Lloyd's Register Marine

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Model Ballast Water Management Plan

Ship name [IMO number]

Name of Company

Reference:
xxx-xxx-xxx

Plan date:
Date Month Year

Plan by:
xxx

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Ballast Water Management Plan

For compliance with Regulation B-1 of the International Convention for the Control and Management of Ships' Ballast Water and Sediments 2004 and the IMO 'Guidelines for Ballast Water Management and Development of Ballast Water Management Plans' Resolution MEPC 127 (53).

Note: This plan is to be written in the working language of the crew; if the text is not in English, French or Spanish the plan is to include a translation into one of these languages.

1. Ship particulars

Ship's name	
Ship type	
Flag	
Port of registry	
Gross tonnage	
IMO number	
Keel laying date	
Delivery date	
Length (between perpendiculars)	
Breadth (moulded)	
International call sign	
Deepest ballast drafts (normal and heavy weather)	
Total ballast capacity[1]	
Ballast water management method(s) used	
Identification (rank) of Ballast Water Management Officer	

[1] In m3 or other units if applicable to the ship

2. Introduction

This Plan is written in accordance with the requirements of regulation B-1 of the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (the BWM Convention) and the associated guidelines.

The purpose of the Plan is to meet the requirements for the control and management of ship's ballast water and sediments in accordance with IMO Resolution MEPC 127(53) – Guidelines for Ballast Water Management and the Development of Ballast Water Management Plans. It provides standard operational guidance for the planning and management of ships' ballast water and sediments.

This Plan has been examined by [insert corporate identity e.g. Lloyd's Register EMEA] and no alteration or revision shall be made to any part of it without the prior approval of the Lloyd's Register Group.

This Plan may be inspected on request by an authorised authority.

Changes to non-mandatory information in Appendices [insert Appendix numbers] will not be required to be approved.

It is the owner/operator's or Master's responsibility to regularly review the Plan and ensure that the information it contains is accurate and up-to-date.

3. Record of circulation

This document is to be circulated to the ship's staff that will be responsible for ballast water management. After reading, it is to be signed and returned to the Ballast Water Management Officer.

Name	Rank	Date joined	Signature and date

4. Record of Amendments

No.	Date	Revised part	Details/description of revision	Signature

5. Purpose of the Plan

Ballast water is essential to control the trim, list, draught, stability, or stresses of the ship. However, ballast water may contain aquatic organisms or pathogens which, if introduced into the sea (including estuaries) or into fresh water courses, may create hazards to the environment, human health, property or resources, impair biological diversity or interfere with other legitimate uses of such areas.

The selected methods of ballast water management take into account the need to ensure that the ballast water management practices used to comply with the BWM Convention do not cause greater harm than they present to the environment, human health, property or resources of any states and the safety of the ship.

It is estimated that at least 7,000 different species are being carried in ships' ballast tanks around the world. Studies carried out in several countries indicated that many species of bacteria, plants, and animals can survive in a viable form in the ballast water and sediment carried in ships, even after journeys of several months' duration.

Subsequent discharge of ballast water or sediment into the waters of port states may result in the establishment of harmful aquatic organisms and pathogens which may pose threats to indigenous human, animal and plant life, and the marine environment. When all factors are favourable, an introduced species may survive to establish a reproductive population in the host environment; it may even become invasive, out-competing native species and multiplying to pest proportions. Although other media have been identified as being responsible for transferring organisms between geographically separated water bodies, ballast water discharge from ships appears to have been among the most prominent.

As a result, the IMO has developed guidelines for the development and implementation of ballast water management plans on board ships (IMO Resolution MEPC 127(53)) aiming to assist governments, appropriate authorities, ships' Masters, operators, owners and port authorities, as well as other interested parties, in preventing, minimising and ultimately eliminating the risk of introducing harmful aquatic organisms and pathogens from ships' ballast water and associated sediments, while protecting ships' safety.

Good record keeping is critical to the success of a sound ballast water management program. The appointed ballast water management officer is responsible for ensuring the maintenance of appropriate records and that ballast water management and/or treatment procedures are followed and recorded.

The function of the Ballast Water Management Plan is to assist in complying with the BWM Convention guidelines and associated national and local measures intended to minimise the risk of transplanting harmful aquatic organisms and pathogens from ships' ballast water and associated sediments, while maintaining ship safety.

As part of this function the plan provides information to port state control and other authorised officers about a ship's ballast handling system, sampling points and ballast water management system.

