

NEW LUMMI ISLAND FERRY



Weight Estimate

Prepared for: Whatcom County Public Works • Bellingham, WA

Ref: 17098.01-002-833-0

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PREPARED BY

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REVISIONS

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1 PURPOSE

The purpose of this document is to provide an estimated concept design level light ship weight and center of gravity for the New Lummi Island Ferry. The subject vessel is a 184 ft x 54 ft x 13.25 ft, 34 car, 150 passenger, double-ended ferry with a maximum loaded draft of 7.50 ft. The vessel will be owned and operated by Whatcom County Public Works.

The calculations and assumptions contained within this document follow the guidelines published in the SNAME *Weight Estimation and Margins Manual* [1] and the *Design Margin Management and Procedures for US Navy Small Craft* [2] for the estimation of vessel light ship weight.

2 PROCEDURE

The weight estimate was created using a Microsoft Excel spreadsheet. The spreadsheet sums the known and calculated structural, equipment, and outfit weights of the vessel. The source of weights in the spreadsheet are identified as calculated (C), estimated (E), or from vendor (V) data. Various margins were applied to the known and calculated weights to account for the varying uncertainty of these weights, and for items not specifically estimated in the spreadsheet such as brackets, etc. Detailed weights are shown in Appendix A.

2.1 Margins

As shown in Table 1, weight margins were generally applied according to the *Design Margin Management and Procedures for the U.S. Navy Small Craft*, Reference [2].

Table 1: Design Margin Management and Procedures for the U.S. Navy Small Craft

Suggested Weight Margins (1)
(Margins remaining at end of each design phase)

Weight Group		Design Phase				Boat Alt. (4)
		Concept/ Feasibility	Preliminary	Contract	Detail	
100	Alum	15	8	5	2	3
	Steel	15	8	5	2	3
	GRP	20	10	5	2	3
	Wood	20	10	5	2	3
200	Propulsion (2)	15	9	6	2	3
300	Electrical (2)	20	12	8	2	5
400	C ³ and N	20	12	8	2	5
500	Auxiliary	20	12	8	2	5
600	Outfit	20	12	8	2	5
700	Other	10	5	3	2	2
F	Loads	15	5	0	0	0

A 6% service life margin (SLM) is included in the weight estimate. This margin is intended to account for new weights that may be added to the vessel throughout its lifespan. As this vessel is expected to eventually be fit with additional batteries for all-electric operation, a larger than typical SLM is used. It was calculated based on a standard 3% SLM with an additional 3% to account for batteries.

2.2 Coordinate System

The coordinate system of this estimate uses a Right Hand coordinate system with:

- The longitudinal axis originating at midships and oriented along centerline, positive towards End 2.
- The vertical axis originating at baseline and oriented normal to baseline, positive up
- The transverse axis originating at the centerline and oriented normal to centerline, positive to starboard

3 CONCLUSIONS

The subject vessel is estimated to have the following light ship weight and center of gravity.

Light Ship Weight:	539 LT
Longitudinal Center of Gravity:	0.07 ft
Transverse Center of Gravity:	0.08 ft
Vertical Center of Gravity:	11.52 ft

The above results includes a 6% Service Life Margin (SLM) and a 6 inch margin on the Vertical Center of Gravity (VCG).

4 REFERENCES

- [1] TnR 7-8 - Weight Estimation and Margins Manual, SNAME
- [2] *Design Margin Management and Procedures for US Navy Small Craft*, Naval Sea Combat Systems Engineering Station, Norfolk, VA: May 1988
- [3] *17098.01-002-832-0, Outline Specification*, Elliott Bay Design Group: October, 2020.
- [4] *17098.01-002-101-1, Profiles and Deck Arrangements*, Elliott Bay Design Group: October, 2020.

Appendix A

Weight Estimate Calculations

VESSEL WEIGHT SUMMARY

Group	Description	Wt. w/ Margin (lb)	Included Margin	LCG (+ aft) (ft)	TCG (+ stbd) (ft)	VCG (+ abl) (ft)	Weight Fraction
1	STRUCTURE	865,597	15.0%	0.00	0.01	10.64	75.8%
2	MACHINERY	44,613	15.0%	0.00	0.00	6.00	3.9%
3	ELECTRICAL	37,518	20.0%	0.00	0.00	7.58	3.3%
4	ELECTRONICS & IC	2,029	20.0%	0.00	0.00	34.00	0.2%
5	AUXILIARY SYSTEMS	45,164	20.0%	1.44	0.57	8.89	4.0%
6	OUTFIT	146,290	20.0%	0.08	0.41	15.81	12.8%
	VCG MARGIN					0.50	
	LIGHT SHIP WEIGHT	1,141,211 509 LT	16.0%	0.07	0.08	11.49	100%

