</a> Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
<a href="#">Stigmatopora argus</a> Spotted Pipefish, Gulf Pipefish [66276]		Species or species habitat may occur within area
<a href="#">Stigmatopora nigra</a> Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
<a href="#">Urocampus carinirostris</a> Hairy Pipefish [66282]		Species or species habitat may occur within area
<a href="#">Vanacampus margaritifer</a> Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
<a href="#">Vanacampus phillipi</a> Port Phillip Pipefish [66284]		Species or species habitat may occur within area
<a href="#">Vanacampus poecilolaemus</a> Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
<b>Mammals</b>		
<a href="#">Arctocephalus forsteri</a> New Zealand Fur-seal [20]		Species or species habitat may occur within area
<a href="#">Neophoca cinerea</a> Australian Sea-lion [22]	Vulnerable	Species or species habitat may occur within area
<b>Reptiles</b>		
<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area

Name	Threatened	Type of Presence
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
<a href="#">Natator depressus</a> Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

## Whales and other Cetaceans [ [Resource Information](#) ]

Name	Status	Type of Presence
<b>Mammals</b>		
<a href="#">Balaenoptera acutorostrata</a> Minke Whale [33]		Species or species habitat may occur within area
<a href="#">Balaenoptera edeni</a> Bryde's Whale [35]		Species or species habitat may occur within area
<a href="#">Balaenoptera musculus</a> Blue Whale [36]	Endangered	Congregation or aggregation known to occur within area
<a href="#">Caperea marginata</a> Pygmy Right Whale [39]		Species or species habitat may occur within area
<a href="#">Delphinus delphis</a> Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
<a href="#">Eubalaena australis</a> Southern Right Whale [40]	Endangered	Breeding known to occur within area
<a href="#">Grampus griseus</a> Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
<a href="#">Lagenorhynchus obscurus</a> Dusky Dolphin [43]		Species or species habitat may occur within area
<a href="#">Megaptera novaeangliae</a> Humpback Whale [38]	Vulnerable	Congregation or aggregation known to occur within area
<a href="#">Orcinus orca</a> Killer Whale, Orca [46]		Species or species habitat may occur within area
<a href="#">Stenella attenuata</a> Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
<a href="#">Tursiops aduncus</a> Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
<a href="#">Tursiops truncatus s. str.</a> Bottlenose Dolphin [68417]		Species or species habitat may occur within area

## Extra Information

### Places on the RNE [\[ Resource Information \]](#)

Note that not all Indigenous sites may be listed.

Name	State	Status
<b>Natural</b>		
<a href="#">Bunker Bay Geological Site</a>	WA	Registered
<a href="#">Leeuwin - Naturaliste Ridge Area</a>	WA	Registered

### State and Territory Reserves [\[ Resource Information \]](#)

Name	State
Leeuwin-Naturaliste	WA
Sugar Loaf Rock	WA

### Regional Forest Agreements [\[ Resource Information \]](#)

Note that all areas with completed RFAs have been included.

Name	State
<a href="#">South West WA RFA</a>	Western Australia

### Invasive Species [\[ Resource Information \]](#)

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resources Audit, 2001.

Name	Status	Type of Presence
<b>Birds</b>		
<a href="#">Anas platyrhynchos</a> Mallard [974]		Species or species habitat likely to occur within area
<a href="#">Columba livia</a> Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
<a href="#">Streptopelia senegalensis</a> Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
<a href="#">Sturnus vulgaris</a> Common Starling [389]		Species or species habitat likely to occur within area
<b>Mammals</b>		
<a href="#">Bos taurus</a> Domestic Cattle [16]		Species or species habitat likely to occur within area
<a href="#">Canis lupus familiaris</a> Domestic Dog [82654]		Species or species habitat likely to occur within area
<a href="#">Felis catus</a> Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
<a href="#">Feral deer</a> Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
<a href="#">Mus musculus</a> House Mouse [120]		Species or species habitat likely to occur within area
<a href="#">Oryctolagus cuniculus</a> Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
<a href="#">Rattus rattus</a> Black Rat, Ship Rat [84]		Species or species

Name	Status	Type of Presence
<a href="#">Sus scrofa</a> Pig [6]		habitat likely to occur within area  Species or species habitat likely to occur within area
<a href="#">Vulpes vulpes</a> Red Fox, Fox [18]		Species or species habitat likely to occur within area
<b>Plants</b>		
<a href="#">Asparagus asparagoides</a> Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
<a href="#">Brachiaria mutica</a> Para Grass [5879]		Species or species habitat may occur within area
<a href="#">Cenchrus ciliaris</a> Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
<a href="#">Chrysanthemoides monilifera</a> Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
<a href="#">Chrysanthemoides monilifera subsp. monilifera</a> Boneseed [16905]		Species or species habitat likely to occur within area
<a href="#">Genista linifolia</a> Flax-leaved Broom, Mediterranean Broom, Flax Broom [2800]		Species or species habitat likely to occur within area
<a href="#">Genista monspessulana</a> Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
<a href="#">Genista sp. X Genista monspessulana</a> Broom [67538]		Species or species habitat may occur within area
<a href="#">Lycium ferocissimum</a> African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
<a href="#">Olea europaea</a> Olive, Common Olive [9160]		Species or species habitat may occur within area
<a href="#">Pinus radiata</a> Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
<a href="#">Rubus fruticosus aggregate</a> Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
<a href="#">Tamarix aphylla</a> Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area



# Coordinates

-33.98478323 114.9774134,-33.98002301 114.9751809,-33.97175301 114.9717319,  
-33.9633183 114.9697496,-33.95899621 114.9698796,-33.95433437 114.972594,  
-33.95129809 114.9799776,-33.9316405 114.9807051,-33.92462724 114.9767265,  
-33.88422355 114.9729699,-33.86464102 114.9653371,-33.8607616 114.9651897,  
-33.85756895 114.9681128,-33.84356264 114.9841072,-33.82845104 114.9835453,  
The information presented in this report has been provided by a range of data sources as acknowledged at  
the end of the report.  
-33.77773662 114.9830064,-33.77181735 114.9789668,-33.76198627 114.977916,  
This report is designed to assist in identifying the location of places which may be relevant in determining  
obligations under the EPBC Act and the Biodiversity Conservation Act 1999. It also provides a list of  
locations in the World Heritage area, National Estate, and other areas of national  
importance. It also provides a list of locations in the Commonwealth marine area, including  
migratory and marine species and lists of threatened ecological communities. Mapping of Commonwealth land is not complete at this  
stage. Maps have been collated from a range of sources at various resolutions.  
-33.65838884 114.9907336,-33.65773448 114.9957007,-33.65666373 114.9969797,  
-33.65220224 115.0002514,-33.64997863 115.0051662,-33.64952178 115.0093921,  
Not all species lists under the EPBC Act have been mapped (see below) and therefore this report is a general  
guide only. Where available data supports mapping of the type of presence that can be determined from the  
data is indicated in general terms. People using this information in making a referral may need to consider  
the qualifications below and may need to seek and consider other information sources.  
-33.5349796 115.0445335,-33.53423721 115.0541275,-33.53536883 115.058183,  
-33.53897805 115.066693,-33.54520272 115.0708047,-33.54914311 115.0744024  
For threatened ecological communities where the distribution is well known, maps are derived from  
recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened  
ecological community distributions are less well known, existing vegetation maps and point location data  
are used to produce indicative distribution maps.  
-33.62288742 115.1539427,-33.63094892 115.1491169,-33.62864531 115.1336935,  
-33.62288742 115.1539427,-33.63094892 115.1491169,-33.62864531 115.1336935,  
For species where the distributions are well known, maps are derived from sources such as recovery plans  
and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated  
under 'type of presence'. For species whose distributions are less well known, point locations are collated  
from government wildlife authorities, museums and non-government organisations; bioclimatic  
distribution models are generated and these validated by experts. In some cases, the distribution maps are  
based solely on expert knowledge.  
-33.54617259 115.0424206,-33.543 115.03282,-33.5357791 115.0304852,-33.535 115.02648,  
-33.531 115.0068,-33.53265 115.00489,-33.53767 115.00762,-33.54337 115.00878,-33.54951  
Only selected species covered by the following provisions of the EPBC Act have been mapped:  
-33.55572026 115.0115815,-33.55915735 115.0100138,-33.56093138 115.0068992,  
-33.56434 115.00765,-33.5742 115.01144,-33.58195462 115.0129747,-33.58464 115.01495,  
-33.59673038 115.0182493,-33.60913 115.02363,-33.63295 115.02839,-33.65545 115.02063,  
The following species and ecological communities have not been mapped and do not appear in reports  
produced from this database:  
-33.70072504 114.9862343,-33.69804 114.97537,-33.70894 114.98004,-33.75054 114.99268,  
-33.7562012 114.9925284,-33.76031664 114.9894259,-33.76567763 114.9915972,  
-33.76829504 114.9922903,-33.77038 114.99208,-33.79266 115.00063,-33.82302 114.99805,  
-33.83223909 114.9949034,-33.84822 114.99454,-33.85733 114.98519,-33.8608 114.98925,  
-33.8646 114.98638,-33.8655 114.9822,-33.86448204 114.9778724,-33.90597 114.9889,  
-33.91209 114.98616,-33.91565 114.98868,-33.92693 114.99062,-33.94888 114.99296  
The following groups have been mapped, but may not cover the complete distribution of the species:  
-33.95449 114.99172,-33.95763 114.98853,-33.95937 114.98564,-33.96099 114.98261,  
-33.96133 114.98033,-33.96965 114.98572,-33.97797 114.98876,-33.982 114.9897227,  
-33.98478323 114.9774134  
Some terrestrial species that overfly the Commonwealth marine area  
migratory species that are very widespread, vagrant, or only occur in small numbers  
The following groups have been mapped, but may not cover the complete distribution of the species:  
non-threatened seabirds which have only been mapped for recorded breeding sites  
seals which have only been mapped for breeding sites near the Australian continent  
Such breeding sites may be important for the protection of the Commonwealth Marine environment.



# Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [-Department of Environment, Climate Change and Water, New South Wales](#)
- [-Department of Sustainability and Environment, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment and Natural Resources, South Australia](#)
- [-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts](#)
- [-Environmental and Resource Management, Queensland](#)
- [-Department of Environment and Conservation, Western Australia](#)
- [-Department of the Environment, Climate Change, Energy and Water](#)
- [-Birds Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- Natural history museums of Australia
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-SA Museum](#)
- [-Queensland Museum](#)
- [-Online Zoological Collections of Australian Museums](#)
- [-Queensland Herbarium](#)
- [-National Herbarium of NSW](#)
- [-Royal Botanic Gardens and National Herbarium of Victoria](#)
- [-Tasmanian Herbarium](#)
- [-State Herbarium of South Australia](#)
- [-Northern Territory Herbarium](#)
- [-Western Australian Herbarium](#)
- [-Australian National Herbarium, Atherton and Canberra](#)
- [-University of New England](#)
- [-Ocean Biogeographic Information System](#)
- [-Australian Government, Department of Defence](#)
- [-State Forests of NSW](#)
- [-Geoscience Australia](#)
- [-CSIRO](#)
- Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact Us](#) page.