6. Plans and drawings of the ballast system

The following plans and information are located in Appendix 1:

1. Ballast tank arrangement
2. Ballast capacity plan
3. Ballast water piping and pumping arrangement, including air pipes and sounding arrangements
4. Ballast water pump capacities
5. Ballast water management system used on board with references to detailed operational and maintenance manuals held on board
6. Installed ballast water treatment systems with references to detailed operational and maintenance manuals held on board (when a treatment system is required to be installed under Regulation B-3 of the Convention)
7. Type approval certificate of the ballast water treatment system (when a treatment system is required to be installed under Regulation B-3 of the BWM Convention)
8. Plan and profile drawing of the ship, or a schematic drawing of the ballast arrangement
9. List and/or diagrams indicating the location of sampling and access points in pipelines and ballast water tanks

7. Description of the ballast system

The following is a description of the ballast system used on board. Reference plans can be found in Appendix 1.

[Insert a description of the ballast water system on board]

7.1 Ballast tank data

Tank(s)	Location (frame nos.)	Capacity (m^3)	Pump(s) available

7.2 Pump(s) data

Pump(s)	Rated capacity (m^3/hr)	Type	Location

7.3 Overflow and filling line data (for flow through and dilution method)

Tank	No. of overflow lines per tank (air vents or overflow lines per tank)	Overflow line nominal diameter (mm)	Overflow lines total cross sectional area (mm²)	Filling line nominal diameter (mm)	Filling line total cross sectional area (mm²)	Ratio of overflow/filling line total cross sectional area

Note: Flow through method should not be performed in tanks which have not been designed to a head up to the top of overflow, due to the risk of over pressurisation.

Note: In case that flow through method is being used, it is necessary prior to this operation to ensure that the overflow arrangements are open. On completion of each tank's ballast exchange the overflow arrangements must be re-secured.

Note: For safety reasons it is strongly recommended that access openings/manhole covers on upper deck should not be used as overflow discharge, unless a blank flange with a seat is fitted to the access cover so that a portable overflow pipe with 90º elbow can be connected during the flow through operation.

8. Ballast water sampling points

Information regarding the location of the ballast water sampling points is contained in Appendix 1.

Compliance monitoring may be undertaken by authorised officers (e.g. port state control), by taking and analysing ballast water and sediment samples from ships.

There is unlikely to be any need for crew members to take samples except at the express request, and under the supervision, of an authorised officer.

Authorised officers must be advised of all safety procedures to be observed when entering enclosed spaces.

Where ballast water or sediment sampling for compliance or effectiveness monitoring is being undertaken, the time required to analyse the samples shall not be used as a basis for unduly delaying the operation, movement or departure of the ship.

When sampling for research or compliance monitoring, authorised officers (e.g. port state control) should give as much notice to the Master as possible that sampling will occur, to assist the Master in planning staffing and operational resources to assist.

The Master has a general obligation to provide reasonable assistance for the above monitoring and information pertaining to ballast arrangements and sampling points.

Port state authorities should indicate to the Master or responsible officer the purpose for which the sample is taken (i.e. monitoring, research or enforcement).

Port state authorities may sample or require samples to analyse ballast water and sediment, before permitting a ship to discharge its ballast water.

Additional guidance regarding sampling procedures may be found in the Annex to MEPC.173(58) – Guidelines for Ballast Water Sampling (G2).

9. Operation of the ballast water management system

[Delete sections that are not applicable]

Forward planning is essential to ensure that all safety considerations, as addressed in sections 10 and 11, are in compliance with ballast exchange, ballast water treatment or other control options.

9.1 Ballast water exchange

Ballast water exchange in open water and the need to exchange should be carefully examined and prepared in advance, in a similar manner to the preparation of a cargo plan for a loaded voyage, and with the same degree of thoroughness.

The BWM Convention requires that vessels should conduct ballast water exchange:

- at least 200 nautical miles from the nearest land and in water at least 200 metres deep; if this is not possible
- as far from the nearest land as possible, and in all cases at least 50 nautical miles from the nearest land and in water at least 200 metres deep; or
- in sea areas designated by the port state.

All local and/or national regulations should be taken into consideration as they may specify other depths and distances from land.

A ship will not be required to deviate from its intended voyage or delay the voyage in order to comply with any particular requirement as stated above. In addition, if the Master decides reasonably that an exchange would threaten the safety or stability of the ship, its crew or its passengers because of adverse weather, ship design or stress, equipment failure, or any other extraordinary condition he is not required to comply with the above paragraphs.

