Client:

ROSETTI

Job:

CROSSWIND

Title:

APPENDIX G - Load-out and Stand-by Mooring Analyses

1	15-07-25	Accepted for contruction (AFC)	A.Balzarotti	F.Ceroni	C.Antonellini
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REV	**DATE**	**DESCRIPTION**	**PREP.**	**CHK.**	**APPROV.**

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1. GENERAL

This report presents the results of the mooring analyses of barge Vervece carried out for TP and BLPH for the following situation at RM fabrication yard:

- Operation mooring configuration (e.g. during loadouts)
- Alongside post load-out mooring configuration (e.g. barge fully loaded during seafastening welding and completion activities)

The mooring arrangement drawings are presented in Appendix to Loadout manual.

2. REFERENCE CODE AND DOCUMENTS

2.1 Codes

/1/. DNVGL-ST-N001 Marine operations and marine warranty, 2023
/2/. IMO (2008). IS code – international code on intact stability. Part A. London, UK: IMO resolution MSC.267 (85)(89)
/3/. IMO (2009). SOLAS – International convenction for the safety of life at sea. Chapter II-1. Part B-1.

2.2 Reference documents

/4/. 110B22-MT-DD-507-00	yard fenders
/5/. ROS	Mooring rope datasheet
/6/. 123A90-FDL-MT-DD-00405	Loadout mooring analysis
/7/. 123A90-FDL-MT-DD-00406	Long term mooring arrangement

2.2.1 Barge documents

/8/. Vervece	Stability booklet

2.3 Software

/9/. OPTIMOOR by tension Technology, version 6.2.8

3. CONCLUSIONS

The table below presents the omnidirectional windspeed capacity based on the most critical wind heading for all the considered configurations.

- Loadout mooring: the stern-to quay mooring configuration can withstand a wind speed of 14.9 m/s with barge draft at quay elevation.

- Alongside post load outs mooring: it complies with the 10-years return period maximum average wind speed with barge in sail away condition.

Omnidirectional wind speed	Load out mooring	Post load out mooring
Intact condition	29 knots	44 knots

Table 3-1: Omnidirectional max wind speed for the mooring configurations

3.1 Practical Guidance

The mooring arrangement (lines, winches, bollards) will be continuously monitored by the mooring operators and adjusted if required.

Favorable weather conditions are required for load out operation, the wind speed limit is set to 10m/s based on SPMT stability, bollards and lines capacity.

4. MOORING ANALYSIS

The calculation models are based on mooring plan and vessel characteristics, considering the wind area of the loaded vessel.

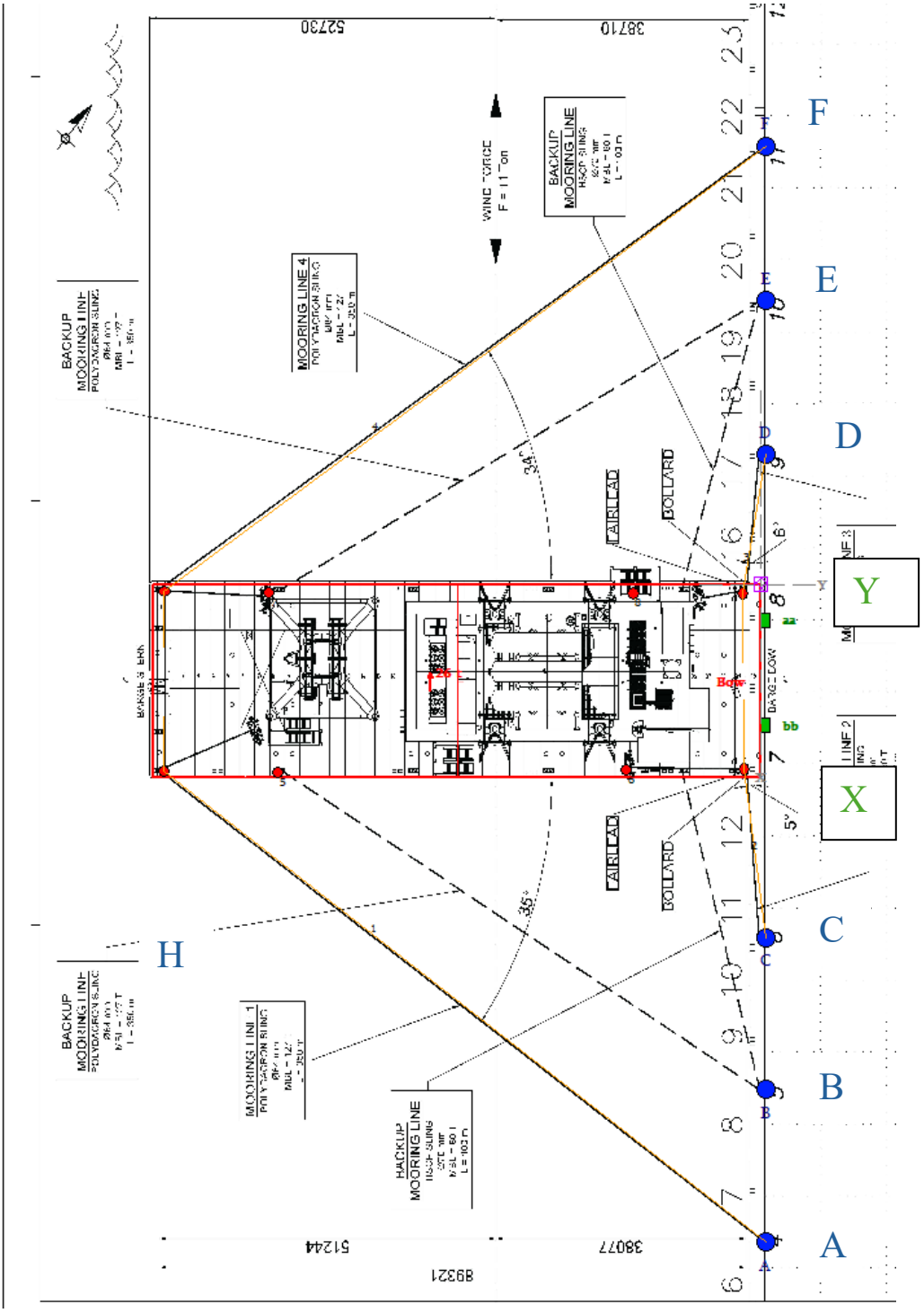


Figure 4-1: OPTIMOOR model – loadout

Berth Data for PBY loadout

(file L:\COMMESSE\ROS\1835\04-CALCOLI\OPTIMOOR\0_loadout\PBY-loadout.bth)
Units in m & tonnes
Solid Pier Shields Wind
Solid Pier Shields Waves

Left to Right of Screen Site Plan Points:	90°
Width of Channel (for Current):	500
Quay Height (Fixed) above Datum:	1.8
Dredged Depth below Datum:	7.0
Permissible Surge Excursion Fwd/Aft: ±	1.00
Permissible Sway Excursion Port/Stbd: ±	1.00
Permissible Vertical Movement: ±	0.50
Recess (Y-Dist from Origin to Quayside):	0.0
Wind Speed Specified at Height:	10.0
Current Specified at Depth:	mean

Hook/ Bollard	X-Dist to Origin	Dist to Fender Line	Ht above Pier	Allowable Load
A	93.2	0.7	0.1	50
B	71.6	0.7	0.1	50
C	50.0	0.7	0.1	50
D	-18.5	0.7	0.1	50
E	-40.2	0.7	0.1	50
F	-62.2	0.7	0.1	50

Fender	X-Dist to Origin	Y-Dist	Ht above Datum	Width Along Side	Face Contact Area (m²)
aa	5.0		1.0	2.0	3.0
bb	20.0		1.0	2.0	3.0

Fender Load-Compression Data
aa 100 tonnes
0.01 m

bb 100 tonnes
0.01 m

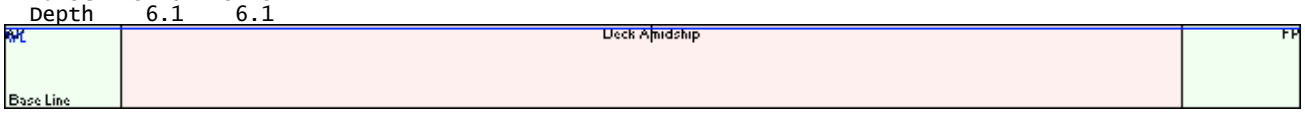
Vessel Data for VERVECE

(file L:\COMMESSE\ROS\1835\04-CALCOLI\OPTIMOOR\0_loadout\vervece.vsl)
Units in m, mm, & tonnes
Longitudinal datum at Midship

