



Celtic Sea Floating Offshore Wind

The Crown Estate Commissioners | Risk Assessment and Method Statement

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Abbreviations

ADCP	Acoustic Doppler Current Profiler
CD	Chart Datum
CT	Conductivity Temperature
CTD	Conductivity Temperature Depth
DDM	Degrees Decimal Minutes
DWR	Datawell Directional Waverider

FLS	Floating Lidar System
GPS	Global Positioning System
LiDAR	Light Detection and Ranging
MSL	Mean Sea Level
nm	Nautical Miles
QA	Quality Assurance
QC	Quality Checked
TSS	Total Suspended Sediment
Tu	Turbidity
WGS 84	World Geodetic System 1984 (Lat° Long°)

1. PROJECT DESCRIPTION

The purpose of this metocean and floating LiDAR campaign is to carry out wind resource and oceanographic surveys in the Celtic Sea, providing the Client with reliable wind resource and metocean databases. The measured data will be available to developers earlier in the development cycle to reduce the uncertainty and risk for developers, and to expedite the final investment decision and commercial operations date of the wind farm.

1.1 Scope of Work

The scope of work includes simultaneous data collection at three sites, site 1A, 3A and 4A, and the storage of a full spare system to replace deployed units, if required.

The equipment will be capable of collecting wind profile, directional waves, current profile, water levels, sea temperature and salinity and meteorological parameters.

To fulfil the project needs and meet the objectives defined above, Partrac will deploy a metocean array at each site (1A, 3A, and 4A). Each array comprises a set of three moorings as listed below:

1. Floating LiDAR (FLS) buoy mooring
2. Datawell Waverider (DWR) buoy mooring (with a Passive acoustic sensor (F-Pod) within the mooring configuration).
3. Sub-surface mooring with seabed Acoustic Current Doppler Profiler (ADCP) and Conductivity, Temperature and Depth (CTD).

Partrac will provide all on-going maintenance and data delivery throughout the deployment period.

1.2 Site Locations

Three site locations have been selected by the client; the target deployment coordinates are outlined in Table 1. Micro siting has been completed for each site, identifying the optimal positionings of each mooring within each site location (Figure 1 to Figure 3).

Table 1 Target Deployment Locations

Site Name	Equipment Type	Deployment Position				Depth (m)
		WGS84 (DMS)		WGS UTM Zone 30N		
		Latitude	Longitude	Easting (m)	Northing (m)	
Site 1A	LiDAR	51° 20' 40.92"N	5° 36' 26.28"W	318418	5691382	74
	Sub-surface	51° 20' 56.40"N	5° 36' 27.36"W	318416	5691860	74
	Wavebuoy	51° 21' 0.36"N	5° 36' 14.04"W	318678	5691979	74
Site 3A	LiDAR	51° 0' 12.60"N	5° 43' 7.68"W	309250	5653730	83
	Sub-surface	51° 0' 24.48"N	5° 42' 55.08"W	309510	5654094	83
	Wavebuoy	51° 0' 30.96"N	5° 43' 6.24"W	309300	5654293	83
Site 4A	LiDAR	50° 57' 36.00"N	5° 23' 53.16"W	331590	5648110	79
	Sub-surface	50° 57' 25.92"N	5° 23' 40.56"W	331824	5647797	77
	Wavebuoy	50° 57' 18.00"N	5° 23' 48.48"W	331663	5647560	75

1.2.1 Site 1A Positioning Map

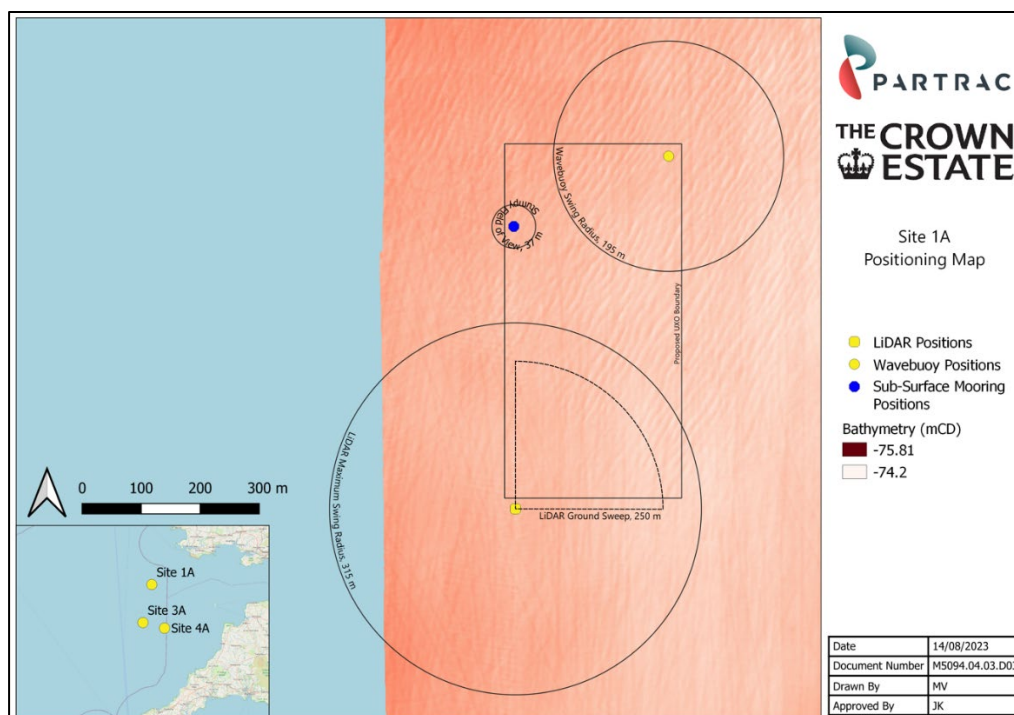


Figure 1: Site 1A deployment locations.

1.2.2 Site 3A Positioning Map

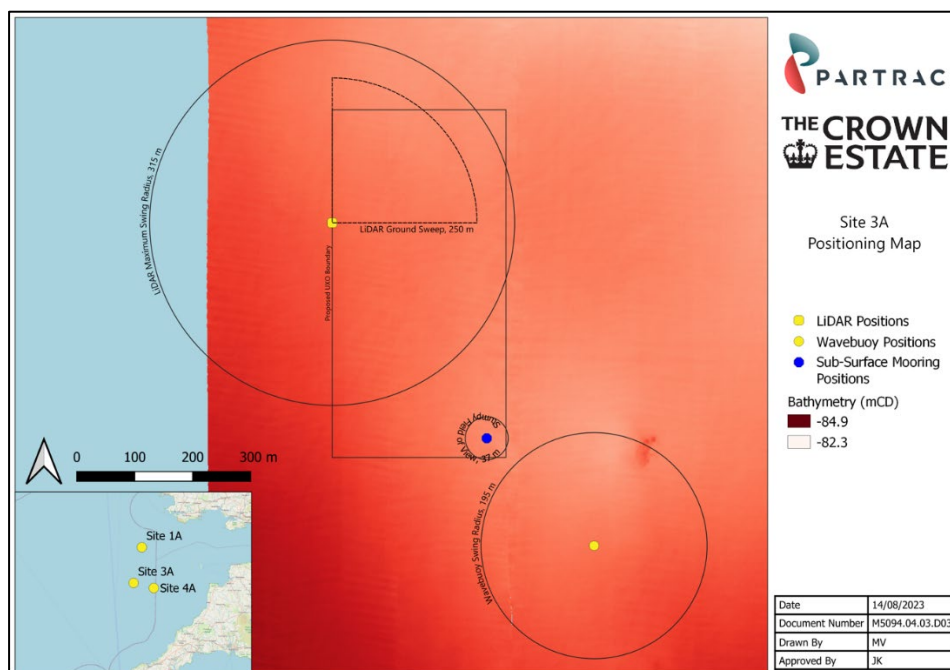


Figure 2: Site 3A deployment locations.

1.2.3 Site 4A Positioning Map

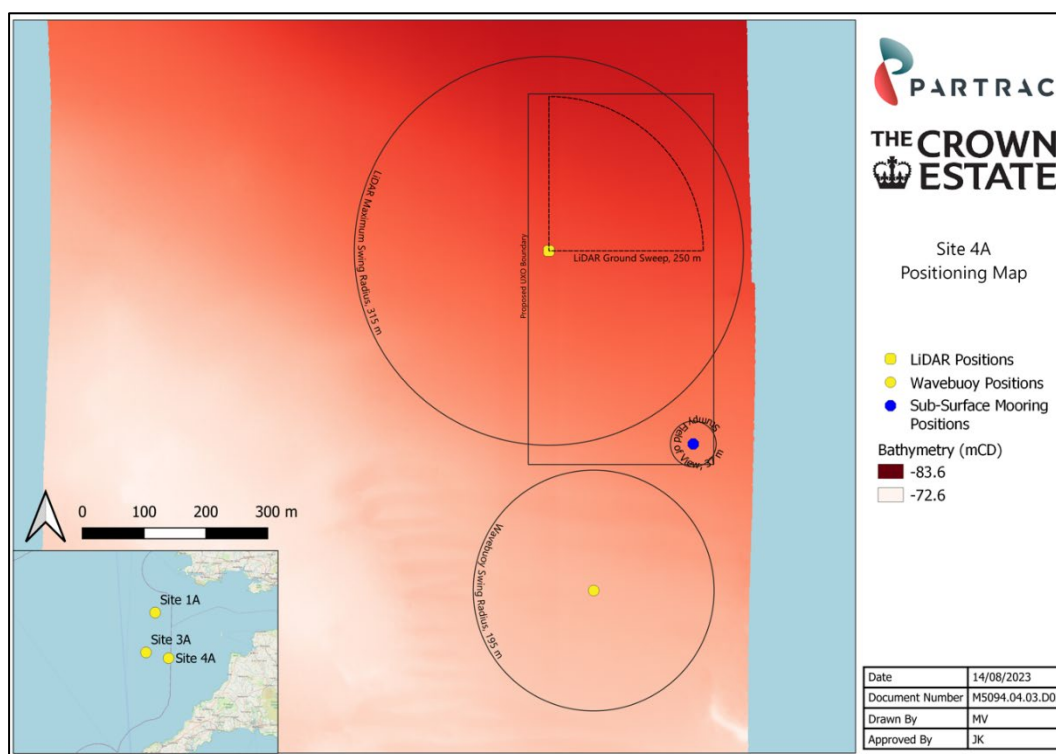


Figure 3: Site 4A deployment locations.

2. MOORINGS

Mooring components are configured for deployment in water depths of 74 - 83m, site dependent. Schematics of the three mooring configurations that will be deployed are shown in Figure 11 to Figure 19. All shackles and rope will be supplied new with applicable Lifting Operations and Lifting Equipment Regulations (LOLER) certification. Prior to deployment, all mooring components, connection points, and instrumentation will be rigorously checked and laid out on deck for safe and controlled operations.