There are three methods of ballast water exchange which have been evaluated and accepted by the IMO. These are the sequential method, the flow through method and the dilution method. The flow through method and the dilution method are considered ‘pump through’ methods.

9.1.1 Sequential method

The sequential method is a process by which a ballast tank intended for the carriage of ballast water is first emptied and then refilled with replacement ballast water to achieve at least a 95 per cent volumetric exchange.

In each tank, all of the ballast water should be discharged until suction of the pumps is lost, and stripping pumps or eductors should be used if possible. This is to avoid a possible situation where organisms are left in the bottom part of the tank and the tank is refilled with new water which may allow re-emergence of organisms.

The sequential method requires careful planning and monitoring by the ship’s staff to mitigate risks to the ship in respect of:

- longitudinal strength
- dynamic loads
- excessive trim
- bottom forward slamming
- propeller emergence
- intact stability; and

– bridge visibility.

A detailed step-by-step operational description of the ballast exchange sequence should be prepared and should be consulted before, during and after the exchange, in addition to the safety considerations in sections 10 and 11. At the same time, the ship's staff should be taking account of the ship's position in relation to the land, navigational hazards, shipping density, current and forecast weather, machinery performance and degree of crew fatigue, before proceeding to the next pair of steps. If any factors are considered unfavourable the ballast exchange should be suspended or halted.

9.1.2 Flow through method

The flow through method is a process by which replacement ballast water is pumped into a ballast tank intended for the carriage of ballast water, allowing water to flow through overflow or other arrangements to achieve at least 95 per cent volumetric exchange of ballast water. Pumping through three times the volume of each ballast water tank shall usually be considered to meet the volumetric exchange standard described above. Pumping through less than three times the volume may be accepted, provided the ship can demonstrate that at least 95 per cent volumetric exchange is met.

The flow through method has the advantage that it can be used in weather conditions which would be marginal for use of the sequential method, since there is little change to the condition of the ship and it is relatively easy to follow for the ship's staff. However, the flow through method introduces certain other risks and problems which must be considered before using this procedure. Refer also to section 6 – "Safety procedures for the ship and the crew".

The disadvantages are that not all tanks are designed with a head to the top of the overflow. Moreover, some tank configurations can be difficult to flush through effectively, in particular cellular double bottom spaces and peak tanks. There is a danger of over pressurisation of tanks and there can be an accumulation of water on deck, which in sub-zero temperature conditions makes the method impractical and dangerous for crew. In addition, pumps and piping will experience an increase in workload.

The above, in addition to the safety aspects addressed in Sections 10 and 11, should be carefully consulted and followed where applicable.

Where peak tanks are partially filled, the flow through method should be avoided to prevent inadvertently exceeding permissible hull girder bending moments and shear forces.

9.1.3 Dilution method

The dilution method is a process by which replacement ballast water is filled through the top of the ballast tank intended for the carriage of ballast water with simultaneous discharge from the bottom, at the same flow rate and maintaining a constant level in the tank through out the ballast exchange operation to achieve at least 95 per cent volumetric exchange of ballast water.

Pumping through three times the volume of each ballast water tank shall usually be considered to meet the volumetric exchange standard described above. Pumping through less than three times the volume may be accepted, provided the ship can demonstrate that at least 95 per cent volumetric exchange is met.

Safety considerations addressed in Sections 10 and 11 should be carefully consulted and followed as applicable.

9.2 Treatment systems

A ballast water management system (BWMS) is any system which processes ballast water such that it meets or exceeds the Ballast Water Performance Standard in Regulation D-2 of the BWM Convention. The BWMS includes ballast water treatment equipment, all associated control equipment, monitoring equipment and sampling facilities.

Ballast water treatment equipment is equipment which mechanically, physically, chemically, or biologically processes, either singularly or in combination, to remove, render harmless, or avoid the uptake or discharge of harmful aquatic organisms and pathogens within ballast water and sediments. Ballast water treatment equipment may operate at the uptake or discharge of ballast water, during the voyage, or at a combination of these events.

The need for ballast water treatment has arisen from the requirements of Regulation D-2 of the BWM Convention. In response to this, a number of technologies have been developed and commercialised by different vendors. Many have their basis in land-based applications for municipal and industrial water effluent treatment, and have been adapted to meet the requirements of the BWM Convention and shipboard operation.

