CGSN Global Surface Moorings
Modeling Results with Instrumentation

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Introduction

The analysis here builds on that done by Jason Gobat in 2012 and includes the effects of instrumentation that was neglected in the original work. (*CGSN Global Surface Mooring Modeling Results, 13 December 2012*). That work analyzed the behavior of the three moorings in a variety of current and wind/wave conditions, drawn from the environmental report for each site.

In this work, the instrumentation listed in Table 1 was added to the models and the results were compared to the previous analysis without instrumentation. As in the Gobat report, static runs that include wind and currents but neglect waves were run as well as dynamic runs that include a variety of wave conditions.

Comparison of the predicted behavior with and without instrumentation indicate that the instrumentation does not increase the expected tensions due to static loading to increase by more than 7% in any case. Increases in the dynamic results are less than 12% in any case. The effects of the instrumentation are dominated by the relatively massive and heavy ADCP, which contributes to increased static and dynamic loads in the part of the mooring above this instrument. Below the ADCP the tension increases predicted are less than a few percent.

Table 1: Instrumentation added to each of the three Global Surface Moorings

Depth	Make/Model	Diameter	Length	Air Wgt	Water Wgt
20	SBE 37-IM	6.22 cm	52.65 cm	4.0 kg	2.4 kg
20	SAMI-PH	15.2 cm	61.3 cm	7.6 kg	1.1 kg
40	SBE 37-IM	6.22 cm	52.65 cm	4.0 kg	2.4 kg
60	SBE 37-IM	6.22 cm	52.65 cm	4.0 kg	2.4 kg
100	SBE 37-IM	6.22 cm	52.65 cm	4.0 kg	2.4 kg
100	SAMI-PH	15.2 cm	61.3 cm	7.6 kg	1.1 kg
130	SBE 37-IM	6.22 cm	52.65 cm	4.0 kg	2.4 kg
180	SBE 37-IM	6.22 cm	52.65 cm	4.0 kg	2.4 kg
250	SBE 37-IM	6.22 cm	52.65 cm	4.0 kg	2.4 kg
350	SBE 37-IM	6.22 cm	52.65 cm	4.0 kg	2.4 kg
500	WorkHorse Longranger (6000 m)	21.0 cm	109 cm	121.6 kg	61.2 kg
500	SBE 37-IM	6.22 cm	52.65 cm	4.0 kg	2.4 kg
750	SBE 37-IM	6.22 cm	52.65 cm	4.0 kg	2.4 kg
1000	SBE 37-IM	6.22 cm	52.65 cm	4.0 kg	2.4 kg
1500	SBE 37-IM	6.22 cm	52.65 cm	4.0 kg	2.4 kg

Static Results

The tables in this section show each moorings behavior in static conditions that include current and wind loading, but no wave loading. Consistent with the Gobat work, the tensions reported in these tables are the maximum observed in the named segment of the mooring. The various current and wind loading used are shown in Table 2 and Figure 1 below.

The effects of including the instrumentation on the predicted static tensions are relatively small, and are dominated by the weight of the ADCP which increases the static tension in the mooring above its location.

Table 2: Current and wind conditions used for static runs.\

	Baseline Current Scale Factor	Eddy Current Scale Factor	Extreme Current Scale Factor	10 Yr Storm Wind	30 Yr Storm Wind	100 Yr Storm Wind
Argentine	1	2	3	24.3 m/s	25.7 m/s	27.0 m/s
Irminger	1	2	3	29.1 m/s	31.1 m/s	33.2 m/s
Southern	1	2	3	28.5 m/s	30.1 m/s	31.7 m/s

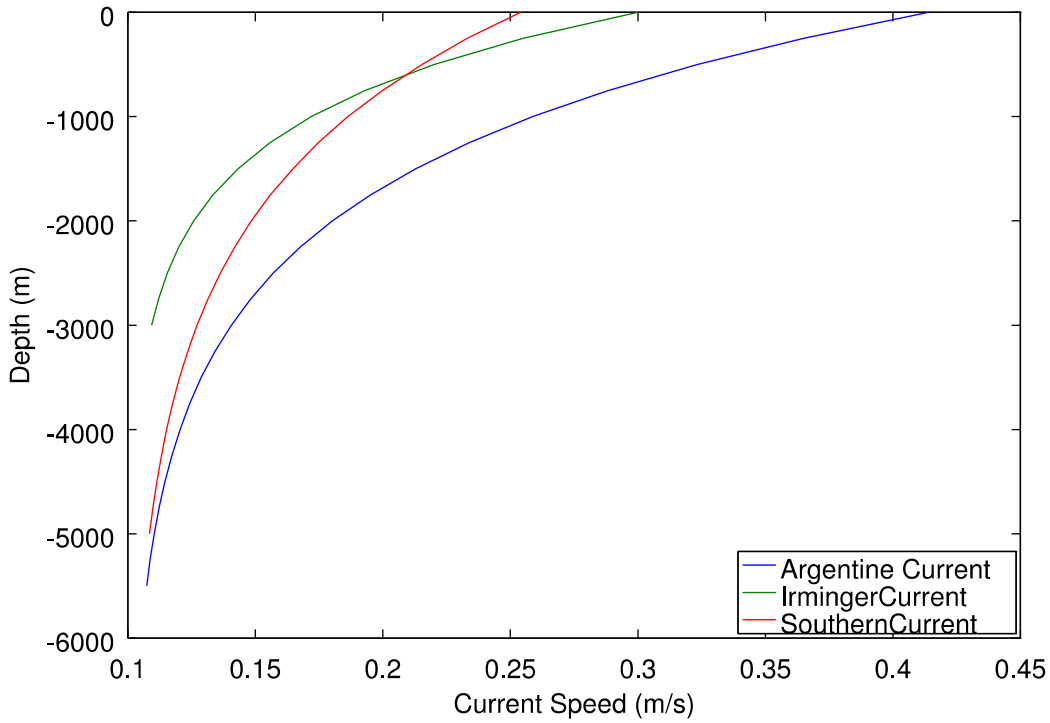

Figure 1: Current profiles, subsequently scaled by CurrentScale factor.

argentine_v2 10 year storm wind, baseline current, lower scope x1.0					**% Change From Gobat**	
Element	**length**	**depth**	**tilt**	**tension**	**depth**	**tension**
surface_buoy	6613.4	0.8	14.14	3616	3.3	6.4
molded_chain_3/4in	6613.4	0.8	14.14	3875	3.3	6.0
near_surface_frame	6603.4	10.5	13.98	3875	0.6	6.0
nilspin_7/16in	6602.3	11.6	14.44	3708	0.6	6.3
ADCP_frame	6116.8	476.5	20.49	3228	0.4	5.4
nilspin_7/16in	6115.2	478.0	22.07	2907	0.4	1.3
nilspin_3/8in	5115.2	1356.3	35.89	2080	0.1	0.9
nilspin_3/8in	4815.2	1593.1	40.14	1915	0.0	1.1
nystron_7/8in	4715.2	1668.9	41.68	1862	0.0	1.1
nylon_7/8in	4625.2	1736.8	42.16	1853	0.0	1.1
colmega_1in	2025.2	3703.0	49.82	1849	-0.0	1.1
balls_1/2in	100.2	5109.2	47.54	4585	0.0	0.4
trawler_1/2in	36.2	5165.1	17.42	4585	0.0	0.4
release_8242_x2	31.2	5169.9	17.84	4551	0.0	0.4
trawler_1/2in	30.0	5171.0	18.14	4410	0.0	0.4
nystron_1in	25.0	5175.8	18.29	4377	0.0	0.4
trawler_1/2in	5.0	5195.3	18.32	4373	0.0	0.4
clump	0.0	5200.0	18.47	4339	0.0	0.4

argentine_v2 30 year storm wind, eddy current, lower scope x1.0					**% Change From Gobat**	
Element	**length**	**depth**	**tilt**	**tension**	**depth**	**tension**
surface_buoy	6613.4	0.9	12.40	5346	1.6	5.1
molded_chain_3/4in	6613.4	0.9	12.40	5607	1.6	4.8
near_surface_frame	6603.4	10.7	13.36	5607	0.4	4.8
nilspin_7/16in	6602.3	11.7	13.95	5449	0.3	5.0
ADCP_frame	6116.8	472.8	23.55	4974	0.2	4.3
nilspin_7/16in	6115.2	474.2	24.88	4679	0.2	1.8
nilspin_3/8in	5115.2	1322.1	38.83	3883	-0.2	1.8
nilspin_3/8in	4815.2	1551.3	41.98	3724	-0.2	1.9
nystron_7/8in	4715.2	1625.3	43.03	3673	-0.2	1.9
nylon_7/8in	4625.2	1692.6	43.63	3664	-0.2	1.9
colmega_1in	2025.2	3722.7	52.88	3662	-0.1	1.9
balls_1/2in	100.2	5119.0	53.60	6077	0.0	1.0
trawler_1/2in	36.2	5168.1	29.34	6077	0.0	1.0
release_8242_x2	31.2	5172.5	29.88	6046	0.0	1.0
trawler_1/2in	30.0	5173.5	30.25	5919	0.0	1.1
nystron_1in	25.0	5177.8	30.43	5889	0.0	1.1
trawler_1/2in	5.0	5195.7	30.48	5886	0.0	1.1
clump	0.0	5200.0	30.66	5855	0.0	1.1

