Table 1

Gulf of Papua, Trade-Wind Cruise - Overview
R/V Melville

Port – Cairns: refuel, add provisions, embark scientists, load equipment

Leg 1

participants: UW: Ogston, Sternberg and 4 students/techs
USC: Goni and 4 students/techs
Australian scientists

locations: see Figure 1 and Table 3;

timeline: see Table 2a for hourly timeline

activities: 2 days, transit to GOP (480 nm, 50 hours)

3 days, site surveys, instrument deployments, and four swath lines along ~30-m isobath in western GOP

- Mooring at site ~1T8-80
  - S4 current meters
  - conductivity/temperature sensors
  - transmissometers/OBS
- Tripod 1 at site ~1T13-20
- Tripod 2 at site ~1T13-30
- Tripod 3 at site ~1T8-30
  - current meters/compass
  - pressure sensor
  - optical backscatter sensors
  - size/settling camera
  - acoustic altimeter
  - conductivity/temperature sensors

Site surveys include: bathymetric survey, water-column profiles and seabed coring

Transit to Port Moresby (190 nm, 19 hours)

Port – Port Moresby, touch and go, exchange scientists, ~7 hours

Leg 2

participants: UW: Nittrouer, Ogston and 4 students/techs
USC: Goni and 4 students/techs
PNG scientists
Australian scientists

locations: see Figure 1 and Table 3

timeline: see Table 2b for hourly timeline

activities: Transit from Port Moresby

4 days, four 24-h anchor stations (neap tides or spring tides)
Sites: ~1T13-20, ~1T13-25, ~1T8-20, and ~1T8-25
gafanhoto water-column profiler (i.e., profiles to seabed), hourly
submersible pump sampler for geochemistry, hourly
CTD/rosette/O_2/fluorescence for calibration, every 4 hours
box corer, hourly

9 days, observations along 13 transects in western GOP, and 3 swath lines
Gafanhoto water-column profiler (all sites)
current meter
optical backscatter sensor/transmissometer
conductivity/temperature
water samples (3 per cast)
CTD/rosette/O_2/fluorescence (selected sites)
submersible pump sampler (selected sites)
box Corer – (all sites)
multi-Corer – (selected sites)
kasten Corer (selected sites)

4 days, four 24-h anchor stations (neap tides or spring tides)
Sites: ~1T13-20, ~1T13-25, ~1T8-20, and ~1T8-25
gafanhoto water-column profiler (i.e., profiles to seabed), hourly
submersible pump sampler for geochemistry, hourly
CTD/rosette/O_2/fluorescence for calibration, every 4 hours
box corer, hourly

Transit to Port Moresby

Port – Port Moresby, touch and go, exchange scientists (~7 hours)

Leg 3

participants: SBU: Aller and 2 students/techs
UW: Nittrouer and 4 students/techs
USC: Goni and 4 students/techs
PNG scientists
Australian scientists

locations: see Figure 1 and Table 3

timeline: see Table 2c for hourly timeline

activities: Transit from Port Moresby

6 days, mixture of seabed and water-column sampling and swath mapping in central GOP, at each station the following will be collected:

- grab samples for benthic biology
- box cores for biogeochemical sampling and flux incubations
- kasten core for biogeochemistry/pore water
- kasten core for radiochemistry
- CTD/rosette/O_2/fluorescence for water column
- water pumping for Ra analyses

The sampling will be interspersed with swath mapping in the central GOP. Approximately 5 days will be dedicated to mapping, and that will allow complete coverage of 30-50 m water depths in the central GOP (see Appendix 2). More mapping will be done on later cruises.

3.5 days, swath mapping in western GOP. Combined with mapping on other legs (4.5 days combined), this will give a total of about 8 days, which is sufficient to cover 30-40 m water depths in western GOP (see Appendix 1). More mapping will be done on later cruises.

Transit to Port Moresby

Port – Port Moresby, touch and go, exchange scientists (~8 hours)

Leg 4

participants: UW: Ogston and 2 students/techs
USC: Goni and 4 students/techs
Australian scientists

locations: see Chart and Table 3

timeline: see Table 2d

activities: Transit from Port Moresby

2 (3) days, instrument recoveries:
Tripod #1 at site 1T13-20
Tripod #2 at site 1T13-30
Tripod #3 at site 1T8-30
Mooring at site 1T8-80
resurvey sites: water-column profiling and seabed coring
(One extra day is included, in case we need to drag for lost instruments. If all instruments are recovered without problem, this day will be used for continued swath mapping.)