## **Research Advice on the Proposed Shark Mitigation Strategy using drum lines for January to April 2014**

**Research Division - January 2014**

**File No 2475/13**

### **Background**

In direct response to the unprecedented shark related fatalities that have occurred in WA over the past several years, the WA Government has increased funding to initiate or enhance a series of shark hazard mitigation programs. In November 2013, a surfer in the south West of the State became the seventh fatality in three years which has prompted the Government to take a more proactive approach to mitigation of shark attacks. In addition to the shark hazard mitigation strategies outlined above, the Government is now proposing an additional strategy (Strategy) for public safety purposes which includes Marine Monitored Areas (MMA) in the metropolitan and south west regions within which drum lines will be deployed at specified beaches to catch specified large sharks and a rapid response deployment where large sharks that have been identified as a threat will be targeted.

### **Proposed Strategy**

The Strategy will involve deploying up to 36 baited drum lines in coastal waters about one kilometre off specified beaches in both of the MMAs (a total of 72). It is understood that the contractors will bait, maintain and patrol the drum lines from 0600 hours to 1800 hours, 7 days per week from a commencement date in January 2014 through to 30 April 2014. Where the baited drum lines capture white, tiger or bull sharks greater than three metres in length, the contractor is to humanely destroy the shark using a firearm. The deceased shark is to then be tagged and removed to a specified distance offshore and discarded. If the baited drum lines catch any other animals, and if they are not in a condition to survive, the contractor is to humanely destroy, tag and discard the animal.

### **Risk Mitigation**

The use of drum lines to capture sharks is only designed to have a localised impact on the relative number of individuals of the targeted species (white sharks, tiger sharks and bull sharks) within the MMAs, not significantly affect total population size. It is recognised that the use of drum lines is likely to capture species other than the target shark species therefore to mitigate against the risks associated with the potential bycatch of, in particular, dolphins, sea lions, marine turtles, and grey nurse sharks, the following is proposed-

- Drum line contractors will be required to maintain detailed records of all catches and provide this information to relevant authorities for assessment purposes.
- Appropriate gear will be used, including significantly large hooks that limit the types and sizes of non-targeted individuals likely to be captured.

- Daily monitoring and maintenance of drum lines from 6.00am to 6.00pm to ensure any species that may be unintentionally caught are freed and released as soon as possible.
- Aerial and land patrols of beaches at which drum lines will be deployed, so that the drum line contractor can be notified of any animals that may be in distress.
- The drum line program is controlled and limited in its operation, ceasing at the end of April 2014.
- The drum line program will be assessed throughout and after its operation by relevant stakeholders, including technical experts from the Department of Fisheries and the Department of Parks and Wildlife (DPaW).

### **Summary of Assessments**

Standard risk assessment protocols (ISO 31000, 2009) were used to complete risk analyses associated with the proposed Strategy for each of the targeted species and the expected suite of non-target species that may interact with the drum line gear. These assessments only considered the likelihoods of different levels of impact based on the current proposal starting in January 2014 and ending in April 2014. It was not an assessment of the risks that would be associated with a continuing/ongoing program- a separate assessment would have to be completed for this situation.

The use of drum lines to capture sharks is designed to have a localised impact on the relative number of individuals of the targeted species within the MMAs, the killing of a few isolated individuals of the target species over a short period of time is therefore unlikely to generate even a measurable effect on these species at a population level. Hence for these species the proposed strategy poses a negligible risk.

Given the mitigation strategies outlined, the strategy poses negligible risks to most other non-targeted species and the broader ecosystem. The only non-targeted species for which there was some immediate concern was dusky whalers for which their recovery program is designed around having minimal impacts on larger individuals. Depending upon the level of capture of this species and what proportion is released alive, the broader assessment of their status may need to be revisited, the results of which may have implications for the commercial fisheries that operate on this species.

### **Detailed Assessments of Ecological Risks from Proposed Strategy**

#### *Methodology*

The assessment of risks associated with the proposed Strategy were undertaken in the context that they will form part of the determination of whether exemptions should be granted for this to occur during the proposed period. In the context of assessing the risks of this proposed strategy, a “significant” impact would be one for which there was a reasonable likelihood that the level of impacts generated on any of these species would be such that these would

materially affect the longer term population dynamics at a whole of population level. It was also completed on the basis that the operations will be undertaken as outlined above and was therefore not an assessment of the risks associated with this same set of activities operating in perpetuity. We suggest that if this or a similar strategy is to be undertaken beyond this current proposal period, a further assessment of cumulative impacts is undertaken, and that this should incorporate relevant data collected during the current proposal period.

The calculation of risk was completed using standard risk assessment protocols as used by the Department (e.g. Jones & Fletcher, 2012) which are based on the ISO 31000 (2009) international standard protocols. We completed a risk analysis associated with the proposed strategy for each of the targeted species and the expected suite of non-target species that may interact with the drum line gear. The consequence and likelihood tables used are presented at the end of this paper.

The key information (the key references consulted are provided at the end of this paper) used to generate the risk scores included:

- the rates of capture of these species recorded in drum line programs in south east Qld and other locations
- the rates of capture using similar equipment in WA for tagging purposes
- research survey information for the lower south west region
- commercial catch and catch rate information for relevant WA fisheries
- relevant stock assessment information as presented within the annual Status Reports of the Fisheries and Aquatic Resources in Western Australia and previously in Fisheries Research Reports.
- relevant biological and behavioural information on these species
- other relevant information on these species and methods including the 2012 review by McPhee and the 2012 correlation study completed by the Department.

## **Assessment of Risks to Targeted Species**

### *White Sharks*

The use of drum lines to capture sharks is designed to have a localised impact on the relative number of individuals of this and other targeted species within the MMAs, it is not designed to generate a significant reduction in overall population numbers.

Based on the low rates of capture of white sharks during the targeted fishing operations that have been completed off WA in the past few years (designed to enable tagging of these sharks), plus the low catch rates of white sharks obtained in drum lines programs off Qld, the number of white sharks expected to be caught by this program by April 2014, especially those in the target size range (>3m) is likely to be less than 10. Current research on the population size of the western population of white sharks in Australia (west of Bass Strait) suggests that this is in the order of few to several thousand. It is possible it has been

increasing over the past decade or more given the rate of attacks per population through this period has been increasing. Consequently, even if the total number of white sharks killed in this program up to the end of April is in the order of 10 to 20 then this is still likely to have only a negligible impact on the total stock size of this population of white sharks. Such a level would therefore be unlikely to even be measurable against background variations. This represents a negligible risk.

#### *Tiger Sharks*

Given the geographic location of the MMAs is at the southern end of the distribution of this tropical species, the catch rates are likely to be lower than obtained off Qld. However, despite this, the catch rates for this species off WA are still expected to be higher than would be obtained for white sharks. Most of these are likely to be less than three metres and hence many may be released alive. Therefore the number of tiger sharks expected to be killed in this program may only be in the order of 10-20 which would again be considered to have an insignificant impact on this population. Given the broad northern geographic extent of this species and the lack of commercial fishing that now occurs in most areas of northern WA where they are mostly located, the number that could be caught before a measurable change in their total population would occur is likely to be in the order of 100s. Consequently, it is unlikely that this would even have a measurable impact making the proposed strategy a negligible risk to this species.

#### *Bull sharks*

This species most commonly occurs in nearshore and estuarine waters. In south west Australia it predominantly occurs in the Swan and Canning rivers. Given the offshore location of the drum line program the number expected to be caught in this program is very low. Therefore there is only a remote likelihood that this strategy will have any impact on this species making this a negligible risk.

### **Assessment of Risks to non- targeted species and the broader ecosystem**

#### *Other Elasmobranchs (sharks and rays)*

The majority of sharks likely to be captured in this program are expected to be of non-targeted species. Some of these non-target species (dusky and sandbar sharks) are part of dedicated commercial fishery management recovery programs, especially the larger individuals of these species.

For sandbar sharks, the current acceptable catch of large individuals by the Northern Shark fishery (in addition to the catch of juveniles by the temperate fishery) was 20 t annually. This would equate to several hundred individuals. As the northern shark fishery has not operated in the past five years, the capture of sandbar sharks by the drum line program is not likely to have an unacceptable impact on this recovery program. This represents a low risk

For dusky sharks, the recovery program which has been successful in generating significant recovery over the past decade assumes minimal capture of large individuals. Therefore, if a

significant number of large dusky sharks were captured and killed this could affect the rate of their recovery and represents the highest potential risk for this drum line program. If the numbers killed through this program exceeds 30 then a reassessment of the stock assessment and potentially the management arrangements for the commercial fishery would need to be undertaken. Such an outcome within the time period of the proposal is unlikely therefore it is assessed as a low- moderate risk.

#### *Teleosts (Demersal scalefish)*

The design of the gear makes it highly unlikely that any of the main demersal scalefish species will be caught in the proposed WA program. Only two teleosts have been captured in the Qld drum line program used in SE Qld. This therefore represents a negligible risk

#### **Other Protected species**

##### *Grey Nurse*

Unlike other regions, Grey Nurse Sharks have never been subjected to targeted fishing (commercial or recreational) in Western Australia (WA). The only significant source of mortality has been from incidental capture. Catch and catch rate data from the demersal gillnet fishery, prior to their listing, indicates that Grey Nurse Sharks were relatively abundant in temperate WA waters in the mid-late 1990s and that the population was stable. In addition, the expected number of captures of this species is low and their survival prior to release should be high given their biological characteristics. The risk to this stock from this proposal is therefore negligible.

##### *Seals/Sealions*

There are no records of these species having been captured on large hooks off WA. Therefore there is only remote likelihood that any individual pinniped will become captured as part of this program and therefore it is a negligible risk.

##### *Turtles*

The distribution of turtles means that they are not common in the target region of WA. This means that individuals of most turtle species are highly unlikely to even interact with the drum lines. Furthermore, as the lines are monitored frequently, based on Qld data there is a high likelihood of successfully releasing alive any turtles that are captured. The proposal therefore represents a negligible risk.

##### *Whales*

The Strategy period occurs outside the typical migration and breeding seasons for the pygmy blue whale, Antarctic blue whale, southern right whale and humpback whale minimising likelihood of entanglement in drum line ropes. In addition the positioning of these lines will be inshore of where the majority of movements occur. Should entanglement of one of these species occur, DPaW has expertise in disentanglement procedures. Furthermore these whale



populations are no longer in threatened status hence from an ecological perspective the risks generated by any entanglement even if it occurs would be negligible.

#### *Dolphins*

Given size of the hooks used it is highly unlikely that any dolphins can be captured by this gear. They are reported as scavenging off the hooks in Qld but very few have actually been captured in 20 years of drum line operations and all were released alive. Therefore this short term program poses a negligible risk.

#### *Ecological Effects*

Given the short time period of this program, the small footprint of the operation compared to the distribution of the species, and relative numbers of individuals that may be captured compared to the total stock sizes of the affected species, this program would not have any measurable effect on broader ecosystem functioning representing a negligible risk.