2.1 Site 1A Mooring Diagrams

2.1.1 Floating LiDAR Buoy

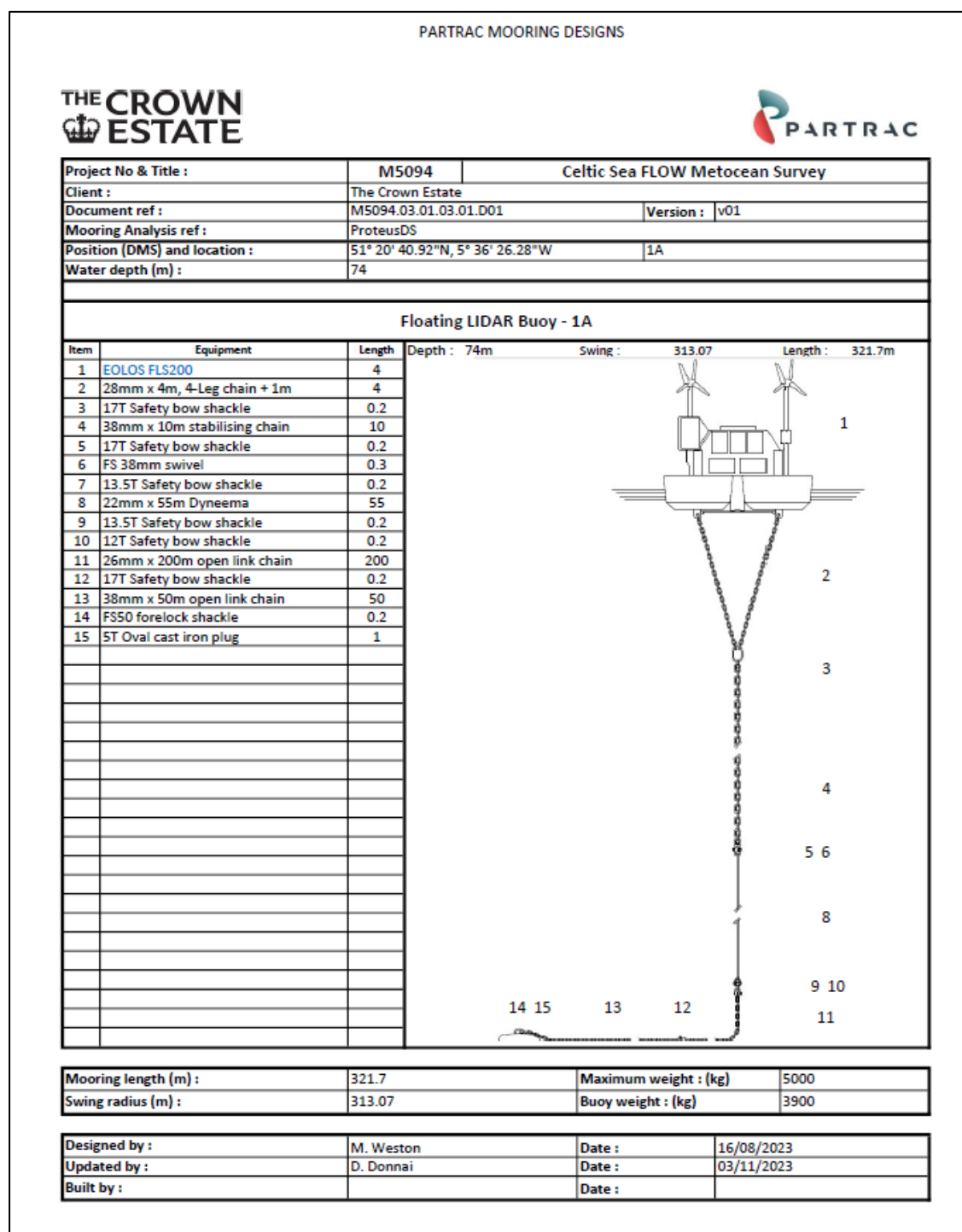


Figure 4: Site 1A FLS LiDAR mooring configuration.

2.1.2 DWR4 Wavebuoy

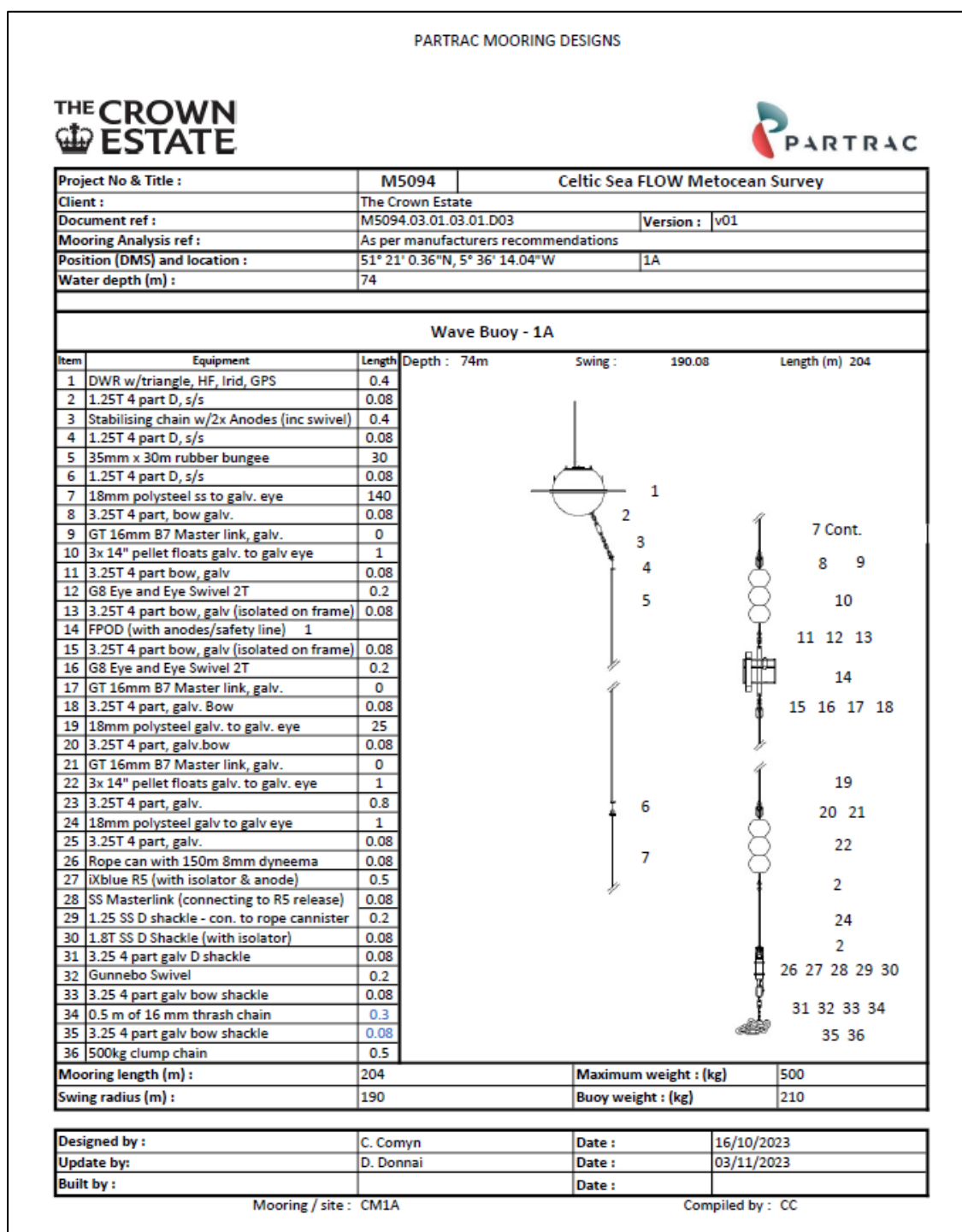


Figure 5: Site 1A Wavebuoy mooring diagram.

2.1.3 Sub-Surface Mooring

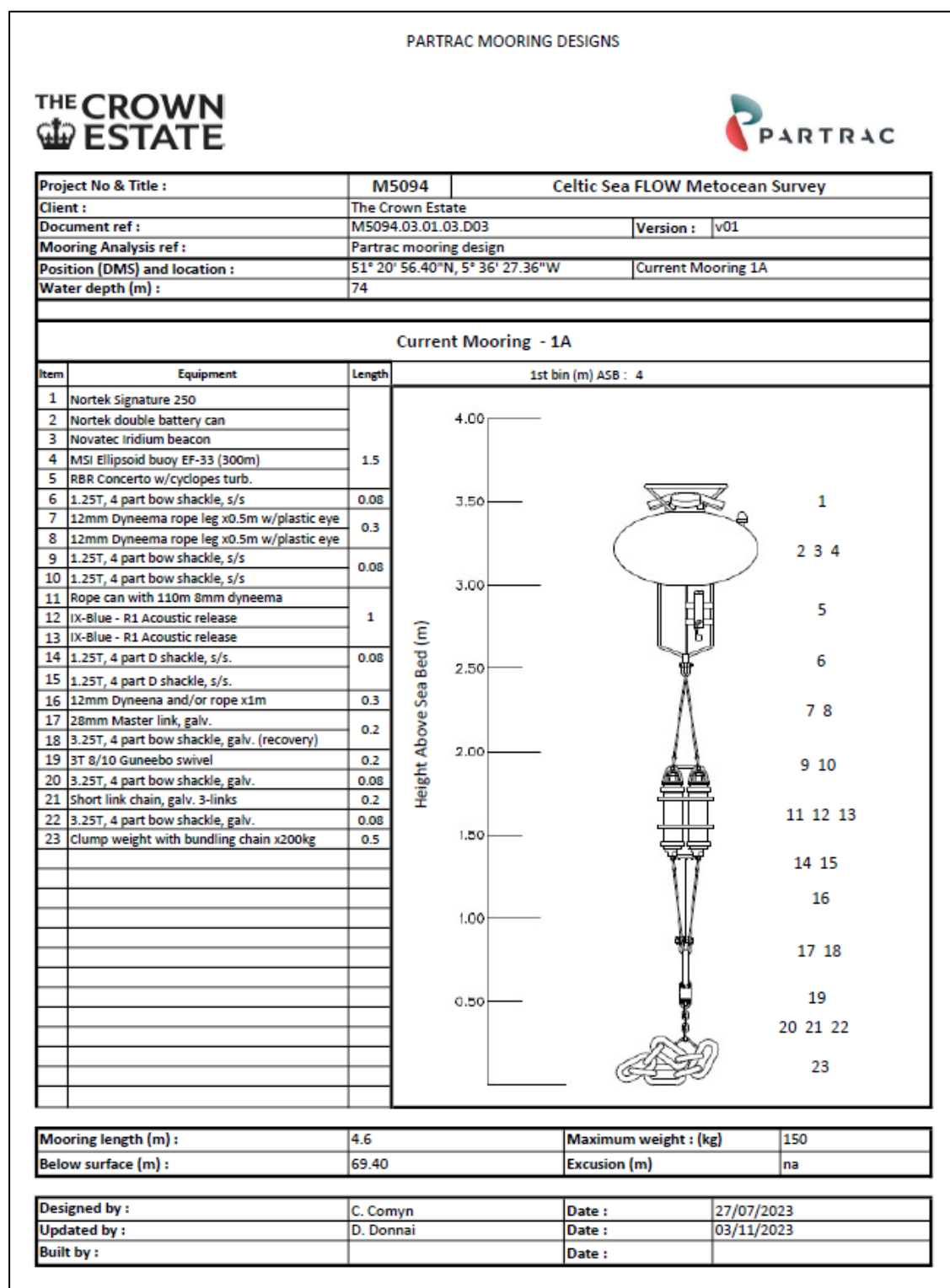


Figure 6: Site 1A Sub-surface mooring diagram.