M	SERVICE LIFE MARGIN (SLM)	65,718		-	-	0.50	6%
	LIGHT SHIP WEIGHT W/ SLM	1,206,930 539 LT		0.07	0.08	11.52	

SWBS No.	1 STRUCTURE Description	Qty.	Unit	Unit Wt. (lb)	Total Wt. (lb)	Margin	LCG (ft)	TCG (ft)	VCG (ft)	Source C, E, V	Notes
100	Estimate for Roll and Weld				25,212		0.00	0.01	10.64		
110	Shell and Supporting Structure				293,615	15%	0.00	0.00	6.09		
120	Hull Structural Bulkheads				114,883	15%	0.00	0.00	8.48		
130	Hull Decks				218,392	15%	0.00	0.00	12.91		
140	Hull Platforms and Flats				-	15%					
150	Deck House Structure				83,881	15%	0.00	0.11	24.72		
160	Special Structures				-	15%					
170	Masts, Kingposts, and Service Platforms				-	15%					
180	Foundations				20,000	15%	0.00	0.00	6.00		
190	Special Purpose Systems				-	15%					
Subgroup-based Margin Total					109,615	15%	0.00	0.01	10.64		
Item-based Margin Total					-	0%					
Group Total W/ Margin					865,597	15%	0.00	0.01	10.64		

100.0 Hull Structure, General

101.0	Estimate for Roll and Weld	3%		840,385	25,212		0.00	0.01	10.64	E	3% per EBDG standard
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110.0 Shell and Supporting Structure

111.1	Shell Plating										
	Flat of Keel - 1/2" Pl	342	ft²	20.40	6,984		0.00	0.00	0.02	C	
	Skeg Side/Box Keel	1013	ft²	15.30	15,498		0.00	0.00	1.98	C	
	Bottom - 3/8" Pl	5061	ft²	15.30	77,429		0.00	0.00	3.66	C	
	Side - 3/8" Pl	2905	ft²	15.30	44,445		0.00	0.00	7.45	C	
	Side to Guard - 3/8" Pl	1729	ft²	15.30	26,456		0.00	0.00	10.93	C	
	Guard - 1/2" Pl	549	ft²	20.40	11,203		0.00	0.00	12.41	C	
116.0	Longitudinal Frames 4x1/2" FB	2857	ft	6.80	19,426		0.00	0.00	3.37	C	
	Side Long'l Frames 8x1/2" FB	1390	ft	13.60	18,903		0.00	0.00	9.63	C	
	Box keel Flg - 1" PL	107	ft²	40.80	4,352		0.00	0.00	3.96	E	
	Docking Keel - 8x3/4" FB	368	ft	20.41	7,512		0.00	0.00	0.35	E	
	Longitudinal Girders - 18x4x3/8 FP	736	ft²	15.30	11,263		0.00	0.00	5.31	E	
	Stem Bar Flg - 10x1" avg	100	ft	34.00	3,400		0.00	0.00	9.40	E	
	Stem Bar (CVK)- 1-1/4"	57	ft²	51.00	2,916		0.00	0.00	9.17	E	
117.0	Ordinary Xverse Frames - 1/4"	2097	ft²	10.20	21,388		0.00	0.00	6.00	E	
	Deck Brackets - 3/8"	700	ft²	15.30	10,710		0.00	0.00	12.50	E	
	Intermediate Deck Edge Bkts - 1/4"	400	ft²	10.20	4,080		0.00	0.00	12.50	E	
	Transverse Keel Brackets - 3/8"	500	ft²	15.30	7,650		0.00	0.00	2.00	E	

120.0 Hull Structural Bulkheads

121.0	Misc Below Deck Bulkheads	1872	ft²	10.20	19,094		0.00	0.00	7.55	E	
	Stiffeners - 25% Margin	0.25	qty	19094.40	4,774		0.00	0.00	8.90	E	
122.0	Hull W.T. Transverse Bulkheads - 5/16"	2076	ft²	12.75	26,467		0.00	0.00	9.14	C	
	Stiffeners - 3"x2"x1/4" L	991	ft	4.04	4,003		0.00	0.00	9.15	C	
122.1	Hull Tonnage BHDs	4211	ft²	10.20	42,952		0.00	0.00	8.73	C	
	Stiffeners - 3"x2"x1/4" L	2631	ft	4.04	10,629		0.00	0.00	8.34	C	
	Face Bar - 10x3/4"	228	ft²	30.60	6,964		0.00	0.00	6.44	C	