LBP:	91.4
Breadth:	27.4
Depth:	6.1
End-on projected windage area:	790 above deck level
Side projected windage area:	340 above deck level
Longitudinal Centroid:	-2.0 fwd midship
Fendering possible from:	0.410 LBP aft of midship
to:	0.410 LBP fwd of midship
Current drag data based on:	OPTIMOOR (Generic Data)
Wind drag data based on:	Pontoon

Flatside Contour

X-dist	-37.5	37.5
Depth	6.1	6.1



Line No.	Fair-Lead X	Fair-Lead Y	Ht on Deck	Dist to Winch	Brake Limit	Pre-Tension	Line Size-Type-BL	Tail Segment-1 Lgth-Size-Type-BL
1	-44.2	-12.8	0.2	8.0	35	20	76 PE 127	
2	43.0	-12.8	0.2	10.0	35	20	76 PE 80	
3	43.0	12.8	0.2	10.0	35	20	76 PE 80	
4	-44.2	12.8	0.2	8.0	35	20	76 PE 127	
5	-28.0	-12.9	0.2	0.0		20	76 PE 127	
6	25.5	-12.5	0.2	0.0		20	76 PE 80	
7	-28.0	12.5	0.2	0.0		20	60 PE 127	
8	25.5	12.5	0.2	0.0		20	60 PE 80	

Codes for Types of Line:
PE: PolyEster (new)

4.1 Environmental Data

4.1.1 Operational conditions

The wind limit set for the loadout operation is 10 m/s; to cover uncertainties in both monitoring and wind speed an alpha factor of 0.67 is applied, resulting in a design wind speed of 14.9 m/s, omnidirectional.

The sheltered location is in a dead-end waterway, hence no current loads are expected and applied. The same applies for wave loads and swell.

4.1.2 Post loadout conditions

The minimum wind speed is the 10-years maximum average of 22.6 m/s omnidirectional.

The sheltered location is in a dead-end waterway, hence no current loads are expected and applied. The same applies for wave loads and swell.

4.2 Quay Arrangement

Description of the mooring system is given in section 14 of Loadout manual main text.

4.2.1 Bollards

Bollards capacity, SWL = 50 t (ref Attachment F)

4.2.2 Winches

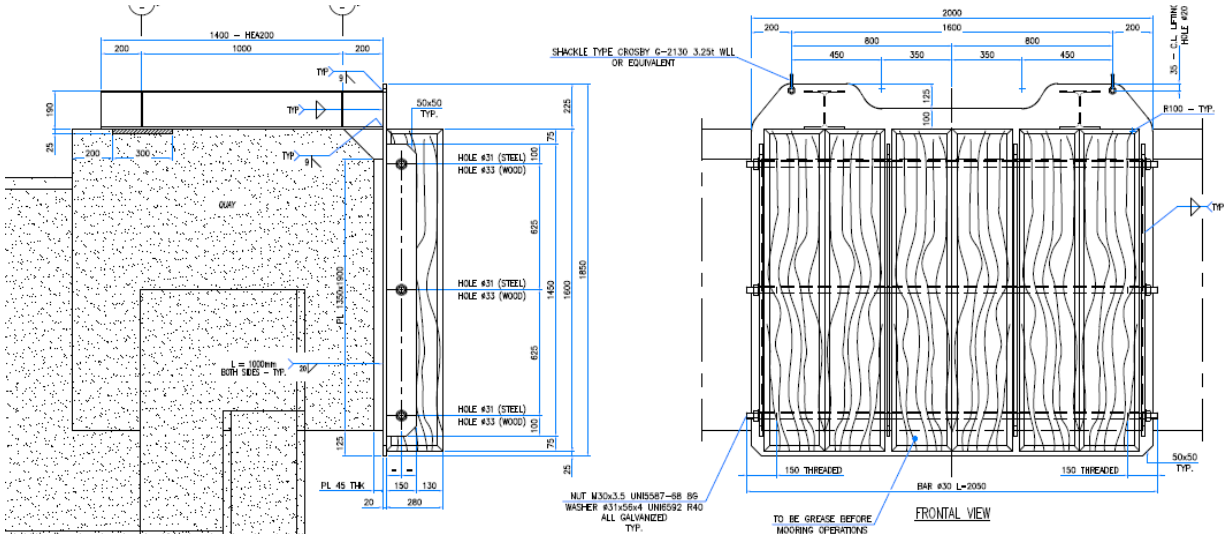
Winches pull capacity, SWL = 24 t
Winches brake capacity, SWL = 35 t

4.2.3 Mooring lines

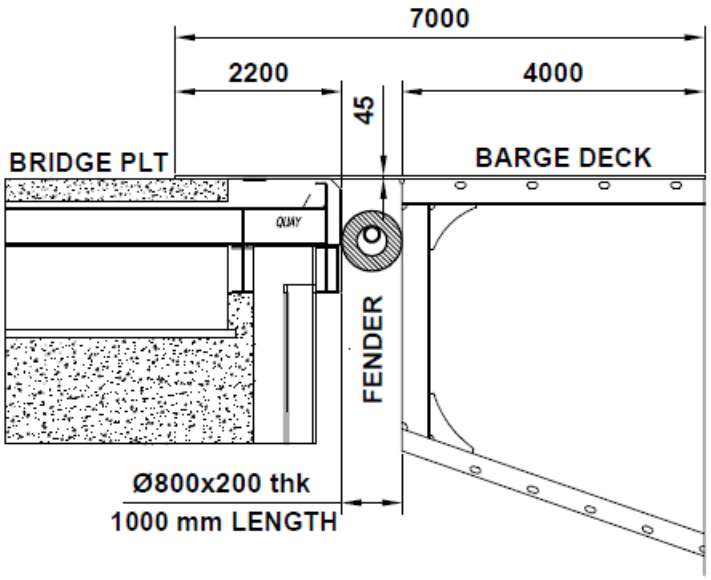
Item	Material	Diameter [mm]	Length [m]	Mass [kg / 100m]	MBL [mton]
Mooring lines	polydacron	76.0	350.0	400.0	127

4.2.4 Fenders

The maximum compression is assumed with a reaction force of 100 t compression for the rigid fenders used during loadout.



While the quay fenders are Hollow cylindric fenders 800x400 L = 1000 mm.
The employed fenders are 1000 mm long and they are composed by an internal steel pipe supporting hard rubber pipe with an external diameter of 800 mm and a thickness equal to 200 mm, these fenders are linked to the capping beam by means of steel chain passing through the internal steel pipe.
The following picture shows a typical section of the fenders employed for loadout operation:



The maximum compression is assumed at 50% with a reaction force of 360 kN compression.

4.3 Windage areas

The exposed windage areas are composed by cargoes and vessel. Optimoor automatically calulates the vessel area, while cargo windage areas are inputed.

Cargo exposed areas are defined in section 8.2 of LO manual, and here after summarized:

Lateral area

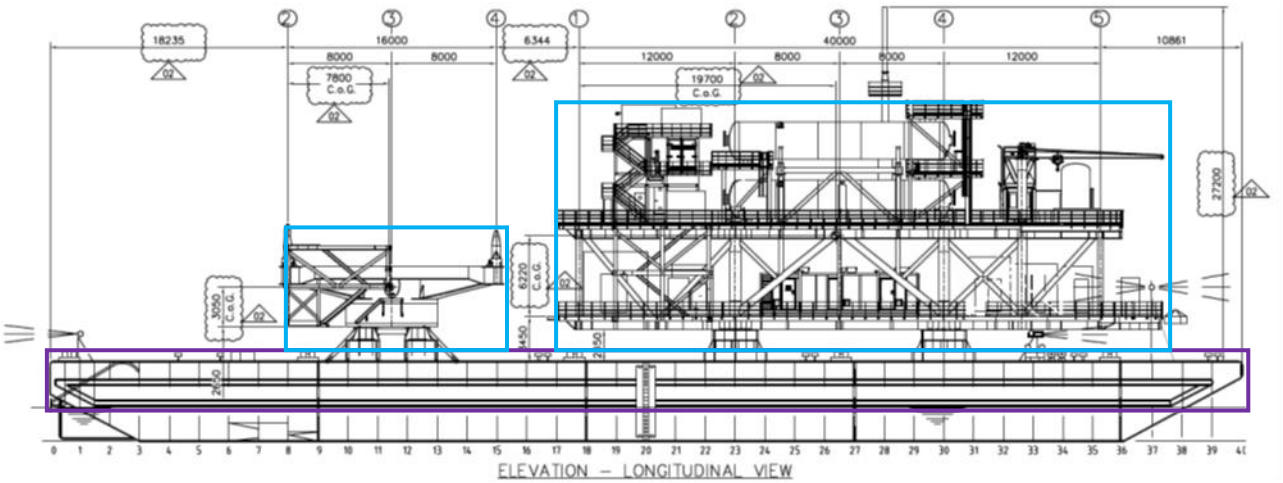


Figure 4-2: Windage lateral area

The following list summarizes the main data relevant to Exposed Areas shown above:

- Cargo Barge (Violet): Exposed area equal to 190 m2 (considering Low Tide Condition) with a Center of Exposed Area located at midship;
- TP, Topside & Grillages (Blue): BLPH Exposed Area equal to 650 m2 with a Center of Exposed Area located at 30.9 m from Barge bow, TP Exposed Area equal to 140 m2 with a Center of Exposed Area located at 66.4m from Barge bow, CF covered by the above numbers.