2.2 Site 3A Mooring Diagrams

2.2.1 Floating LiDAR Buoy

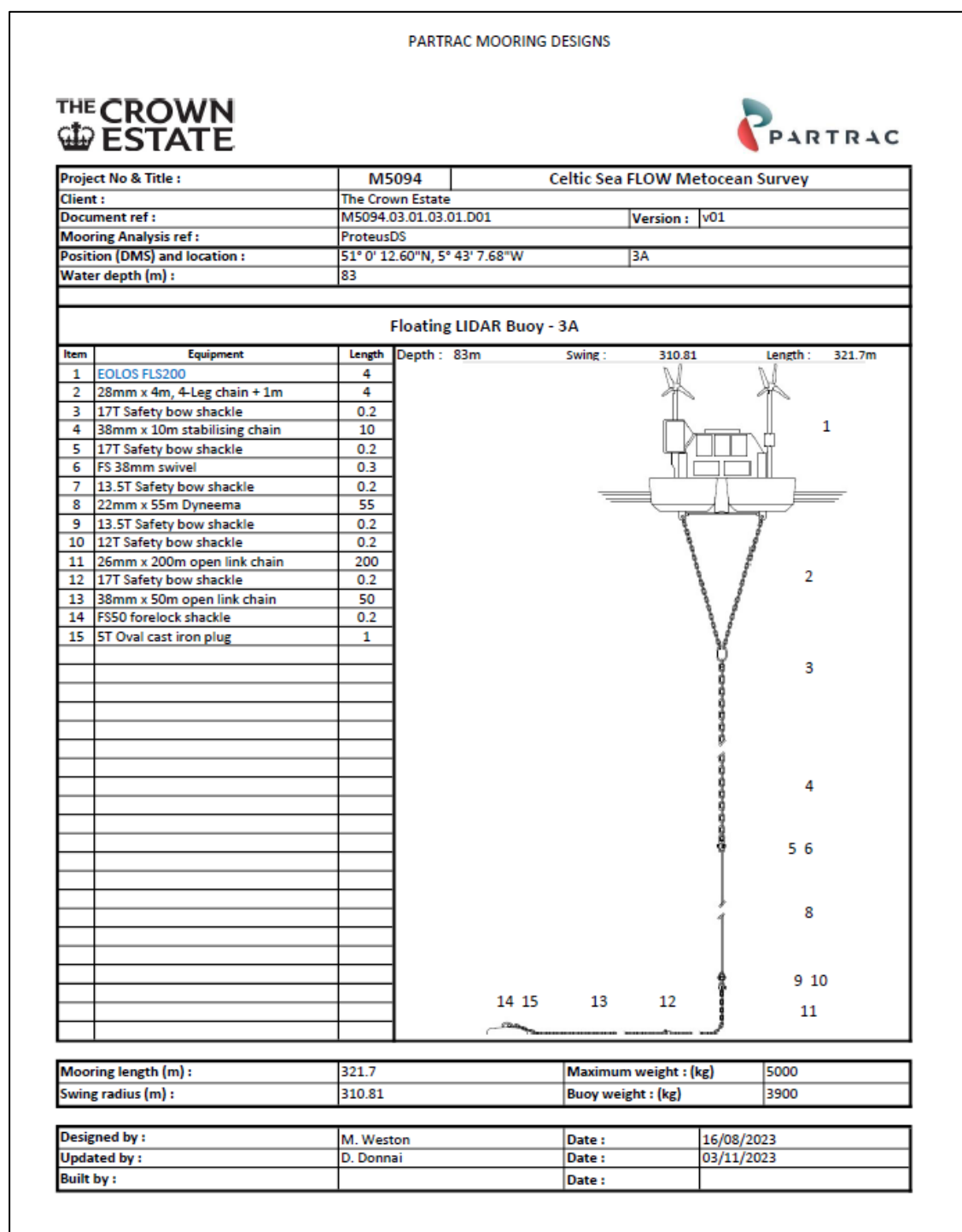


Figure 7: Site 3A FLS mooring diagram.

2.2.2 DWR4 Wavebuoy

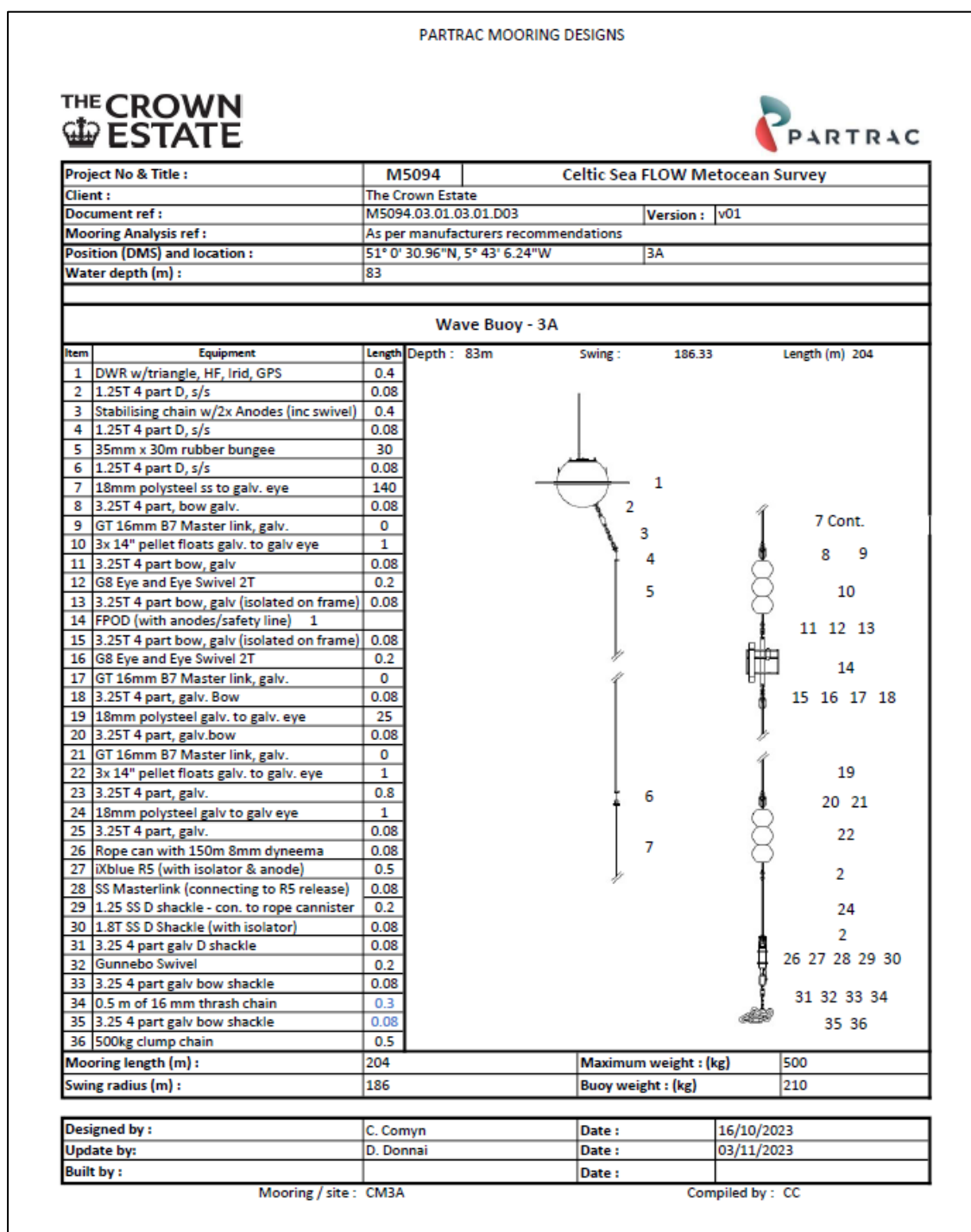


Figure 8: Site 3A DWR4 Wavebuoy mooring diagram.

2.2.3 Sub-surface Mooring

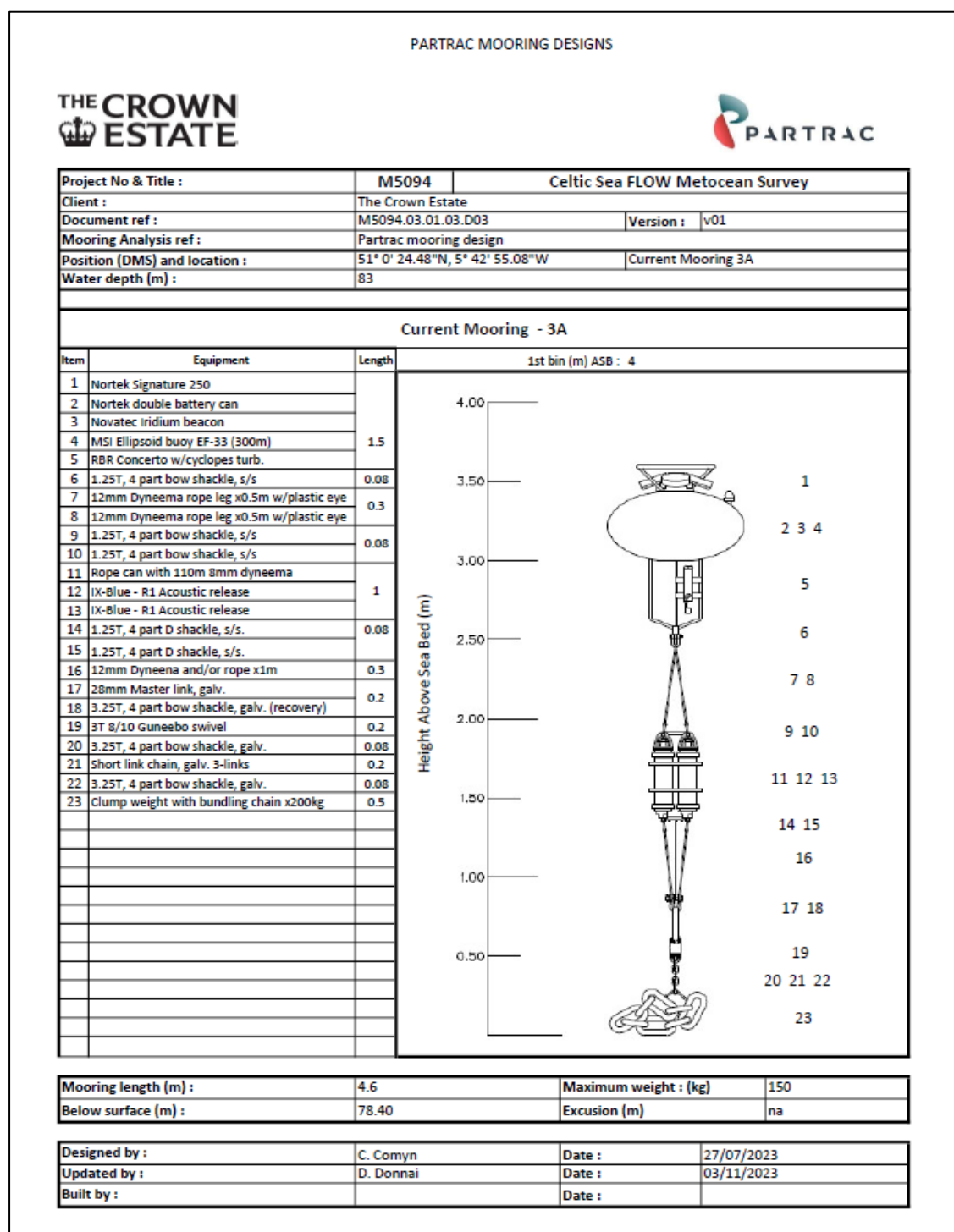


Figure 9: Site 3A Sub-surface mooring diagram.