It should be ensured that ballast water management systems installed on board are type approved and that relevant certificates are readily available, in addition to compliance with the BWM Convention requirements.

When such a system is fitted on board it should be operated in accordance with the system design criteria and the manufacturer's operational and maintenance instructions, as contained in the relevant booklet.

When systems encounter failure and/or malfunctions, these are to be recorded in the Ballast Water Record Book.

9.3 Precautionary practices

9.3.1 Minimising uptake of harmful aquatic organisms, pathogens and sediments

When loading ballast, every effort should be made to avoid the uptake of potentially harmful aquatic organisms, pathogens and sediment that may contain such organisms. The uptake of ballast water should be minimised or, where practicable, avoided in the following areas and situations:

- areas identified by the port state, including:
  - areas with outbreaks, infestations or known populations of harmful organisms and pathogens
  - areas with current phytoplankton blooms (algal blooms, such as red tides)
  - nearby sewage outfalls
  - nearby dredging operations
  - when a tidal stream is known to be turbid
  - areas where tidal flushing is known to be poor, and
- in darkness when bottom-dwelling organisms may rise up in the water column
- in very shallow water
- where propellers may stir up sediment.

If it is necessary to take on and discharge ballast water in the same port to facilitate safe cargo operations, care should be taken to avoid unnecessary discharge of ballast water that has been taken up in another port.

Managed ballast water which is mixed with unmanaged ballast water is no longer in compliance with Regulations D-1 and D-2 of the Annex to the BWM Convention.

Every effort should be made to minimise departure and arrival ballast quantities, but always within the constraints of safe navigation.

9.3.2 Non-release or minimal release of ballast water

In cases where ballast exchange or other treatment options are not possible, ballast water may be retained in tanks or holds. Should this not be possible, the ship should only discharge the minimum essential amount of ballast water in accordance with port states' contingency strategies.

9.3.3 Discharge to reception facilities

If reception facilities for ballast water and/or sediments are provided by a port state, they should be used where appropriate.

10. Safety procedures for the ship and the crew

[This section should contain the specific safety aspects of the ballast water management system(s) used. Delete if not applicable]

Forward planning is essential to ensure that all safety considerations, as addressed in sections 10 and 11, are in compliance with ballast exchange, ballast water treatment or other control options.

10.1 Exchange at sea

The exchange of ballast water in open sea has to be distinguished from ballast operations carried out in ports or in sheltered waters.

Ballast water operation at sea has the potential to be more hazardous than ballast water operations carried out in port.

It is the Master's responsibility to plan and conduct a detailed procedure for ballast water exchange using and taking into account the provisions of section 12.

A decision should be made at the completion of each sequence, taking into account factors such as the ship's position, weather forecast, machinery performance, stability, strength, and the degree of crew fatigue, before proceeding to the next sequence. If any factors are considered unfavourable to the ballast exchange, a decision should be made to either suspend exchange operations until conditions become more favourable or halt exchange operations.

Contingency procedures should be considered for situations which may affect ballast water exchange at sea, including deteriorating weather conditions, pump failure and loss of power, time to complete the ballast water exchange for each tank or an inappropriate sequence thereof, and continual monitoring of the ballast water operation. Monitoring should include pumps, levels in tanks, line and pump pressures, stability and stresses.

10.2 Safety considerations

Ballast water exchange has a number of safety considerations. These include:

- avoiding over and under-pressurisation of ballast tanks
- avoiding sloshing loads in tanks
- maintaining adequate intact stability in accordance with an approved trim and stability booklet, taking into account the free surface effects
- keeping hull girder shear forces and bending moments within permissible seagoing strength limits as shown in the approved loading manual
- minimising torsional forces
- managing draughts and trim to ensure adequate:
  - bridge visibility
  - propeller immersion to prevent temporary loss of manoeuvrability and/or ability to make headway
  - draft forward to prevent slamming damage to ship bottom forward
- re-securing watertight closures (e.g., manholes) which may have been opened during ballast exchange; crew safety is paramount during this operation
- controlling maximum pumping/flow rates to ensure the tank is not subjected to a pressure greater than that for which it has been designed

- ensuring weather conditions are suitable and implementing weather routing in areas seasonably affected by cyclones, typhoons, hurricanes, or heavy icing conditions.