Total side windage area = 190+790 m2

Front area

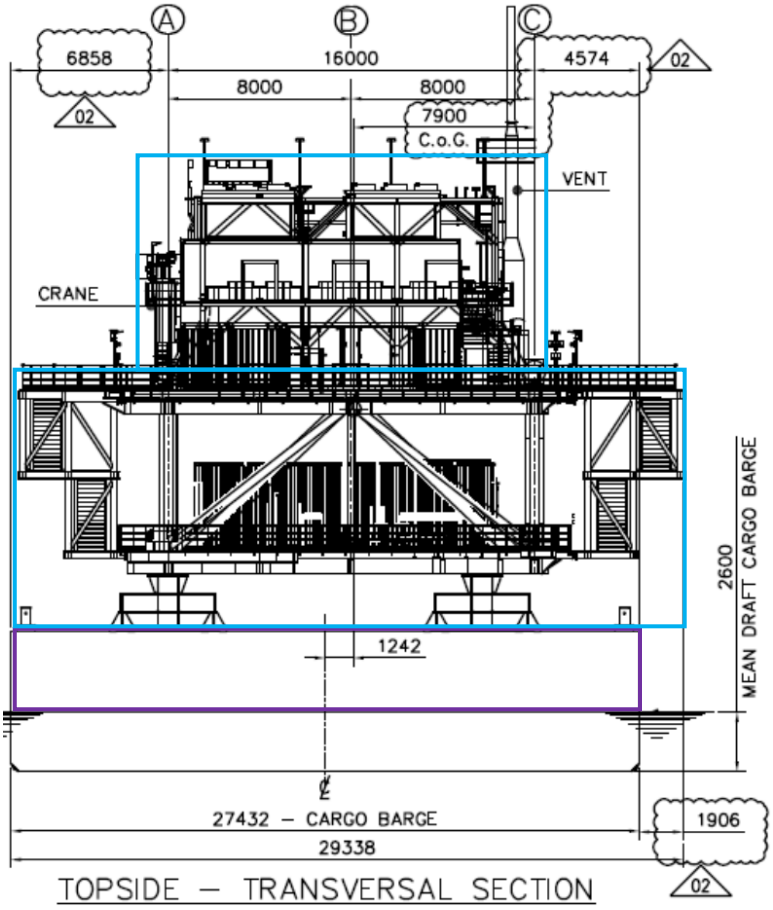


Figure 4-3: Windage front area

The following list summarizes the main data relevant to Exposed Areas considered for this condition:

- Cargo barge (Violet): Exposed area equal to 80 m2 (considering towing ballast arrangement) with a Center of Exposed Area located on Barge Centre Line;
- Topside (Blue): Exposed Area equal to 340 m2 with a Center of Exposed Area located on Barge Centre Line;

Total front windage area = 80+340 m2

5. MOORING ANALYSIS RESULTS INTACT

Mooring analyses are performed following the WSD approach, hence the Safety factos used for:

- Bollards: SF = 2.0 intact, SF = 1.5 damaged
- Lines: SF = 3.0 intact, SF = 2.0 damaged

5.1 Loadout mooring – All wind directions

The wind rose given in fig.5-3 shows the maximum allowable wind speed per heading to stay within the SWL of the bollards on the quay as those are the limiting factors for the mooring spread. Directions refer to berth X-axis.

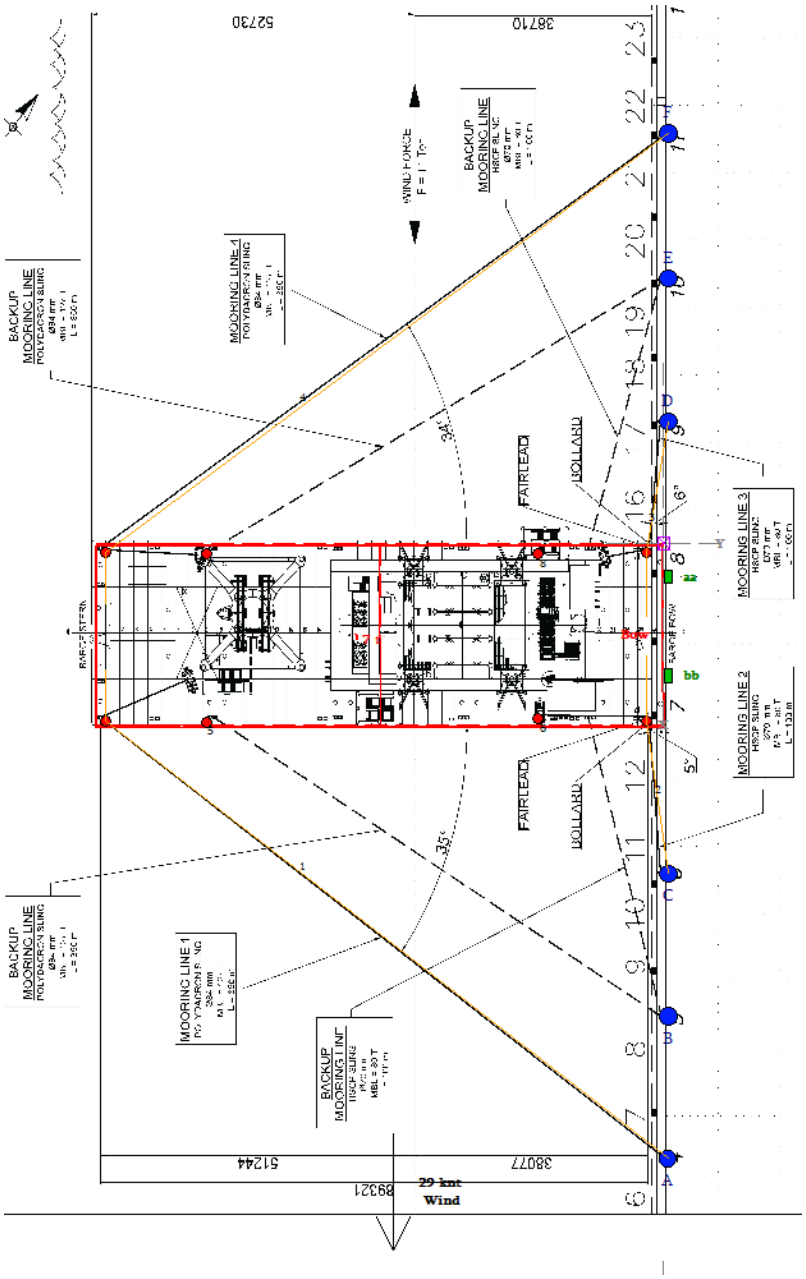


Figure 5-1: OPTIMOOR layout

Static Mooring Response for VERVECE at PBY loadout

Units in m & tonnes (file L:\COMMESSE\ROS\1783\04-CALCOLI\10-OPTIMOOR\0_loadout\LO.opt)
Remarks: MOORING ARRANGEMENT LOADOUT OPS. IN PBY YARD - RAVENNA
Intact

Static Analysis for Time: 0700 02 Aug 2025
Water Level: 0.00 above Datum
Draft: 4.3
Trim: 0.0
Bottom Clearance: 2.7

Deck Level at Target: 0.0 above pier
Wind Speed: 29 knots
Wind Direction: All° True (solid pier shields wind)

Fwd Offset of Vessel Target: 0.0 from Berth Target
Total End-On Windage Area: 839
Total Side Windage Area: 505

	Longitudinal	Transverse	Yaw Moment/LBP
Target Moves(min and max):	0.0 fwd 0.0 aft	0.4 inw -0.3 out	0.0° port 0.0° stbd	0.0 up 0.0 up