2.3 Site 4A Mooring Diagrams

2.3.1 Floating LiDAR Buoy

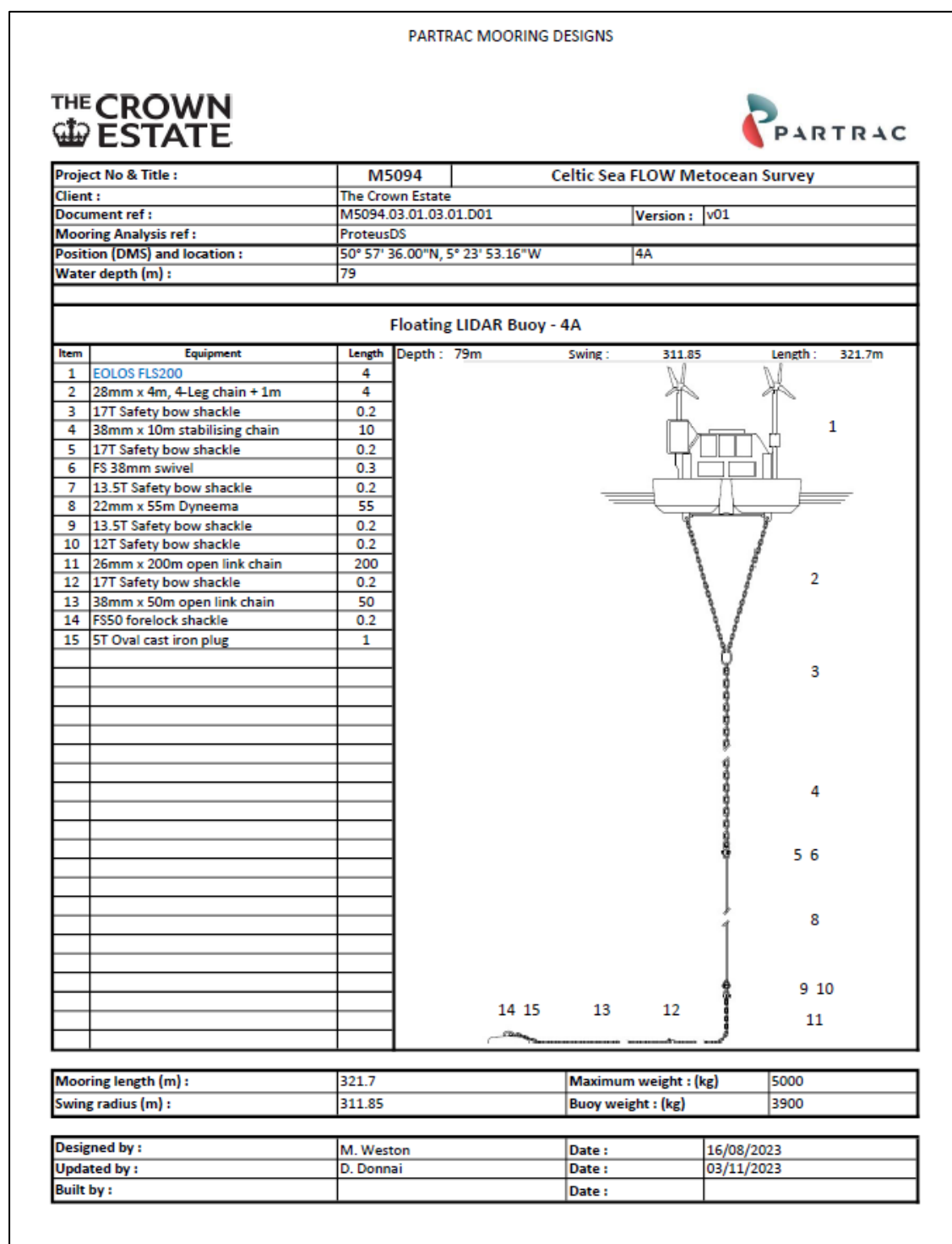


Figure 10: Site 4A FLS mooring diagram.

2.3.2 DWR4 Wavebuoy

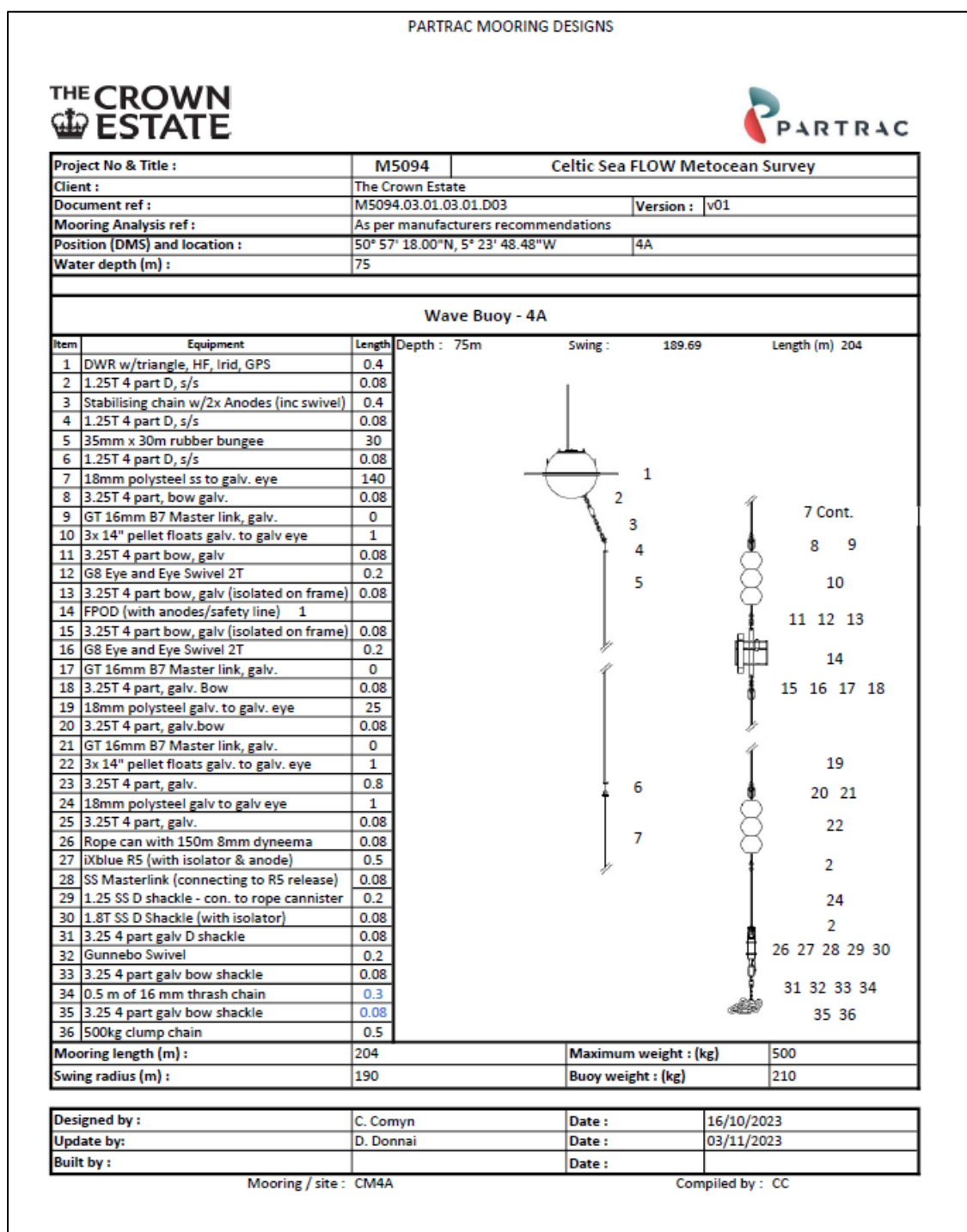


Figure 11: Site 4A DWR4 mooring diagram.

2.3.3 Sub-surface Mooring

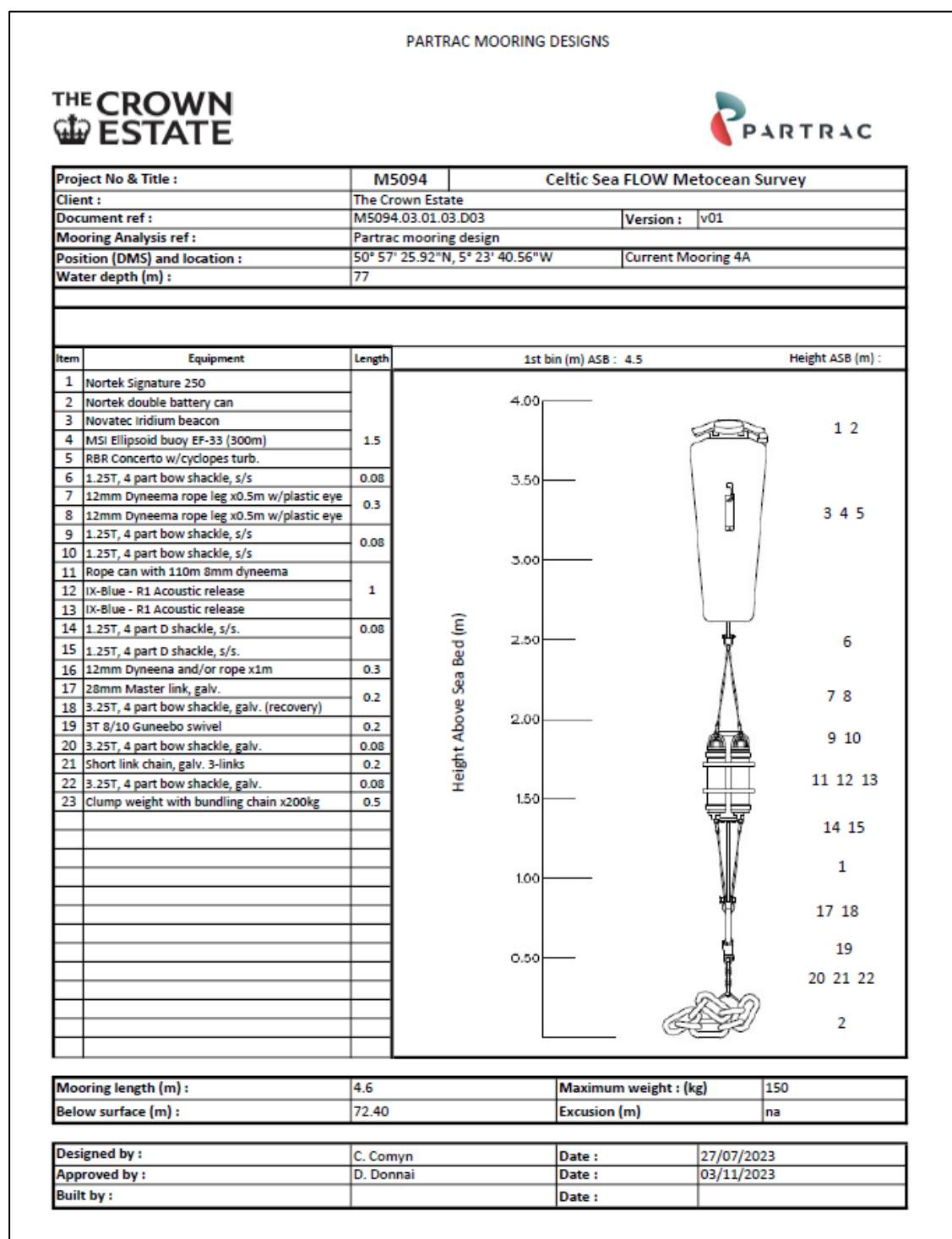


Figure 12: Site 4A Sub-surface mooring diagram.

3. OPERATIONS

3.1 Operations Plan

Details of the plan for operations is provided in Table 3.

Table 2: Operations plan

Day	Activity	Date	Time
Day 1	Load vessel for Site 3A and 4A equipment & conduct final safety walkthroughs		AM
	Steam to Site 4A		PM
Day 2	Deploy Site 4A Metocean array		AM
	Steam to site 3A Deploy Site 3A Metocean array		PM
Day 3	Complete work at Site 3A		AM
	Transit back to base		PM
Day 4	Load vessel with 1A equipment		AM
	Steam to Site 1A		PM
Day 5	Deploy Site 1A Metocean array		AM
	Transit back to base		PM
Day 6	Demob vessel		AM

3.2 Tasks and Responsibilities

Key tasks and responsibilities are detailed in Table 4.

Table 3: Operational key tasks and responsibilities

Number	Principal Equipment Required	Certification?	Who inspects?
1	Vessel	Y	Auditor
2	Vessel lifting equipment	Y	Auditor
3	F-LiDAR FLS200 Buoy	Y	EOLOS/ Partrac
7	Stumpy moorings	Y	Partrac
5	Wave Buoy	Y	Partrac
7	Mooring and ancillaries	Y	Partrac
8	Sinker weight	N	Partrac

Number	Participants	Position	Done before?
1	Name (Partrac)	Partac In Charge	Y
2	Name (Partrac)	Oceanographer	Y
3	TBC (EOLOS)	Technician	Y
4	TBC (Skipper)	Vessel Captain	Y
5	Vessel crew as per crew list	Deck	Y
Number	Procedures	Who performs?	Who supervises?
1	Inspection and test of vessel equipment	Vessel	Partrac
2	Equipment preparations for offshore operations	Vessel	Partrac
3	Verification of deployment co-ordinates and water depth	Partrac / Vessel Captain	Client
4	Deck preparations for offshore operations	Partrac / Vessel Crew	Partrac / Vessel Captain
Number	Environmental Precautions	Responsible person	Supervisor
1	Suitability of environmental conditions	Partrac / Vessel Captain	Partrac / Vessel Captain
2	Oil spill prevention (use of prevention kit)	Vessel Captain	Partrac / Vessel Captain
3	Fuel spillage prevention (use of spill prevention kit)	Vessel Captain	Partrac / Vessel Captain
4	Recovery of all equipment from the seabed	Partrac	Partrac

3.3 Methodology

3.3.1 Vessel

TBD

3.3.2 Equipment Preparation

The Metocean equipment and Floating Lidar buoys will be prepared at the Port of Milford Haven, Wales prior to deployment. The port of mobilisation will be the Port of Milford Haven.