10.2.1 Sequential method

- keeping hull girder shear forces and bending moments within permissible seagoing strength limits as shown in the approved loading manual
- maintaining adequate intact stability in accordance with an approved trim and stability booklet, taking into account the free surface effects
- managing draughts and trim to ensure adequate:
  - bridge visibility
  - propeller immersion to prevent temporary loss of manoeuvrability and/or ability to make headway
  - draft forward to prevent slamming damage to ship bottom forward
- preventing structural damage to topside and hopper side tanks caused by inertia loading, as a result of a full ballast hold with empty adjacent wing tanks
- preventing structural damage to partially filled ballast water tanks or holds caused by sloshing as a result of resonance with ship motion.

10.2.2 Flow through method

- avoiding accumulation of water on decks which can cause a safety hazard to crew working on deck; effects on the stability may be negligible.

10.2.3 Dilution method

- avoiding under-pressurisation or over-pressurisation damage of ballast water tanks caused by blockages in air pipes or using excessive pumping rates relative to the design of the ballast system.

10.3 Conditions under which ballast water exchange at sea should not be undertaken

These circumstances may result from critical situations of an exceptional nature or force majeure due to stress of weather, known equipment failures or defects, or any other circumstances in which human life or safety of the ship is threatened.

Ballast water exchange at sea should be avoided in freezing weather conditions. However, if it is necessary, particular attention should be paid to the hazards associated with the freezing of overboard discharge arrangements, air pipes, ballast system valves together with their means of control, and the build up of ice on deck.

Consideration must always be given to personnel safety, including precautions which may be required when personnel are required to work on deck at night, in heavy weather, when ballast water overflows the deck, and in freezing conditions. These concerns may be related to the risks to personnel of falling and injury, due to the slippery wet surface of the deck plate, when water is overflowing on deck, and to direct contact with the ballast water, in terms of occupational health and safety.

[A list of conditions specific to the ship is to be included here.]

10.4 Treatment methods

For treatment systems that use or generate active substances (chemicals) particular attention should be paid to:

- health and safety issues related to the handling and storage of chemicals and/or other active substances
- use of appropriate Personal Protective Equipment (PPE)

- avoiding accidental discharge of hazardous materials to the environment
- safety issues associated with the ballast water treatment system installed on board
- Material Safety Data Sheet for any chemicals/active substances employed or produced during the treatment process
- emergency procedures and by-pass arrangements in case of ballast water treatment system malfunction

Where applicable, the IMO Circular, BWM.2/Circ.20 – Guidance to Ensure Safe Handling and Storage of Chemicals and Preparations Used to Treat Ballast Water and the Development of Safety Procedures for Risks to the Ship and Crew Resulting from the Treatment Process – is to be taken into consideration.

Reference should be made to the manufacturer's instruction and maintenance manuals regarding safety aspects of the system.

Information regarding the safety aspects of the onboard systems should be carefully consulted before carrying out any operation.

[Details of safety considerations associated with the treatment system installed are to be included here. These should include hazards to both the crew and the ship.]

10.5 Precautionary advice to Masters when undertaking ballast water exchange operations

Masters should take all necessary precautions when undertaking ballast water exchange sequences that involve periods when the criteria for propeller immersion, minimum forward draft and bridge visibility cannot be met.

During ballast water exchange sequences there may be times when, for a transitory period, one or more of the following criteria cannot be fully met or are found to be difficult to maintain:

- bridge visibility standards (SOLAS V/22)
- propeller immersion
- minimum draft forward
- emergency fire pump suction.

In planning a ballast water exchange operation that includes sequences which involve periods when the criteria for propeller immersion, minimum draft and/or trim are not met, the following should be taken into consideration:

- the duration(s) and time(s) during the operation that any of the criteria will not be met
- the effect(s) on the navigational and manoeuvring capabilities of the ship; and
- the time to complete the operation.

A decision to proceed with the operation should only be taken when it is anticipated that:

- the ship will be in open water
- the traffic density will be low
- an enhanced navigational watch will be maintained including, if necessary, an additional look out forward with adequate communications with the navigation bridge
- the manoeuvrability of the vessel will not be unduly impaired by the draft and trim and/or propeller immersion during the transitory period; and
- the general weather and sea state conditions will be suitable and unlikely to deteriorate.

11. Operational or safety restrictions

[The following procedures which are of a general nature should be supplemented and/or amended accordingly.]