argentine_v2 100 year storm wind, extreme current, lower scope x1.0					% Change From Gobat	
Element	**length**	**depth**	**tilt**	**tension**	**depth**	**tension**
surface_buoy	6613.4	1.1	11.80	7765	1.1	4.1
molded_chain_3/4in	6613.4	1.1	11.80	8028	1.1	4.0
near_surface_frame	6603.4	10.8	13.66	8027	0.3	4.0
nilspin_7/16in	6602.3	11.9	14.40	7888	0.3	4.0
ADCP_frame	6116.8	466.9	26.97	7421	0.0	3.6
nilspin_7/16in	6115.2	468.3	28.17	7179	0.0	2.0
nilspin_3/8in	5115.2	1280.4	42.38	6422	-0.4	2.0
nilspin_3/8in	4815.2	1498.3	45.08	6272	-0.4	2.1
nystron_7/8in	4715.2	1568.8	45.93	6224	-0.4	2.1
nylon_7/8in	4625.2	1634.0	46.60	6216	-0.4	2.1
colmega_1in	2025.2	3723.9	56.67	6228	-0.1	2.1
balls_1/2in	100.2	5129.6	58.52	8343	0.0	1.5
trawler_1/2in	36.2	5172.0	40.12	8343	0.0	1.5
release_8242_x2	31.2	5175.8	40.63	8315	0.0	1.5
trawler_1/2in	30.0	5176.7	40.99	8209	0.0	1.5
nystron_1in	25.0	5180.5	41.16	8182	0.0	1.5
trawler_1/2in	5.0	5196.2	41.21	8180	0.0	1.5
clump	0.0	5200.0	41.39	8153	0.0	1.5

irminger_v2 10 year storm wind, baseline current, lower scope x1.0					% Change From Gobat	
Element	**length**	**depth**	**tilt**	**tension**	**depth**	**tension**
surface_buoy	3438.4	0.8	19.57	3654	0.3	5.8
molded_chain_3/4in	3438.4	0.8	19.57	3906	0.3	5.5
near_surface_frame	3428.4	10.3	18.93	3905	0.7	5.5
nilspin_7/16in	3427.3	11.3	19.43	3743	0.7	5.7
ADCP_frame	2941.8	463.5	24.75	3276	0.7	4.7
nilspin_7/16in	2940.2	464.9	26.50	2963	0.7	0.8
nilspin_3/8in	1940.2	1309.2	39.33	2169	0.2	0.3
nilspin_3/8in	1640.2	1534.9	43.35	2011	0.2	0.3
nystron_7/8in	1540.2	1606.9	44.82	1961	0.1	0.4
nylon_7/8in	1450.2	1671.5	45.16	1953	0.1	0.4
colmega_1in	800.2	2170.0	46.67	1965	0.1	0.4
balls_1/2in	100.2	2709.0	46.01	4712	0.0	0.1
trawler_1/2in	36.2	2765.1	17.58	4712	0.0	0.1
release_8242_x2	31.2	2769.9	18.00	4678	0.0	0.1
trawler_1/2in	30.0	2771.0	18.29	4537	0.0	0.1
nystron_1in	25.0	2775.8	18.44	4503	0.0	0.1
trawler_1/2in	5.0	2795.3	18.46	4500	0.0	0.1
clump	0.0	2800.0	18.61	4466	0.0	0.1

irminger_v2 30 year storm wind, eddy current, lower scope x1.0					% Change From Gobat	
Element	**length**	**depth**	**tilt**	**tension**	**depth**	**tension**
surface_buoy	3438.4	0.9	18.71	4597	3.1	5.1
molded_chain_3/4in	3438.4	0.9	18.71	4851	3.1	4.9
near_surface_frame	3428.4	10.4	18.81	4851	0.8	4.9
nilspin_7/16in	3427.3	11.4	19.37	4698	0.8	5.0
ADCP_frame	2941.8	460.1	26.67	4236	0.6	4.2
nilspin_7/16in	2940.2	461.5	28.20	3939	0.6	1.3
nilspin_3/8in	1940.2	1287.8	40.64	3162	0.1	1.1
nilspin_3/8in	1640.2	1510.6	43.85	3008	0.0	1.2
nystron_7/8in	1540.2	1582.2	44.96	2958	0.0	1.2
nylon_7/8in	1450.2	1647.1	45.39	2949	0.0	1.2
colmega_1in	800.2	2163.5	47.63	2963	0.0	1.2
balls_1/2in	100.2	2713.5	48.33	5565	0.0	0.6
trawler_1/2in	36.2	2766.5	23.81	5565	0.0	0.6
release_8242_x2	31.2	2771.1	24.30	5533	0.0	0.6
trawler_1/2in	30.0	2772.2	24.64	5399	0.0	0.6
nystron_1in	25.0	2776.7	24.81	5366	0.0	0.6
trawler_1/2in	5.0	2795.5	24.86	5363	0.0	0.6
clump	0.0	2800.0	25.03	5331	0.0	0.6

irminger_v2 100 year storm wind, extreme current, lower scope x1.0					% Change From Gobat	
Element	**length**	**depth**	**tilt**	**tension**	**depth**	**tension**
surface_buoy	3438.4	0.9	17.76	5966	1.8	4.7
molded_chain_3/4in	3438.4	0.9	17.76	6222	1.8	4.5
near_surface_frame	3428.4	10.5	18.63	6222	0.6	4.5
nilspin_7/16in	3427.3	11.5	19.27	6085	0.6	4.5
ADCP_frame	2941.8	456.5	28.64	5628	0.4	3.9
nilspin_7/16in	2940.2	457.8	29.98	5358	0.4	1.8
nilspin_3/8in	1940.2	1264.4	42.29	4603	-0.1	1.8
nilspin_3/8in	1640.2	1482.3	45.00	4452	-0.1	1.8
nystron_7/8in	1540.2	1552.7	45.90	4403	-0.1	1.9
nylon_7/8in	1450.2	1617.2	46.41	4395	-0.1	1.9
colmega_1in	800.2	2153.8	49.28	4411	-0.1	1.8
balls_1/2in	100.2	2719.2	50.93	6856	0.0	1.1
trawler_1/2in	36.2	2768.5	30.65	6856	0.0	1.1
release_8242_x2	31.2	2772.8	31.16	6825	0.0	1.1
trawler_1/2in	30.0	2773.8	31.52	6702	0.0	1.1
nystron_1in	25.0	2778.1	31.69	6672	0.0	1.1
trawler_1/2in	5.0	2795.8	31.77	6669	0.0	1.1
clump	0.0	2800.0	31.94	6639	0.0	1.1

southern_v2 10 year storm wind, baseline current, lower scope x1.0					**% Change From Gobat**	
Element	**length**	**depth**	**tilt**	**tension**	**depth**	**tension**
surface_buoy	6113.4	0.8	18.68	3648	1.8	5.9
molded_chain_3/4in	6113.4	0.8	18.68	3901	1.8	5.5
near_surface_frame	6103.4	10.3	18.00	3901	0.7	5.5
nilspin_7/16in	6102.3	11.3	18.47	3736	0.7	5.7
ADCP_frame	5616.8	467.2	23.38	3266	0.7	4.8
nilspin_7/16in	5615.2	468.6	25.04	2949	0.7	0.8
nilspin_3/8in	4615.2	1327.5	37.66	2140	0.2	0.3
nilspin_3/8in	4315.2	1558.9	41.69	1979	0.2	0.3
nystron_7/8in	4215.2	1632.8	43.16	1928	0.2	0.3
nylon_7/8in	4125.2	1699.3	43.55	1919	0.2	0.3
colmega_1in	1825.2	3436.5	49.35	1917	0.0	0.3
balls_1/2in	100.2	4709.4	47.39	4647	0.0	0.1
trawler_1/2in	36.2	4765.2	17.79	4647	0.0	0.1
release_8242_x2	31.2	4769.9	18.22	4613	0.0	0.1
trawler_1/2in	30.0	4771.1	18.52	4472	0.0	0.1
nystron_1in	25.0	4775.8	18.67	4438	0.0	0.1
trawler_1/2in	5.0	4795.3	18.69	4435	0.0	0.1
clump	0.0	4800.0	18.84	4401	0.0	0.1