130.0 Hull Decks

131.0	Main Deck - 3/8"	8513	ft²	15.30	130,252		0.00	0.00	13.21	C	
	Long'l Stiffeners 120x8 BF	5201	ft	6.43	33,448		0.00	0.00	13.17	C	
	Long'l Stiffeners 2x3/16" FB	1763	ft	1.28	2,248		0.00	0.00	13.17	C	
	Xverse Girders - 15x4x3/8" FP	1617	ft²	15.30	24,736		0.00	0.00	12.27	C	
	Long'l Girders - 18x4x3/8" FP	718	ft²	15.30	10,986		0.00	0.00	12.02	C	
	CL Long'l Girder - 18x0.375" web w/ 6x3/4" flg	64	ft	38.25	2,454		0.00	0.00	12.11	C	ER only
	Wear Plate - 1/2" PL	500	ft²	20.40	10,200		0.00	0.00	13.27	E	
	Stanchions	19	qty	214.13	4,068		0.00	0.00	7.00	E	ER only

140.0 Hull Platforms and Flats

150.0 Deck House Structure

151.1	Curtain Plate - 5/16" PL	2949	ft²	4.33	12,760		0.00	0.00	19.50	C	
	Stiffeners - 5x1/4" FB	986	ft²	10.20	10,056		0.00	0.90	19.50	C	
	Window Mullions - 5 1/2"x1/4" web w/ 6x1/2"	159	ft	5.04	802		0.00	0.00	18.28	E	
	Racking Frame (Lower)	57	ft	8.78	501		0.00	0.00	18.28	E	
	Racking Frame (Upper)	51	ft	7.06	360		0.00	0.00	17.83	E	
151.2	Main Deck Bulkheads										
	Inbd Longitudinal Bulkheads - 5/16" Pl	1538	ft²	4.33	6,656		0.00	0.00	17.75	C	
	Ext. Transverse Bulkheads - 5/16" Pl	199	ft²	4.33	862		0.00	0.00	17.83	C	

SWBS No.	1 STRUCTURE Description	Qty. Qty.	Unit Unit	Unit Wt. (lb)	Total Wt. (lb)	Margin	LCG (ft)	TCG (ft)	VCG (ft)	Source C, E, V	Notes
	Stiffeners - 4x1/4" FB	2064	ft	1.14	2,355		0.00	0.00	18.00	C	
	Girders	697	ft	4.33	3,014		0.00	0.00	19.50	C	
	Window Mullions - 5 1/2"x1/4" web w/ 6x1/2"	159	ft	5.04	802		0.00	0.00	18.28	E	
	Racking Frame	57	ft	8.78	501		0.00	0.00	18.28	E	
151.3	Bridge Deck (Deck plate, stiffers, frames, girders, b 1	qty		27632.31	27,632		0.00	0.00	31.00	E	Parametric from 14073
151.4	01 Deck - 3/8" Pl	1218	ft²	5.18	6,316		0.00	0.00	22.50	C	
	Stiffeners	0.30	qty	6315.96	1,895		0.00	0.00	22.50	E	30% of plate weight
	Girders	158	ft	2.88	454		0.00	0.00	22.58		
	01 Deck Bulkheads - 5/16" Pl	561	ft²	4.33	2,428		0.00	0.00	26.00	C	
	Stiffeners	0.30	qty	2427.99	728		0.00	0.00	17.83	E	30% of plate weight
	Racking Frame	51	ft	7.06	360		0.00	0.00	17.83	E	
151.5	Pilothouse Bulkheads - 5/16" Pl	427	qty	4.33	1,846		0.00	0.00	37.00	E	
	Stiffeners + Girders	0.50	qty	1846.19	923		0.00	0.00	37.00	E	50% of plate weight
	Pilothouse Top - 3/8" Pl	344	ft²	5.18	1,783		0.00	0.00	39.50	E	
	Stiffeners	0.25	qty	1783.30	446		0.00	0.00	39.50	E	25% of plate weight
	Visor	1	qty	400.00	400		0.00	0.00	38.00	E	
160.0 Special Structures											
170.0 Masts, Kingposts, and Service Platforms											
180.0 Foundations											
180.0	Misc. Foundations	1	ea	15000.00	20,000		0.00	0.00	6.00	E	
190.0 Special Purpose Systems											