Line to Bollard	Pull -in	Tot.Line Length	In-Line ±Motion	Winch Slippage	Worst Directn	Line Tension	Percent Strength
1-A	17.8	103.4		1.1	180°	35.0	28%
2-C	4.8	29.0			175°	26.5	33%
3-D	4.3	25.4			0°	26.4	33%
4-F	17.6	101.9		1.3	0°	35.0	28%

Fender	Thrust	Compression	Pressure	Contact Area
aa	53	0.00	17.6	100%
bb	62	0.01	20.7	100%

Hook/ Bollard	X-Force	Y-Force	Other X-Load	Other Y-Load	Total Horiz Force	Direction in Plan	Uplift
A	-28.2	-20.8			35.0	-126°	
C	-3.7	-26.2			26.5	-172°	0.1
D	-4.5	26.0			26.4	-10°	0.1
F	-28.8	20.1			35.0	-55°	

Approximate natural periods
Surge: 3.9 Sway: 68 secs

Figure 5-2: OPTIMOOR results

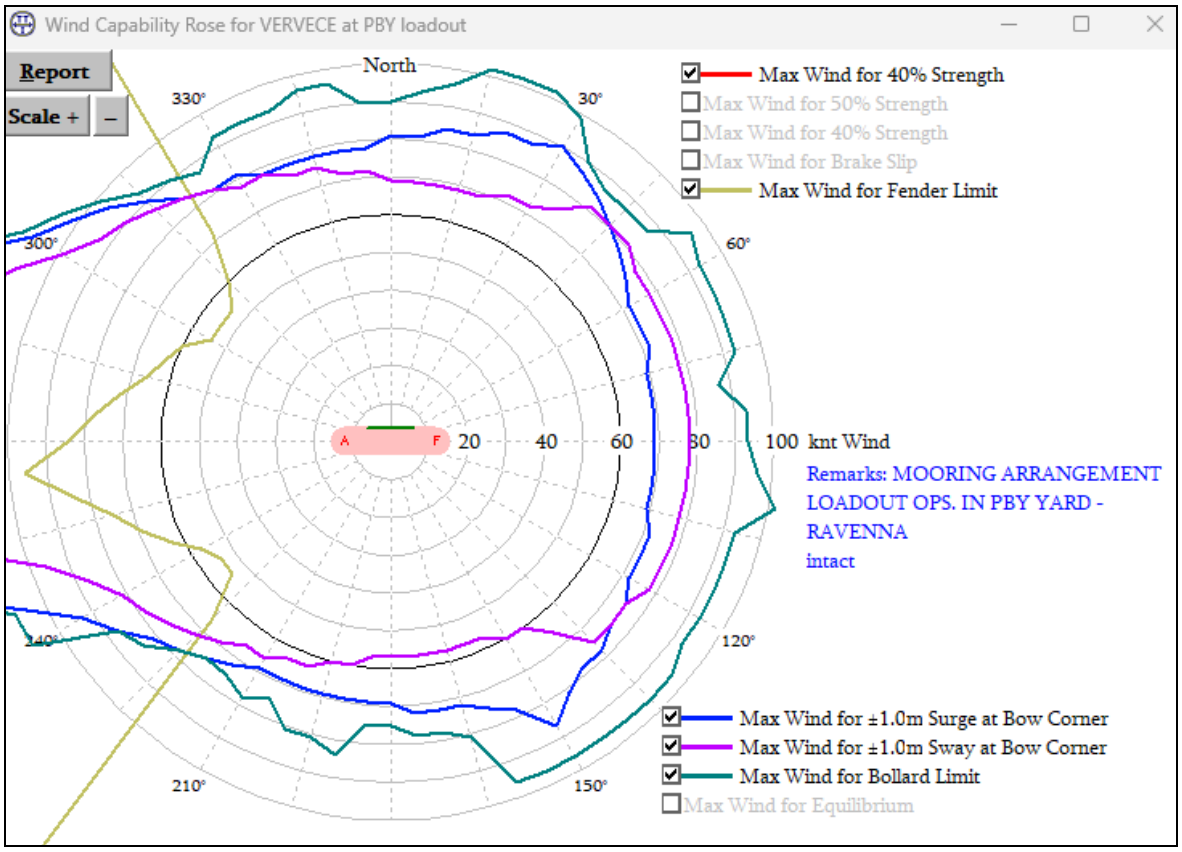


Figure 5-3: wind rose loadout – max allowable wind speed per heading

5.1.1 Summary Table

Maximum Fender compression = 62 t < 100 t	UC = 0.62
Maximum Line Tension = 35 t < 127 / 3 = 42.3	UC = 0.82
Maximum Bollard force = 35 t < 50 t (allowable)	UC = 0.70

5.2 Long term (post-loadout) mooring – All wind directions

The wind rose given in fig. 5-5 shows the maximum allowable wind speed per heading to stay within the SWL of the bollards on the quay as those are the limiting factors for the mooring spread.

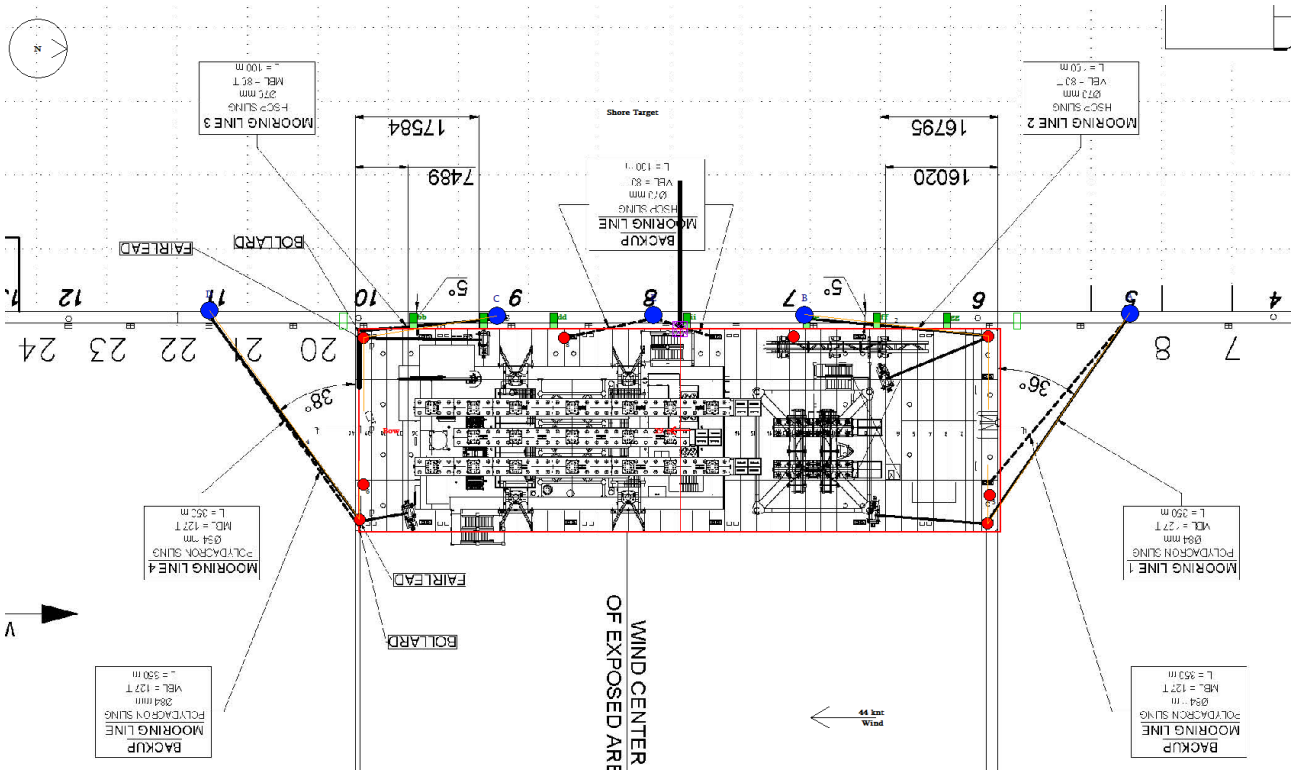


Figure 5-4: OPTIMOOR layout

Berth Data for PBY long-term

(file L:\COMMESSE\ROS\1835\04-CALCOLI\OPTIMOOR\1_long-term\PBY-longterm.bth)
Units in m & tonnes
Solid Pier Shields Wind
Solid Pier Shields Waves

Left to Right of Screen Site Plan Points:	0°
Width of Channel (for Current):	500
Pier Height (Fixed) above Datum:	1.8
Dredged Depth below Datum:	7.0
Permissible Surge Excursion Fwd/Aft: ±	1.00
Permissible Sway Excursion Port/Stbd: ±	1.00
Permissible Vertical Movement: ±	0.50
Dist of Berth Target to Right of Origin:	0.0
Wind Speed Specified at Height:	10.0
Current Specified at Depth:	mean