southern_v2 30 year storm wind, eddy current, lower scope x1.0					**% Change From Gobat**	
Element	**length**	**depth**	**tilt**	**tension**	**depth**	**tension**
surface_buoy	6113.4	0.9	17.18	4600	1.5	5.1
molded_chain_3/4in	6113.4	0.9	17.18	4855	1.5	4.8
near_surface_frame	6103.4	10.4	17.12	4855	0.5	4.8
nilspin_7/16in	6102.3	11.5	17.60	4696	0.5	4.9
ADCP_frame	5616.8	467.5	23.96	4226	0.5	4.1
nilspin_7/16in	5615.2	468.9	25.36	3918	0.5	1.1
nilspin_3/8in	4615.2	1322.7	37.86	3116	0.1	0.9
nilspin_3/8in	4315.2	1554.7	41.21	2955	0.0	1.0
nystron_7/8in	4215.2	1629.5	42.37	2903	0.0	1.0
nylon_7/8in	4125.2	1697.2	42.91	2894	-0.0	1.0
colmega_1in	1825.2	3477.6	51.59	2892	-0.0	1.0
balls_1/2in	100.2	4715.8	52.49	5409	0.0	0.5
trawler_1/2in	36.2	4767.0	25.46	5409	0.0	0.5
release_8242_x2	31.2	4771.5	25.99	5377	0.0	0.5
trawler_1/2in	30.0	4772.6	26.37	5245	0.0	0.5
nystron_1in	25.0	4777.1	26.55	5213	0.0	0.5
trawler_1/2in	5.0	4795.5	26.60	5210	0.0	0.5
clump	0.0	4800.0	26.79	5178	0.0	0.5

southern_v2 100 year storm wind, extreme current, lower scope x1.0					**% Change From Gobat**	
Element	**length**	**depth**	**tilt**	**tension**	**depth**	**tension**
surface_buoy	6113.4	0.9	15.64	5973	1.5	4.3
molded_chain_3/4in	6113.4	0.9	15.64	6231	1.5	4.1
near_surface_frame	6103.4	10.6	16.20	6230	0.4	4.1
nilspin_7/16in	6102.3	11.6	16.71	6078	0.4	4.2
ADCP_frame	5616.8	467.6	24.75	5609	0.3	3.6
nilspin_7/16in	5615.2	469.0	25.97	5318	0.3	1.4
nilspin_3/8in	4615.2	1313.4	38.84	4527	-0.1	1.3
nilspin_3/8in	4315.2	1542.9	41.84	4368	-0.1	1.3
nystron_7/8in	4215.2	1617.1	42.84	4317	-0.1	1.3
nylon_7/8in	4125.2	1684.9	43.52	4308	-0.2	1.3
colmega_1in	1825.2	3507.4	54.35	4312	-0.1	1.3
balls_1/2in	100.2	4723.8	56.93	6598	0.0	0.8
trawler_1/2in	36.2	4769.7	33.90	6598	0.0	0.8
release_8242_x2	31.2	4773.8	34.48	6568	0.0	0.8
trawler_1/2in	30.0	4774.8	34.88	6451	0.0	0.8
nystron_1in	25.0	4778.9	35.07	6422	0.0	0.8
trawler_1/2in	5.0	4795.9	35.15	6419	0.0	0.8
clump	0.0	4800.0	35.34	6390	0.0	0.8

Dynamic Results

The tables in this section show each moorings behavior in response to wave-forcing on top of the static loads of current and wind. Consistent with the Gobat work, the tensions reported in these tables are those at the top of each segment. The various current and wind loading used are shown in Table 3, the current loading is the same as presented in Table 2 and Figure 1 above.

As in the static case, the tension increases are dominated by the addition of the ADCP. The total increases in the dynamic results shown here is about half due to the additional static load as illustrated above, and half due to increased dynamic loading due to the inertia of the ADCP.

Table 3: Wind and wave conditions for dynamic analysis

Argentine	Wind	Sig. Wave Height	Peak Period
Mean Conditions	9.6 m/s	3 m	9 s
10 Year Storm	24.3 m/s	11.1 m	15.8 s
30 Year Storm	25.7 m/s	11.9 m	16.3 s
100Yrs Storm	27 m/s	12.7 m	16.9 s

Irminger	Wind	Sig. Wave Height	Peak Period
Mean Conditions	9.9 m/s	3.5 m	9.5 s
10 Year Storm	29.1 m/s	13.2 m	15.3 s
30 Year Storm	31.1 m/s	13.8 m	15.7 s
100Yrs Storm	33.2 m/s	14.4 m	16.1 s

Southern	Wind	Sig. Wave Height	Peak Period
Mean Conditions	11 m/s	4.5 m	10.5 s
10 Year Storm	28.5 m/s	13.9 m	18.6 s
30 Year Storm	30.1 m/s	15 m	19.4 s

argentine_v2, Mean waves , baseline current				% Change From Gobat (2012)		
Element	**Static**	**Sigma**	**Static+3Sigma**	**Static**	**Sigma**	**Static+3*Sigma**
molded_chain_3/4in	2863	867	5463	8.6	10.3	9.4
near_surface_frame	3128	835	5635	7.8	10.3	8.9
nilspin_7/16in	2954	658	4927	8.3	13.0	10.1
ADCP_frame	2456	606	4273	7.5	10.1	8.6
nilspin_7/16in	2113	318	3066	1.9	0.5	1.4
nilspin_3/8in	1219	114	1561	1.7	-1.3	1.0
nilspin_3/8in	1038	60	1220	2.1	0.2	1.8
nystron_7/8in	981	49	1129	2.2	1.2	2.1
nylon_7/8in	971	43	1101	2.2	1.3	2.1
colmega_1in	855	13	895	2.5	0.2	2.4
balls_1/2in	962	14	1004	2.3	0.3	2.2
trawler_1/2in	3850	22	3916	0.4	3.4	0.5
release_8242_x2	3815	22	3881	0.4	3.5	0.5
trawler_1/2in	3669	23	3738	0.5	3.6	0.5
nystron_1in	3634	23	3704	0.5	3.7	0.5
trawler_1/2in	3631	23	3701	0.5	3.7	0.5
clump	3596	23	3666	0.5	3.7	0.5

argentine_v2, 10 year storm, baseline current				% Change From Gobat (2012)		
Element	**Static**	**Sigma**	**Static+3Sigma**	**Static**	**Sigma**	**Static+3*Sigma**
molded_chain_3/4in	3616	1560	8296	6.4	8.9	7.8
near_surface_frame	3875	1515	8419	6.0	8.8	7.5
nilspin_7/16in	3708	1146	7146	6.3	10.8	8.4
ADCP_frame	3228	1076	6457	5.4	7.7	6.5
nilspin_7/16in	2907	353	3965	1.3	9.0	3.3
nilspin_3/8in	2080	137	2490	0.9	5.9	1.7
nilspin_3/8in	1915	88	2179	1.1	4.7	1.5
nystron_7/8in	1862	78	2098	1.1	4.3	1.4
nylon_7/8in	1853	70	2064	1.1	4.1	1.4
colmega_1in	1740	16	1788	1.2	2.9	1.2
balls_1/2in	1849	17	1898	1.1	1.4	1.1
trawler_1/2in	4585	21	4649	0.4	4.3	0.4
release_8242_x2	4551	21	4616	0.4	4.3	0.4
trawler_1/2in	4410	22	4476	0.4	4.5	0.4
nystron_1in	4377	22	4443	0.4	4.5	0.4
trawler_1/2in	4373	22	4440	0.4	4.6	0.4
clump	4339	22	4406	0.4	4.6	0.4

argentine_v2, 100 year storm, extreme current				% Change From Gobat (2012)		
Element	**Static**	**Sigma**	**Static+3Sigma**	**Static**	**Sigma**	**Static+3*Sigma**
molded_chain_3/4in	7766	1915	13510	4.2	-2.6	1.2
near_surface_frame	8028	1871	13642	4.0	-2.7	1.1
nilspin_7/16in	7889	1467	12290	4.1	-1.7	1.9
ADCP_frame	7423	1388	11587	3.6	-4.3	0.6
nilspin_7/16in	7180	387	8341	2.0	7.8	2.8
nilspin_3/8in	6424	156	6893	2.0	-0.6	1.9
nilspin_3/8in	6274	108	6597	2.1	-3.6	1.8
nystron_7/8in	6225	98	6520	2.1	-4.1	1.8
nylon_7/8in	6218	88	6483	2.1	-4.1	1.9
colmega_1in	6133	16	6180	2.2	-11.7	2.1
balls_1/2in	6229	16	6277	2.1	-11.4	2.0
trawler_1/2in	8344	17	8395	1.5	-8.6	1.4
release_8242_x2	8317	17	8368	1.5	-8.6	1.4
trawler_1/2in	8210	17	8262	1.5	-8.4	1.5
nystron_1in	8184	17	8235	1.5	-8.4	1.5
trawler_1/2in	8181	17	8233	1.5	-8.4	1.5
clump	8155	17	8206	1.5	-8.4	1.5

irminger_v2, Mean waves , baseline current				% Change From Gobat (2012)		
Element	**Static**	**Sigma**	**Static+3Sigma**	**Static**	**Sigma**	**Static+3*Sigma**
molded_chain_3/4in	2364	929	5150	10.1	10.6	10.4
near_surface_frame	2629	895	5315	9.0	10.5	9.7
nilspin_7/16in	2455	697	4547	9.7	14.0	11.6
ADCP_frame	1956	643	3883	9.1	10.8	9.9
nilspin_7/16in	1611	325	2587	1.8	5.9	3.3
nilspin_3/8in	714	115	1057	1.4	3.1	2.0
nilspin_3/8in	541	62	727	2.0	3.2	2.3
nystron_7/8in	490	52	644	2.2	3.5	2.5
nylon_7/8in	482	46	619	2.2	3.5	2.5
colmega_1in	455	27	537	2.4	4.1	2.6
balls_1/2in	493	34	594	2.2	2.0	2.2
trawler_1/2in	3467	48	3611	0.2	5.3	0.4
release_8242_x2	3432	48	3577	0.2	5.4	0.4
trawler_1/2in	3285	50	3435	0.2	5.6	0.5
nystron_1in	3249	50	3401	0.2	5.6	0.5
trawler_1/2in	3246	50	3397	0.2	5.6	0.5
clump	3211	50	3362	0.2	5.6	0.5