3.3.3 Pre-Operational Checks

3.3.3.1 Assessment of Weather

Persons responsible: Partrac In Charge, Vessel Master.

Assessment of the weather conditions for buoy deployment will be completed through a combination of site-specific forecasts, Meteorological Office forecast, various other wind and swell predictions, verification with near real-time observations and local knowledge.

If wind, tidal and sea conditions are within the operational limits (provided below) then the recovery operations can begin.

Equipment deployment and recovery operation limits:

- $H_m0 = 1.0\text{m}$ ($H_{\text{max}} 1.6\text{m}$).
- Wind speed = 20 knots.

Vessel Transit:

- $H_m0 = 1.5\text{m}$
- Wind speed = 25 knots

It must be noted that the vessel and crew's safety is the responsibility of the Master and with due regard to this, operations will be conducted ultimately at the Master's discretion.

3.3.3.2 Logistics

In preparation for mobilisation, weather limits will be monitored and must show a clear workable weather window before mobilisation.

Vessel mobilisation will include the following actions:

- Vessel induction.
- The deck is prepared for operations
- Final review of the metocean conditions and forecast for the day's operations.
- Prior to commencing works, the Client will be notified of the indented operations.

3.3.3.3 Pre-Operation

- Arrive at the deployment site and assess weather conditions and wave height. If conditions are considered to be within the operational limits specified in section 4.3.3.1 then operations can commence.
- Point of work risk assessment to be carried out by Master and Principal Engineer dependent on local conditions.
- Vessel to exhibit shapes/lights for "vessel restricted in her ability to manoeuvre" as per Collision Regulations (to remain exhibited until completion of operation).
- The deck must be cleared of any equipment that is not required for the lifting operations.
- Tidal speed and direction must be taken into account when assessing how to deploy the moorings
- Tool Box Talk is to be completed on site by Partrac.

- The vessel specific lift plan will be reviewed in conjunction with this RAMS document during the Tool Box Talk.
- The RAMS and Lift Plan are to be signed by all crew involved in the operations.
- Final deck preparations and setup.
- After final assessment of current and wind conditions, operations can commence.

3.3.3.4 Responsibilities

- Crane and winch operations: Vessel crew;
- Deck work: Vessel crew, Partrac engineers;
- Watch Officer: Vessel;
- Coordination of deployment operations: Vessel Master / IC; and
- Positioning: Bridge / IC.

3.3.4 Floating LiDAR Operations

3.3.4.1 Deployment

Any minor deviation from the approved RAMS must be captured in a point of work risk assessment. If a significant change is required to the approved procedure, all changes must be reviewed by the Partrac Project Manager who will decide on the level of approval required. Work must not proceed until all changes have received the necessary approvals.

- Prior to deployment Partrac IC must ensure that EOLOS engineers are ready to deploy the buoy. EOLOS must ensure that the wind turbines have been isolated.
- 50m or 38mm open link chain, followed by 200m of 26mm riser chain will be loaded onto the main winch and the 5T clump weight secured to the loose end.
- The vessel will manoeuvre into deployment position accounting for wave and tidal conditions on site.
- Vessel will settle into position and inform crew to begin operations.
- The clump weight, now connected to the mooring chain, will be lifted overboard using the vessel crane.
- Taglines will be used for the 5T clump to ensure the load is easily controllable.
- The weight will be taken on the main winch and the crane disconnected.
- The main winch lowers the mooring weight to the seabed, as the mooring chain pays out the vessel must slowly move away from position to avoid laying the chain in a pile.

- Once 10 m of 26 mm chain is left on deck, the shark jaws lock the chain, and a safety strop will be added to secure the chain.
- Shark jaws are isolated by the vessel crew to remove the possibility of accidental release.
- The Dyneema rope will be flaked on deck; 60m of 22mm Dyneema at Site3A and 55m of 22mm at Site 1A and 4A. One end of the Dyneema will be attached to the end of the 26mm riser chain and the other end will be attached to the swivel assembly below the ballast chain.
- For the buoy lift, a combination of 2 x 10 m, 3T SWL slings, and a quick release hook, will be used. One end of each sling will be hooked to the crane, fed through the lifting lugs of the LiDAR and back up to a quick release on the crane hook (Figure 21).
- Two dyneema tag lines will be attached to the buoy to control the buoys swing during the lift.
- The buoy will be lifted overboard and as soon as the buoy is afloat, the quick release will be pulled, and the deployment slings recovered to deck. Taglines will remain attached until the buoy is ready to be let go.
- The 10m of 38mm chain bridal under the buoy, as well as the dyneema line will be allowed to slide over the side of the vessel until all that is held is the final bight on the vessel quick release (Figure 22).
- Tag lines will be removed, and the vessel will move to ensure the buoy is not against the side of the vessel and to ensure the chain does not hit the buoy when the final bight is released.
- Using UHF communication from the skipper, the crew will be instructed to stand in the safe zones, as identified in the vessel induction and toolbox talks, visual check to confirm the buoy is clear of the chains potential whip, the chain will be released, and the last bite of chain will slide off the deck.
- A location check and sensor check will be carried out prior to leaving the buoy on position.

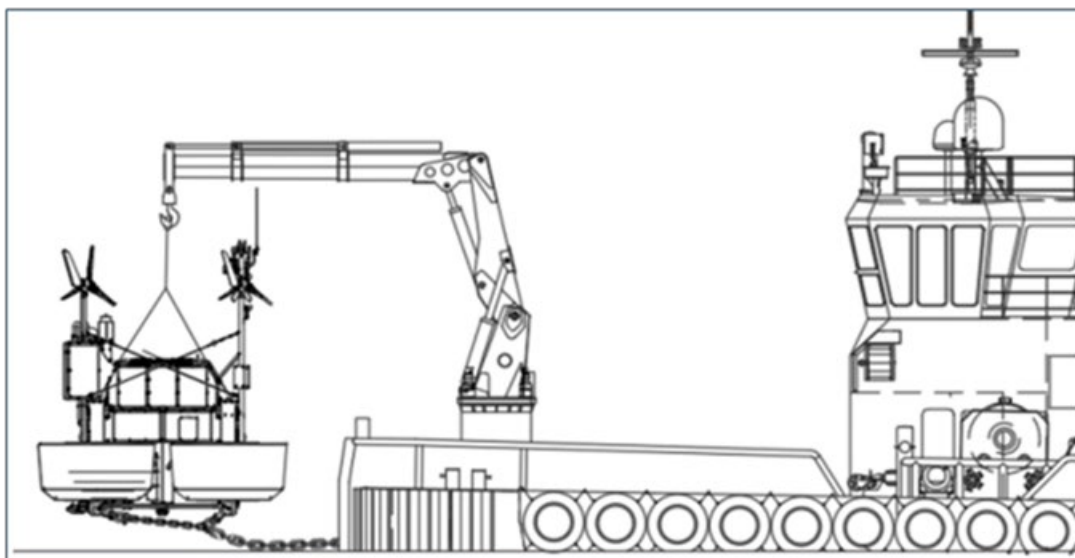


Figure 13: FLS200 deployment method schematic.

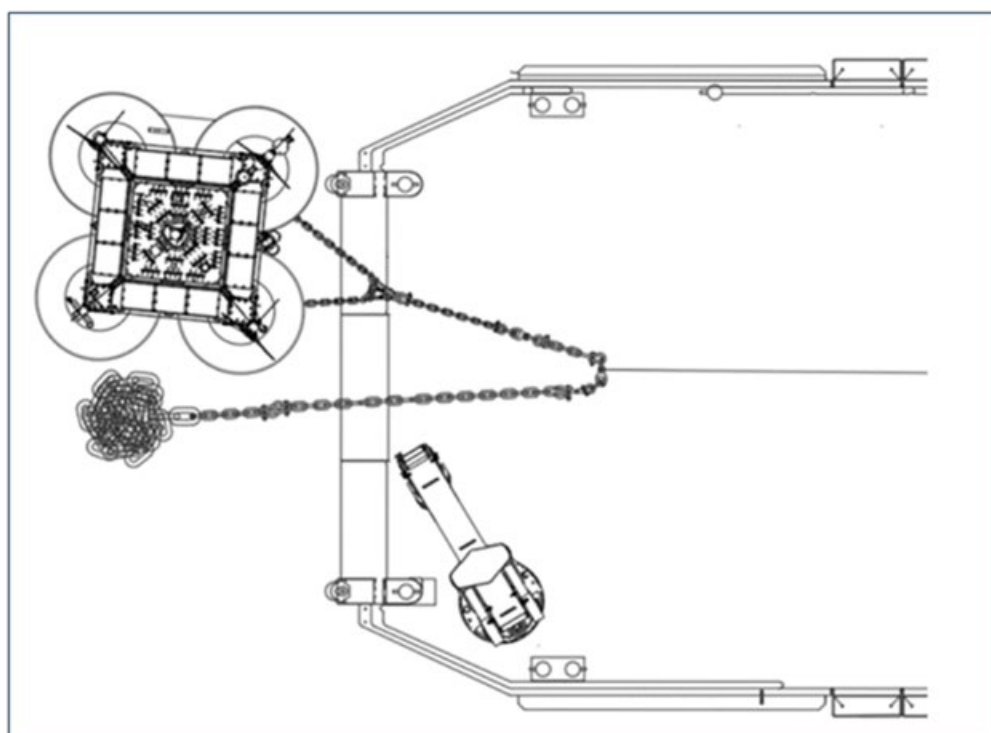


Figure 14: FLS200 final deployment positioning.

3.3.4.2 Recovery

- The vessel will approach the buoy from downwind / tide according to the prevailing conditions and settle into position.
- Once close to the vessel, a threading boat hook (happy hooker) will be used to attach two tag lines to the towing eyes on the nearside of the buoy (Figure 23).

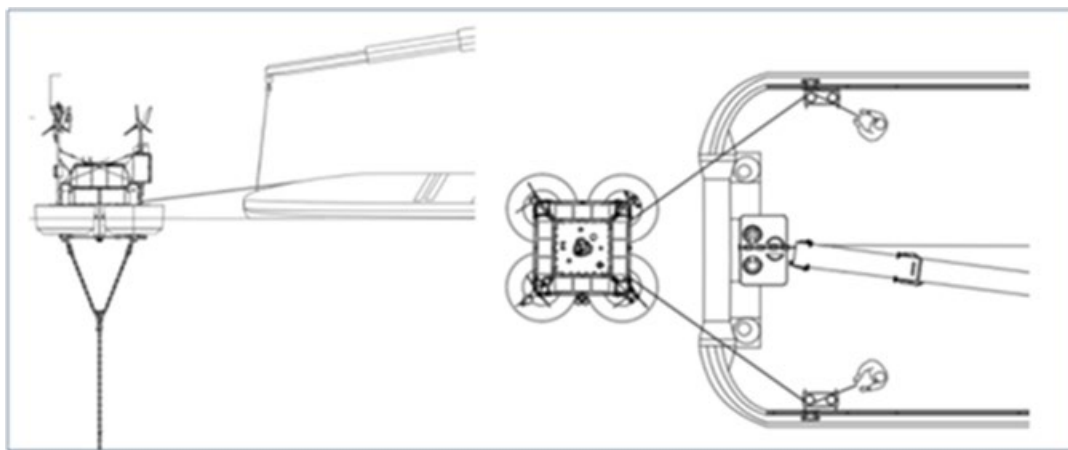


Figure 15: FLS200 LiDAR buoy with tag lines.