Hook/ Bollard	X-Dist to Origin	Dist to Fender Line	Ht above Pier	Allowable Load
A	64.1	2.0	0.1	50
B	17.7	2.0	0.1	50
C	-26.1	2.0	0.1	50
D	-67.0	2.0	0.1	50
E	-3.8	2.0	0.1	50

Fender	X-Dist to Origin	Ht above Datum	Width Along Side	Face Contact Area (m²)
aa	-48.0	0.0	1.0	
bb	-38.0	0.0	1.0	
cc	-28.0	0.0	1.0	
dd	-18.0	0.0	1.0	
ee	18.0	0.0	1.0	
ff	28.0	0.0	1.0	
gg	38.0	0.0	1.0	
hh	48.0	0.0	1.0	
ii	1.0	0.0	1.0	

Fender Load-Compression Data

aa	150	360	tonnes
	0.17	0.40	m
bb	150	360	tonnes
	0.17	0.40	m
cc	150	360	tonnes
	0.17	0.40	m
dd	150	360	tonnes
	0.17	0.40	m
ee	150	360	tonnes
	0.17	0.40	m
ff	150	360	tonnes
	0.17	0.40	m
gg	150	360	tonnes
	0.17	0.40	m
hh	150	360	tonnes
	0.17	0.40	m
ii	150	360	tonnes
	0.17	0.40	m

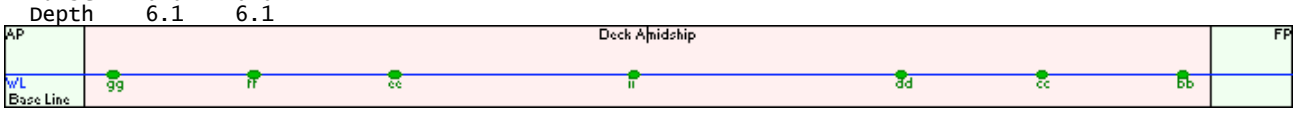
Vessel Data for VERVECE

(file L:\COMMESSE\ROS\1783\04-CALCOLI\10-OPTIMOOR\1_long-term\vervece.vsl)
Units in m, mm, & tonnes
Longitudinal datum at Midship

LBP:	91.4
Breadth:	27.4
Depth:	6.1
Target:	45.7 fwd from midship and 0.0 above deck at side
End-on projected windage area:	790 above deck level
Side projected windage area:	340 above deck level
Longitudinal Centroid:	-2.0 fwd midship
Fendering possible from:	0.438 LBP aft of midship
to:	0.438 LBP fwd of midship
Current drag data based on:	OPTIMOOR (Generic Data)
Wind drag data based on:	Pontoon

Flatside Contour

X-dist	-40.0	40.0
Depth	6.1	6.1



Line No.	Fair-Lead X	Fair-Lead Y	Ht on Deck	Dist to Winch	Brake Limit	Pre-Tension	Line Size-Type-BL	Tail Segment-1 Lgth-Size-Type-BL
1	-43.8	-12.5	0.2	8.0	35	20	76 PE 127	
2	-43.9	12.5	0.2	10.0	35	20	76 PE 80	
3	45.1	12.5	0.2	10.0	35	20	76 PE 80	
4	45.7	-12.5	0.2	8.0	35	20	76 PE 127	
5	-44.1	-8.0	0.2	0.0		20	76 PE 127	
6	45.1	-8.0	0.2	0.0		20	76 PE 80	
7	-16.2	12.5	0.2	0.0		20	60 PE 127	
8	16.6	12.5	0.2	0.0		20	60 PE 80	

Codes for Types of Line:
PE: PolyEster (new)

Static Mooring Response for VERVECE at PBY long-term

Units in m & tonnes (file L:\COMMESSE\ROS\1783\04-CALCOLI\10-OPTIMOOR\1_long-term\LT.opt)
Remarks: MOORING ARRANGEMENT LONG TERM IN PBY YARD - RAVENNA
draft @ SA

Static Analysis for Time: 0700 04 Aug 2025
Water Level: 0.00 above Datum
Draft: 2.5
Trim: 0.0
Bottom Clearance: 4.5

Deck Level at Target: 1.8 above pier
Wind Speed: 44 knots
Wind Direction: All° True (solid pier shields wind)

Fwd Offset of Vessel Target: 45.7 from Berth Target
Total End-On Windage Area: 889
Total Side Windage Area: 669

	Longitudinal	Transverse	Yaw Moment/LBP
Target Moves(min and max):	1.4 fwd	0.0 inw	0.0° port 0.0 up
	-1.2 aft	0.0 inw	0.0° stbd 0.0 up

Line to Bollard	Pull -in	Tot.Line Length	In-Line ±Motion	Winch Slippage	Worst Directn	Line Tension	Percent Strength
1-A	4.6	38.2			340°	26.7	21%
2-B	4.8	31.6			180°	29.9	37%
3-C	3.7	25.6			20°	32.1	40%
4-D	4.7	38.7			180°	26.0	20%

Fender	Thrust	Compression	Pressure	Contact Area
bb	10	0.01		
cc	10	0.01		
dd	9	0.01		
ee	9	0.01		
ff	10	0.01		
gg	10	0.01		
ii	9	0.01		

Hook/ Bollard	X- Force	Y- Force	Other X-Load	Other Y-Load	Total Horiz Force	Direction in Plan	Uplift
A	-16.2	21.1			26.6	-38°	1.4
B	29.6	3.4			29.8	83°	2.1
C	-31.6	4.9			32.0	-81°	3.0
D	16.3	20.3			26.0	39°	1.4

Approximate natural periods
Surge: 35 Sway: 5.9 secs

Figure 5-5: OPTIMOOR results

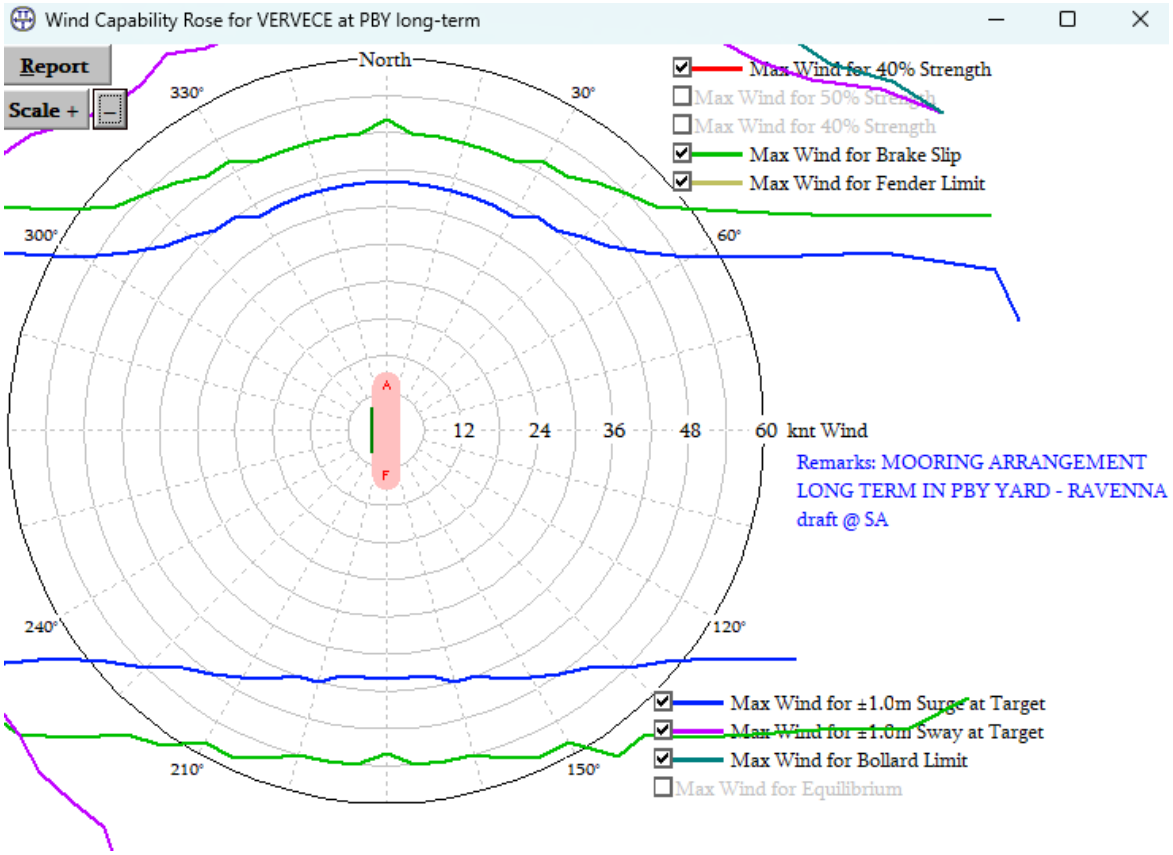


Figure 5-6: wind rose POST-loadout – max allowable wind speed per heading

5.2.1 Summary Table

Maximum Fender compression = 10 t < 360 kN/9.81 UC = 0.27

Maximum Line Tension = 32.1 t < 127 / 3 = 42.3 UC = 0.75

Maximum Bollard force = 32.1 t < 50 t (allowable) UC = 0.64

6. MOORING ANALYSIS RESULTS – SINGLE LINE FAILURE

Mooring analyses are performed following the WSD approach, hence the Safety factos used for:

- Bollards: SF = 2.0 intact, SF = 1.5 damaged
- Lines: SF = 3.0 intact, SF = 2.0 damaged

6.1 Loadout mooring – Single line failure

6.1.1 Failure line 1

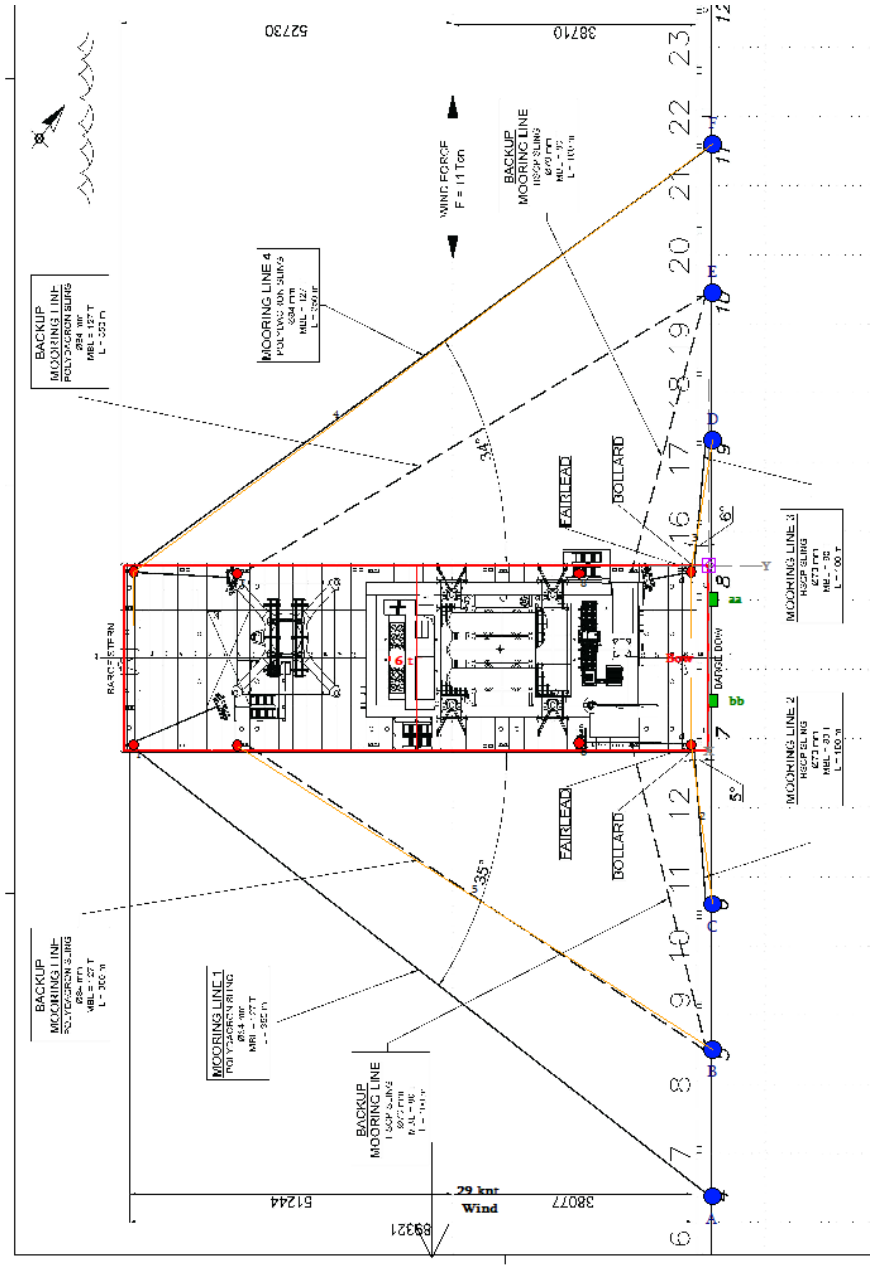


Figure 6-1: OPTIMOOR layout – damaged STB - STERN

Static Mooring Response for VERVECE at PBY loadout

Units in m & tonnes (file L:\COMMESSE\ROS\1783\04-CALCOLI\10-OPTIMOOR\0_loadout\LO-D1.opt)
Remarks: MOORING ARRANGEMENT LOADOUT OPS. IN PBY YARD - RAVENNA
damaged line 1

Static Analysis for Time: 0700 02 Aug 2025
Water Level: 0.00 above Datum
Draft: 4.3
Trim: 0.0
Bottom Clearance: 2.7

Deck Level at Target: 0.0 above pier
Wind Speed: 29 knots
Wind Direction: All° True (solid pier shields wind)

Fwd Offset of Vessel Target: 0.0 from Berth Target
Total End-On Windage Area: 839
Total Side Windage Area: 505

	Longitudinal	Transverse	Yaw Moment/LBP
Target Moves(min and max):	0.0 fwd	0.1 inw	0.0° stbd	0.0 up
	0.0 fwd	-0.5 out	-0.4° stbd	0.0 up

Line to Bollard	Pull -in	Tot.Line Length	In-Line ±Motion	Winch Slippage	Worst Directn	Line Tension	Percent Strength
2-C	5.0	28.8			170°	26.6	33%
3-D	4.0	25.7			0°	24.6	31%
4-F	17.5	102.0		1.1	355°	35.0	28%
5-B	12.5	74.5			190°	39.8	31%

Fender	Thrust	Compression	Pressure	Contact Area
aa	77	0.00	25.6	100%
bb	33	0.00	11.1	100%

Hook/ Bollard	X- Force	Y- Force	Other X-Load	Other Y-Load	Total Horiz Force	Direction in Plan	Uplift
B	-34.3	-20.3			39.8	-121°	
C	-4.3	-26.3			26.6	-171°	0.1
D	-4.1	24.3			24.6	-10°	0.1
F	-28.7	20.3			35.0	-55°	