#### **Advice**

The potential risks to targeted and non-targeted species arising from implementation of the set of activities listed within the proposed Marine Monitored Areas strategy were assessed using standard ISO 31000 based, risk analysis procedures based on the information currently available.

The strategy as proposed, was assessed as posing only negligible risks to the three targeted species, most of the non-targeted species and the broader ecosystem. Dusky whaler was the only species identified potentially requiring additional management interventions resulting from this strategy, but this is unlikely.

A significant factor in determining these risk levels was the set of risk mitigation procedures that have been proposed, especially the short duration of the proposed activities (January – April 2014) plus the limited geographic extent of their operation compared to the broad distribution of most of the potentially affected species.

If this program, or a similar strategy was to continue beyond the current proposal period (Jan-April 2014) and/or be extended to other geographic areas, another risk assessment should be undertaken that also examines for the potential of cumulative impacts to be generated.

Dr Rick Fletcher  
Executive Director Research  
10 January 2014

## RISK ASSESSMENT CATEGORIES AND LEVELS

### LIKELIHOOD LEVELS

1. Remote -Never heard of but not impossible here. (<5% probability)
2. Unlikely - May occur here, but only in exceptional circumstances. (>5%)
3. Possible - Clear evidence to suggest this is possible in this situation. (>30%)
4. Likely - It is likely, but not certain, to occur here. (>50%)
5. Certain -It is almost certain to occur here (>90%)

### CONSEQUENCE LEVELS

#### STOCKS (target and non-target)

1. Measurable but minor levels of depletion to stocks.
2. Maximum acceptable level of depletion of stock.
3. Level of depletion unacceptable but still not affecting recruitment levels of stock
4. Level of depletion of fish stocks are already (or will definitely) affect future recruitment potential/levels of stock.
5. Permanent or widespread and long term depletion of key fish stocks, close to extinction levels.

#### ECOSYSTEMS

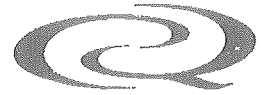
1. Measurable but minor change in the environment or ecosystem structure but no measurable change to function
2. Maximum acceptable level of change in the environment/ecosystem structure with no material change in function.
3. Ecosystem function altered to an unacceptable level with some function or major components now missing &/or new species are prevalent.
4. Long term, significant impact with an extreme change to both ecosystem structure and function. Different dynamics now occur with different species/groups now the major targets of capture or surveys.
5. Permanent or widespread long term damage to the environment. Total collapse or complete shift of ecosystem processes.

### RISK LEVELS

Description	Risk Score (C x L)	Risk Level
Negligible	0 - 2	1
Low	3 - 6	2
Medium	7 - 10	3
High	11- 16	4
Severe	17 -25	5

## KEY REFERENCES CONSULTED

- Chidlow et al., (2006) Identification of Western Australian Grey Nurse Shark aggregation sites - Final Report to the Australian Government, Department of the Environment and Heritage, May 2006. *Fisheries Research Report* No. 155, Department of Fisheries, Western Australia, 48p.
- Department of Fisheries (2012) A correlation study of the potential risk factors associated with white shark attacks in Western Australian waters. *Fisheries Occasional Paper* 109. Department of Fisheries, WA.
- Department of Fisheries (2013) State of the Fisheries and Aquatic Resources of Western Australia 2012/13.
- Dudley, SFJ (1997). A comparison of the shark control programs of New South South Wales and Queensland (Australia) and KwaZulu-Natal (South Africa). *Ocean Coastal Management* 34;1-27
- Jones, J.B. and W.J. Fletcher (2012) Assessment of the risk associated with the release of abalone sourced from abalone hatcheries for enhancement or marine grow-out in the open ocean areas of WA. *Fisheries Research Report* No. 227, Department of Fisheries, Western Australia 20pp
- McAuley, R. and Simpfendorfer C. (2003). Catch composition of the Western Australian temperate demersal gillnet and demersal longline fisheries, 1994 to 1999, *Fisheries Research Report* No. 146, Department of Fisheries, Western Australia, 78 pp.
- McAuley, et al. (2005) Biology and stock assessment of the thickskin (sandbar) shark, *Carcharhinus plumbeus*, in Western Australia and further refinement of the dusky shark, *Carcharhinus obscurus*. stock assessment, Final FRDC Report – Project 2000/134, *Fisheries Research Report* No. 151, Department of Fisheries, Western Australia, 132p.
- McPhee, D (2012). Likely effectiveness of netting or other capture programs as a shark hazard mitigation strategy in Western Australia. *Fisheries Occasional Paper* 108. Department of Fisheries, WA.
- Sumpton et al., (2011) Gear selectivity of large-mesh nets and drumlines used to catch sharks in the Queensland Shark Control Program. *African Journal Marine Science*. 33:37-43



Mr Kim Taylor  
General Manager  
Office of the Environmental Protection Authority  
Locked Bag 10 East Perth, WA 6892

Your Ref -AC01-2014-004  
Our Ref- 2475/13; R103147

Cc Mr Stuart Smith

**RE: SHARK DRUM LINE DEPLOYMENT, MANAGEMENT AND ASSOCIATED SERVICES**

In relation to your enquiry regarding the risk status to tiger sharks from this program, I can confirm that DoF considers the current strategy is still unlikely to have a measurable impact on the total tiger shark population in WA and therefore still represents a negligible risk.

Tiger sharks are a relatively abundant, tropical and subtropical shark species with a geographic distribution that extends from the west coast of WA over the northern half of Australia to NSW. Within much of its range in WA, this species is subjected to only minor levels of exploitation. There is minimal retained catch by commercial fishing because their flesh is not marketable so they are not targeted. Furthermore their inadvertent capture is also low in WA because of a prohibition on the use of commercial shark fishing gear off large areas of the north-west coast since 1993, a cessation of commercial shark fishing in northern WA in 2008 and statewide restrictions on the retention of shark catches for commercial purposes. Similarly their level of recreational capture is very low due to current regulations.

In summary, the combination of (1) the extremely small footprint of the drumline activities relative to the total distribution of this species in WA; (2) the very short term nature of the program; (3) the total mortalities for the program still likely to be within the types of magnitude outlined within the original risk assessment; (4) the minimal levels of mortality in other areas of WA - are all consistent with this current program still only posing a negligible risk to the tiger shark population of WA.

As presented in the original assessment, if drumlining activities are to continue beyond the current program, a further review of all risks (including those to tiger sharks) should be completed to assess the potential for cumulative impacts. Such a review would utilise the data collected during the current drumline program.

Yours sincerely

Dr Rick Fletcher  
EXECUTIVE DIRECTOR – RESEARCH  
28 February 2014

**Advice on the Proposed Shark Mitigation Strategy using drum lines for the period  
November 2014 - April 2017**

**Department of Fisheries, Research Division - April 2014**

**File No 2475/13**

**Background**

In direct response to the unprecedented number of shark related fatalities that occurred in WA over the past several years, starting in 2008 the WA Government funded a number of initiatives in order to mitigate the risks of further bites and fatalities including a series of research programs, enhancements to the level of shark monitoring and aerial patrols. In November 2013, a surfer in the south west of the State became the seventh fatality in just over three years, which prompted the Government to take a more proactive approach to mitigation of shark attacks. The Government therefore proposed, in combination with the extensive shark hazard mitigation strategies already in place, use of an additional direct action strategy (Strategy) for public safety purposes. This proposal involved fishing for large sharks using large-hook drum lines within two Marine Monitored areas (MMAs) located off the metropolitan and south west regions (see Map Figure 1). Within these two MMAs, large (300cm Total Length or greater) white sharks, tiger sharks and bull sharks will be targeted by (i) drum lines being routinely deployed at specified beaches and (ii) vessels will rapidly respond by deploying some of the available drum lines in instances where large sharks have been identified as a threat within these areas.

After obtaining necessary State and Commonwealth approvals, an initial deployment of up to 36 baited drum lines in each MMA began in early January 2014 and will cease on 30 April 2014. It is proposed that a similar program will be undertaken for three years beginning in November 2014 after which a major review will be completed.

**Proposed strategy**

The proposed Strategy will still involve deploying only up to 36 baited drum lines in coastal waters about one kilometre off specified beaches in each of the MMAs. This number will cover both (i) routine deployment and (ii) rapid response (maximum number of drum lines for the Strategy is 72). Contractors will be required to bait, maintain and patrol the drum lines from 0600 hours to 1800 hours, 7 days per week over a three year period from 15 November 2014 through to 30 April 2017 each year.

White, tiger or bull sharks 300 cm Total Length (TL) or greater captured on these drum lines will be destroyed by the contractor using a firearm. Any other captured animals that are not in a condition to survive will also be destroyed. Deceased sharks (whether destroyed or killed by their capture) will be fitted with uniquely-identified disposal tags and removed to a specified distance offshore and discarded or, where practical, retained for scientific study.

Captured animals that are considered to have a chance of survival will be released as swiftly and carefully as possible. As long as it will not reasonably compromise their chances of

survival, released sharks may be tagged with conventional fin tags and genetic samples will also be taken. Provision will also be made for some electronic tagging if such tagging is determined to be scientifically beneficial and to not compromise sharks' survival rates.



Figure 1. Map of Western Australia indicating the size and location of the two Marine Monitored Areas.

## **Risk mitigation**

The Strategy is designed to reduce the risk of human-shark interactions within defined and limited MMAs and not to alter the status or recovery of any shark stock. The use of a limited number of drum lines to capture sharks within the MMAs is therefore designed to only have a localised impact on the abundance of large individuals of specified shark species (white, tiger and bull sharks 300 cm TL or greater) within these MMAs, not to significantly affect the total population size of these species. Based on the experiences in other locations, it is recognised that the use of drum lines can capture species other than the target sharks. To minimise the risks associated with the potential capture of non-target species, specifically dolphins, sea lions, turtles and non-target sharks, the following is proposed.

The likelihood capture and/or mortality of non-target species is reduced by-

- The gear used includes significantly larger hooks than used elsewhere in the world for this purpose, with a hook design that has a closed gape. These two features should substantially limit the types and sizes of non-targeted individuals likely to be captured. This gear configuration has already proven highly effective in limiting the number of non-target, bycatch species that have been captured so far in the current (January – April 2014) WA program compared to other drum line and netting programs. Importantly, only one non-shark individual has been captured to date.
- Daily monitoring and maintenance of drum lines from 0600 hours to 1800 hours to ensure any species or small (< 300 cm TL) target species that may be unintentionally caught are freed and released as soon as possible
- Aerial and land patrols operate at most of the beaches where the drum lines will be deployed, so that the drum line contractor can be notified of any captures.
- The drum line program will be limited in its area (two MMAs) and time of operation (5.5 months per year).

The risks associated with any impacts of capture and/or mortality of non-target species are also minimised because they will be closely monitored to ensure that the rates and composition of capture are consistent with those expected and used in determining the risk evaluations. This will include:

- The program is proposed to operate for only three years after which a review will be undertaken.
- Drum line contractors will be required to maintain detailed records of all catches and provide this information to relevant authorities for assessment purposes.
- The drum line program will continue to be assessed throughout and after its operation by relevant technical experts from the Department of Fisheries and, where necessary, the Department of Parks and Wildlife (DPaW).