SWBS No.	2 MACHINERY Description	Qty.	Unit	Unit Wt. (lb)	Total Wt. (lb)	Margin	LCG (ft)	TCG (ft)	VCG (ft)	Source C, E, V	Notes
200	Propulsion Plant, General				-	15%					
220	Energy Generating Systems (Nonnuclear)				-	15%					
230	Propulsion Units				12,052	15%	0.00	0.00	6.00		
240	Transmission and Propulsor Systems				21,971	15%	0.00	0.00	6.00		
250	Propulsion Support Systems (Except Fuel/Lube)				4,331	15%	0.00	0.00	6.00		
260	Propulsion Support Systems (Fuel and Lube Oil)				440	15%	0.00	0.00	6.00		
270	Lube Oil Fill, Transfer, and Purification				-	15%					
280	Lube Oil Fill, Transfer, and Purification				-	15%					
290	Special Purpose Systems				-	15%					
Subgroup-based Margin Total					5,819	15%	0.00	0.00	6.00		
Item-based Margin Total					-	0%					
Group Total W/ Margin					44,613	15%	0.00	0.00	6.00		

200	Propulsion Plant, General										
220	Energy Generating Systems (Nonnuclear)										
230	Propulsion Units										
	Cummins QSK19	2	ea	5317	10,634		0.00	0.00	6.00	V	
	Oil Capacity	36	gal	7.71	278		0.00	0.00	6.00	E	
	Coolant Capacity	42	gal	8.34	350		0.00	0.00	6.00	E	
	Leonardo DRS PA44-625	2	ea	395	790		0.00	0.00	6.00	V	
240	Transmission and Propulsor Systems										
	Parametric Estimate	1	ea	21971	21,971		0.00	0.00	6.00	E	
250	Propulsion Support Systems (Except Fuel/Lube)										
	Parametric Estimate	1	ea	4331	4,331		0.00	0.00	6.00	E	
260	Propulsion Support Systems (Fuel and Lube Oil)										
	Parametric Estimate	1	ea	440	440		0.00	0.00	6.00	E	
270	Lube Oil Fill, Transfer, and Purification										
280	Lube Oil Fill, Transfer, and Purification										
290	Special Purpose Systems										

SWBS No.	3 ELECTRICAL Description	Qty.	Unit	Unit Wt. (lb)	Total Wt. (lb)	Margin	LCG (ft)	TCG (ft)	VCG (ft)	Source C, E, V	Notes
310	Electric Power Generation				18,247	20%	0.00	0.00	6.72		
320	Power Distribution Systems				10,302	20%	0.00	0.00	6.00		
330	Lighting System				1,569	20%	0.00	0.00	22.50		
340	Power Generation Support Systems				1,148	20%	0.00	0.00	15.00		
350	Turbine Support Systems				-	20%					
360	Turbine Support Systems				-	20%					
370	Turbine Support Systems				-	20%					
380	Turbine Support Systems				-	20%					
390	Special Purpose Systems				-	20%					
Subgroup-based Margin Total					6,253	20%	0.00	0.00	7.58		
Item-based Margin Total					-	0%					
Group Total W/ Margin					37,518	20%	0.00	0.00	7.58		

310 Electric Power Generation											
	Northern Lights M99C13	2	ea	2565	5,130		0.00	0.00	6.00	E	
	130 kWh Battery Racks	2	ea	6559	13,117		0.00	0.00	7.00	E	
320 Power Distribution Systems											
	Parametric Estimate	1	ea	10301.7	10,302		0.00	0.00	6.00	E	
330 Lighting System											
	Parametric Estimate	1	ea	1568.7	1,569		0.00	0.00	22.50	E	
340 Power Generation Support Systems											
	Parametric Estimate	1	ea	1147.83	1,148		0.00	0.00	15.00	E	
350 Turbine Support Systems											
360 Turbine Support Systems											
370 Turbine Support Systems											
380 Turbine Support Systems											
390 Special Purpose Systems											