irminger_v2, 10 year storm, baseline current				% Change From Gobat (2012)		
Element	**Static**	**Sigma**	**Static+3Sigma**	**Static**	**Sigma**	**Static+3*Sigma**
molded_chain_3/4in	3654	2001	9656	5.8	7.1	6.6
near_surface_frame	3905	1931	9699	5.5	7.0	6.4
nilspin_7/16in	3743	1386	7901	5.7	8.6	7.2
ADCP_frame	3276	1305	7191	4.7	5.6	5.2
nilspin_7/16in	2963	409	4189	0.8	2.7	1.4
nilspin_3/8in	2169	156	2637	0.3	0.3	0.3
nilspin_3/8in	2011	98	2304	0.3	0.6	0.4
nystron_7/8in	1961	86	2218	0.4	0.7	0.4
nylon_7/8in	1953	75	2178	0.4	0.5	0.4
colmega_1in	1924	39	2041	0.4	-2.1	0.2
balls_1/2in	1965	48	2110	0.4	-1.1	0.3
trawler_1/2in	4712	56	4881	0.1	0.8	0.1
release_8242_x2	4678	56	4847	0.1	0.9	0.1
trawler_1/2in	4537	57	4710	0.1	1.0	0.1
nystron_1in	4503	58	4677	0.1	1.0	0.1
trawler_1/2in	4500	58	4673	0.1	1.0	0.1
clump	4466	58	4640	0.1	1.0	0.1

irminger_v2, 100 year storm, extreme current				% Change From Gobat (2012)		
Element	**Static**	**Sigma**	**Static+3Sigma**	**Static**	**Sigma**	**Static+3*Sigma**
molded_chain_3/4in	5966	2524	13539	4.7	7.0	5.9
near_surface_frame	6222	2451	13575	4.5	6.8	5.7
nilspin_7/16in	6085	1802	11492	4.5	7.4	5.8
ADCP_frame	5628	1700	10729	3.9	4.4	4.1
nilspin_7/16in	5358	440	6678	1.8	6.1	2.6
nilspin_3/8in	4603	178	5139	1.8	1.9	1.8
nilspin_3/8in	4452	122	4818	1.8	3.3	1.9
nystron_7/8in	4403	110	4734	1.9	4.0	2.0
nylon_7/8in	4395	98	4688	1.9	4.8	2.0
colmega_1in	4370	58	4545	1.9	14.1	2.3
balls_1/2in	4411	66	4609	1.8	9.8	2.2
trawler_1/2in	6856	68	7059	1.1	7.8	1.3
release_8242_x2	6825	68	7029	1.1	7.8	1.3
trawler_1/2in	6702	68	6908	1.1	7.7	1.3
nystron_1in	6672	69	6878	1.1	7.7	1.3
trawler_1/2in	6669	69	6875	1.1	7.6	1.3
clump	6639	69	6845	1.1	7.7	1.3

southern_v2, Mean waves , baseline current				**% Change From Gobat (2012)**		
Element	**Static**	**Sigma**	**Static+3Sigma**	**Static**	**Sigma**	**Static+3*Sigma**
molded_chain_3/4in	2565	1059	5741	9.2	10.4	9.9
near_surface_frame	2830	1022	5898	8.3	10.5	9.4
nilspin_7/16in	2656	786	5014	8.9	13.4	10.9
ADCP_frame	2157	728	4340	8.1	10.3	9.2
nilspin_7/16in	1811	340	2832	1.6	6.0	3.1
nilspin_3/8in	902	121	1264	0.9	2.2	1.3
nilspin_3/8in	715	67	917	1.2	2.5	1.5
nystron_7/8in	657	57	827	1.3	2.9	1.6
nylon_7/8in	647	50	798	1.3	2.9	1.6
colmega_1in	544	16	592	1.6	1.0	1.5
balls_1/2in	639	16	688	1.4	1.2	1.3
trawler_1/2in	3596	25	3672	0.2	5.5	0.3
release_8242_x2	3561	25	3637	0.2	5.5	0.3
trawler_1/2in	3414	26	3493	0.2	5.7	0.3
nystron_1in	3379	27	3459	0.2	5.7	0.3
trawler_1/2in	3375	27	3456	0.2	5.7	0.3
clump	3340	27	3420	0.2	5.7	0.3

southern_v2, 10 year storm, baseline current				**% Change From Gobat (2012)**		
Element	**Static**	**Sigma**	**Static+3Sigma**	**Static**	**Sigma**	**Static+3*Sigma**
molded_chain_3/4in	3648	1461	8032	5.9	8.8	7.5
near_surface_frame	3901	1436	8210	5.5	8.8	7.2
nilspin_7/16in	3737	1239	7452	5.8	8.9	7.3
ADCP_frame	3266	1173	6785	4.8	6.4	5.6
nilspin_7/16in	2949	330	3939	0.8	5.3	1.9
nilspin_3/8in	2141	134	2544	0.3	2.1	0.6
nilspin_3/8in	1979	92	2256	0.3	2.1	0.6
nystron_7/8in	1928	84	2179	0.4	2.0	0.5
nylon_7/8in	1919	76	2146	0.4	1.9	0.5
colmega_1in	1819	17	1870	0.4	1.1	0.4
balls_1/2in	1917	19	1973	0.4	-0.0	0.3
trawler_1/2in	4647	24	4719	0.1	6.6	0.2
release_8242_x2	4613	24	4686	0.1	6.7	0.2
trawler_1/2in	4472	25	4547	0.1	7.2	0.2
nystron_1in	4439	25	4514	0.1	7.4	0.2
trawler_1/2in	4435	25	4510	0.1	7.4	0.2
clump	4402	25	4477	0.1	7.4	0.2

southern_v2, 100 year storm, extreme current				**% Change From Gobat (2012)**		
Element	**Static**	**Sigma**	**Static+3Sigma**	**Static**	**Sigma**	**Static+3*Sigma**
molded_chain_3/4in	5972	1686	11031	4.3	6.5	5.3
near_surface_frame	6230	1651	11183	4.1	6.2	5.0
nilspin_7/16in	6078	1486	10535	4.2	6.8	5.3
ADCP_frame	5608	1413	9848	3.6	4.5	4.0
nilspin_7/16in	5317	348	6361	1.3	3.8	1.7
nilspin_3/8in	4526	151	4980	1.2	-0.3	1.1
nilspin_3/8in	4367	113	4706	1.3	0.7	1.3
nystron_7/8in	4316	105	4631	1.3	1.0	1.3
nylon_7/8in	4307	95	4594	1.3	1.1	1.3
colmega_1in	4222	19	4278	1.4	2.3	1.4
balls_1/2in	4312	22	4376	1.3	2.2	1.3
trawler_1/2in	6597	22	6663	0.8	1.4	0.8
release_8242_x2	6567	22	6633	0.8	1.4	0.8
trawler_1/2in	6450	22	6516	0.8	1.3	0.8
nystron_1in	6421	22	6487	0.8	1.3	0.8
trawler_1/2in	6418	22	6484	0.8	1.3	0.8
clump	6389	22	6456	0.8	1.3	0.8

Argentine Basin Surface Mooring
Water Depth 5200 M
CGSN Site Name: GA01SUMO
Revision 1.3