- The range or levels of acceptable catch will be developed for each of the target species and other potential bycatch species. The actual numbers will be examined against these ranges each year to ensure that the risks levels have not materially altered.
- If a major change in the rate of captures for any species occurs within a season, an additional review can be undertaken prior to the standard annual review.

### **Summary of assessments**

Using international standard (ISO 31000, 2009) risk analysis methods, assessments were completed for each of the targeted species and the potential suite of non-target species that may interact with the drum line gear associated with the proposed Strategy. These assessments consider the likelihoods of different levels of impact on the population size of each of the species based on the current proposal for the Strategy of a three year program running from 15 November to 30 April each year starting in November 2014.

The use of drum lines to capture sharks is designed to only have a localised impact on the relative number of individuals of the targeted species within each of the MMAs. The killing of relatively small numbers of each target species over a short period of time is therefore unlikely to generate even a measurable effect on these species at a population level given their large distributions. Consequently for these species the proposed strategy poses a negligible risk.

Only the tiger shark (*Galeocerdo cuvier*) has been captured in sufficient numbers during the initial program (January – March 2014) to require a more detailed analysis than presented in the initial risk assessment (DOF, 2014). This includes comparing expected annual drum line catches with historical State-wide catch levels plus documentation of the current set of extensive shark fishing restrictions in place across much of its distribution in WA.

There were concerns prior to the program becoming operational that the dusky shark (*Carcharhinus obscurus*) recovery program that includes strategies to minimise mortality rates of individuals older than 10 years of age may have been affected by the drum line program. To date only one dusky shark has been captured. The magnitude of the catch of this species has so far posed a negligible threat to the sustainability of this commercially-important stock. If the catches increase to material levels there is the option to adjust the management of the commercial fisheries that operate on this species.

### **Assessments of ecological risks from proposed strategy**

#### *Methodology*

Ecological risk assessments have been undertaken to assist in determining whether exemptions to relevant State and Commonwealth legislation should be granted for the proposed Strategy. In the context of assessing the risks of this proposed strategy, a “significant” impact would be one for which there was a reasonable likelihood that the number of individuals of a species that are captured and ultimately died from this program



would materially affect the longer term sustainability and population dynamics at the whole of population level, or would affect the ecosystem at a regional level. It does not assess the risks associated with the social concerns about the capture of sharks.

The risk analyses assume that the activities will be undertaken in accordance with the terms outlined above between 15 November and 30 April each year for a three year term in the two MMAs and only with the specified number of drum lines (maximum of 72).

The calculation of risk levels was completed using standard risk assessment protocols (e.g. Jones & Fletcher, 2012), which are based on the ISO 31000 (2009) and AS:HB89 (2012) international standard protocols. A separate risk analysis was completed for each of the target species and the non-target species that may be caught by, or entangled in, the proposed drum line gear. The consequence and likelihood tables used are presented in Appendix 1.

The key information (see Appendix 2 for key references consulted) used to generate the risk scores included:

- the rates of capture of these species recorded in drum line programs in south east Qld and other locations
- the rates of capture using similar equipment in WA for tagging purposes
- research survey information for the lower south west region
- commercial catch and catch rate information for relevant WA fisheries
- relevant stock assessment information as presented within the annual State of Fisheries Aquatic Resources of WA and previously in Fisheries Research Reports.
- relevant biological and behavioural information on these species
- other relevant information on these species and methods including the 2012 review by McPhee and the 2012 correlation study completed by the Department.
- rates and composition of capture in the WA drum line program January- March 2014.

#### **WA drum line catch (January to March 2014)**

Catches in WA drum lines during the period January 26 – March 16 2014 have almost exclusively been comprised of tiger sharks (Figure 2).

*Tiger Sharks:* In total, 105 tiger sharks were caught (69% in the Metro region; 31% in the South west region). Of these, 11 (10%) were dead upon gear retrieval with a total of 61 tiger sharks released alive (58%) with the remainder destroyed, either because they were in a poor condition upon capture, or they were 300 cm TL or larger (Figure 3).

Most tiger sharks caught in the Metropolitan region were directly measured (TL in cm) but for some captures no size data is available. Where sharks were not brought on deck, markings on the side of the vessel were used to gauge lengths. Individual tiger sharks captured have ranged in size from 153 – 450 cm TL (mean size = 275 cm TL, SD = 63 cm, n = 88 tiger sharks) with a larger size range of tiger sharks was captured in the Metropolitan region (Figure 4).

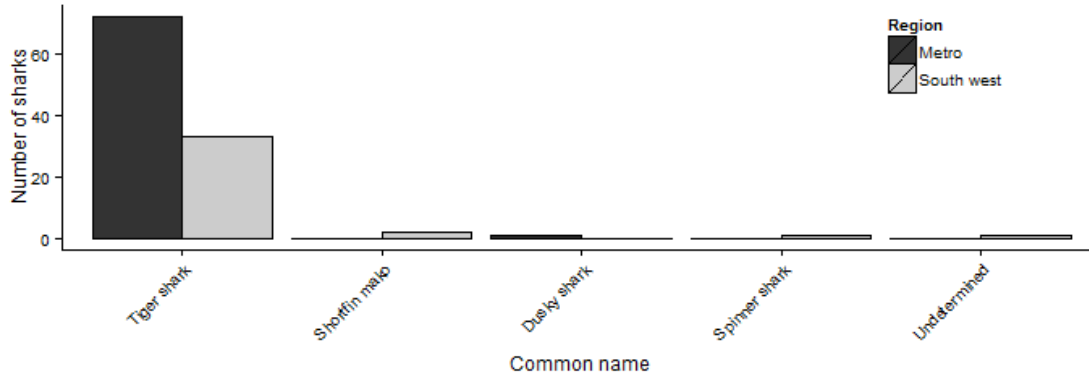


Figure 2. Shark catch (including those killed and released) from Western Australian drum lines deployed in the Metropolitan and South West regions from January 26 to March 16 2014

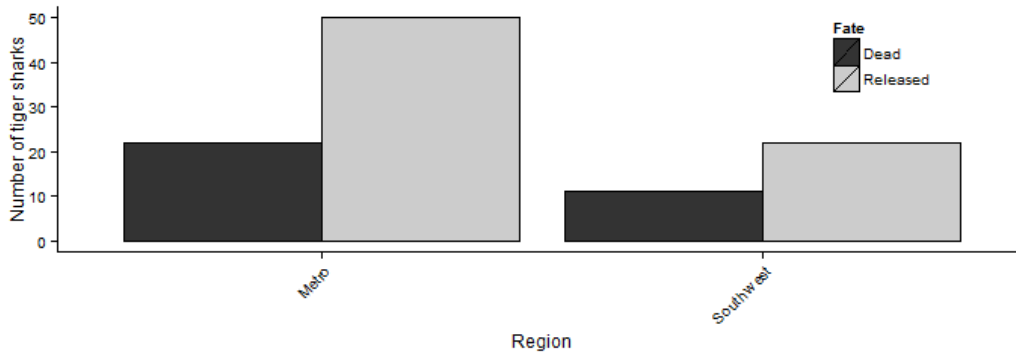


Figure 3. Fate of tiger sharks caught on Western Australian drum lines deployed in the Metropolitan and South west regions from January 26 to March 16 2014. Dead = animals dead upon gear retrieval and sharks that were destroyed

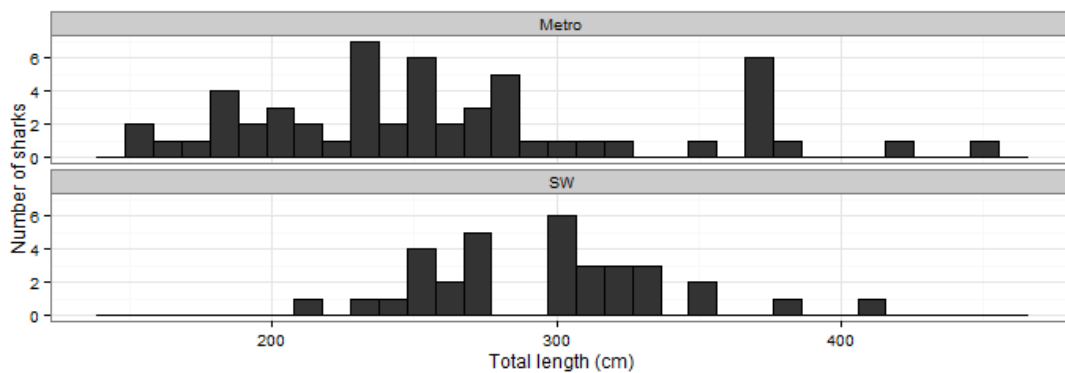


Figure 4. Total length (TL, in cm) of all tiger sharks caught in the Metropolitan and South west (SW) during January 26 to March 16 2014. N = 88 sharks because not all sharks were measured.

Based on length-weight conversions (Kohler et al. 1996) the estimated weight of tiger sharks killed in this program assuming 100% survival of released sharks would be approximately 7 tonnes. Given the very large hook size and that one electronically tagged shark appeared to die after release, the total mortality is likely to be higher. The maximum amount, even assuming no survival is estimated to be only 17 tonnes, the most likely figure will be somewhere in between.

*Other Species:* Few other species or individuals have been caught so far by the WA drum line program (Figure 2). These include one or two individuals of dusky shark, mako shark, spinner shark and only one non-shark – a single north-west blowfish (*Lagocephalus sceleratus*).

### **Comparison with shark control measures used elsewhere**

Drum lines, long lines and gillnets have been used to target potentially dangerous sharks in other locations including Queensland, New South Wales, South Africa, Brazil and Hawaii (McPhee, 2012; Table 1). Direct comparisons between the operations of different shark control measures are complicated by a number of factors. These include differences in oceanographic conditions and therefore regional species composition, background abundance levels and movements of different shark species, histories of commercial fishing effort, fishery management and marine conservation measures plus differences in available data series and how long after initiation of the programs that the data were started to be collected. In addition, gear types, hooks sizes and bait types also vary among these programs.

In terms of the number of hooks used, the WA program is similar to the drum line program coordinated by the Natal Sharks Board in KwaZulu-Natal, South Africa but much smaller than the number used in the Queensland drum line program (Table 1). In WA, the hook size (shank length and hook diameter) is much larger than used elsewhere and the gape of the hooks has been closed compared to the standard J hooks. As was predicted in the initial risk assessment (DOF, 2014), the larger hook size and closed gape used in WA appears responsible for the very low numbers of non-shark bycatch species captured so far (only 1 north-west blowfish).

Similar to WA, tiger sharks form a major component of the Queensland drum line catch, and to a lesser extent the long line catch in Brazil and to an even lesser extent South Africa (Figure 5, Table 1). This pattern probably reflects differences in average water temperatures and the tropical/subtropical distribution of this species.