1 (0) days swath mapping in western GOP

2 days, transit from GOP to Cairns (480 nm, 50 hours)

Port – Cairns: disembark scientists, unload equipment

Table 2

Gulf of Papua, Trade-Wind Cruise – Detailed time schedule
R/V Melville

Table 2a. Leg 1 detailed time schedule
Gulf of Papua R/V Melville Cruise Plan

1600	28 Aug 03	Depart Cairns, Australia, transit to GOP
1800	30 Aug 03	Arrive 1T8-80, start site survey for mooring station
2200	30 Aug 03	Deploy mooring
0100	31 Aug 03	Transit to 1T7-30
0400	31 Aug 03	Arrive 1T7-30, start swath mapping NE to 1T13-30
0800	31 Aug 03	Arrive 1T13-30, start site survey for two tripod sites
1200	31 Aug 03	Arrive 1T13-20, deploy tripod #1
1600	31 Aug 03	Transit to 1T13-30
1700	31 Aug 03	Arrive 1T13-30, deploy tripod #2
2100	31 Aug 03	Swath map SW to 1T8-30
0100	1 Sep 03	Arrive 1T8-30, start site survey for tripod site
0500	1 Sep 03	Arrive 1T8-30, deploy tripod #3
0900	1 Sep 03	Swath map SW to 1T1-30
1400	1 Sep 03	Arrive 1T1-30, start swath mapping NE toward T13
2200	1 Sep 03	Arrive T13, continue swath mapping SW toward T1
0600	2 Sep 03	Arrive T1, continue swath mapping NE toward T13
1400	2 Sep 03	Arrive T13, start transit to Port Moresby
0900	3 Sep 03	Arrive Port Moresby, PNG (transit 190 nm)
	3 Sep 03	Disembark/embark scientists by small boat
1600	3 Sep 03	Depart Port Moresby

Table 2b. Leg 2 detailed time schedule
Gulf of Papua R/V Melville Cruise Plan

1600	3 Sep 03	Depart Port Moresby, transit to T13 (190 nm)
1100	4 Sep 03	Arrive at Transect T13, start anchor station at T13-25
1100	5 Sep 03	End anchor station, start transit to T13-20
1200	5 Sep 03	Arrive T13-20, start anchor station
1200	6 Sep 03	End anchor station, start swath mapping to T8
1500	6 Sep 03	Arrive T8-25, start anchor station
1500	7 Sep 03	End anchor station, start transit to T8-20
1600	7 Sep 03	Arrive T8-20, start anchor station
1600	8 Sep 03	End anchor stations, start swath mapping to T1
2100	8 Sep 03	Start transect survey of T1*
2100	9 Sep 03	Start transect survey of T2**
0900	10 Sep 03	Start transect survey of T3**
2100	10 Sep 03	Start transect survey of T4*
2100	11 Sep 03	Start transect survey of T5**
0900	12 Sep 03	Start transect survey of T6**
2100	12 Sep 03	Start transect survey of T7**
0900	13 Sep 03	Start transect survey of T8*
0900	14 Sep 03	Start transect survey of T9**
2100	14 Sep 03	Start transect survey of T10*
2100	15 Sep 03	Start transect survey of T11**
0900	16 Sep 03	Start transect survey of T12**
2100	16 Sep 03	Start transect survey of T13*
2200	17 Sep 03	Arrive T13-25, start anchor station
2200	18 Sep 03	End anchor station, start transit to T13-20
2300	18 Sep 03	Arrive T13-20, start anchor station
2300	19 Sep 03	End anchor station, start swath mapping SW to T8
0200	20 Sep 03	Arrive T8-25, start anchor station
0200	21 Sep 03	End anchor station, start transit to T8-20
0300	21 Sep 03	Arrive T8-20, start anchor station
0300	22 Sep 03	End anchor station, start swath mapping SW to T1
0600	22 Sep 03	Arrive at T1, start swath mapping NE to T13
1400	22 Sep 03	Arrive at T13, start transit to Port Moresby
0900	23 Sep 03	Arrive Port Moresby (transit 190 nm)
		Disembark/embark scientists by small boat
1600	23 Sep 03	Depart Port Moresby