No.	Mooring Component Discription	Hardware Code	Item Stretch Length	Mooring Length	Mooring Depth	Required Depth	Notes
1	**Global Surface Buoy**	**DRAFT**	1.3	1.3	1.3		
	Flange to Flange Termination	FT	0	0	1.3		
	Buoy Universal		0.47	1.77	1.77		
	Flange to Flange Termination	FT	0	1.77	1.77		
2	**10** Meter EM Chain with 3/4" Trawler Chain		10	11.77	11.77		
	Flange to Flange Termination	FT	0	11.77	11.77		
3	**Near Surface Instrument Frame**		0.2	11.97	11.97	**12.5**	
	Special IM Termination	IM	0.05	12.02	12.02	**-0.53**	
4	**486.3** Meters 7/16" Jac.Nil. Inductive Wirerope		486.3	498.32	498.32		**Note A**
	Special IM Termination	IM	0.2	498.52	498.52		
5	**Longranger ADCP in Frame (looking Up)**		1.56	500.08	500.08	**500**	**Note B**
	Special IM Termination	IM	0.2	500.28	500.28	**0.08**	
6	**1000** Meters 7/16" Jac.Nil. Inductive Wirerope		1000	1500.28	1500.28		**Note C**
	Hardware	I	0.25	1500.53	1500.53		
7	**300** Meters 3/8" TB Jac. Wirerope		300	1800.53	1800.53		
	Hardware	L	0.27	1800.8	1800.8		
8	**100** Meters 3/8" TB Jac. Wirerope		100	1900.8	1900.8	**1900.8**	
	Special Wire to Nylon Termination		0.07	1900.87			
9	**200** Meters 7/8" Plaited Nylon		200	2100.87			**Note D**
	Hardware		0.27	2101.14			
10	**2600** Meters 7/8" Plaited Nylon		2600	4701.14			
	Short Spliced at Sea		0	4701.14			
11	**1925** Meters 1" Colmega		1925	6626.14			
	Hardware	I	0.25	6626.39			
12	4-17" Glassballs on 1/2" Trawler Chain		4	6630.39			
	Hardware	K	0.255	6630.65			
13	4-17" Glassballs on 1/2" Trawler Chain		4	6634.65			
	Hardware	K	0.255	6634.9			
14	4-17" Glassballs on 1/2" Trawler Chain		4	6638.9			
	Hardware	K	0.255	6639.16			
15	4-17" Glassballs on 1/2" Trawler Chain		4	6643.16			
	Hardware	K	0.255	6643.41			
15	4-17" Glassballs on 1/2" Trawler Chain		4	6647.41			
	Hardware	K	0.255	6647.67			
16	4-17" Glassballs on 1/2" Trawler Chain		4	6651.67			
	Hardware	K	0.255	6651.92			
17	4-17" Glassballs on 1/2" Trawler Chain		4	6655.92			
	Hardware	K	0.255	6656.18			
18	4-17" Glassballs on 1/2" Trawler Chain		4	6660.18			
	Hardware	K	0.255	6660.43			
19	4-17" Glassballs on 1/2" Trawler Chain		4	6664.43			
	Hardware	K	0.255	6664.69			
20	4-17" Glassballs on 1/2" Trawler Chain		4	6668.69			

	Hardware	K	0.255	6668.94
21	4-17" Glassballs on 1/2" Trawler Chain		4	6672.94
	Hardware	K	0.255	6673.2
22	4-17" Glassballs on 1/2" Trawler Chain		4	6677.2
	Hardware	K	0.255	6677.45
23	4-17" Glassballs on 1/2" Trawler Chain		4	6681.45
	Hardware	K	0.255	6681.71
24	4-17" Glassballs on 1/2" Trawler Chain		4	6685.71
	Hardware	K	0.255	6685.96
25	4-17" Glassballs on 1/2" Trawler Chain		4	6689.96
	Hardware	K	0.255	6690.22
26	4-17" Glassballs on 1/2" Trawler Chain		4	6694.22
	Hardware	K	0.255	6694.47
27	**5** Meters 1/2" Trawler Chain		5	6699.47
	Hardware	J	0.26	6699.73
28	Dualed Edgetech Releases	M	1.945	6701.68
	Hardware	I	0.29	6701.97
29	**5** Meters 1/2" Trawler Chain		5	6706.97
	Hardware	I	0.29	6707.26
30	**20** Meters 1" Samson Nystron		20	6727.26
	Hardware	I	0.29	6727.55
31	**5** Meters 1/2" Trawler Chain		5	6732.55
	Hardware	I	0.29	6732.84
	9000 Lb Ww Anchor		1	6733.84
	OVERALL MOORING LENGTH			**6733.84**

Depth 5200
Scope 1.2949683

Note A

Measure and Label cable back from upper swage of 7/16" Wire for mounting Instrumentation

8.0 Meters - Label 20 Meters
28.0 Meters - Label 40 Meters
48.0 Meters - Label 60 Meters
68.0 Meters - Label 80 Meters
88.0 Meters - Label 100 Meters
118.0 Meters - Label 130 Meters
168.0 Meters - Label 180 Meters
238.0 Meters - Label 250 Meters
338.0 Meters - Label 350 Meters

NOTE: "B"

500 Meter Inductive Microcat mounted in ADCP Frame

NOTE: "C"

Measure and Label cable back from upper swage of 7/16" Wire for mounting Instrumentation

249.9 Meters - Label 750 Meters
499.9 Meters - Label 1000 Meters
999.9 Meters - Label 1500 Meters

Note: "D"
Special overbraid on upper 90 meters of 7/8" Nylon

Hardware Designation	
I	(1) 5/8" Chain SH., (1) 7/8" E L., (1) 7/8" Anchor SH.
J	(1) 5/8" Chain SH., (1) 7/8" E L., (1) 3/4" Chain SH.
K	(2) 5/8" Chain SH., (1) 7/8" End Link
L	(2) 3/4" Chain SH., (1) 7/8" End Link
M	(1) 1-1/4" Master Link

Hardware Required Per Mooring, Without Spares	
39	- 5/8 Chain Shackles: Shot peened and coated
3	- 3/4" Chain Shackles: Shot peened and coated
6	- 7/8" Anchor Shackles: Shot peened and coated
24	- 7/8" End Links
1	- 1-1/4" Master Link

Irminger Sea Surface Mooring
Water Depth 2800 M
CGSN Site Name: GI01SUMO
Revision 1.4

NOTE: This Spreadsheet is the Control Source for Information Depicted in Mooring Diagram 3602-40001.DWG, Irminger Sea Surface Mooring

No.	Mooring Component Discription	Hardware Code	Item Stretch Length	Mooring Length	Mooring Depth	Required Depth	Notes
1	**Global Standard Power Surface Buoy**	**DRAFT**	1.3	1.15	1.3		
	Flange to Flange Termination	FT	0	0	1.3		
	Buoy Universal		0.47	1.62	1.77		
	Flange to Flange Termination	FT	0	1.62	1.77		
2	**10** Meter EM Chain with 3/4" Trawler Chain		10	11.62	11.77		
	Flange to Flange Termination	FT	0	11.62	11.77		
3	**Near Surface Instrument Frame**		0.2	11.82	11.97	**12.5**	**Note A**
	Special IM Termination	IM	0.05	11.87	12.02	**-0.53**	
4	**486.3** Meters 7/16" Jac.Nil. Inductive Wirerope		486.3	498.17	498.32		**Note B**
	Special IM Termination	IM	0.2	498.37	498.52		
5	**ADCPS-N in Frame (Looking Up)**		1.56	499.93	500.08	**500**	**Note C, D**
	Special IM Termination	IM	0.05	499.98	500.13	**0.08**	
6	**1000** Meters 7/16" Jac.Nil. Inductive Wirerope		1000	1499.98	1500.13		**Note E**
	Hardware	L	0.27	1500.25	1500.4		
7	**300** Meters 3/8" TB Jac. Wirerope		300	1800.25	1800.4		
	Hardware	L	0.27	1800.52	1800.67		
8	**100** Meters 3/8" TB Jac. Wirerope		100	1900.52	1900.67	**1900.67**	
	Special Wire to Nystron Termination		0.07	1900.59			
9	**90** Meters 7/8" Nystron		90	1990.59			
	Hardware	L	0.27	1990.86			
10	**650** Meters 7/8" Plaited Nylon		650	2640.86			
	Short Spliced at Sea		0	2640.86			
11	**700** Meters 1" Colmega		700	3340.86			
	Hardware	I	0.25	3341.11			
12	4-17" Glassballs on 1/2" Trawler Chain		4	3345.11			
	Hardware	K	0.255	3345.37			
13	4-17" Glassballs on 1/2" Trawler Chain		4	3349.37			
	Hardware	K	0.255	3349.62			
14	4-17" Glassballs on 1/2" Trawler Chain		4	3353.62			
	Hardware	K	0.255	3353.88			
15	4-17" Glassballs on 1/2" Trawler Chain		4	3357.88			
	Hardware	K	0.255	3358.13			
15	4-17" Glassballs on 1/2" Trawler Chain		4	3362.13			
	Hardware	K	0.255	3362.39			
16	4-17" Glassballs on 1/2" Trawler Chain		4	3366.39			
	Hardware	K	0.255	3366.64			
17	4-17" Glassballs on 1/2" Trawler Chain		4	3370.64			
	Hardware	K	0.255	3370.9			

18	4-17" Glassballs on 1/2" Trawler Chain		4	3374.9
	Hardware	K	0.255	3375.15
19	4-17" Glassballs on 1/2" Trawler Chain		4	3379.15
	Hardware	K	0.255	3379.41
20	4-17" Glassballs on 1/2" Trawler Chain		4	3383.41
	Hardware	K	0.255	3383.66
21	4-17" Glassballs on 1/2" Trawler Chain		4	3387.66
	Hardware	K	0.255	3387.92
22	4-17" Glassballs on 1/2" Trawler Chain		4	3391.92
	Hardware	K	0.255	3392.17
23	4-17" Glassballs on 1/2" Trawler Chain		4	3396.17
	Hardware	K	0.255	3396.43
24	4-17" Glassballs on 1/2" Trawler Chain		4	3400.43
	Hardware	K	0.255	3400.68
25	4-17" Glassballs on 1/2" Trawler Chain		4	3404.68
	Hardware	K	0.255	3404.94
26	4-17" Glassballs on 1/2" Trawler Chain		4	3408.94
	Hardware	K	0.255	3409.19
27	**5** Meters 1/2" Trawler Chain		5	3414.19
	Hardware	J	0.26	3414.45
28	Dualed Edgetech Releases	M	1.945	3416.4
	Hardware	I	0.29	3416.69
29	**5** Meters 1/2" Trawler Chain		5	3421.69
	Hardware	I	0.29	3421.98
30	**20** Meters 1" Samson Nystron		20	3441.98
	Hardware	I	0.29	3442.27
31	**5** Meters 1/2" Trawler Chain		5	3447.27
	Hardware	I	0.29	3447.56
	7700 Lb Ww Anchor		1	3448.56
	OVERALL MOORING LENGTH			**3448.71**