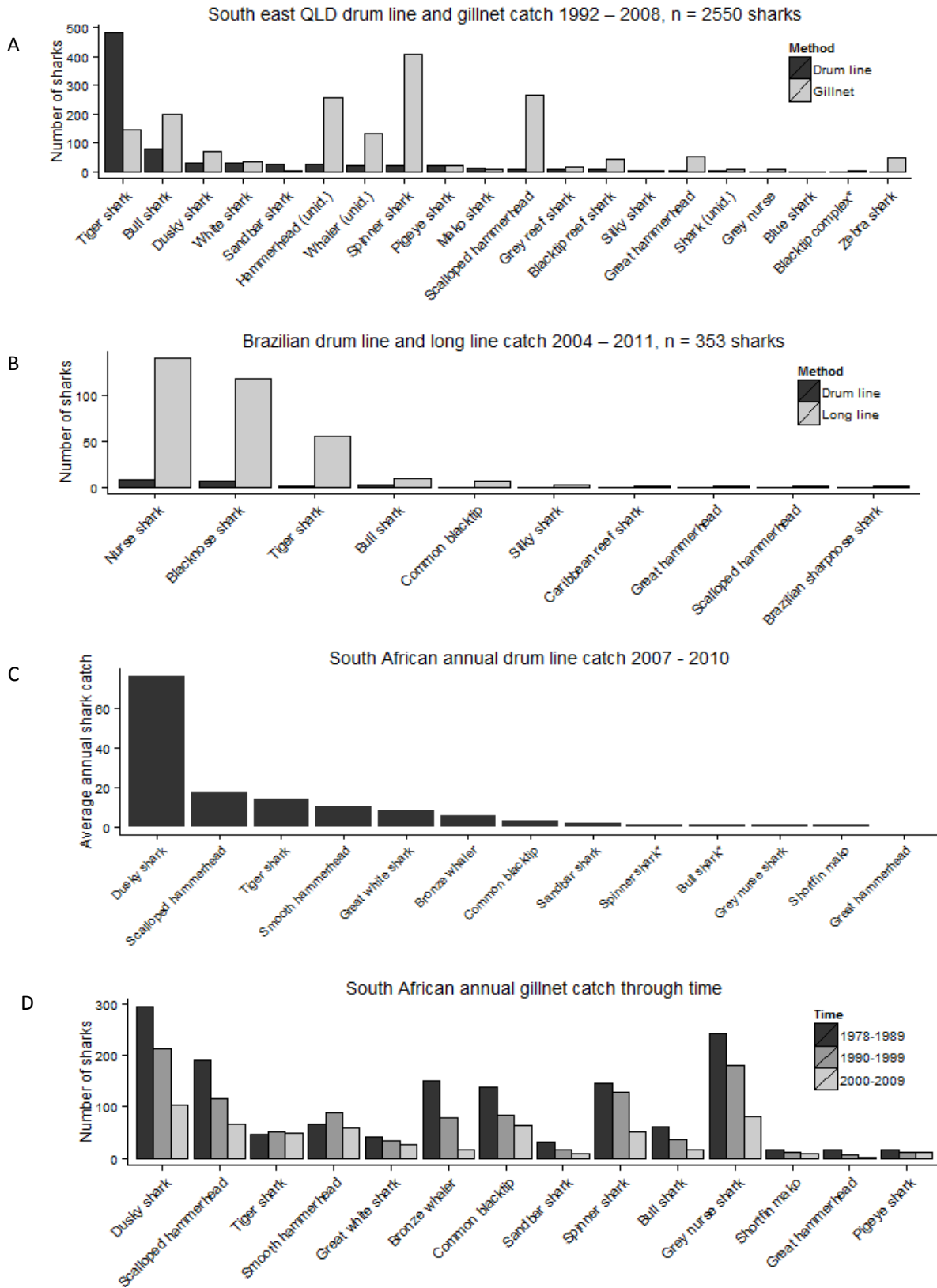


Figure 5. Shark catch from shark control measures in (A) south east Queensland, (B) Recife, Brazil, (C) KwaZulu-Natal (KZN) South Africa – drum line and (D) KZN – gillnets. Note that graph (C) and (D) shows the annual catch and not the total catch. \* = less than one shark a year. Graphs reproduced from data presented in Cliff and Dudley (2011), Sumpton et al. (2011) and Hazin and Afonso (2013).

Table 1.Examples of shark control measures using drum lines, long lines or gillnets

Location	Time scale	Gear used	Fishing duration	Target species	Main shark species caught	Non-shark bycatch
Western Australia	January to April 2014	<u>Drum lines</u> - 72 hooks (25/0 Customised – Closed Gape – circle like) initially baited with Bonito, Mackerel and since with miscellaneous fish and elasmobranch heads and frames. Set approx. 1 km offshore.	24 hours a day. Hooks are baited or checked at least once a day.	White shark, tiger shark, Those less than 3m are released	Tiger shark	1 north-west blowfish (silver toadfish, <i>Lagocephalus sceleratus</i> ).
Queensland <sup>1</sup>	Ongoing from 1962	<u>Drum lines</u> - 352 hooks (14/0 Mustad J design) baited with sea mullet and set in water 8 – 10 m depth. 35 hooks set off south east Queensland beaches. Hooks are checked 20 days a month.  <u>Gillnets</u> – Approx. 35 surface large-mesh nets (186 m TL, 6 m drop, stretched mesh size of 50 cm) set in water 8 – 10 m depth.	24 hours a day. Hooks are baited and checked 20 days a month.  24 hours a day. Nets are checked 20 days a month.	Bull shark, tiger shark, white shark  Most killed	Tiger shark, bull shark	<u>Drum lines</u> and Gillnets- Mostly loggerhead turtle (approx.10 per year at Gold Coast, Sunshine Coast and Rainbow Beach). Also small number of green turtle, leatherback turtle, common dolphin, bottlenose dolphin, white-spot eagle ray, <i>Manta</i> spp . and other rays.
New South Wales <sup>2</sup>	Ongoing from 1937	<u>Gillnets</u> – Bottom-set large-mesh nets used at 51 beaches (150 m TL, 6 m drop, stretched mesh size of 50 – 60 cm) set in water 10 – 12 m depth.	Soak time varies from 12 – 96 hours. Nets are set every weekend day and nine week days per month from September to April.	White shark, bull shark  Most are found dead	Hammerhead shark, whaler shark ( <i>Carcharhinus</i> s. Spp), angel shark	Currently around 5 bottlenose dolphins a year.
South Africa <sup>3</sup>	Ongoing from 2005	<u>Drum lines</u> – 79 hooks (14/0 Mustad J design) baited with Southern Rover or Jacobever species.  <u>Gillnets</u> – 23.4 km of netting used along a 320 km stretch of coast (most nets are 214 m long, 6.3 m deep and 300 – 500 m offshore).	24 hours a day (although hooks and nets are sometimes removed in winter during the 'sardine run'). Hooks and nets are checked daily from Monday – Friday.	Bull Shark, white Shark Alive sharks are towed as far offshore as possible, tagged and released.	Dusky Shark, scalloped hammerhead	<u>Drum lines</u> - Less than 10 animals a year consisting of <i>Manta</i> spp., loggerhead turtles, leatherback turtle, other turtles, long-beaked and common dolphins.
Brazil <sup>4</sup>	2004 to 2011	<u>Drum lines</u> – 23 lines with two different hook types and sizes (9/0 J-style and 17/0 circle) baited with Moray Eels or Oilfish.  <u>Long lines</u> – Two lines (100 hooks per line, same hooks size and bait as drum lines).	Drum lines fished 24 hours a day and hooks baited and checked daily at dawn. Long line hooks had an average soak time of 15 hours.	Tiger Shark, bull shark Live animals were relocated, tagged and released.	Nurse Shark, Tiger Shark	Less than 100 teleosts a year (mostly Ariidae). Eight turtles Cheloniidae) in total.
Hawaii <sup>5</sup>	1959 to 1976	<u>Long lines</u> – various configurations with up to 100 hooks at any one time. Skipjack tuna was the main bait. Light long lines and hand lines were also fished sporadically between 18 – 118 m depth).	Not reported for each gear type.	Tiger Shark, Most were killed.	Sandbar Shark, Tiger Shark	None reported in the Wetherbee et al. 1994 publication.

1 = Sumpton et al. (2011); 2 = Reid et al. (2011); 3 = Cliff and Dudley (2011); 4 = Hazin and Afonso (2013); 5 = Wetherbee et al. (1994). Other drum line shark mitigation measures may have been deployed elsewhere. Note that the shank length and gape diameter of hooks varies among models making direct comparisons of hook size difficult.

Recent Brazilian shark mitigation measures have focussed on relocating tiger sharks caught on long lines and drum lines away from popular beaches. This approach has coincided with a reduction in the number of shark bite incidents at local Recife beaches and, in theory, has the potential of a reduced impact on this stock. In South Africa attempts are made to tow dangerous sharks offshore, although the distance depends on sea conditions, condition of the shark and how secure the shark is noosed alongside the boat (Jeremy Cliff *pers. comm*). The survival rate of transported sharks is not reported and may well be lower the further they are moved.

It is unlikely that such an approach would be appropriate for dealing with captured sharks in WA. Transporting large sharks the significant distance necessary to get them away from WA coastal waters would be logistically impractical and could lead to the mortality of sharks in transit. Moreover, from bather safety and public liability perspectives, determining acceptable release locations especially for potentially dangerous white sharks would be extremely challenging and would reduce the amount of time available for contractors to check other hooks and release non-target sharks.

### **Assessment of risks to targeted species**

#### *White sharks*

The use of drum lines to capture sharks in WA is intended to have a localised impact on the relative number of individuals of this and other targeted species within the MMAs. It is not designed to generate a significant reduction in overall population numbers. The lack of any white shark captures in the initial 3 month period within the MMA locations is not surprising, it was predicted that few would be captured at this time of the year.

When the program operates between November and April, based on catch rates of white sharks in local west coast fisheries, tagging programs and drum line programs that operate on other white shark populations, fewer than 10 white sharks in the target size range (>3m) are expected to be caught each year. This would lead to a likely cumulative catch of less than 25 white sharks (>3m) over the three year period.

The level of annual catch would be consistent with the low annual catches of white sharks that have been sustained for decades through the drum line and netting programs off Queensland and NSW and much lower than the numbers (estimated to be > 50) previously caught each year as bycatch by commercial fishing prior to the major reductions in effort that occurred in the mid 1990's.

Estimating the current status and size of the western white shark population size (west of Bass Strait) has been difficult due to the lack of long term monitoring information. Recent research has focused on reconstructing the likely historical catch levels generated from all sources (including commercial and recreational fishing plus whaling) in combination with different life history scenarios and initial population sizes to generate potential fishing mortalities for the western white shark population based on available lines of evidence. These include the catch rates of white sharks by commercial fishers across periods before, during

and after the highest levels of white shark captures occurred, trends in the rate of attacks per head of population over the past 20 years and encounter (observed) rates by abalone divers.