Approximate natural periods
Surge: 3.9 Sway: 67 secs

Figure 6-2: OPTIMOOR results - damaged STB - STERN

Summary Table

Maximum Fender compression = 77 t < 100 t UC = 0.77

Maximum Line Tension = 40 t < 127 / 2 = 63.5 UC = 0.63

Maximum Bollard force = 40 t < 50 t (allowable) UC = 0.80

6.1.2 Failure line 4

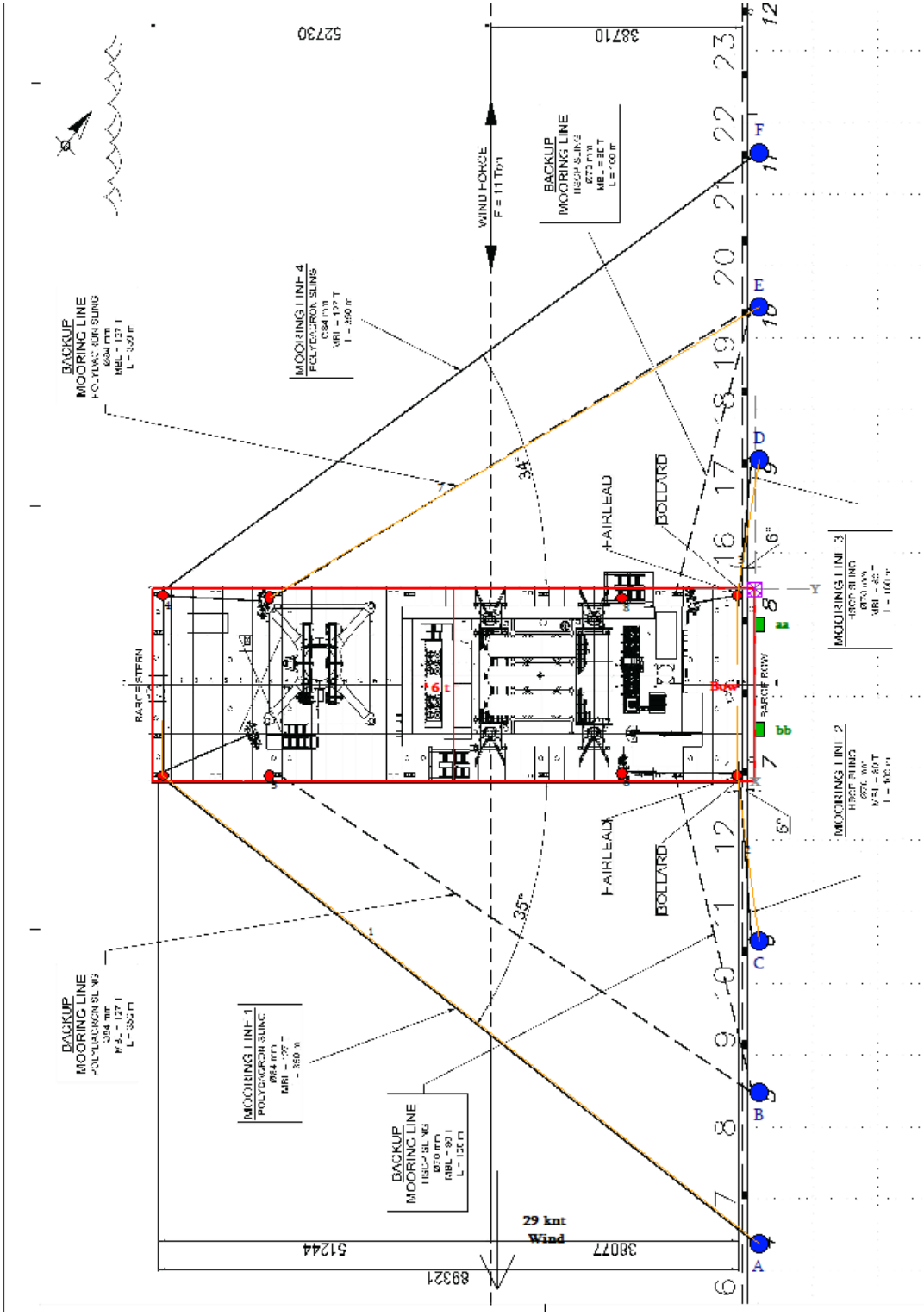


Figure 6-3: OPTIMOOR layout – damaged PS - STERN

Static Mooring Response for VERVECE at PBY loadout

Units in m & tonnes (file L:\COMMESSE\ROS\1783\04-CALCOLI\10-OPTIMOOR\0_loadout\LO-D4.opt)
Remarks: MOORING ARRANGEMENT LOADOUT OPS. IN PBY YARD - RAVENNA
damaged line 4

Static Analysis for Time: 0700 02 Aug 2025
Water Level: 0.00 above Datum
Draft: 4.3
Trim: 0.0
Bottom Clearance: 2.7

Deck Level at Target: 0.0 above pier
Wind Speed: 29 knots
Wind Direction: All° True (solid pier shields wind)

Fwd Offset of Vessel Target: 0.0 from Berth Target
Total End-On Windage Area: 839
Total Side Windage Area: 505

	Longitudinal	Transverse	Yaw Moment/LBP	
Target Moves(min and max):	0.3 fwd	0.2 inw	1.5° port	0.0 up
	-0.5 aft	-0.1 out	0.1° port	0.0 up

Line to Bollard	Pull -in	Tot.Line Length	In-Line ±Motion	Winch Slippage	Worst Directn	Line Tension	Percent Strength
1-A	17.0	103.5			210°	34.9	27%
2-C	4.8	29.0			155°	24.0	30%
3-D	4.3	25.5			10°	26.2	33%
7-E	11.0	74.1			0°	36.6	29%

Fender	Thrust	Compression	Pressure	Contact Area
aa		0.00		
bb	74	0.01	24.8	100%

Hook/ Bollard	X- Force	Y- Force	Other X-Load	Other Y-Load	Total Horiz Force	Direction in Plan	Uplift
A	-28.0	-20.8			34.9	-127°	
C	-3.1	-23.8			24.0	-173°	0.1
D	-6.4	25.4			26.2	-14°	0.1
E	-32.6	16.7			36.6	-63°	

Approximate natural periods
Surge: 3.9 Sway: 68 secs

Figure 6-4: OPTIMOOR results - damaged PS - BOW

Summary Table

Maximum Fender compression = 74 t < 100 t UC = 0.74

Maximum Line Tension = 36.6 t < 127 / 2 = 63.5 UC = 0.57

Maximum Bollard force = 36.6 t < 50 t (allowable) UC = 0.73

6.1.3 Failure line 2

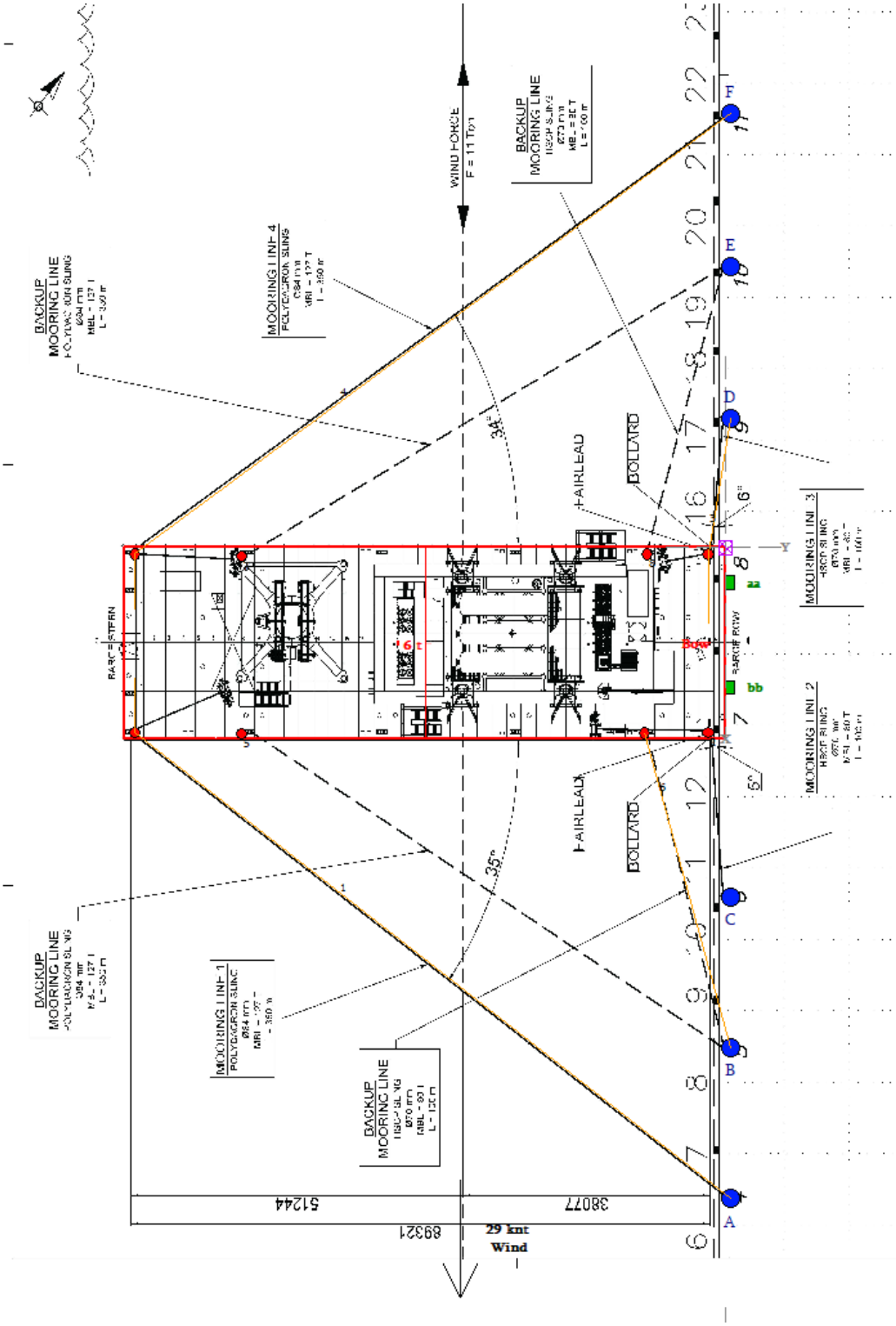


Figure 6-5: OPTIMOOR layout – damaged STB - BOW

Static Mooring Response for VERVECE at PBY loadout

Units in m & tonnes (file L:\COMMESSE\ROS\1783\04-CALCOLI\10-OPTIMOOR\0_loadout\LO-D2.opt)
Remarks: MOORING ARRANGEMENT LOADOUT OPS. IN PBY YARD - RAVENNA
damaged line 2