Depth 2800
Scope 1.2316804

Note "A"
Estimated Ww : (-250 Lbs)

NOTE: "B"
Measure and Label cable back from upper swage of 7/16" Wire for mounting Instrumentation

8.0 Meters - Label 20 Meters
28.0 Meters - Label 40 Meters
48.0 Meters - Label 60 Meters
88.0 Meters - Label 100 Meters
118.0 Meters - Label 130 Meters
168.0 Meters - Label 180 Meters
238.0 Meters - Label 250 Meters

338.0 Meters - Label 350 Meters

Note "C"
Estimated Ww : (-156 Lbs)

NOTE: "D"
ADCPS-N
Mounted in ADCP Frame

NOTE: "E"
Measure and Label cable back from upper swage of 7/16" Wire for mounting Instrumentation
249.9 Meters - Label 750 Meters
499.9 Meters - Label 1000 Meters
999.9 Meters - Label 1500 Meters

Ltr	Hardware Designation
I	(1) 5/8" Chain SH., (1) 7/8" E L., (1) 7/8" Anchor SH.
J	(1) 5/8" Chain SH., (1) 7/8" E L., (1) 3/4" Chain SH.
K	(2) 5/8" Chain SH., (1) 7/8" End Link
L	(2) 3/4" Chain SH., (1) 7/8" End Link
M	(1) 1-1/4" Master Link

Qty	Hardware Required, Without Spares
38	- 5/8 Chain Shackles: Shot peened and coated
7	- 3/4" Chain Shackles: Shot peened and coated
5	- 7/8" Anchor Shackles: Shot peened and coated
25	- 7/8" End Links
1	- 1-1/4" Master Link

55 South Surface Mooring
Water Depth 4800 M
CGSN Site Name: GS01SUMO
Revision 1.3

No.	Mooring Component Discription	Hardware Code	Item Stretch Length	Mooring Length	Mooring Depth	Required Depth	Notes
1	**Global High Power Surface Buoy**	**DRAFT**	1.3	1.3	1.3		
	Flange to Flange Termination	FT	0	0	1.3		
	Buoy Universal		0.47	1.77	1.77		
	Flange to Flange Termination	FT	0	1.77	1.77		
2	**10** Meter EM Chain with 3/4" Trawler Chain		10	11.77	11.77		
	Flange to Flange Termination	FT	0	11.77	11.77		
3	**Near Surface Instrument Frame**		0.2	11.97	11.97	**12.5**	
	Special IM Termination	IM	0.05	12.02	12.02	**-0.53**	
4	**486.3** Meters 7/16" Jac.Nil. Inductive Wirerope		486.3	498.32	498.32		**Note A**
	Special IM Termination	IM	0.2	498.52	498.52		
5	**Longranger ADCP in Frame (looking Up)**		1.56	500.08	500.08	**500**	**Note B**
	Special IM Termination	IM	0.2	500.28	500.28	**0.08**	
6	**1000** Meters 7/16" Jac.Nil. Inductive Wirerope		1000	1500.28	1500.28		**Note C**
	Hardware	I	0.25	1500.53	1500.53		
7	**300** Meters 3/8" TB Jac. Wirerope		300	1800.53	1800.53		
	Hardware	L	0.27	1800.8	1800.8		
8	**100** Meters 3/8" TB Jac. Wirerope		100	1900.8	1900.8	**1900.8**	**Note D**
	Special Wire to Nylon Termination		0.07	1900.87			
9	**200** Meters 7/8" Nylon		200	2100.87			
	Short Spliced at Sea		0.27	2101.14			
10	**2300** Meters 7/8" Plaited Nylon		2300	4401.14			
	Short Spliced at Sea		0	4401.14			
11	**1725** Meters 1" Colmega		1725	6126.14			
	Hardware	I	0.25	6126.39			
12	4-17" Glassballs on 1/2" Trawler Chain		4	6130.39			
	Hardware	K	0.255	6130.65			
13	4-17" Glassballs on 1/2" Trawler Chain		4	6134.65			
	Hardware	K	0.255	6134.9			
14	4-17" Glassballs on 1/2" Trawler Chain		4	6138.9			
	Hardware	K	0.255	6139.16			
15	4-17" Glassballs on 1/2" Trawler Chain		4	6143.16			
	Hardware	K	0.255	6143.41			
15	4-17" Glassballs on 1/2" Trawler Chain		4	6147.41			
	Hardware	K	0.255	6147.67			
16	4-17" Glassballs on 1/2" Trawler Chain		4	6151.67			
	Hardware	K	0.255	6151.92			
17	4-17" Glassballs on 1/2" Trawler Chain		4	6155.92			
	Hardware	K	0.255	6156.18			
18	4-17" Glassballs on 1/2" Trawler Chain		4	6160.18			
	Hardware	K	0.255	6160.43			
19	4-17" Glassballs on 1/2" Trawler Chain		4	6164.43			
	Hardware	K	0.255	6164.69			
20	4-17" Glassballs on 1/2" Trawler Chain		4	6168.69			
	Hardware	K	0.255	6168.94			

21	4-17" Glassballs on 1/2" Trawler Chain		4	6172.94
	Hardware	K	0.255	6173.2
22	4-17" Glassballs on 1/2" Trawler Chain		4	6177.2
	Hardware	K	0.255	6177.45
23	4-17" Glassballs on 1/2" Trawler Chain		4	6181.45
	Hardware	K	0.255	6181.71
24	4-17" Glassballs on 1/2" Trawler Chain		4	6185.71
	Hardware	K	0.255	6185.96
25	4-17" Glassballs on 1/2" Trawler Chain		4	6189.96
	Hardware	K	0.255	6190.22
26	4-17" Glassballs on 1/2" Trawler Chain		4	6194.22
	Hardware	K	0.255	6194.47
27	**5** Meters 1/2" Trawler Chain		5	6199.47
	Hardware	J	0.26	6199.73
28	Dualed Edgetech Releases	M	1.945	6201.68
	Hardware	I	0.29	6201.97
29	**5** Meters 1/2" Trawler Chain		5	6206.97
	Hardware	I	0.29	6207.26
30	**20** Meters 1" Samson Nystron		20	6227.26
	Hardware	I	0.29	6227.55
31	**5** Meters 1/2" Trawler Chain		5	6232.55
	Hardware	I	0.29	6232.84
	9000 Lb Ww Anchor		1	6233.84
	OVERALL MOORING LENGTH			**6233.84**

Depth 4800
Scope 1.2987156

NOTE: "A"

Measure and Label cable back from upper swage of 7/16" Wire for mounting Instrumentation

8.0 Meters - Label 20 Meters
28.0 Meters - Label 40 Meters
48.0 Meters - Label 60 Meters
68.0 Meters - Label 80 Meters
88.0 Meters - Label 100 Meters
118.0 Meters - Label 130 Meters
168.0 Meters - Label 180 Meters
238.0 Meters - Label 250 Meters
338.0 Meters - Label 350 Meters

NOTE: "B"

500 Meter Inductive Microcat mounted in ADCP Frame

NOTE: "C"

Measure and Label cable back from upper swage of 7/16" Wire for mounting Instrumentation

249.9 Meters - Label 750 Meters
499.9 Meters - Label 1000 Meters
999.9 Meters - Label 1500 Meters

Note: "D"
Special overbraid on upper 90 meters of 7/8" Nylon

Ltr	Hardware Designation
I	(1) 5/8" Chain SH., (1) 7/8" E L., (1) 7/8" Anchor SH.
J	(1) 5/8" Chain SH., (1) 7/8" E L., (1) 3/4" Chain SH.
K	(2) 5/8" Chain SH., (1) 7/8" End Link
L	(2) 3/4" Chain SH., (1) 7/8" End Link
M	(1) 1-1/4" Master Link