11.1 Ballast water exchange

A ballast plan for a ballast voyage should be prepared in advance, in a similar manner to the preparation of a cargo plan for a loaded voyage, and with the same degree of thoroughness. This pre-planning is necessary in order to maintain safety and in case compliance with ballast exchange or other ballast water treatment or control options is required.

The safety information in Section 10 should be taken into account when preparing the voyage plan.

This section gives guidance on additional operational and safety ballast handling procedures to be followed at sea.

Additionally, operational limits defined for specific ballast exchange conditions must be adhered to during operation. Therefore, it is considered imperative to plan for and find the appropriate weather window to conduct safe sequential ballast exchange operations.

Ballast exchange operations are complex procedures and may last from several hours to days. All personnel engaged in ballast exchange should be trained to respond to routine and emergency procedures.

It should always be considered that while performing a ballast exchange at sea, failure of the power system or any part of the ballast pumping and piping system can occur. Such incidents should be brought immediately to the attention of the company's safety officer and emergency procedures should be activated to bring the ship back to her ballast seagoing condition as soon as possible. Such emergency procedures could be ballasting by gravity and even utilisation of the general service pump. Ships enrolled with the LR Ship Emergency Response Service (SERS) could, if necessary, activate the service.

11.2 Ballast water treatment

A number of different chemicals or chemical processes may be employed in ballast water treatment systems. Some systems generate chemicals during the treatment process; for others, chemicals are required to be stored on board.

If chemicals are stored on board, the crew will require training on their use and handling. Suitable storage space for chemicals and proper ventilation are of paramount importance. The Safety Data Sheet for chemicals stored on board needs to be consulted and, where necessary, the appropriate fire protection and extinction arrangements will need to be installed. Additional information on the safety precautions for specific chemicals is provided in Appendix 4.

In case of systems that generate chemicals during the treatment process, the crew will require training on the hazards associated with them.

Additional safety procedures need to be available to ships' staff to warn them about the dangers of entering ballast tanks which may have been inerted or have gas residues.

To ensure that the ballast water system remains operational in the event of treatment system failure, suitable by-passes or overrides should be installed to protect the safety of the ship and personnel. The by-pass should activate an alarm and the event should be recorded by the control equipment.

Ballast water treatment systems should incorporate a visual alarm which is always activated whenever the system is in operation for purposes of cleaning, calibration or repair, and these events should be

recorded by the control equipment. It is recommended that automatic ballast water treatment controls and alarms are integrated with, or located close to, the ship's ballast water controls.

Limiting factors such as water quality, temperature, salinity, turbidity etc., which may affect the performance of the treatment unit, shall also be taken into consideration. Reference shall be made to the manufacturer's operational manuals.

11.3 Procedures for safe tank entry

[Insert reference to the company's tank entry procedure.]

12. Description of the methods used on board for ballast water management and sediment control

12.1 Procedures for ballast water exchange (if applicable)

When exchanging ballast at sea, safety and operational information and restrictions must be taken into account at all times.

For ship-specific Ballast Exchange Plan(s) see Appendix 3.

[Insert a brief description of the methods used.]

BEP no.	Description of conditions	Condition Number from Approved Manual, which the BEP is based on	Methods of Ballast exchange examined

12.2 Procedures for ballast water treatment (if applicable)

See Appendix 4 for a description of the ballast water treatment system installed on board.

13. Procedures for the disposal of sediments

Where practicable, routine cleaning of the ballast tank to remove sediments should be carried out in mid-ocean, under controlled arrangements in port, or in dry dock.

When sediment has accumulated, consideration should be given to flushing tank bottoms and other surfaces when in suitable areas, i.e., outside 200 nautical miles from land and in water depths of over 200 metres.

The volume of sediment in a ballast tank should be monitored on a regular basis.

Sediment in ballast tanks should be removed in a timely manner and as necessary, always taking into account the safety and operational considerations addressed in this Plan. The frequency and timing of removal will also depend on factors such as sediment build up, the ship's trading pattern, availability of reception facilities, workload of the ship's personnel and safety considerations.

Removal of sediment from the ballast tank should preferably be undertaken under controlled conditions in port, at a repair facility, or in dry dock. The removed sediment should preferably be disposed of in a sediment reception facility if available, reasonable and practicable.

Flushing by using water movement within a tank to bring sediment into suspension will only remove a part of the mud, depending on the configuration of an individual tank and its piping arrangement. Removal may be more appropriate on a routine basis during scheduled dry dockings. This is often needed for other reasons anyway.