The most plausible scenarios of current compared to unexploited population size, fishing mortalities and life history characteristics suggest that the western Australian white shark population either did not decline significantly or if it did, it has “recovered” to at least stable levels since the reduction in fishing effort and mortality and their listing as protected species nearly two decades ago. The results of these analyses suggest that the size of this western population is therefore likely to be in the order of at least a few to several thousand individuals<sup>1</sup>. As such, the expected very low level of annual and therefore cumulative mortality from drum lines over the next three years is highly likely to only have a negligible impact on the total size of the western Australian population of white sharks.

### *Tiger sharks*

Tiger sharks are a relatively abundant, tropical and subtropical shark species with a geographic distribution that extends from the west coast of WA over the northern half of Australia to southern NSW. The drum lines deployed for the WA Strategy are located at the southern end of their range on the west coast of Australia (Figure 5). This species is currently subjected to only minor levels of exploitation elsewhere along the WA coast.

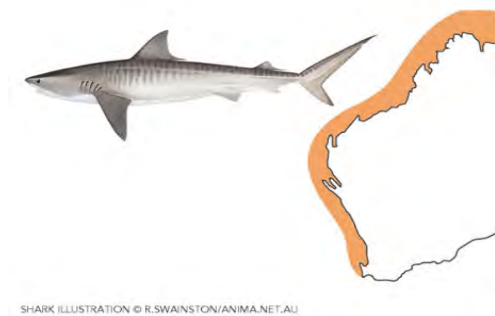


Figure 6. Distribution of the tiger shark in WA

Tiger sharks have only been fished at irregular intervals at a range of different locations mostly in the tropical (northern) part of their WA range. In the late 1980s tiger sharks were caught on drop lines in Shark Bay and during 1996 – 2006 plus significant catches of tiger sharks occurred on longlines in northern WA shark fisheries with a peak in annual catch of 81 tonnes in 2004 – 05 (Figure 6). Tiger shark landings in the West Coast Demersal Gillnet and Demersal Longline Fishery also reached 8 tonnes in 2005 – 2006 and small numbers of tiger sharks were also caught in the Eighty Mile Beach, the Kimberley Gillnet and Barramundi Fishery and the Pilbara Fish Trawl Fishery (Heupel and McAuley, 2007). The combined annual mortality based on these historical catches far exceeds the expected annual catch from the WA drum lines.

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<sup>1</sup> A report that outlines the plausible scenarios for the western white shark population will be available online in April/May 2014, followed by a more extensive report of the biology and potential impacts of fisheries on the white shark population.

Currently there is minimal retained catch of tiger sharks by commercial fishing throughout WA because their flesh is not marketable so they are not targeted. Furthermore their inadvertent capture is also low in WA because of a prohibition on the use of commercial shark fishing gear off large areas of the north-west coast since 1993, plus a general prohibition on the use of metal trace wire and large hooks in November 2006 and a dramatic decrease in and cessation of commercial shark fishing effort in northern WA in 2005 and 2008/09, respectively and the closure to commercial shark fishing off the metropolitan coast in 2008. Furthermore, there are statewide restrictions on the retention of shark catches for commercial purposes. Similarly the level of legitimate recreational fishing mortality is very low due to current regulations and recreational fishing practices (Ryan et al. 2013). Therefore the annual catch of tiger sharks in the last eight years across WA has been minimal.

The stock status of tiger sharks in WA has not been formally assessed. Catch rate data for the northern shark fisheries revealed a decline from 0.20 kg hook<sup>-1</sup> in 1998/1999 to 0.06 kg hook<sup>-1</sup> in 2001/02. Significantly the catch rate remained relatively stable from then until the end of the time series (2004/05) which equates to the time period when the highest tiger shark catch levels were occurring (Figure 7, Heupel and McAuley, 2007).

More recent catch rate data from a long term time series of annual fisheries-independent longline surveys (2001 – 2013) shows a steady increase in the catch rate for this species in the WA region north of 29° (Figure 8). This survey is ongoing and will therefore continue to provide data on tiger sharks within this region.

In summary, the combination of (1) the extremely small footprint and southerly location (which is at the edge of their distribution) of the drum line activities relative to the total distribution of this species in WA; (2) the very short term nature of the proposed program – three years; (3) the likely annual rate of captures (with the majority being released) are less than previously reported from historical commercial fishing activities (now ceased) and are of a similar to that obtained in research surveys (all of which are released); (4) the minimal levels of mortality of this species in other areas of WA; are all consistent with the proposed activities only posing a negligible risk to the WA population of tiger sharks.



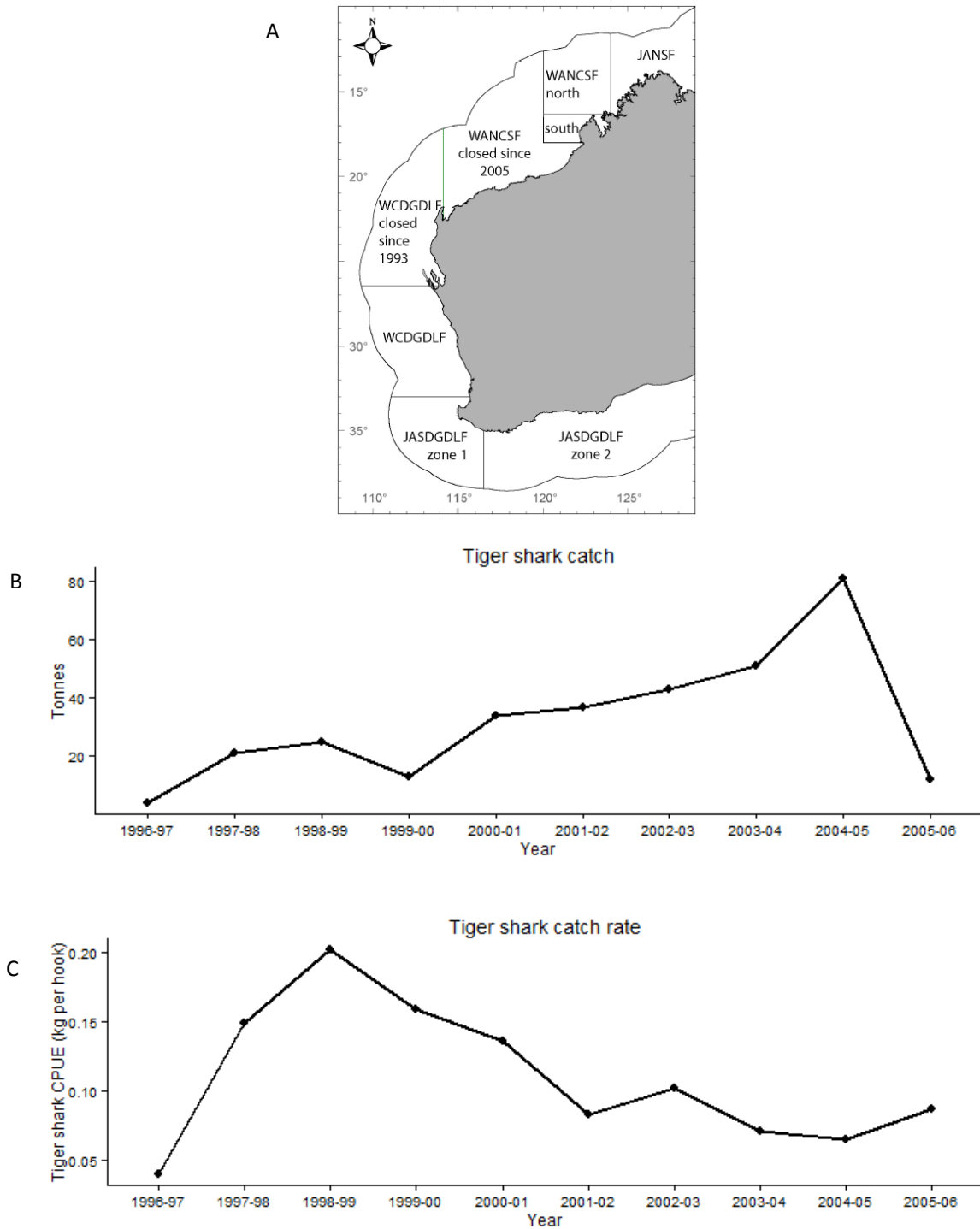


Figure 7 (A) Distribution of the Western Australian target shark fisheries (Map taken from Heupel and McAuley 2007). Note that the area off the metropolitan coast is now also closed to commercial shark fishing, (B) tiger shark catch in the northern shark fisheries (Western Australian North Coast Shark Fishery (WANCSE) and the Joint Authority Northern Shark Fishery (JANSF) and (c) tiger shark catch rate in the northern shark fisheries

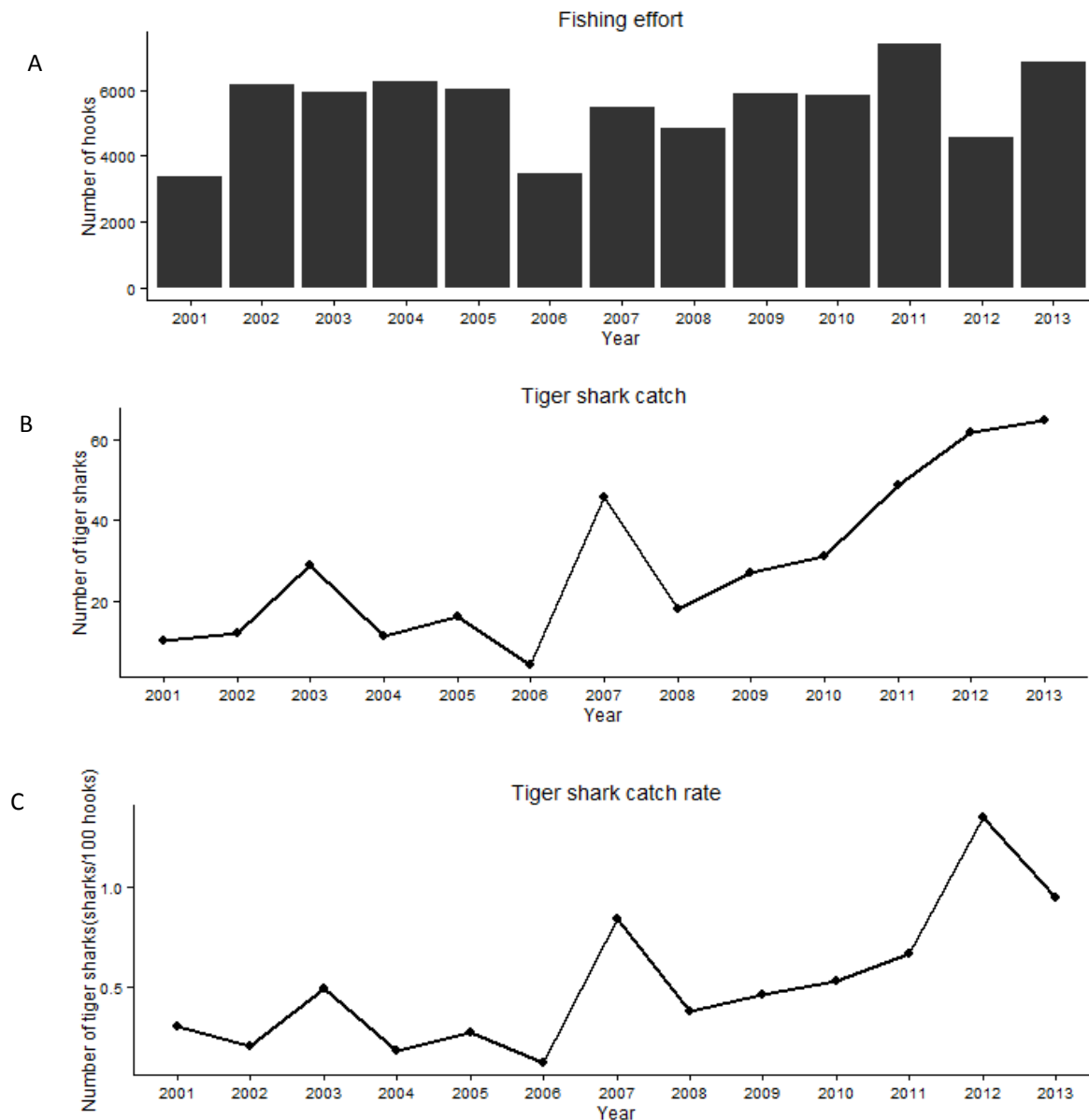


Figure 8 (A) Fishing effort (B) tiger shark catch and (C) tiger shark catch rate in a fisheries-independent survey of sharks north of 29°S latitude during 2001 – 2013