Qty	Hardware Required, Without Spares
39	- 5/8 Chain Shackles: Shot peened and coated
3	- 3/4" Chain Shackles: Shot peened and coated
6	- 7/8" Anchor Shackles: Shot peened and coated
24	- 7/8" End Links
1	- 1-1/4" Master Link

```
#include "argentine_v2.spec"

Problem Description
    title = "Argentine Basin OOI"
    type  = surface

Analysis Parameters
    static-relaxation = 0.05 /*JAH:  Reduced this from 0.1 to aid static convergenc
e */
    static-iterations = 1000  /*JAH:  Changed from 5000 to 1000 */
    static-tolerance  = 0.0001
    static-initial-guess = catenary
    relax-adapt-up    = 1.02
    relax-adapt-down  = 1.1
    static-outer-method = secant
    static-outer-iterations = 1000

    static-outer-relaxation = 0.995
    static-outer-tolerance  = 0.01

    duration           = TF
    time-step          = DT
    dynamic-relaxation = 1.0
    dynamic-iterations = 15
    dynamic-tolerance  = 1e-6
    dynamic-rho        = -0.5
    current-steps      = STEPS

Environment
    rho              = 1027
    gravity          = 9.81
    depth            = 5200
    bottom-stiffness = 0
    bottom-damping   = 0
    current-scale = SCALE
    x-current        = (0,    0.414)
                       (250,  0.3648)
                       (500,  0.3232)
                       (750,  0.2882)
                       (1000, 0.2587)
                       (1250, 0.2338)
                       (1500, 0.2128)
                       (1750, 0.1952)
                       (2000, 0.1802)
                       (2250, 0.1677)
                       (2500, 0.1570)
                       (2750, 0.1481)
                       (3000, 0.1406)
                       (3250, 0.1342)
                       (3500, 0.1288)
                       (3750, 0.1243)
                       (4000, 0.1205)
                       (4250, 0.1173)
                       (4500, 0.1146)
                       (4750, 0.1123)
                       (5000, 0.1104)
                       (5250, 0.1087)
                       (5500, 0.1074)
#ifdef TEN
    x-wind           = 24.3              /* 10 year storm */
    x-wave           = (5.55, 15.8, 0)
#elif defined (THIRTY)
    x-wind           = 25.7             /* 30 year storm */
    x-wave           = (5.95, 16.3, 0)
#elif defined (HUNDRED)
    x-wind           = 27.0             /* 100 year storm */
    x-wave           = (6.35, 16.9, 0)
#else
    x-wind           = 9.6 /* mean wind speed */
    x-wave           = (1.5,  9.0, 0)  /* 3m mean wave height, guess 9sec */
#endif

    forcing-method   = wave-follower
    input-type       = random

Layout
    terminal = {
        anchor = clump
    }
    segment = {
    length = 5
    material = trawler_1/2in
    nodes = (5,1.0)

    }
    connector = pinned
    segment = {
    length = 20
    material = nystron_1in
    nodes = (21,1.0)

    }
    connector = pinned
    segment = {
    length = 5
    material = trawler_1/2in
    nodes = (5,1.0)

    }
    connector = pinned
    segment = {
    length = 1.2
    material = release_8242_x2
    nodes = (5,1.0)

    }
    connector = pinned
    segment = {
    length = 5
    material = trawler_1/2in
    nodes = (5,1.0)

    }
    connector = pinned
    segment = {
    length = 64
    material = balls_1/2in
    nodes = (65,1.0)

    }
    connector = pinned
    segment = {
    length = 1925*SCOPE
    material = colmega_1in
    nodes = (963,1.0)

    }
    segment = {
    length = 2600*SCOPE
    material = nylon_7/8in
    nodes = (1301,1.0)

    }
    connector = pinned
```

```
    segment = {
    length = 90
    material = nystron_7/8in
    nodes = (91,1.0)

    }
    segment = {
    length = 100
    material = nilspin_3/8in
    nodes = (101,1.0)

    }

    connector = pinned
    segment = {
    length = 300
    material = nilspin_3/8in
    nodes = (301,1.0)

    }
    connector = pinned
    segment = {
    length = 1000 //Approx 500m depth, to 1500m depth
    attachments = CTDs : (2 500 750 1000)
    material = nilspin_7/16in
    nodes = (1001,1.0)

    }
    connector = pinned
    segment = {
    length = 1.56
    material = ADCP_frame
    attachments = ADCP : (2)
    nodes = (5,1.0)

    }
    connector = pinned
    segment = {
    length = 485.5  //Approx 11m depth, to 500m depth
    attachments = CTDs : (76 126 161 186 201 221 231 241) , PHSEN : (200 240), PCO2
W : (230 210 185)
    material = nilspin_7/16in
    nodes = (243,1.0)

    }
    connector = pinned
    segment = {
    length = 1.07
    material = near_surface_frame
    nodes = (5,1.0)

    }
    connector = pinned
    segment = {
    length = 10
    material = molded_chain_3/4in
    nodes = (21,1.0)

    }
    connector = pinned
    terminal = {
    buoy = surface_buoy

    }

#include "ooi.db"
```

```
end
```

```
#include "irminger_v2.spec"

Problem Description
    title = "Irminger Sea OOI"
    type  = surface

Analysis Parameters
    static-relaxation = 0.05 /*JAH:  Reduced this from 0.1 to aid static convergenc
e */
    static-iterations = 1000  /*JAH:  Changed from 5000 to 1000 */
    static-tolerance  = 0.0001
    static-initial-guess = catenary
    static-outer-method = secant

    relax-adapt-up    = 1.02
    relax-adapt-down  = 1.1

    static-outer-iterations = 1000
    static-outer-method = secant
    static-outer-relaxation = 0.995
    static-outer-tolerance  = 0.01

    duration           = TF
    time-step          = DT
    dynamic-relaxation = 1.0
    dynamic-iterations = 15
    dynamic-tolerance  = 1e-6
    dynamic-rho        = -0.5
    current-steps      = STEPS

Environment
    rho              = 1027
    gravity          = 9.81
    depth            = 2800
    bottom-stiffness = 0
    bottom-damping   = 0
    current-scale = SCALE               /* 1=baseline, 2=eddy, 3=extreme */
    x-current        = (0,    0.3)
                       (250,  0.2549)
                       (500,  0.22)
                       (750,  0.1929)
                       (1000, 0.172)
                       (1250, 0.1557)
                       (1500, 0.1432)
                       (1750, 0.1334)
                       (2000, 0.1259)
                       (2250, 0.12)
                       (2500, 0.1155)
                       (2750, 0.112)
                       (3000, 0.1093)
#ifdef TEN
    x-wind           = 29.1             /* ten year storm */
    x-wave           = (6.6, 15.3, 0)
#elif defined (THIRTY)
    x-wind           = 31.1             /* thirty year storm */
    x-wave           = (6.9, 15.7, 0)
#elif defined (HUNDRED)
    x-wind           = 33.2             /* 100 year storm */
    x-wave           = (7.2, 16.1, 0)
#else
    x-wind           = 9.9 /* mean wind speed */
    x-wave           = (1.75, 9.5, 0)    /* ~3.5m mean wave height, guess 9.5 */
#endif

    forcing-method   = wave-follower
    input-type       = random
```

```
Layout
    terminal = {
        anchor = clump
    }
    segment = {
    length = 5
    material = trawler_1/2in
    nodes = (5,1.0)

    }
    connector = pinned
    segment = {
    length = 20
    material = nystron_1in
    nodes = (21,1.0)

    }
    connector = pinned
    segment = {
    length = 5
    material = trawler_1/2in
    nodes = (5,1.0)

    }
    connector = pinned
    segment = {
    length = 1.2
    material = release_8242_x2
    nodes = (5,1.0)

    }
    connector = pinned
    segment = {
    length = 5
    material = trawler_1/2in
    nodes = (5,1.0)

    }
    connector = pinned
    segment = {
    length = 64
    material = balls_1/2in
    nodes = (65,1.0)

    }
    connector = pinned
    segment = {
    length = 700*SCOPE
    material = colmega_1in
    nodes = (701,1.0)

    }
    segment = {
    length = 650*SCOPE
    material = nylon_7/8in
    nodes = (651,1.0)

    }
    connector = pinned
    segment = {
    length = 90
    material = nystron_7/8in
    nodes = (91,1.0)

    }
    segment = {
    length = 100
```

```
    material = nilspin_3/8in
    nodes = (101,1.0)

    }
    connector = pinned
    segment = {
    length = 300
    material = nilspin_3/8in
    nodes = (301,1.0)

    }
    connector = pinned
    segment = {
    length = 1000 //Approx 500m depth, to 1500m depth
    attachments = CTDs : (2 500 750 1000)
    material = nilspin_7/16in
    nodes = (1001,1.0)

    }
    connector = pinned
    segment = {
    length = 1.56
    material = ADCP_frame
    attachments = ADCP : (2)
    nodes = (5,1.0)

    }
    connector = pinned
    segment = {
    length = 485.5  //Approx 11m depth, to 500m depth
    attachments = CTDs : (76 126 161 186 201 221 231 241) , PHSEN : (200 240), PCO2
W : (230 210 185)
    material = nilspin_7/16in
    nodes = (243,1.0)

    }
    connector = pinned
    segment = {
    length = 1.07
    material = near_surface_frame
    nodes = (5,1.0)

    }
    connector = pinned
    segment = {
    length = 10
    material = molded_chain_3/4in