SWBS No.	4 ELECTRONICS & IC Description	Qty.	Unit	Wt. (lb)	Total Wt. (lb)	Margin	LCG (ft)	TCG (ft)	VCG (ft)	Source C, E, V	Notes
410	Command and Control Systems				1,691	20%	0.00	0.00	34.00		
420	Navigation Systems				-	20%					
430	Interior Communications				-	20%					
440	Exterior Communications				-	20%					
450	Surveillance Systems, Surface and Air				-	20%					
460	Surveillance Systems (Underwater)				-	20%					
470	Countermeasure Systems				-	20%					
480	Fire Control Systems				-	20%					
490	Special Purpose Systems				-	20%					
Subgroup-based Margin Total					338	20%	0.00	0.00	34.00		
Item-based Margin Total					-	0%					
Group Total W/ Margin					2,029	20%	0.00	0.00	34.00		

410 Command and Control Systems											
	Electronics	1	ea	1691	1,691		0.00	0.00	34.00	E	
420 Navigation Systems											
430 Interior Communications											
440 Exterior Communications											
450 Surveillance Systems, Surface and Air											
460 Surveillance Systems (Underwater)											
470 Countermeasure Systems											
480 Fire Control Systems											
490 Special Purpose Systems											

SWBS No.	5 AUXILIARY SYSTEMS Description	Qty.	Unit	Unit Wt. (lb)	Total Wt. (lb)	Margin	LCG (ft)	TCG (ft)	VCG (ft)	Source C, E, V	Notes
500	Auxiliary Systems, General				2,833	20%	0.00	0.00	10.00		
510	Climate Control				2,925	20%	0.00	0.00	10.00		
520	Sea Water Systems				5,094	20%	0.00	0.00	8.00		
530	Fresh Water Systems				452	20%	0.00	0.00	8.00		
540	Fuels and Lubricants, Handling and Storage				-	20%					
550	Air, Gas, and Miscellaneous Fluid Systems				5,663	20%	0.00	0.00	8.00		
560	Ship Control Systems				17,600	20%	0.00	0.00	8.00		
580	Mechanical Handling Systems				2,820	20%	24.85	9.76	15.04		
590	Special Purpose Systems				250	20%	-64.00	-24.83	16.00		
Subgroup-based Margin Total					7,527	20%	1.44	0.57	8.89		
Item-based Margin Total					-	0%					
Group Total W/ Margin					45,164	20%	1.44	0.57	8.89		

500 Auxiliary Systems, General											
	Parametric Estimate	1	ea	2833	2,833		0.00	0.00	10.00	E	
510 Climate Control											
	Parametric Estimate	1	ea	2925	2,925		0.00	0.00	10.00	E	
520 Sea Water Systems											
	Parametric Estimate	1	ea	5094	5,094		0.00	0.00	8.00	E	
530 Fresh Water Systems											
	Parametric Estimate	1	ea	452	452		0.00	0.00	8.00	E	
540 Fuels and Lubricants, Handling and Storage											
550 Air, Gas, and Miscellaneous Fluid Systems											
	Parametric Estimate	1	ea	5662.61	5,663		0.00	0.00	8.00	E	
560 Ship Control Systems											
	Parametric Estimate	1	ea	17600	17,600		0.00	0.00	8.00	E	
580 Mechanical Handling Systems											
	Anchor	1	ea	800	800		48.00	18.85	16.00	E	
	Anchor Chain - 7/8" Stud Link	1	shot	660	660		48.00	18.85	16.00	E	
	Chock	4	ea	160	640		0.00	0.00	14.00	E	
	Kevels	8	ea	90	720		0.00	0.00	14.00	E	
590 Special Purpose Systems											
	Jason's Cradel and Davit	1	ea	250	250		-64.00	-24.83	16.00	E	

SWBS No.	6 OUTFIT Description	Qty.	Unit	Unit Wt. (lb)	Total Wt. (lb)	Margin	LCG (ft)	TCG (ft)	VCG (ft)	Source C, E, V	Notes
610	Ship Fittings				8,639	20%	0.00	0.00	21.50		
620	Hull Compartmentation				26,521	20%	0.24	-0.09	16.28		
630	Preservatives and Coverings				71,811	20%	0.00	0.00	14.70		
640	Living Spaces				6,798	20%	1.50	8.32	21.29		
650	Service Spaces				200	20%	-34.83	-20.75	16.13		
660	Working Spaces				360	20%	0.00	0.00	6.00		
670	Stowage Spaces				700	20%	0.00	0.00	16.00		
680	Cargo Stowage				6,829	20%	0.00	0.00	13.50		
690	Special Purpose Systems				50	20%	0.00	0.00	16.00		
Subgroup-based Margin Total					24,382	20%	0.08	0.41	15.81		
Item-based Margin Total					-	0%					
Group Total W/ Margin					146,290	20%	0.08	0.41	15.81		