Footnotes for Table 2b

*Transect surveys for T1, T4, T8, T10 and T13 are relatively long:

15 hours total – 6 stations between 20 m and ~70m (~2.5 hours/sta)
gafanhoto (water-column profiling system that can go to seabed)
CTD/rosette/O_2/fluorescence
submersible pump
multi-corer
box corer
kasten corer
3 hours – a bathymetric survey along the transect, in order to identify stations
5 hours – transit between stations
1 hour – transit time to next transect
Total time for long transects ~24 hours

**Transect surveys for T2, T3,T5, T6, T7, T9, T11, T12 are relatively short:
5 hours total – 2 stations (~2.5 hours/sta)
gafanhoto
CTD/rosette/O_2/fluorescence
submersible pump
multi-corer
box corer
kasten corer
3 hours – a bathymetric survey along the transect, in order to identify stations
2 hours – transit time between stations
1 hour – transit time to next transect
Total time for short transects ~11 hours (12 hours are used for ship-time calculations)

Table 2c. Leg 3 detailed time schedule
Gulf of Papua R/V Melville Cruise Plan

1600	23 Sep 03	Depart Port Moresby, transit to central GOP (165 nm)
0900	24 Sep 03	Arrive 50 m in central GOP box, start swath mapping SW/NE in overlapping tracks that move landward within central GOP box, also sampling surface water*
0900	25 Sep 03	Confirm site and arrive at GH50, start water-column and seabed biogeochemical station**
1700	25 Sep 03	Continue swath mapping landward from location where mapping was discontinued earlier in the day, also sampling surface water*
1000	27 Sep 03	Confirm site and arrive at GH40, start water-column and seabed biogeochemical station**
1800	27 Sep 03	Continue swath mapping landward from location where mapping was discontinued earlier in the day, also sampling surface water*
1000	29 Sep 03	Confirm site and arrive at GH30, start water-column and seabed biogeochemical station**
1800	29 Sep 03	Continue swath mapping landward from location where mapping was discontinued earlier in the day, also sampling surface water*
0600	30 Sep 03	Start swath mapping in western GOP from location where earlier mapping was discontinued (end of Leg 2), continue for 13 more swath lines.
1300	4 Oct 03	Start transit to Port Moresby
0800	5 Oct 03	Arrive Port Moresby (190 nm)
		Disembark/embark scientists by small boat
1600	5 Oct 03	Depart Port Moresby

Footnotes for Table 2c

* Surface water sampling (day time) to obtain ground truth (pigments, SPM) for remote sensing

** Water-column and seabed biogeochemical stations – to be completed in this manner, if not possible on R/V Cape Ferguson cruise (due to sea conditions)
1 hour – CTD/rosette/O_2/fluorescence (bottom water)
1 hour – 3 benthic grab samples
1 hour – 2 box cores
1 hour – 2 kasten cores
2 hour – surface-water Ra pump
2 hour – bottom-water Ra pump
** Water-column and seabed biogeochemical stations – to be completed in this manner, if above sampling was done on R/V Cape Ferguson cruise.
1 hour – CTD/rosette/O_2/fluorescence (bottom water)
3 hours – piston core
2 hour – surface-water Ra pump
2 hour – bottom-water Ra pump
Total time for biogeochemical stations ~8 hours

Table 2d, Leg 4 detailed time schedule
Gulf of Papua R/V Melville Cruise Plan

1600	5 Oct 03	Depart Port Moresby, transit to 1T13-30 (190 nm)
1100	6 Oct 03	Arrive 1T13-30, retrieve tripod #1, sample water column and seabed
1500	6 Oct 03	Transit to 1T13-20
1600	6 Oct 03	Arrive 1T13-20, retrieve tripod #2, sample water column and seabed
2000	6 Oct 03	Start swath mapping
0600	7 Oct 03	Arrive at 1T8-30, retrieve tripod #3, sample water column and seabed
1000	7 Oct 03	Transit to 1T8-80
1300	7 Oct 03	Arrive at 1T8-80, retrieve mooring, sample water column and seabed
1700	7 Oct 03	Start swath mapping in western GOP, complete 5 more lines*
0600	9 Oct 03	Start transit to Cairns
0800	11 Oct 03	Arrive Cairns (480 nm)

* If problems arise with instrument recovery, this time for swath mapping will be consumed to drag for instruments.