    nodes = (21,1.0)

    }
    connector = pinned
    terminal = {
    buoy = surface_buoy

    }

#include "ooi.db"

end
```

```
#include "southern_v2.spec"

Problem Description
    title = "Southern Ocean OOI"
    type  = surface

Analysis Parameters
    static-relaxation = 0.05 /*JAH:  Reduced this from 0.1 to aid static convergenc
e */
    static-iterations = 1000  /*JAH:  Changed from 5000 to 1000 */
    static-tolerance  = 0.0001
    static-initial-guess = catenary
    static-outer-method = secant

    relax-adapt-up    = 1.01
    relax-adapt-down  = 1.2

    static-outer-iterations = 1000

    static-outer-relaxation = 0.998
    static-outer-tolerance  = 0.01

    duration           = TF
    time-step          = DT
    dynamic-relaxation = 1.0
    dynamic-iterations = 15
    dynamic-tolerance  = 1e-6
    dynamic-rho        = -0.5
    current-steps      = STEPS

Environment
    rho              = 1027
    gravity          = 9.81
    depth            = 4800
    bottom-stiffness = 0
    bottom-damping   = 0
    current-scale = SCALE
    x-current        = (0,    0.254)
                       (250,  0.233)
                       (500,  0.2153)
                       (750,  0.1998)
                       (1000, 0.1863)
                       (1250, 0.1747)
                       (1500, 0.1647)
                       (1750, 0.1559)
                       (2000, 0.1484)
                       (2250, 0.1419)
                       (2500, 0.1363)
                       (2750, 0.1314)
                       (3000, 0.1271)
                       (3250, 0.1235)
                       (3500, 0.1203)
                       (3750, 0.1176)
                       (4000, 0.1152)
                       (4250, 0.1132)
                       (4500, 0.1114)
                       (4750, 0.1099)
                       (5000, 0.1085)
#ifdef TEN
    x-wind           = 28.5             /* 10 year storm */
    x-wave           = (6.95, 18.6, 0)
#elif defined (THIRTY)
    x-wind           = 30.1             /* 30 year storm */
    x-wave           = (7.5, 19.4, 0)
#elif defined (HUNDRED)
    x-wind           = 31.7             /* 100 year storm */
    x-wave           = (8.0, 20.2, 0)
#else
    x-wind           = 11.0 /* mean wind speed */
    x-wave           = (2.25, 10.5, 0) /* 4.5m mean wave height, 10.5s ss6 */
#endif

    forcing-method   = wave-follower
    input-type       = random

Layout
    terminal = {
        anchor = clump
    }
    segment = {
    length = 5
    material = trawler_1/2in
    nodes = (5,1.0)

    }
    connector = pinned
    segment = {
    length = 20
    material = nystron_1in
    nodes = (21,1.0)

    }
    connector = pinned
    segment = {
    length = 5
    material = trawler_1/2in
    nodes = (5,1.0)

    }
    connector = pinned
    segment = {
    length = 1.2
    material = release_8242_x2
    nodes = (5,1.0)

    }
    connector = pinned
    segment = {
    length = 5
    material = trawler_1/2in
    nodes = (5,1.0)

    }
    connector = pinned
    segment = {
    length = 64
    material = balls_1/2in
    nodes = (65,1.0)

    }
    connector = pinned
    segment = {
    length = 1725*SCOPE
    material = colmega_1in
    nodes = (863,1.0)

    }
    segment = {
    length = 2300*SCOPE
    material = nylon_7/8in
    nodes = (1151,1.0)

    }
    connector = pinned
```

```
    segment = {
    length = 90
    material = nystron_7/8in
    nodes = (91,1.0)

    }
    segment = {
    length = 100
    material = nilspin_3/8in
    nodes = (101,1.0)

    }

    connector = pinned
    segment = {
    length = 300
    material = nilspin_3/8in
    nodes = (301,1.0)

    }
    connector = pinned
    segment = {
    length = 1000 //Approx 500m depth, to 1500m depth
    attachments = CTDs : (2 500 750 1000)
    material = nilspin_7/16in
    nodes = (1001,1.0)

    }
    connector = pinned
    segment = {
    length = 1.56
    material = ADCP_frame
    attachments = ADCP : (2)
    nodes = (5,1.0)

    }
    connector = pinned
    segment = {
    length = 485.5  //Approx 11m depth, to 500m depth
    attachments = CTDs : (76 126 161 186 201 221 231 241) , PHSEN : (200 240), PCO2
W : (230 210 185)
    material = nilspin_7/16in
    nodes = (243,1.0)

    }
    connector = pinned
    segment = {
    length = 1.07
    material = near_surface_frame
    nodes = (5,1.0)

    }
    connector = pinned
    segment = {
    length = 10
    material = molded_chain_3/4in
    nodes = (21,1.0)

    }
    connector = pinned
    terminal = {
    buoy = surface_buoy

    }

#include "ooi.db"
```

```
end
```

```
Materials
    molded_chain_3/4in
        category=chain
        type=linear
        diam=0.127
        mass=26.75
        wet=-118.3
        length=0
        Cdn=1.0
        Cdt=0.1
        EA=1.3e8
        EI=100
        GJ=0.1
        SWL=10600*4.448
        yield=10600*4.448*4
    trawler_1/2in
        category=chain
        type=linear
        diam=0.0475
        wet=31.64
        mass=3.712
        length=0
        Cdn=0.55
        Cdt=0.05
        EA=6e+007
        EI=0.1
        GJ=0.1
        SWL=0.25*26500*9.81
        yield=26500*9.81
    nilspin_3/8in
        category=wire
        type=linear
        diam=0.0127
        wet=3.109
        mass=0.446
        length=0
        Cdn=1.5
        Cdt=0.005
        EA=4.944e+006
        EI=100
        GJ=1
        SWL=5560*4.448
        yield=13900*4.448
    nilspin_7/16in
        category=wire
        type=linear
        diam=0.0143
        wet=4.1009
        mass=0.58316
        length=0
        Cdn=1.5
        Cdt=0.005
        EA=6.7304e+006
        EI=100
        GJ=1
        SWL=7520*4.448
        yield=18800*4.448
    nylon_7/8in
        category=rope
        type=linear
        diam=0.02222
        wet=0.2846
        mass=0.29
        length=0
        Cdn=1.5
        Cdt=0.005
        EA=84071
        EI=10
        GJ=0.01
        SWL=22500*4.448*0.4
        yield=22500*4.448
    nystron_1in
        category=rope
        type=linear
        diam=0.0254
        wet=0.7957
        mass=0.47
        length=0
        Cdn=1.5
        Cdt=0.005
        EA=748784
        EI=10
        GJ=0.01
        SWL=31500*4.448*0.4
        yield=31500*4.448
    nystron_7/8in
        category=rope
        type=linear
        diam=0.02222
        wet=0.597
        mass=0.3528
        length=0
        Cdn=1.5
        Cdt=0.005
        EA=570855
        EI=10
        GJ=0.01
        SWL=23000*4.448*0.4
        yield=23000*4.448
    colmega_1in
        category=rope
        type=linear
        diam=0.025
        wet=-0.378
        mass=0.302
        length=0
        Cdn=1.5
        Cdt=0.005
        EA=75000
        EI=10
        GJ=0.01
        SWL=18225*4.448*0.4
        yield=18225*4.448
    balls_1/2in
        category=chain
        type=linear
        diam=0.0475
        wet=-217.5
        mass=21.712
        length=0
        Cdn=2.6
        Cdt=0.7
        EA=6e+007
        EI=0.1
        GJ=0.0001
        SWL=0.25*26500*9.81
        yield=26500*9.81
    release_8242_x2
        type=linear
        diam=0.3
        wet=550
        mass=72
        length=1.2
        Cdn=2.0
```

```
        Cdt=1.0
        EA=10e8
        EI=1e6
        GJ=1000
        SWL=12000*4.448
        yield=12000*4.448*2
    near_surface_frame
        type=linear
        diam=0.91
        length=1.07
        mass=111.5
        wet=727.5
        Cdn=1.0
        Cdt=1.0
        EA=10e8
        GJ=1e6
        EI=1e6
        SWL=10000*4.448
        yield=15000*4.448
    ADCP_frame
        diam=0.58
        length=1.56
        mass=93.6
        wet=610.2
        Cdn=1.0
        Cdt=1.0
        EA=10e8
        GJ=1e8
        EI=1e8
        SWL=10000*4.448
        yield=15000*4.448

Connectors
    sbe37
        category=instrument
        mass=4.10909
        wet=26.15
        diam=0.13716
        Cdt=0
        Cdn=1

 CTDs
        //d = 0.0622
        //length = 0.5265
        diam = 0.204  //Equivalent spherical diameter for equivalent normal area
        m=4
        wet=2.4*9.81
        Cdn=1.0
        Cdt=0.2

 PHSEN
        //d = 0.152
        //length = 0.613
        diam = 0.344 //Equivalent spherical diameter for equivalent normal area
        m=7.6
        wet=1.1*9.81
        Cdn=1.0
        Cdt=0.2

 PCO2W
        //d = 0.152
        //length = 0.525
        diam = 0.319 //Equivalent spherical diameter for equivalent normal area
        m=7.6
        wet=1.1*9.81
        Cdn=1.0
        Cdt=0.2

 ADCP
        //d = 0.21
        //length = 1.09
        diam = 0.54 //Equivalent spherical diameter for equivalent normal area
        m=121.6
        wet=61.2*9.81
        Cdn=1.0
        Cdt=0.2

Buoys
    surface_buoy
        type=axisymmetric
        mass=3945
        Cdn=1.0
        Cdt=1.0
        Sw=10.0
        Cdw=1.0
        diameters=(0.0,2.54) (0.46,3.05) (1.38,3.05)

Anchors
    clump
```