However, flushing at sea may be a useful tool on some occasions such as when a ship changes its trading area.

When sediment is removed from the ship's ballast tanks and is to be disposed of by that ship at sea, disposal should only take place in areas outside 200 nautical miles from land and in water over 200 metres deep.

14. Methods of communication

This section contains information to assist the Master in the procedures for co-ordinating the discharge of ballast water of a coastal state, local government or other involved parties. The quick and effective communication between the ship and coastal state or other involved parties becomes vital in mitigating the effects of an unnecessary delay for ships seeking entry to port states.

The requirements and roles of the various national and local authorities involved vary widely between states and even from port to port. Approaches to the responsibility for ballast water exchange also vary. In the majority of coastal states, responsibility for compliance with port state requirements is placed on the shipowner and the ship.

Generic reports and information can be found in Appendix 5 to assist the Master when communicating a ballast water exchange and treatment plan to a port state which has not issued any specific requirements.

The coastal state should be contacted for specific ballast water discharge requirements and reporting before the vessel's arrival in port states' territorial waters.

Therefore, the Master with the responsible officer should obtain all necessary information and prepare the vessel accordingly, taking into consideration the safety and operational restrictions as described in this Plan and relevant sections. Information on specific port state procedures can be obtained by referring to the appendices of this Plan, or consulting the company and/or local agent for latest information/requirements.

14.1 Action to be taken by the vessel when the coastal state has specific procedures for discharge of ballast water

- Follow agreed reporting procedures.
- Contact the ship's agent to ascertain the latest information/requirements on ballast discharge in the waters of the respective states
- Advise/communicate with the company and request any other information they might hold on ballast water discharge.
- Ensure that you plan for all above actions and that safety and operational restrictions are consulted.

14.2 Action to be taken by the vessel when the coastal state has no specific procedures for discharge of ballast water

- Contact the ship's agent and/or company to obtain latest information on the discharge requirements at the port state territory.
- Carry out discharge of ballast water as per the ballast exchange sequence or ballast water treatment system as applicable.
- Take into consideration safety and operational procedures related to respective discharge.
- Keep proper records and have them readily available for possible inspection.

15. Duties of the Ballast Water Management Officer

The Ballast Water Management Officer is responsible for implementing the procedures of the Ballast Water Management Plan. Their role is to:

- ensure the safety of the ship and crew
- ensure that ballast water management and/or treatment procedures are followed and recorded
- where ballast exchange is required, ensure that the steps/sequences of the ballast exchange sequence are followed in the prepared order
- where ballast water treatment is required, ensure that all safety precautions and considerations, as detailed in the manufacturer's manuals, are taken into account by the personnel involved
- when applicable, ensure that the treatment system is operated within the design parameters in accordance with the manufacturer's instructions
- ensure adequate personnel and equipment are available for the execution of the planned ballast water management operations
- ensure all required ballast water management records are maintained and up-to-date, including the Ballast Water Record Book
- where required, prepare the appropriate national or port ballast water declaration form before arrival
- assist the port state control or quarantine officers with any sampling that may need to be undertaken
- undertake familiarisation and training of crew in ballast water management requirements and applicable shipboard systems and procedures
- perform other duties, as specified by the company.

The Master must ensure that the Ballast Water Management Plan is clearly understood by the appointed officer and by any other ship's staff that may be involved.

The Ballast Water Management Officer must keep the Master advised on the progress of the ballast water management operations and any envisaged deviations from the agreed plan. Should there be any doubt, or if the Management Plan is not in line with the schedule, the Master shall be advised accordingly.

16. Recording requirements

The Ballast Water Management Officer is to ensure that the Ballast Water Record Book and any other necessary documentation/forms are completed and kept up-to-date.

16.1 Ballast Water Record Book

The Ballast Water Record Book may be an electronic record system or it may be integrated into another record book or system and shall at least contain the information as specified in Appendix II of the BWM Convention.

The Ballast Water Record Book is to be maintained on board for a minimum of two years in order to provide port state control or other authorised officers with information they may require concerning the ballast water on board the ship. Thereafter, the manual should be maintained in the company's control for a minimum period of three years.

[Insert company-specific recording requirements.]

17. Crew training and familiarisation

It is essential that the Master, ship's officer and crew have an understanding of the need for ballast water management.

If crew members understand the reasons for the exchange or treatment of ballast water and associated sediments, they are more likely to ensure that it is carried out effectively and efficiently.