Table 3

Gulf of Papua, Trade-Wind Cruise – Station locations
R/V Melville

NAME	LONG	LAT
T1-10	143.5833	-9.0833
T1-15	143.6083	-9.1041
T1-20	143.6250	-9.1208
T1-25	143.7080	-9.2000
T1-30	143.7350	-9.2300
T1-50	143.8500	-9.3400
T1-60	143.9050	-9.4000
T2-20	143.6860	-9.0400
T2-30	143.7750	-9.1333
T3-20	143.7550	-9.0000
T3-30	143.8083	-9.0500
T4-10	143.7750	-8.9083
T4-15	143.7850	-8.9200
T4-20	143.7950	-8.9300
T4-25	143.8275	-8.9600
T4-30	143.8575	-8.9900
T4-50	143.9600	-9.0900
T4-60	144.1200	-9.2500
T5-20	143.8950	-8.8950
T5-30	143.9200	-8.9200
T6-20	143.9500	-8.8375
T6-30	143.9770	-8.8620
T7-20	144.0125	-8.7800
T7-30	144.0363	-8.8050
T8-10	143.9400	-8.6100
T8-15	143.9600	-8.6300
T8-20 (anchor)	143.9833	-8.6500
T8-25 (anchor)	144.0100	-8.6800
T8-30 (tripod)	144.0800	-8.7450
T8-50	144.1200	-8.7875
T8-60	144.1900	-8.8525
T8-80 (mooring)	144.4600	-9.1275
T9-20	144.1500	-8.6700
T9-30	144.1800	-8.7000

T10-10	144.0917	-8.5000
T10-15	144.1200	-8.5275
T10-20	144.1650	-8.5700
T10-25	144.1975	-8.6000
T10-30	144.2150	-8.6200
T10-50	144.2425	-8.6450
T10-60	144.4100	-8.8100
T11-20	144.2200	-8.5000
T11-30	144.2550	-8.5333
T12-20	144.2333	-8.4000
T12-30	144.2775	-8.4450
T13-10	144.2500	-8.2917
T13-15	144.2700	-8.3100
T13-20 (tripod/anchor)	144.2900	-8.3300
T13-25 (anchor)	144.3000	-8.3417
T13-30 (tripod)	144.3100	-8.3500
T13-50	144.3500	-8.3833
T13-60	144.4700	-8.5000
GH-30	144.5000	-8.1680
GH-40	144.5180	-8.1920
GH-50	144.7870	-8.0370