610 Ship Fittings											
612.0	Railings	665	ft	13	8,639		0.00	0.00	21.50	E	
620 Hull Compartmentation											
621.0	PAX/PH Area Joiner Bulkheads	3321.96	ft²	3.5	11,627		0.00	0.00	21.83	E	
622.0	Floor Plates and Gratings ER Deck Plates (1/4" AL)	1937	ft²	3.528	6,835		0.00	0.00	4.17	E	
623.0	Ladders										
	Interior Stairs	30	steps	25	750		8.83	9.00	6.00	E	
	Exterior Stairs	60	steps	25	1,500		0.00	0.00	24.00	E	
	Man Overboard Ladder	1	qty	50	50		40.02	-16.17	17.50	E	
	Vertical Ladders	5	qty	100	500		0.00	-19.25	25.00	E	
624.0	Doors and Hatches										
	Weather Tight Doors	11	ea	250	2,750		0.00	0.00	25.00	E	
	Non-weather tight doors	4	ea	120	480		0.00	0.00	21.00	E	
	Fire Door	3	ea	250	750		0.00	0.00	0.00	E	
	FWTH	8	ea	140	1,120		0.00	0.00	13.00	E	
	ER Quick Acting FWTH	1	qty	160	160		-13.67	7.38	13.00	E	
625.0	Windows										In Group 100
630 Preservatives and Coverings											
631.0	Paint (2.4% LS for steel or 4% for Al Vessels)	2.4%			865597	20,774	0.00	0.01	10.64	E	
633.0	Cathodic Protection	1	ea	200	200		0.00	0.00	7.50	E	
634.0	Deck Coverings Entire Main Deck, 01 Deck Enclosure	9158.3	ft²	2	18,317		0.00	0.00	24.75	E	
635.0	Accoustic and thermal insulation A-60 insulation above ER	5492.9	ft²	2.5	13,732		0.00	0.00	8.83	E	
		3392.0	ft²	5	16,960		0.00	0.00	12.50	E	
636.0	Ceilings (01 and PH)	1461.8	ft²	1.25	1,827		0.00	0.00	25.35	E	
640 Living Spaces											
641.0	Crew Spaces										
	Table	2	ea	80	160		0.00	0.00	16.00	E	
	Chairs	4	ea	22	88		0.00	0.00	16.00	E	
	Counter Space	1	ea	400	400		0.00	0.00	16.00	E	
	Refrigerator	1	ea	180	180		0.00	0.00	16.00	E	
	Coffee Maker	1	ea	35	35		0.00	0.00	16.00	E	
	Microwave	1	ea	35	35		0.00	0.00	16.00	E	
	Sink	1	ea	10	10		0.00	0.00	16.00	E	
	Pilot House						0.00	0.00	16.00	E	
	Console	2	ea	800	1,600		0.00	0.00	35.50	E	
	Chairs	2	ea	140	280		0.00	0.00	34.00	E	
644.0	Sanitary Spaces	1	ea	250	250		40.67	-21.17	18.00	E	
645.0	Passenger Spaces										
	Seating, Main Deck	80	qty	35	2,800		0.00	22.00	15.00	E	
	Bike Racks	2	ea	200	400		0.00	0.00	15.00	E	
	Hand Rails	320	ft	1.5	480		0.00	0.50	20.50	E	
	Trash Cans	8	ea	10	80		0.00	0.50	19.00	E	

SWBS No.	6 OUTFIT Description	Qty.	Unit	Unit Wt. (lb)	Total Wt. (lb)	Margin	LCG (ft)	TCG (ft)	VCG (ft)	Source C, E, V	Notes
650	Service Spaces										
	Cleaning Gear Locker	1	ea	100	100		-28.00	-20.75	16.00	E	
	Deck Locker	1	ea	100	100		-41.67	-20.75	16.25	E	
660	Working Spaces										
	Work Bench	1	ea	300	300		0.00	0.00	6.00	E	
	Eye Wash Station	1	ea	60	60		0.00	0.00	6.00	E	
670	Stowage Spaces										
	PFD Locker	4	qty	75	300		0.00	0.00	16.00	E	
	Life Jackets	200	qty	2	400		0.00	0.00	16.00	E	
680	Cargo Stowage										
	Curbing	360	ft	18.97	6,829		0.00	0.00	13.50	E	
690	Special Purpose Systems										
	Lifesaving Equipment	1	qty	50	50		0.00	0.00	16.00	E	