- Two x 3T, 10 m slings will then be fed through the four red certified lifting lugs using a happy hooker and connected to the vessel crane (Figure 24, Figure 25).
- The weight will be slowly taken on the crane, and buoy will be lifted out of the water and set on to the deck.



Figure 16: FLS200 buoy lifting points.

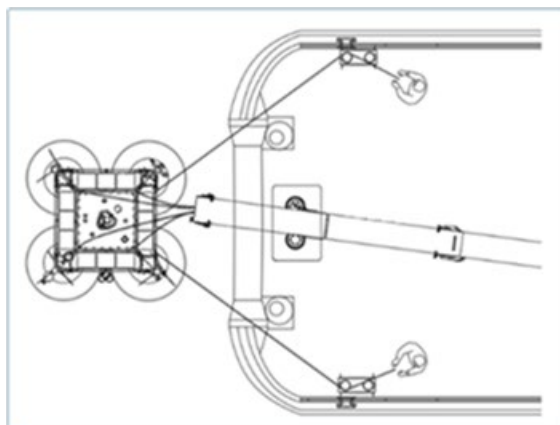


Figure 17: FLS200 LiDAR buoy with lifting strops attached ready for recovery lift.

- Once on deck, a happy hooker will be used to attach a doubled over, 5T strop to the mooring chain and the strop connected to the main winch.
- The main winch will be used to recover the mooring chain bridal and stabilising chain onto the deck of the vessel.
- Once the bridal is on deck, exposing the stabilising chain, the mooring will be secured using a 5T sling and the locking pins, creating a stopper while the LiDAR is disconnected from the mooring.
- The main winch will continue to recover the stabilising chain up to the top of the dyneema.
- The dyneema section of the mooring will be attached to the towing winch and the weight will be transferred from the main winch to the towing winch.
- Once the dyneema is secured on the towing winch, the stabilising chain will be disconnected.
- The dyneema will now be taken up on the towing winch, taking care not to damage the rope. The vessel will move towards the clump weight deployment location as the towing winch heaves in the mooring.
- Once the main riser chain is on deck the chain will be stoppered off using the 5T sling and locking pins. The main winch will be attached and then the towing winch and dyneema can be disconnected.
- The riser chain can now be heaved up using the main winch as the vessel continues to move towards the clump weight deployment location.
- The 200m of mooring chain will be recovered onto the main winch.
- Once the 5T clump weight comes into view, a happy hooker will be used to pass a 6m 5T strop through the eye of the top weight. Both ends of the strop will be attached to the vessels crane hook (providing a lifting capacity of 10T). Tag lines will also be attached and secured to bollards.

- The crane will lift the 5T clump weight over the bow of the vessel and onto the deck. The lift will remain as low as possible, and all personnel are to remain clear.
- All equipment should be lifted to a location clear of the bow and secured to the deck for transit.

3.3.5 Wave Buoy Operations

3.3.5.1 Deployment

Vessel positioning and mooring prep:

- The vessel should position at least 3 x the mooring length, up current from the prevailing conditions to be able to manoeuvre to the deployment position whilst streaming the wave buoy.
- The IC is to identify the correct buoy for deployment which should then be lifted into the deployment positions on deck.
- The bungee will be flaked onto the deck. One end will be connected to the wavebuoy and the other end will be connected to the upper section of mooring line.
- The upper section of mooring line will be laid out on deck and coiled in a figure-of-eight loop to avoid loose bights of rope on deck.
- One end of the upper section of mooring line is to be connected to the bungee, and the other end is to be connected to the top of the 3 x pellet float and PAM equipment section (Figure 28).
- The lower section mooring line will then be laid out on deck, further aft of the upper section, and coiled in a figure-of-eight loop to avoid loose bights of line. One end will be attached to the bottom of the PAM equipment section. The other end will be attached to the top of the 3 x pellet float and acoustic release section (Figure 28).
- The acoustic release section will then be attached to the sinker weight via 0.5m of 18mm chain.



Figure 18: Example of sinker weight, mooring line, and bungee configuration.

Manoeuvring and securing the sinker weight:

- A Seacatch (certified on-load release), with the safety pin in place, will be attached to the 3.25T shackle at the top of the thrash chain. The Seacatch will be connected to a 3m 2T WLL strop which will be secured over the deck pins at the bow at a later stage once the anchor weight has been lifted into the release position.
- The sinker weight will be connected to the crane with a 2m 1T WLL strop and lifted over the bow of the vessel, ensuring that the weight is kept low, and taglines are attached. The 3m 2T strop connected to the Seacatch can now be secured to a certified hard point on deck.
- The crane is now to be lowered and the weight transferred onto the Seacatch ensuring the Seacatch is in the correct orientation to safely release (vertical or horizontal with clearance around the pin). The trigger line to the Seacatch must be closely monitored.
- The Seacatch is an on-load release hook therefore it is crucial that the trigger line does not become entangled accidentally releasing the load.
- Prior to releasing the load from the crane, a secondary 4m 3T safety strop is to be fed through the anchor weight and onto a certified hardpoint on deck as a backup safety line. Once secured the crane and the 1T strop can be removed from the sinker weight.

Deploying the wave buoy:

- The crane will be connected to the lifting bridal of the wavebuoy, via a 3T Seacatch release. Sea fastenings will be released, and the buoy can be lifted using the crane.
- Taglines will be used to control the lift and prevent swinging of the buoy.

- The buoy will be lifted outboard and lowered to the sea surface. The taglines will be removed, and the buoy will be released from the crane by releasing the Seacatch once the buoy has reached sea level.

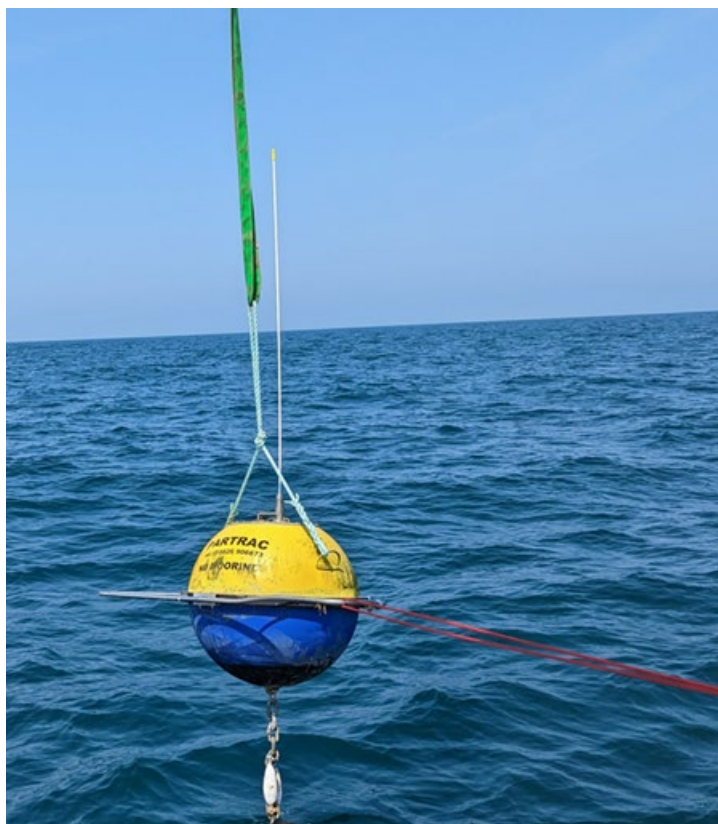


Figure 19: DWR deployment operations.

- The wavebuoy will drift away as the vessel manoeuvres towards the deployment position. The bungee and the mooring line will slowly pay out until the entire mooring is streamed out. The lift supervisor will monitor personnel movements as the lines pay out.
- The PAM equipment, pellet floats and acoustic release system sections will be lifted over the roller using a seacatch quick release on the crane hook, one section at a time, as the mooring pays out (Figure 28). Care will be taken when lowering each section to the sea surface.

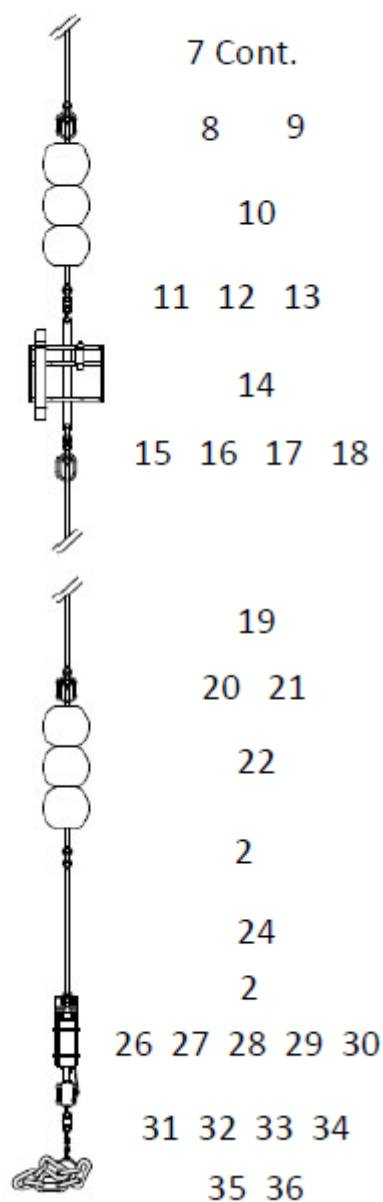


Figure 20: PAM instrumentation, pellet float, and acoustic release sections of the DWR moorings.

- Once the entire mooring has streamed outboard and is under tow, the Partrac IC will inform the bridge that the mooring is now ready for release once above the target location.
- As the vessel approaches the deployment position the vessel Master will inform the Partrac IC and the backup safety stop can be removed from the sinker weight. All deck personnel are now to remain clear of all lines on deck.



Figure 21: Sinker weight ready to be deployed.

- When on position the Master will give the ‘release’ command over the radio. The safety pin of the Seacatch will be removed using the trigger line. This will release the anchor weight, allowing it to free fall to the seabed.
- The deployment position will be recorded on the vessel navigation system. The buoy position will be monitored to ensure that the buoy is secure on its mooring.
- The buoy deployment positions will be checked, and data telemetry will be verified at the earliest opportunity via mobile or satellite phone to the office.

3.3.5.2 Recovery

- The vessel will approach the wavebuoy slowly from downstream. It will be positioned in such a way to allow recovery operations to commence without drifting onto the buoy or mooring ropes and to allow for recovery off the bow. Constant and clear communication of distances to the buoy and mooring will be maintained between the deck and bridge.
- A boat hook will be used to hold the bridal of the buoy while a happy hooker is used to attach a lifting strop to the bridal.
- Once in a safe position, and with permission from the bridge, the vessel’s crane hook will be attached to the lifting strop on the buoy.
- The buoy will then be lifted using the vessel crane, tag lines will be attached as soon as it is safe to do so. Once on deck, the buoy will be secured on a tyre to stabilise the buoy. The tag lines will be removed, and the buoy secured to deck prior to releasing the crane hook.