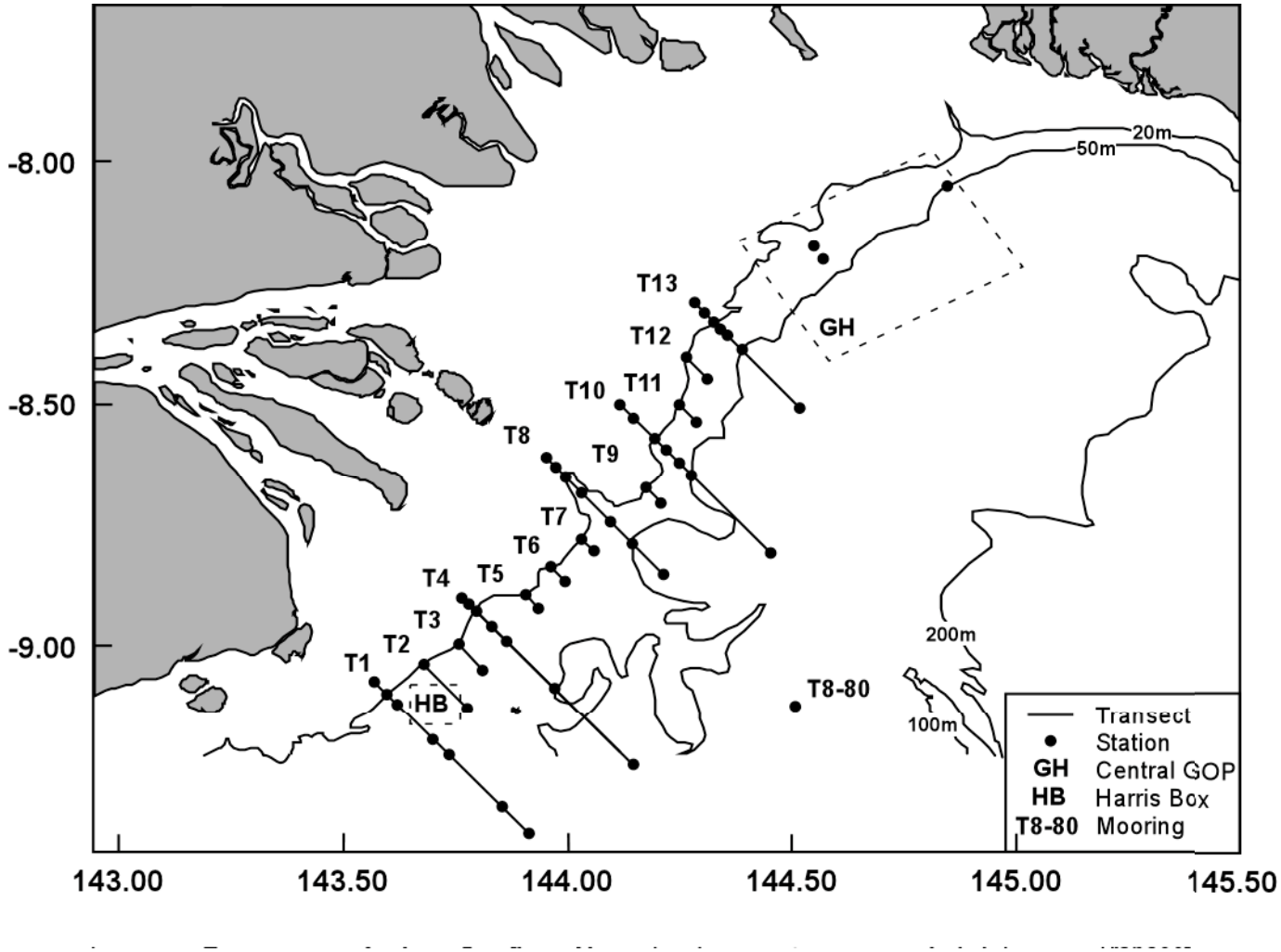

Figure 1. – The Gulf of Papua (GOP) is divided between the western and central regions. Thirteen shelf-perpendicular transects are located in the western GOP, and are shown as T1 to T13. Some of these will have extensive sampling (6 stations) and some will have less extensive sampling (2 stations). Exact locations of transects and stations will be adjusted based on observations from swath bathymetry; e.g., transects will be adjusted to include both channel and non-channel areas; stations will be adjusted to include topset, foreset or bottomset sites. HB is the Harris Box, see Figure 2.

The central GOP is shown in the large box labeled GH. Biogeochemical stations within this box will be adjusted based on observations from swath bathymetry. Three stations that were sampled previously, and have appropriate characteristics are shown within the GH box.

Station locations are listed in Table 3.