*Bull sharks*

All available data from more than 20 years of dedicated Department of Fisheries’ shark research suggest that this species’ distribution within the MMAs is largely confined to the Swan/Canning system. Given the apparent scarcity/absence of bull sharks in near-shore marine waters off south-western WA, the expected number of bull sharks that will be caught in this program is negligible. Therefore, there is a remote likelihood that this strategy will have any impact on this species’ population, making the overall risk of this program impacting any bull shark population(s) occurring in the MMAs negligible.

## **Assessment of risks to non- targeted species and the broader ecosystem**

### *Other elasmobranchs (sharks and rays)*

One of the program's most important and economically valuable bycatch species is the dusky shark (*Carcharhinus obscurus*). The western Australian dusky shark stock supports significant commercial fisheries and is the subject of a well-designed and successful recovery plan.

For dusky sharks, the recovery program which has been successful in generating significant recovery over the past decade assumes minimal capture of large individuals. Therefore, if a significant number of large dusky sharks were killed (e.g. more than 30 individuals yr<sup>-1</sup>) through the drum line program, these activities could affect the rate of their recovery. If the numbers killed through this program begin to exceed 30 per year, a reassessment of management arrangements for the commercial fishery would need to be undertaken. Given the very low capture rate experienced in the program to date (only one), such an outcome occurring within the three year time period of the proposal is now unlikely. Therefore it is assessed as a low risk but with trigger limits to be established.

### *Demersal scalefish*

The design of the gear (e.g. large hooks size) makes it highly unlikely that any of the main demersal scalefish species will be caught in the proposed WA program. Only two teleosts (both tuna, *Thunnus* spp.) were captured on drum lines in southeast Qld over a 16 year period and so far no demersal scalefish have been caught in WA drum lines. This therefore represents a negligible risk

## **Other Protected species**

### *Grey Nurse*

Unlike populations in eastern state regions, the population of Grey Nurse Sharks in WA have never been subjected to targeted fishing (commercial or recreational). Incidental catch and catch rate data from the demersal gillnet fishery, prior to their listing in the mid-late 1990s indicates that Grey Nurse Sharks were relatively abundant in temperate WA waters and that the population was stable (Cavanagh et al., 2003; Chidlow, et al . 2006). In addition, the number of captures of this species is expected to be very low and their survival prior to release should be high given their ability to buccally ventilate and maintain neutral buoyancy. So far, none of these sharks have been caught so far in the WA program supporting the initial assessment that the risk to this population is negligible.

### *Seals/Sealions*

There are no records of these species having been captured on large hooks off WA and none have been captured in the program to date. The size and design of the hooks make it a remote likelihood that any individual pinniped will become captured as part of this program and therefore the program poses a negligible risk.

### *Turtles*

Turtles are not common in the more temperate like regions where the MMAs are located. Individuals of most turtle species are therefore highly unlikely to be in the vicinity of the MMAs and therefore even interact with the drum lines. The size and circle like design of the hooks make it a remote likelihood that any turtle will be captured on the drum lines. Furthermore, as the lines are monitored frequently, there is a likelihood of successfully releasing alive any turtles that are captured or entangled in the lines. The proposal therefore represents a negligible risk

### *Whales*

The time period (November–April) occurs outside the typical migration and breeding seasons for the whale species that migrate along the WA coast reducing the likelihood of encountering drum line ropes. In addition, the positioning of these lines will be inshore of where the majority of movements occur plus the use of single floats reduces the likelihood of entanglements if they are encountered. Although a small number of whales have become entangled in gillnets in south east Queensland (26 in 16 years) no whale entanglements have occurred on Queensland’s drum lines. Should entanglement of one of these species occur, DPaW has considerable expertise in disentanglement procedures. Furthermore these whale populations are generally considered to have recovered significantly from their previously threatened status, consequently from a stock sustainability perspective even in the extremely remote likelihood that an entanglement occurs and causes a death, this would still represent a negligible risk to the stock (see also Stoklosa, 2013).

### *Dolphins*

Given the size and shape of the hooks used, it is highly unlikely that dolphins will be captured by this gear. Dolphins are reported as scavenging off the hooks used in Queensland but even though their J shaped hooks are more likely to enable dolphins to be caught, very few have actually been captured in 16 years of drum line operations and all were released alive Therefore, the WA program poses a negligible risk to any dolphin species or population that may overlap with these MMAs.

### *Ecological Effects*

Collectively, the program will only operate for a short time period in each of just three years. The footprint of the operation is extremely small compared to the distribution of the species most likely to be directly affected with relatively small numbers of individuals likely to be captured and even less killed compared to their total stock size. The program will therefore generate only negligible impacts on each of the affected species. Consequently it is not plausible that these negligible impacts would generate a measurable impact on the broader marine ecosystem. Consequently, the removal of a maximum of several tonnes of a common species of shark per annum from two small areas of the west coast bioregion by this program would not have any measurable effect on the functioning of the broader marine ecosystems within this bioregion and therefore represents a negligible risk.

## **Advice**

The potential risks to targeted and non-targeted species arising from implementation of the set of activities listed within the proposed Marine Monitored Areas strategy were assessed using international standards (ISO 31000, 2009) based, risk analysis procedures using the information currently available.

The strategy as proposed was assessed as posing only negligible risks to the three targeted species, most of the non-targeted species and the broader ecosystem. The potential catch of dusky sharks (*Carcharhinus obscurus*) which was previously identified as an issue that may require additional management interventions (DoF 2014), but the magnitude of catches that would require this intervention has not been realised (only one caught to date).

A significant factor in determining these risk levels was the set of risk mitigation procedures that have been proposed, especially the short duration of the proposed activities (15 November – 30 April) for just three years, plus the very limited geographic extent of their operation compared to the broad distribution of the potentially affected species and the gear configuration (including hook size and design) which has demonstrably kept the level of bycatch species to a minimum, especially non sharks species.

If this program, or a similar strategy was to continue beyond the current three year proposal period (2017) and/or be extended to other geographic areas, another risk assessment should be undertaken that examines potential cumulative impacts.

It is also recommended that annual reviews are undertaken. Furthermore if the rates of capture begin to materially exceed those outlined above, a within season review would also be warranted. Appropriate trigger levels will be established to meet this requirement.

Dr Rick Fletcher  
Executive Director Research  
2 April 2014

## Appendix 1 - RISK ASSESSMENT CATEGORIES AND LEVELS

### LIKELIHOOD LEVELS

1. Remote - Never heard of but not impossible here. (<5% probability)
2. Unlikely - May occur here, but only in exceptional circumstances. (>5%)
3. Possible - Clear evidence to suggest this is possible in this situation. (>30%)
4. Likely - It is likely, but not certain, to occur here. (>50%)
5. Certain -It is almost certain to occur here (>90%)

### CONSEQUENCE LEVELS

#### STOCKS (target and non-target)

0. No measurable decline
1. Measurable but minor levels of depletion to stocks.
2. Maximum acceptable level of depletion of stock.
3. Level of depletion unacceptable but still not affecting recruitment levels of stock
4. Level of depletion of fish stocks are already (or will definitely) affect future recruitment potential/levels of stock.
5. Permanent or widespread and long term depletion of key fish stocks, close to extinction levels.

#### ECOSYSTEMS

0. No Measurable change.
1. Measurable but minor change in the environment or ecosystem structure but no measurable change to function
2. Maximum acceptable level of change in the environment/ecosystem structure with no material change in function.
3. Ecosystem function altered to an unacceptable level with some function or major components now missing &/or new species are prevalent.
4. Long term, significant impact with an extreme change to both ecosystem structure and function. Different dynamics now occur with different species/groups now the major targets of capture or surveys.
5. Permanent or widespread long term damage to the environment. Total collapse or complete shift of ecosystem processes.