- The bungee will be recovered by hand and the direction of the mooring will be continually relayed to the Master. If the manual handling strain exceeds what is safe, the mooring can be released, and vessel manoeuvred directly over the clump weight position to reduce mooring strain. Communication between the deck and the bridge at this point is critical to ensure the vessel position relative to mooring recovery is coordinated.
- When the entire bungee is in board and the upper section of the mooring rope is accessible, the rope will be secured to the main winch and the bungee will then be disconnected from the rope section.
- The top section of the mooring rope will be recovered over the roller using the winch, with a constant relay of rope lead direction to the Master. Vessel will be moved directly over clump to prevent compromising the mooring rope.
- At the point the line is straight up and down, the winch should stop to allow the heave of the vessel to ease the sinker weight clear of the seabed.
- When it is evident that the tension on the line has released the sinker weight from the seabed, the winch can continue hauling.
- Once the three pellet floats above the PAM equipment reach the surface the winch will be stopped. A IT stop will be attached to the eye of the float section and attached to the vessel crane.
- The crane will be positioned outboard to then lift the floats and PAM equipment clear of the roller and onto the vessel deck. The two mooring sections will then be disconnected, and the upper mooring line removed from the winch.
- Once the PAM equipment is laid on deck the winch will be reconnected below the PAM equipment onto the lower rope section. The PAM equipment can now be disconnected from the mooring entirely to allow the winch to pull in the lower section of line.
- Once the three pellet floats above the acoustic release system reach the surface the winch will be stopped. A IT stop will be attached to the eye of the float section and attached to the vessel crane.
- The crane will again be positioned outboard of the vessel to lift the floats, acoustic release system and sinker weight as one, over the roller and onto deck.
- All equipment will be cleared of the deck and secured with sea fastenings for transit.

3.3.6 Subsea Mooring Operations

3.3.6.1 Deployment

- All parts of the mooring will be connected on deck.
- The crane will be connected to the lifting eye on the upper section of the buoy frame, via a Seacatch release.
- The mooring will be lifted as a single unit and manoeuvred over the side of the vessel, to sea level, using the vessel crane. Taglines must be attached and wrapped around bollards to provide sufficient resistance to hold the clump to prevent swinging.
- Once the vessel is over the deployment location, on the command from the bridge, the taglines will be removed, the mooring will be fully submerged and the Seacatch will be released, allowing the mooring to free fall to the seabed.
- The deployment position will be recorded on the vessel navigation system.
- The buoy position will be confirmed by ranging to the acoustic release transponders to ensure the mooring has not been compromised during deployment.

3.3.6.2 Recovery

- Before and during operations, a Stop the Job can be given to reassess the procedures and if necessary to redefine as part of another Toolbox talk.
- The position of the mooring will be confirmed upon arrival at site by ranging to the acoustic releases.
- The vessel will then reposition approximately 100m perpendicular to the prevailing conditions, so the mooring does not surface underneath the vessel.
- The release command will then be sent to the primary release and tracked upon release by ranging to the unit.
- If the release fails, the secondary unit will be released. The dual release system allows for the safe recovery of all survey equipment, in the event that one of the systems fails.
- Once at the surface, the vessel will approach the mooring and monitor where the mooring line is leading.
- The vessel will approach from down current to the prevailing conditions.
- The mooring will be recovered using a happy hooker to attach a strop to the top frame of the ellipsoid buoy. Both ends of the strop will be attached to the vessel crane.

- The buoy will then be lifted out of the water using the main crane, outboard of the bow roller. When the mooring is at the height of the roller tag lines will be attached, and the mooring brought inboard, making sure not to drag the floatation collar over the roller.
- A boat hook should be used to control the swing of the mooring until a tag line can be attached.
- Once on the deck, the excess dyneema line will be removed from the pop-up release cannister. Once at the end of the slack line, a knot will be placed in the dyneema line, and the line will be attached to the vessel winch.
- Once the line is attached to the vessel winch, the dyneema line connected to the pop-up cannister will be cut to separate the mooring assembly from the recovery line.
- The dyneema recovery line will then be passed through a trawl block attached to the vessel crane and the crane slewed over the bow to ensure the recovery line is free from snagging.
- The winch will then slowly haul in the excess line until all the tension has been taken up on the winch and the anchor weight then recovered.
- Once the anchor weight is at the surface, the crane will lift the sinker weight on to deck, maintaining minimal height throughout; and
- Once the sinker weight is on deck, the entire system will be removed from the winch and fastened to the deck of the vessel before further operations.

4. HEALTH, SAFETY AND ENVIRONMENTAL RISK ASSESSMENT

Due to the dynamic nature of the operations, the on-site risks will be re-assessed and controlled.

All vessel and survey personnel involved in the works will be required to read and sign this documentation. This is to be issued in a timely manner in advance of works in order that amendments can be made if necessary and the output re-circulated to all relevant parties.

In addition to this Risk Assessment, personnel are required to take part in Toolbox Talks, Lift Plans and Vessel Inductions, each of which also require sign off by all personnel involved. The lifesaving rules and Partrac's ABC of HSE approach will be discussed during the pre-operational discussions, Particular attention will be paid to the STOP THE JOB policy that is adopted. Any person involved in the operation is entitled to stop the job if they see any risk to health or safety.

Health, Safety and Environmental incidents arising will be reported to the client at the earliest opportunity in accordance with the Project Execution Plan (PEP) and the Emergency Response Plan (ERP).

A copy of the Risk Assessment will be available to all persons who could be affected and will be stored on Partrac's server. A hard copy will be prepared for the project folder and will accompany the Survey Team offshore.

All documentation in support of the Risk Assessment including the Toolbox Talk form, Safety Observation Cards, and Vessel Induction forms will also accompany the team on mobilisation. H&S Risks & Control Measures.

4.1 H&S Risks and Control Measures

Risks are assessed using the following scoring system.

		Probability					
			1	2	3	4	5
Severity	1						
	2						
	3						
	4						
	5						

Probability	
1	Almost impossible
2	Most unlikely
3	Possible
4	Most likely
5	Almost certain

Severity			
	Injury	Equipment Damage	Environmental damage
1	No injury	No damage	No environmental damage
2	First Aid injury	Minor damage	Minor environmental damage
3	Medical treatment	Medium damage	Medium environmental damage
4	Lost time injury	Lost time damage	Major environmental damage
5	Fatality	Catastrophic damage	Environmental disaster

Legend		
	Low Risk	No further action required
	Medium Risk	Risk only acceptable after approval by Partrac HSE team
	High Risk	Unacceptable as risk after mitigation, find alternative

4.2 Identification of the Top Three Hazards

Activity										
Identification of the Top 3 Hazards										
Item	Task	Hazard	Consequence	Initial Risk			Control Measures	Residual Risk		
				P	S	R		P	S	R
1.	Lifting equipment.	Struck / crush. Failure of lifting equipment. Swinging weights.	Injury / fatality Loss of equipment into the water. Damag to equipment.	3	5	15	Tested, certified, and inspected lifting equipment only. Trained lifting operators only. Use of Banksman. Use of Tag lines. Toolbox Talk. Lift Plan. Use of appropriate PPE. Exclusion zones will be in place so personnel cannot stand underneath a load or between a fixed structure and load.	2	5	10
2.	Vessel operations (deployment / recovery of mooring components)	Man overboard	Injury / fatality by drowning.	3	5	15	No non-essential personnel on deck during operations. Partrac personnel to be instructed on no-go areas during operations. All vessel crew experienced in deck operations with regards to buoy deployment and recovery. Toolbox Talk to cover any safety issues and/or concerns. Body Positions: During buoy deployments all personnel will be inboard of the buoy and moorings. No personnel will be within 1m of open deck. No lone working. Environment: Sea state, swell and weather conditions are monitored before and during any operation. Operations will be stopped if conditions are deemed unfit for working on deck, and the operation re-assessed. Verified MOB procedures. Monthly MOB drills carried out by vessel crew Use of 275 KN life jackets with PLB.	2	5	10

Activity	Identification of the Top 3 Hazards										
3.	Deployment/ recovery operations	Caught in bight of mooring. Entanglement with presons.	Injury / fatality Lost time.	3	5	15	No non-essential personnel on deck during operations. Partrac personnel to be instructed on no-go areas during operations and supervised by the First Officer. All vessel crew experienced in deck operations with regards to buoy deployment and recovery. Body Positions: During buoy deployments all personnel will be inboard of the buoy and moorings and away from pinch points. Toolbox Talk to cover any safety issues and/or concerns, No lone working. Buddy system. Toolbox talk. Trained, competent personnel only. Use of appropriate PPE.	2	5	10	Tolerable

4.3 Health and Safety Risk Assessment

Activity	Loading of equipment to vehicle										
Item	Task	Hazard	Consequence	Initial Risk			Control Measures	Residual Risk			Unacceptable
				P	S	R		P	S	R	Tolerable
1.	Manual Handling	Personal injury	Lost time injury	3	4	12	Assess the type of task (lifting, carrying); the load (weight, size, shape, surface-type); the environment in which the task is being carried out (quayside, pontoon, access to vessel). Eliminate the task if possible. Assess if mechanical assistance is available for carrying out the task (e.g., crane, fork-lift, pallet truck). If not:	1	4	4	Acceptable

Activity Loading of equipment to vehicle											
							- Assess the capabilities of the individual(s) carrying out the manual handling activity with respect to the task, load, and environment. - Assume correct posture and procedures for lifting. Use of appropriate PPE. Spread the lift over 2 persons or identify mechanical aid if the lift is too heavy or awkward.				
2.	Lifting Operations	Personal injury	Injury / fatality	3	5	15	Use pallet lifter, forklift, or harbour crane. Use of appropriate PPE (lifejacket (with PLB), hard hat, gloves, safety glasses, steel toe footwear). Exclusion zones will be in place so personnel cannot stand underneath a load or between a fixed structure and load.	2	5	10	Tolerable
3.	Vehicle weight capacity	Over-loading vehicle	No Injury	3	1	3	Distribute weight equally. Weights of items are known, and total weight can be verified. Verification of vehicle payload weight from equipment requisition form. Two drivers for drive to port.	2	1	2	Acceptable

Activity Loading / unloading of equipment to vessel											
Item	Task	Hazard	Consequence	Initial Risk			Control Measures	Residual Risk			Unacceptable
				P	S	R		P	S	R	Tolerable
1.	Embarking / disembarking vessel	Falling into water Falling onto another vessel alongside Drowning Hypothermia	Lost time injury	3	4	12	Wearing correct PPE, 275 N life jacket with PLB. Do not join or disembark vessel until vessel is tied up securely and	1	4	4	Acceptable

Activity	Loading / unloading of equipment to vessel									
						authorisation is given by the vessel skipper. Ensure that all safety barriers are fitted on the vessel. Ensure all spills are clearly marked and spill kit is used to remove liquid from floors and decks. Ensure all wiring and other trip hazards on deck are protected, covered, or removed. Man overboard procedures to be outlined within the vessel induction. No lone working. Access via secured gangway Ensure vessel is securely moored prior to embarking/disembarking				
2.	Manual Handling	Personal injury	Lost time injury	3	4	12 Assess the type of task (lifting, carrying); the load (weight, size, shape, surface-type); the environment in which the task is being carried out (quayside, pontoon, access to vessel). Eliminate the task if possible. Assess if mechanical assistance is available for carrying out the task (e.g., crane, fork-lift, pallet truck). If not: - Assess the capabilities of the individual(s) carrying out the manual handling activity with respect to the task, load, and environment. - Assume correct posture and procedures for lifting. Use of appropriate PPE. Spread the lift over 2 persons or identify mechanical aid if the lift is too heavy or awkward.	1	4	4	Acceptable

Activity	Loading / unloading of equipment to vessel										
3.	Lifting Operations	Crushing injury	Injury / fatality	2	5	10	Complete a Lift Plan. Use of appropriate PPE (lifejacket, hard hat, gloves, safety glasses, steel toe footwear). Tested, certified, and inspected lifting equipment. Trained lifting operators. Use of Banksman. Use of Tag lines. Toolbox Talk. Use of appropriate PPE. Non-essential personnel to be alerted and moved away from the lifting operation. Ensure that heavy loads are placed within the operational zone of the hydraulic crane. Load at or near high tide for heavier items. Exclusion zones will be in place so personnel cannot stand underneath a load or between a fixed structure and load.	2	5	10	Tolerable

Activity	Loading / unloading of equipment to vessel										
4.	Lifting Operations	Personal injury	Injury / fatality	3	5	15	Complete a Lift Plan. Use of appropriate PPE (lifejacket, hard hat, gloves, safety glasses, steel toe footwear). Tested, certified, and inspected lifting equipment. Trained lifting operators. Use of Banksman. Use of Tag lines. Toolbox Talk. Use of appropriate PPE. Non-essential personnel to be alerted and moved away from the lifting operation. Ensure that heavy loads are placed within the operational zone of the hydraulic crane. Load at or near high tide for heavier items. Exclusion zones will be in place so personnel cannot stand underneath a load or between a fixed structure and load.	2	5	10	Tolerable