Static Analysis for Time: 0700 02 Aug 2025
Water Level: 0.00 above Datum
Draft: 4.3
Trim: 0.0
Bottom Clearance: 2.7

Deck Level at Target: 0.0 above pier
Wind Speed: 29 knots
Wind Direction: All° True (solid pier shields wind)

Fwd Offset of Vessel Target: 0.0 from Berth Target
Total End-On Windage Area: 839
Total Side Windage Area: 505

	Longitudinal	Transverse	Yaw Moment/LBP
Target Moves(min and max):	0.3 fwd	0.3 inw	1.6° port	0.0 up
	-0.5 aft	-0.3 out	0.0° port	0.0 up

Line to Bollard	Pull -in	Tot.Line Length	In-Line ±Motion	Winch Slippage	Worst Directn	Line Tension	Percent Strength
1-A	17.9	102.5		1.2	180°	35.0	28%
3-D	4.3	25.4			15°	27.8	35%
4-F	17.7	103.5		2.7	355°	35.0	28%
6-B	7.2	39.8			175°	28.9	36%

Fender	Thrust	Compression	Pressure	Contact Area
aa	34	0.00	11.2	100%
bb	80	0.01	26.5	100%

Hook/ Bollard	X-Force	Y-Force	Other X-Load	Other Y-Load	Total Horiz Force	Direction in Plan	Uplift
A	-28.2	-21.4			35.0	-126°	
B	-8.0	-27.7			28.9	-164°	0.1
D	-6.8	27.0			27.8	-14°	0.1
F	-29.5	20.1			35.0	-57°	

Approximate natural periods
Surge: 3.9 Sway: 73 secs

Figure 6-6: OPTIMOOR results - damaged PS - STERN

Summary Table

Maximum Fender compression = 80 t < 100 t UC = 0.80

Maximum Line Tension = 35.0 t < 127 / 2 = 63.5 UC = 0.55

Maximum Bollard force = 35.0 t < 50 t (allowable) UC = 0.70

6.1.1 Failure line 3

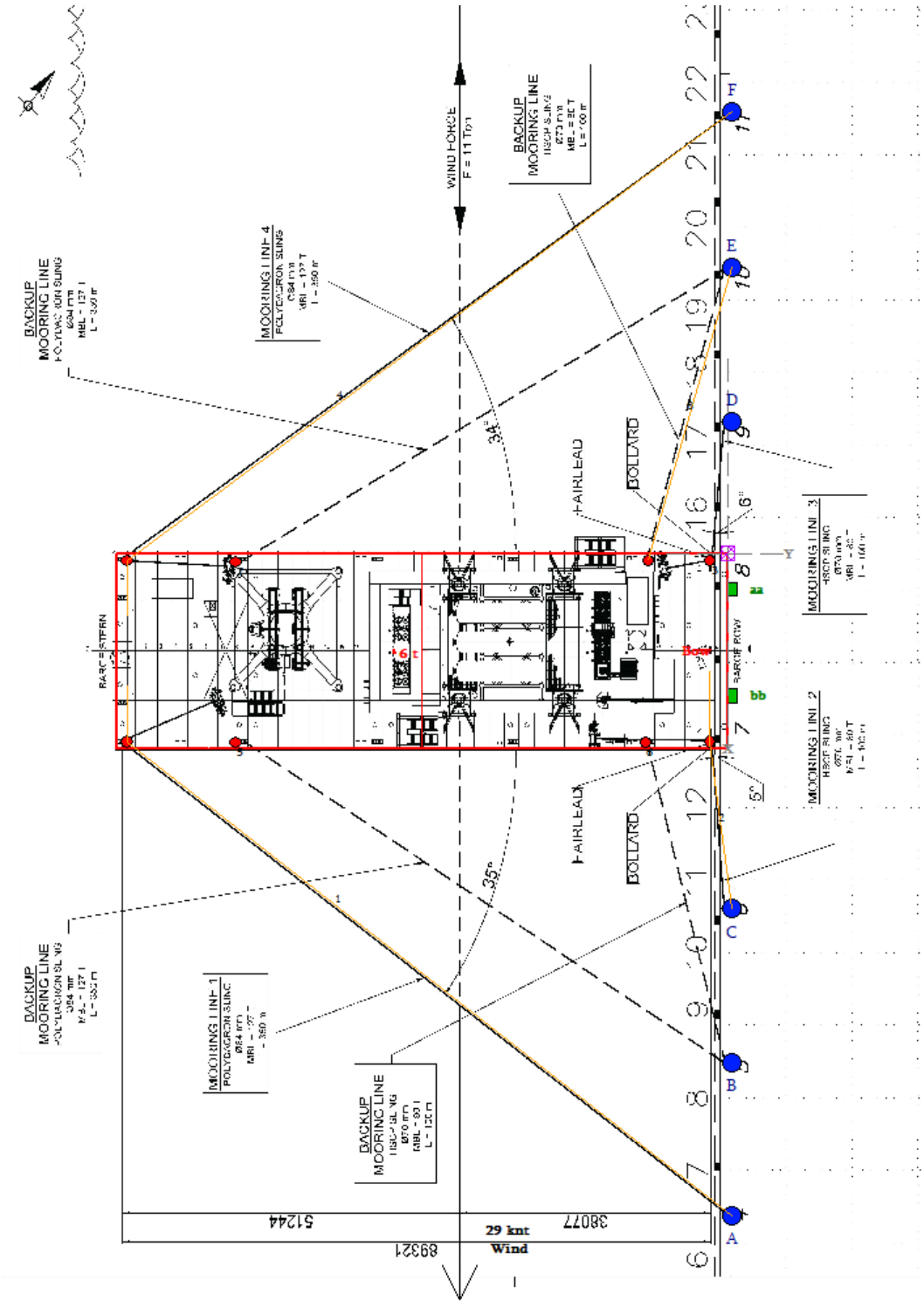


Figure 6-7: OPTIMOOR layout – damaged PS - BOW

Static Mooring Response for VERVECE at PBY loadout

Units in m & tonnes (file L:\COMMESSE\ROS\1783\04-CALCOLI\10-OPTIMOOR\0_loadout\LO-D3.opt)
Remarks: MOORING ARRANGEMENT LOADOUT OPS. IN PBY YARD - RAVENNA
damaged line 3

Static Analysis for Time: 0700 02 Aug 2025
Water Level: 0.00 above Datum
Draft: 4.3
Trim: 0.0
Bottom Clearance: 2.7

Deck Level at Target: 0.0 above pier
Wind Speed: 29 knots
Wind Direction: All° True (solid pier shields wind)

Fwd Offset of Vessel Target: 0.0 from Berth Target
Total End-On Windage Area: 839
Total Side Windage Area: 505

	Longitudinal	Transverse	Yaw Moment/LBP
Target Moves(min and max):	0.0 fwd	0.4 inw	0.0° port 0.0 up
	0.0 fwd	-0.3 out	0.0° stbd 0.0 up

Line to Bollard	Pull -in	Tot.Line Length	In-Line ±Motion	Winch Slippage	Worst Directn	Line Tension	Percent Strength
1-A	16.0	104.5			180°	31.7	25%
2-C	4.8	29.0			175°	26.9	34%
4-F	15.0	103.4			0°	28.2	22%
8-E	6.5	36.5			0°	28.4	35%

Fender	Thrust	Compression	Pressure	Contact Area
aa	48	0.00	16.0	100%
bb	47	0.00	15.8	100%

Hook/ Bollard	X- Force	Y- Force	Other X-Load	Other Y-Load	Total Horiz Force	Direction in Plan	Uplift
A	-25.5	-18.9			31.7	-127°	
C	-3.8	-26.6			26.9	-172°	0.1
E	-8.3	27.1			28.4	-17°	0.1
F	-23.1	16.2			28.2	-55°	

Approximate natural periods
Surge: 3.9 Sway: 74 secs

Figure 6-8: OPTIMOOR results - damaged STB - STERN

Summary Table

Maximum Fender compression = 48 t < 100 t UC = 0.48

Maximum Line Tension = 31.7 t < 127 / 2 = 63.5 UC = 0.50

Maximum Bollard force = 31.7 t < 50 t (allowable) UC = 0.63