### RISK LEVELS

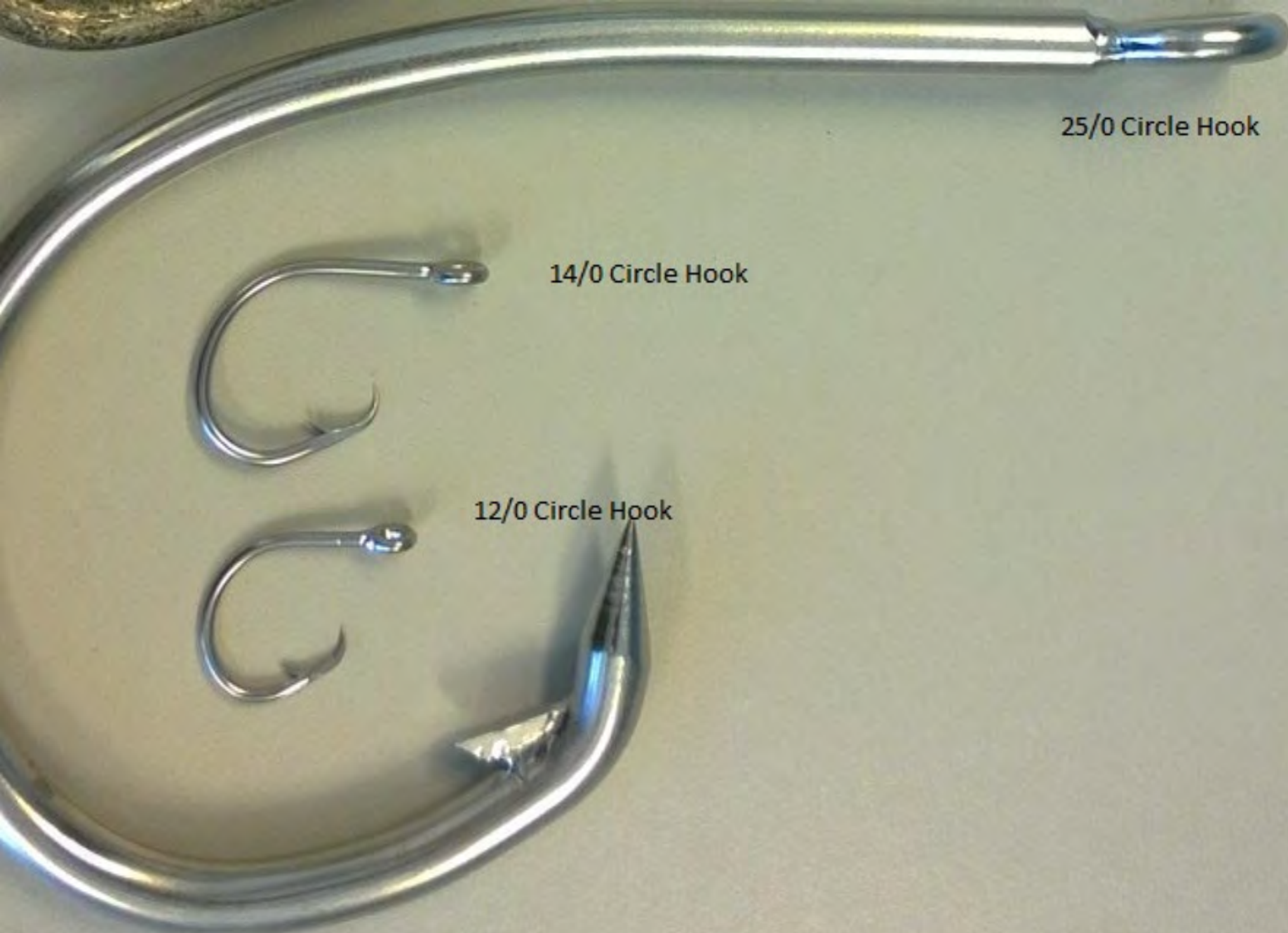
Description	Risk Score (C x L)	Risk Level
Negligible	0 - 2	1
Low	3 - 6	2
Medium	7 - 10	3
High	11- 16	4
Severe	17 -25	5

## **Appendix 2 Key References consulted or cited.**

- Cavenagh et al., (2003) The conservation status of Australian chondrichthyans: report of the IUCN Shark Specialist Group Australia and Oceania Regional Red List Workshop, University of Queensland, Brisbane, p. 170.
- Chidlow et al., (2006) Identification of Western Australian Grey Nurse Shark aggregation sites - Final Report to the Australian Government, Department of the Environment and Heritage, May 2006. *Fisheries Research Report* No. 155, Department of Fisheries, Western Australia, pp 48.
- Cliff, G and Dudley, S. F. J. (2011). Reducing the environmental impact of shark-control programs: a case study from KwaZulu-Natal, South Africa. *Marine and Freshwater Research* 62: 700-709.
- Department of Fisheries (2012) A correlation study of the potential risk factors associated with white shark attacks in Western Australian waters. *Fisheries Occasional Paper* 109. Department of Fisheries, WA.
- Department of Fisheries (2013) State of the Fisheries and Aquatic Resources of Western Australia 2012/13.
- Department of Fisheries (2014) Research Advice on the Proposed Shark Mitigation Strategy using drum lines for January to April 2014. Department of Fisheries, Western Australia, January 2014. Published on EPA website 12 February 2014. 8 pp.
- Dudley, SFJ (1997). A comparison of the shark control programs of New South Wales and Queensland (Australia) and KwaZulu-Natal (South Africa). *Ocean Coastal Management* 34:1-27.
- Hazin, F.H.Z. and Afonso, A.S. (2013). A green strategy for shark attack mitigation off Recife, Brazil. *Animal Conservation*. In press.
- Heupel, M and McAuley, R. (2007). Sharks and rays (Chondrichthyans) in the North-west Marine Region. Final report to Department of the Environment and Water Resources, National Oceans Office Branch, 123 pp.
- ISO (2009) Risk management – principles and guidelines. 31000. International Organisation of Standards, Geneva. Switzerland 24pp.
- Jones, J.B. and Fletcher, W.J. (2012) Assessment of the risk associated with the release of abalone sourced from abalone hatcheries for enhancement or marine grow-out in the open ocean areas of WA. *Fisheries Research Report* No. 227, Department of Fisheries, Western Australia 20pp.
- Kohler, N et al. (1996) Length-length and length-weight relationships for 13 shark species from the Western North Atlantic. NOAA Technical Memorandum NMFS-NE-110, 29 pp.

- Ryan, K et al. (2013). An integrated system to survey boat-based recreational fishing in Western Australia 2011/2012. *Fisheries Research Report* No. 249, Department of Fisheries, Western Australia, 162 pp.
- McAuley, R. and Simpfendorfer C. (2003). Catch composition of the Western Australian temperate demersal gillnet and demersal longline fisheries, 1994 to 1999, *Fisheries Research Report* No. 146, Department of Fisheries, Western Australia, 78 pp.
- McAuley, R et al. (2005) Biology and stock assessment of the thickskin (sandbar) shark, *Carcharhinus plumbeus*, in Western Australia and further refinement of the dusky shark, *Carcharhinus obscurus*, stock assessment, Final FRDC Report – Project 2000/134, *Fisheries Research Report* No. 151, Department of Fisheries, Western Australia, 132 pp.
- McPhee, D (2012). Likely effectiveness of netting or other capture programs as a shark hazard mitigation strategy in Western Australia. *Fisheries Occasional Paper* 108. Department of Fisheries, WA.
- Reid D. et al. (2011) Decadal trends in shark catches and effort from the New South Wales, Australia, shark meshing program 1950 – 2010. *Marine and Freshwater Research* 62: 676-693.
- Standards Australia (2012) Risk Management – Guidelines on risk assessment techniques. HB 89. SIA Global International. 92pp.
- Stoklosa R. 2013. West Coast Lobster Fishery Ecological Risk Assessment 20 February 2013. Fisheries Occasional Paper 118. Department of Fisheries, Western Australia. 99pp.
- Sumpton, W. et al., (2011) Gear selectivity of large-mesh nets and drumlins used to catch sharks in the Queensland Shark Control Program. *African Journal Marine Science* 33:37-43.
- Wetherbee et al., (1994) A review of shark control in Hawaii with recommendations for future research. *Pacific Science* 48, (2): 95-115.
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25/0 Circle Hook

14/0 Circle Hook

12/0 Circle Hook



Government of **Western Australia**

# Shark Drum Line Deployment, Management and Associated Services

## **CONTRACTOR PROTOCOLS**

## START OF CONTRACT

The Contractor will meet with a team drawn from the following agencies in relation to roles and responsibilities:

1. Department of the Premier and Cabinet
2. Department of Fisheries
3. Department of Parks and Wildlife

The Contractor will be provided with an Operations Protocol pack which will include:

1. Scenario protocols
2. Contact Numbers
3. Maps of the MMA
4. A range of coordinates for drum line deployment
5. Security Information
6. Reporting Procedures
7. Meeting requirements
8. Communications

### **Drum Lines**

1. The Contractor will be provided with 36 drum lines.
2. 30 drum lines will be deployed.
3. The remaining 6 drum lines will remain on the vessel at all times for incident or sighting response.

### **Security**

The Contractor may meet with resistance from protestors.

The Contractor will have the necessary contact numbers for assistance.

In the event of the following the Contractor will call:

- Protestors swimming/boating around the drum lines – Department of Transport
- Protestor vandalising drum line – WA Police
- Protestor removing bait or marine animals from the drum line – Department of Fisheries

The Contractor is not to engage with protestors in any way.

# DRUM LINE OPERATIONS

## Target Species

Target species are white (*Carcharodon carcharias*), bull (*Carcharhinus leucas*) and tiger (*Galeocerdo cuvier*) sharks of 3m total length and greater.

## Hours of operation

Hours of operation are between 6am and 6pm, seven days a week.

## Daily requirements

1. Check drum lines throughout each day and re bait as required.
2. Complete final check of drum lines at the end of each day and re bait as required.
3. Ensure a minimum of 6 drum lines on board the vessel at all times.

## Observers

1. Observers from agencies including, but not limited to, the following must be permitted onto the vessel at any time throughout the contract:
  - a. Department of Parks and Wildlife
  - b. Department of the Premier and Cabinet
  - c. Department of Fisheries

## By Catch, Non Target Shark Species, Or Target Species Under 3m In Length, On Drum Line

1. Identify catch on a drum line.
2. Manage marine animal depending on its condition -
  - a. The animal is considered healthy and has a reasonable chance of survival - release as quickly as possible.
  - b. The animal is dead – tag the animal and store on deck, cover securely for disposal. Photograph catch, with tag number clearly visible.
  - c. The animal is considered to not have a reasonable chance of survival - destroy humanely, tag and store on deck, cover securely for disposal. Photograph catch, with tag number clearly visible.
3. If the animal is to be released, advise Operations Manager, who will advise relevant agencies if shark is being released near a SLSWA beach.
4. Complete log book.
5. Contact to be made with Operations Manager in relation to marine mammal and turtle by catch for DPaW.

## Target Shark Species 3m Or Greater Caught On Drum Line

1. Target shark species 3m or greater identified on drum line.
2. Humanely destroy target species over 3m, if not already dead.
3. Bring animal on board the vessel and cover securely.
4. Check animal for internal and external research tags. Tag and photograph the animal and record in log book.
5. Drum line is rebaited and returned to its position.
6. Contact Contract Manager and Operations Manager to advise of target species catch.
7. Animal to be disposed of offshore in State waters

## RESPONDING TO A SHARK THREAT OR ATTACK

### SHARK SIGHTING

1. Operations Manager advises Contractor of confirmed sighting in the MMA.
2. Operations Manager confirms location and requests deployment to the site.
3. Contractor advises estimated time of arrival.
4. Contractor places appropriate gear in the water and slowly patrols the area.
5. The Contract vessel must be approximately 1km offshore within 1 hour of arrival at site.

### SHARK ATTACK

1. Operations Manager requests Contractor to attend shark attack site, providing location specifics.
2. Contractor advises Operations Manager of estimated time of arrival to site.
3. Contractor to set 5 drum lines in the attack zone.
4. Drum lines to be gradually moved to approximately 1km offshore.
5. Drum lines remain overnight and in place for a maximum period of 7 days.

## REPORTING PROTOCOLS

### The following reports are to be completed:

1. Bait Purchase Report (or similar)
2. First Deployment Worksheet
3. Vessel Inspection Log Book
4. Drum Line Maintenance Log Book
5. Catch and Research Log Book
6. Response Log Book
7. Final Retrieval Worksheet

All Log Books and photographs are to be emailed to the Contract Manager by close of business Sunday each week.