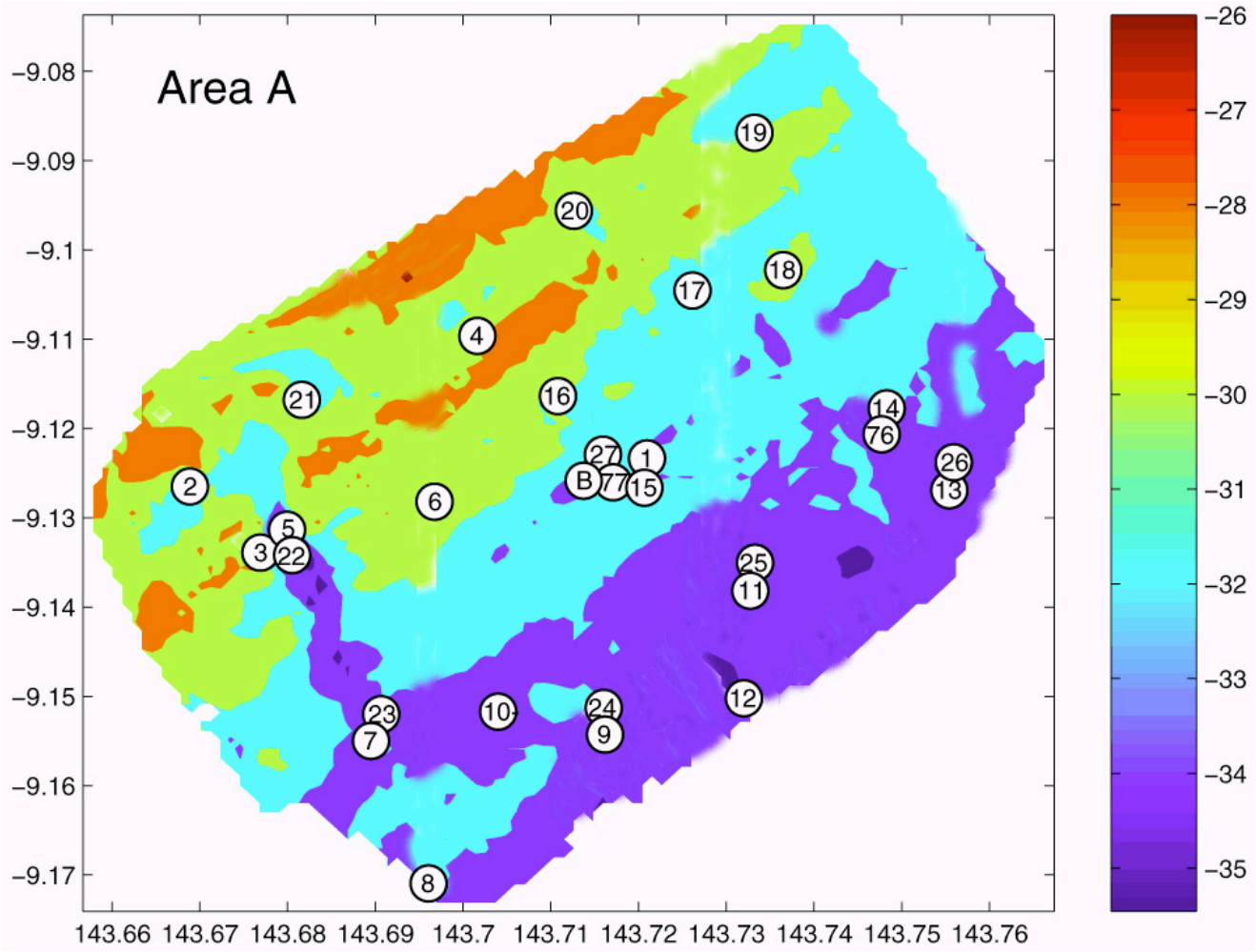

Figure 2. – Peter Harris (Geoscience Australian, formerly known as AGSO) surveyed a small area near the southwestern distributary of the Fly Delta (location of this box is shown in Fig. 1). Water depths generally get deeper toward the southeast, but a cross-shelf channel can be seen to cut northwestward. [numbers are locations of grab samples]

Appendix 1
Swath Plan for Western GOP

1. The continental shelf from 20-60m isobaths covers ~23 nautical miles across shelf. The best plan is to divide the swath mapping into two boxes divided by transect T9 and defined by the following:

   a. 20-60m South box:

T1-20	143.6250	9.1208
T9-20	144.0125	8.7800
T9-60	144.4750	8.9350
T1-60	143.9050	8.4000

   b. 20-60m North box:

T9-20	144.0125	8.7800
T13-20	144.2900	8.3300
T13-60	144.4700	8.5000
T9-60	144.4750	8.9350

2. To map 20-25m isobaths (2 boxes):

Tr length	No. Tracks	Turn time	Total length	Map time	Total time
67 Nm	32	11 hrs	2144 nm	214 hrs	225 hrs