Activity	Loading / unloading of equipment to vessel										
5.	Lifting Operations (suspended and slewing loads)	Failure of lifting equipment	Injury / fatality	3	5	15	Complete a Lift Plan. Tested, certified, and inspected lifting equipment. LOLER certification of all lifting accessories Trained lifting operators. Use of Banksman. All non-essential personnel to clear deck. Exclusion zones will be in place so personnel cannot stand underneath a load or between a fixed structure and load. Use of appropriate PPE (lifejacket, hard hat, gloves, safety glasses, steel toe footwear).	2	5	10	Tolerable
6.	Use of electrical equipment (e.g., laptops, 12 V batteries)	Exposure of electrical equipment to sea water Damage to any instrument communication cables	Electrocution Damage to equipment Injury / fatality	2	5	10	Ensure all personnel using electrical equipment are trained and competent. Ensure all electrical equipment is used within its designed environment. Where equipment is taken out of its designed environment ensure appropriately protected from the elements and damage. Use weather-proof extension cables (rated IP54) and boxes to cover multi-plugs and connections. Power down all equipment before disconnecting.	1	5	5	Acceptable

Activity											
Deployment / recovery of equipment											
Item	Task	Hazard	Consequence	Initial Risk			Control Measures	Residual Risk			Unacceptable
				P	S	R		P	S	R	Tolerable
1.	Lifting > 50 kg across deck in position for deployment or recovery.	Crushing or landing on personnel.	Injury / fatality	3	5	15	Compliance with Lifting Procedures (Lift Plan) Use of appropriate PPE (lifejacket, hard hat, gloves, safety glasses, steel toe footwear). Use crane. Always listen to crane operators. One person in charge of the lift ('Banksman'). Exclusion zones will be in place so personnel cannot stand underneath a load or between a fixed structure and load. Use taglines to steady loads. All non-essential personnel to clear deck.	2	5	10	Tolerable
2.	Lifting equipment over or in board.	Swinging of equipment leading to crushing against side of vessel.	Injury / fatality	3	5	15	Compliance with Lifting Procedures (Lift Plan) Never stand underneath load, between a fixed structure and load or in the path of a load being lifted. Use taglines to steady the buoy, releasing lines before the buoy enters the water. All non-essential personnel to clear the deck.	2	5	10	Tolerable

Activity	Deployment / recovery of equipment										
3.	Entanglement with other fishing gear.	Deployment or recovery lines snagged in fishing gear. Vessel becoming snagged as a result.	Lost time / damage	3	4	12	Notice to mariners issued prior to operations being undertaken. If fishing activity is being undertaken in the location, then discussion with the fishing vessels is required before work can take place. If fishing gear is in place on the deployment locations, then no deployments can occur until this risk is further understood through discussion with the fishermen. If the equipment becomes entangled with fishing gear on recovery, the gear is to be cut away and the local authorities advised. Handling of the fishing gear is to be managed by the vessel crew. Guidance on the most appropriate course of action is ultimately the responsibility of the vessel skipper.	2	4	8	Tolerable
4.	Lifting equipment.	Struck / crush.	Injury / fatality	3	5	15	Tested, certified, and inspected lifting equipment only. Trained lifting operators only. Use of Banksman. Use of Tag lines. Toolbox Talk. Lift Plan. Use of appropriate PPE. Exclusion zones will be in place so personnel cannot stand underneath a load or between a fixed structure and load.	2	5	10	Tolerable

Activity	Deployment / recovery of equipment										
5.	Vessel operations.	Man overboard.	Injury / fatality	3	5	15	No non-essential personnel on deck during operations. Partrac personnel to be instructed on no-go areas during operations. All vessel crew experienced in deck operations with regards to buoy deployment and recovery. Toolbox Talk to cover any safety issues and/or concerns. Body Positions: During buoy deployments all personnel will be inboard of the buoy and moorings. No personnel will be within 1m of open deck. No lone working. Environment: Sea state, swell and weather conditions are monitored before and during any operation. Operations will be stopped if conditions are deemed unfit for working on deck, and the operation re-assessed. Verified MOB procedures. Use of 275KN life jackets.	2	5	10	Tolerable

Activity	Deployment / recovery of equipment										
6.	Deployment/ recovery operations	Caught in bight of mooring	Injury / fatality	3	5	15	No non-essential personnel on deck during operations. Partrac personnel to be instructed on no-go areas during operations and supervised by the First Officer. All vessel crew experienced in deck operations with regards to buoy deployment and recovery. Body Positions: During buoy deployments all personnel will be inboard of the buoy and moorings and away from pinch points. Toolbox Talk to cover any safety issues and/or concerns, No lone working. Buddy system. Trained, competent personnel only. Use of appropriate PPE.	2	5	10	Tolerable
7.	Recovery Operations	Mooring line coming up compromised/ snapping	Lost time / damage	3	4	12	All splices and mooring lines checked thoroughly before deployment. Constant observation whilst mooring line is being recovered. If anything appears compromised operations are stopped, and all non-essential personnel cleared from deck. Operations continued at a slower controlled pace.	2	4	8	Tolerable
8.	Service Operations	Internal electronics of buoy exposed to moisture	Lost time / damage	3	4	12	Vessel will be positioned to provide shelter to the buoy on deck. A temporary weatherproof shelter will be erected around the buoy. If conditions are too wet the buoy will be brought ashore for servicing.	1	4	4	Acceptable

Activity											
Deployment / recovery of equipment											
9.	Deck Operations	Damage to ships structure due to swinging loads	Lost time / damage	3	3	9	Tag line for metocean buoys. SOP followed and meteorological limits adhered to. No operations if there is too much movement in the vessel	1	3	3	Acceptable
10.	Deck Operations	Injury due to failure of lifting equipment	Injury/ fatality	3	5	15	Complete a Lift Plan. Tested, certified, and inspected lifting equipment. Pre use checks carried out before lifting. Positioning of crew on vessel to minimise being injured if equipment fails. Appropriate PPE to be worn. Use of appropriate PPE (lifejacket, hard hat, gloves, safety glasses, steel toe footwear). Trained lifting operators. Use of Banksman. Never stand underneath load or within the path of a load being lifted.	2	5	10	Tolerable
11.	Navigation	Entanglement and damage to vessel due to collision with buoy	Lost time / Damage	2	4	8	Ensure deck and bridge crew have clear sight of the buoy and lines in the water Position lookouts according to approach (port/starboard bridge wings and deck) No recoveries during hours of darkness If lines stray beneath the vessel the props are to be disengaged Clear and regular communication to be maintained between the deck and the bridge	1	4	4	Acceptable
12.	Deck Operations	Damage to crane due to excessive side loading	Lost time / Damage	2	4	8	Taglines will keep weight horizontal to ensure load is directly below crane head	1	4	4	Acceptable

Activity	Deployment / recovery of equipment										
13.	Vessel Positioning	Interaction with existing infrastructure	Lost time/ damage to equipment or vessel	3	4	12	500m exclusion zone on pipelines Vessel positioning system to be up to date with all existing infrastructure on site Visual inspection of area prior to deployment All deployments to be carried out within the agreed licenced area.	1	4	4	Acceptable

4.4 In-Charge Responsibilities

The In Charge has the responsibility to ensure that:

- All work is carried out in accordance with this RAMS document.
- Correct PPE is being worn by all members of the deck party during all work operations on board the vessel and at the quayside.
- Safety checks are carried out on equipment deployment lines to ensure free entry into the water.
- All lifting equipment must be certified. All lifting equipment tested and prepared prior to departing the quayside.
- Toolbox Talk and Lift Plans carried out prior to operations, with specific instructions on personnel positioning during lift operations.
- Weather forecast to be obtained prior to operations and monitored during the works.

4.5 Maintenance and Monitoring of Control Measures

- Review Risk Assessment prior to work commencing and re-state all the risks to all personnel involved.
- Ensure PPE is well maintained and serviced, prior to field work.
- No lone working on site - a minimum of two staff always present.
- Minimum one trained First Aider present.
- Toolbox Talks and Lift Plans to be conducted prior to any operations.

4.6 Standard PPE Requirements

Each person must have the Personal Protective Equipment (PPE) listed in Table 6. Check your equipment, ensure that all lifejackets are in date, and you are satisfied that they have been tested.

Table 4: Standard PPE requirements

Item	Description	Specification	Issued in standard kit?
1.	275 N Lifejacket	SOLAS	Y
2.	Hard-hat with chin strap	EN 397	Y
3.	Lace-up safety boots	EN ISO 20345	Y
4.	High visibility vest	EN ISO 20471	Y
5.	Coveralls	EN ISO 11612 EN 1149	Y
6.	Gloves	EN 388 (4222)	Y
7.	Safety glasses	EN 166	Y
8.	Waterproofs	EN ISO 20471	Y

Item	Description	Specification	Issued in standard kit?
		EN ISO 11612 EN 1149	
9.	Thermal protection	User defined	N
10.	Sunscreen	SPF30+	N

4.7 Minimum Training Requirements

Table 7 details the training requirements which are mandatory for all personnel intending to carry out offshore operations.

Table 5: Training requirements

Job Role	Operation	Qualification
All personnel	Offshore vessel operations (General)	Offshore Medical (ENG1 or similar)
		Sea Survival (STCW or GWO)
Lifting Supervisor	Lifting	Slinger and Banksman
Crane operator	Lifting	CPCS Crane Operator (Or similar)
Skipper	Master of Vessel	Suitable skipper qualification for vessel tonnage
Partrac In Charge	Operations overview	First Aid
Vessel Crew	General	Fire Fighting

4.7.1 Emergency Contacts

Table 6: Emergency contacts

Company / Organisation	Name / Position	Phone	Mobile	E-mail
Partrac	Peter Wilson – HSE Director	+44 (0) 1626 906 673	+44 (0) 7793 249080	pwilson@partrac.com
Partrac	Chris Comyn – Operations Manager	+44 (0) 1626 906 673	+44 (0) 7496 831561	ccomyn@partrac.com
Partrac	Sam Athey – Project Director	+44 (0) 1626 906 673	+44 (0) 7748 904766	sathey@partrac.com
Partrac	Ross Flatman – Principal Metocean Engineer	+44 (0) 1626 906 673	+44 (0) 7792 793999	rflatman@partrac.com
Partrac	Julie Knott – Project Manager	+44 (0) 1626 906 673	+44 (0) 7811 697427	julie.knott@partrac.com
Partrac	Office	+44 (0) 1626 906 673		info@partrac.com
Harbour				
Sharon Adams	Commercial Officer	+44 (0) 7837 178560		Sharon.adams@mhpa.co.uk
Vessel				
Client				
The Crown Estate Commissioners	Catherine Brady – Project Manager			
The Crown Estate Commissioners	Graham Moates – Project Director			
The Crown Estate Commissioners	Jonathan Turner – HSE Director			
ABPmer	Caroline Chambers – Technical			

Company / Organisation	Name / Position	Phone	Mobile	E-mail

5. SIGNATORIES

Each person in the Survey Team including the Vessel Master and all crew must read and sign this Risk Assessment prior to commencement of mobilisation.

I understand the risks involved as described throughout this document for the activity described in Section 1 (Method Statement) of this document.

Any further risks not identified prior to survey will be outlined in the Toolbox Talks, for which further signatures will be required.

Updates to this documentation may be requested via the Project Director Sam Athey (Partrac Ltd).

Person (Print name)	Position	Signature	Date

Appendices

Appendix A

Dynamic Risk Assessment

A.1 New Risk Identified During the Survey

Activity									
New Risks Identified Whilst on Survey									
Item	Task	Hazard	Initial Risk			Control Measures	Residual Risk		
			L	S	R		L	S	R