3. To map 25-30m isobaths (2 boxes):

Tr length	No. Tracks	Turn time	Total length	Map time	Total time
67 Nm	27	9 hrs	1809 nm	181 hrs	190 hrs

4. To map 30-40m isobaths (2 boxes):

Tr length	No. Tracks	Turn time	Total length	Map time	Total time
67 Nm	23	6 hrs	1541 nm	154 hrs	160 hrs

5. To map 40-50m isobaths (2 boxes):

Tr length	No. Tracks	Turn time	Total length	Map time	Total time
67 Nm	18	6 hrs	1206 nm	121 hrs	127 hrs

6. To map 50-60m isobaths (2 boxes):

Tr length	No. Tracks	Turn time	Total length	Map time	Total time
67 Nm	113	38 hrs	7571 nm	757 hrs	795 hrs

7. The swath is assumed to be 5 times the water depth, which gives a 20% overlap for mapping. This is based on the EM-300 on the Thompson, which has a 150-degree swath. Other systems with a 90-degree swath will be 1.3 or so times these estimates. Used in this calculation is a mapping speed of 10 knots and 20 minutes for each turn, which are estimates based on experience with the Thompson. The Melville probably will map more slowly (~8 kts).

8. Summary:
   20-30m 415 hours or 17.3 days
   30-40m 160 hours or 6.7 days
   40-50m 127 hours or 5.3 days
   50-60m 795 hours or 33.1 days

Appendix 2
Swath Plan for Central GOP

9. The 20-70m isobaths near transect H are 41 km wide and only 12 km wide near transect G. Therefore the best plan is to divide the swath mapping into three boxes defined by the following:

   c. all 20-40m box:
      144° 20' 30" 08° 11' 00"
      144° 44' 30" 07° 59' 00"
      144° 47' 00" 08° 03' 00"
      144° 24' 00" 08° 15' 30"
   d. north 40-70m box:
      144° 47' 00" 08° 03' 00"
      144° 51' 30" 08° 07" 30"
      144° 36' 00" 08° 09' 00"
      144° 39' 30" 08° 14' 30"
   e. south 40-70m box:
      144° 36' 00" 08° 09' 00"
      144° 24' 00" 08° 15' 30"
      144° 34' 00" 08° 28' 30"
      144° 43' 00" 08° 19' 00"

10. To map 20-25m isobaths:

Tr length	No. Tracks	Turn time	Total length	Map time	Total time
27 Nm	24	8 hrs	648 nm	65 hrs	73 hrs

11. To map 25-30m isobaths (1 box):

Tr length	No. Tracks	Turn time	Total length	Map time	Total time
27 Nm	20	7 hrs	540 nm	54 hrs	61 hrs

12. To map 30-40m isobaths (1 box):

Tr length	No. Tracks	Turn time	Total length	Map time	Total time
27 Nm	20	7 hrs	540 nm	54 hrs	61 hrs

13. To map 40-50m isobaths (2 boxes):

Tr length	No. Tracks	Turn time	Total length	Map time	Total time
14, 13 Nm	46	15 hrs	403 nm	41 hrs	56 hrs

14. To map 50-60m isobaths (2 boxes):

Tr length	No. Tracks	Turn time	Total length	Map time	Total time
14, 13 Nm	51	17 hrs	634 nm	64 hrs	81 hrs

15. To map 60-70m isobaths (2 boxes):

Tr length	No. Tracks	Turn time	Total length	Map time	Total time
13,14 Nm	68	22 hrs	872 nm	87 hrs	109 hrs

16. The swath is assumed to be 5 times the water depth, which gives a 20% overlap for mapping. This is based on the EM-300 on the Thompson, which has a 150-degree swath. Other systems with a 90-degree swath will be 1.3 or so times these estimates. Used in this calculation is a mapping speed of 10 knots and 20 minutes for each turn, which are estimates based on experience with the Thompson. The Melville probably will map more slowly (~8 kts).

17. Summary:

20-30m	134 hours or 5.6 days
30-40m	61 hours or 2.5 days
40-50m	56 hours or 2.3 days
50-60m	81 hours or 3.4 days
60-70m	109 hours or 4.5 days