Owners, managers, operators and others involved in officer and crew training for ballast water management should consider the following:

Training for ships' Masters and crews as appropriate should include instructions on the requirements of the BWM Convention, the ballast water and sediment management procedures, and the Ballast Water Record Book, particularly having regard to matters of ship safety, maintenance of records and reporting requirements in accordance with the information contained in the Convention.

Ships' officers and ratings engaged in ballast water exchange at sea must be aware of what is expected of them and should be trained in and familiarised with the following:

- ship's pumping arrangements including ballast arrangements
- locations of air and sounding pipes of all ballast tanks
- positions of all ballast tank suctions and pipelines
- overboard discharge arrangements and openings for release of water on deck
- inspection and maintenance for ensuring that sounding pipes are clear and non-return devices and air pipes are in good order
- times and circumstances required to undertake the various ballast water exchange operations
- methods used for ballast water exchange at sea, the related safety precautions and associated hazards
- methods of on board ballast water record keeping, reporting and recording of routine soundings
- locations and suitable access points for sampling purposes.

The Master and Ballast Water Management Officer should ensure that the personnel assigned key responsibilities in any ballast exchange procedures are suitable and well trained according to the above. Special attention should be given to the safety aspects related to the subject procedures.

Provisions for crew training and familiarisation include the following:

- requirements of a general nature regarding ballast water management
- training and information on ballast water management practices
- ballast water exchange
- ballast water treatment systems
- general safety considerations
- the Ballast Water Record Book and maintenance of records
- the operation and maintenance of installed ballast water treatment systems (when a treatment system is required to be installed under Regulation B-3 of the BWM Convention)
- limitations and operational restrictions of the installed ballast water treatment systems (when a treatment system is required to be installed under Regulation B-3 of the BWM Convention)

- training and information on handling and storage of any active substances used in the installed ballast water treatment system (when a treatment system is required to be installed under Regulation B-3 of the BWM Convention)
- training and information on emergency procedures and bypass arrangements of the installed ballast water treatment system (when a treatment system is required to be installed under Regulation B-3 of the BWM Convention)
- safety aspects associated with the particular systems and procedures used on board the ship which affect the safety or human health of crew and passengers and/or the safety of the ship
- precautions for entering tanks for sediment removal
- procedures for the safe handling and packaging of sediment
- storage of sediment.

[Company specific training details (regimes, videos, etc) can be added in this section.]

17.1 Training record for ballast water management manual

Date	Name	Rank	Signature	Remarks	Verified by

18. Exemptions

[Insert details of any exemptions granted to the ship under regulation A-4 of the BWM Convention.]

[Exemptions granted under regulation A-4 are also to be recorded in the Ballast Water Record Book.]

Appendix 1 – Plans

[Insert copies of relevant plans:

- ballast tank arrangement
- ballast capacity plan
- ballast water piping and pumping arrangement, including air pipes and sounding arrangements
- ballast water pump capacities
- the ballast water management system used on board with references to detailed operational and maintenance manuals held on board
- installed ballast water treatment systems with references to detailed operational and maintenance manuals held on board (when a treatment system is required to be installed under Regulation B-3 of the BWM Convention)
- type approval certificate of the ballast water treatment system (when a treatment system is required to be installed under Regulation B-3 of the BWM Convention)
- a plan and profile of the ship, or a schematic drawing of the ballast arrangement

a list and/or diagrams indicating the location of sampling and access points in pipelines and ballast water tanks.]

Appendix 2 – Assessment criteria for the sequential method

[For compliance with Lloyd's Register ShipRight procedure – assessment of Ballast Water Management Plans)

[Applicable until a treatment system is required to be installed under Regulation B-3 of the BWM Convention]

Longitudinal strength

The following pages have been extracted from the ship's approved……..

[Insert relevant reference and criteria]

Stability

The following pages have been extracted from the ship's approved……..

[Insert relevant reference and criteria]

The Master and appointed Officer shall ensure that the effects of combined free surface moments are always taken into account during ballast water exchange operations. Reference shall be made to the vessel's approved Trim and Stability Booklet.

Minimum draught forward

Min draught forward	Tfb	: x.xx	[m]

[Insert relevant reference and criteria]

Propeller immersion

Propeller shaft above baseline	H	: x.xx	[m]
Propeller diameter	Dp	: x.xx	[m]

Propeller immersion is defined as the distance between propeller tip and waterline.

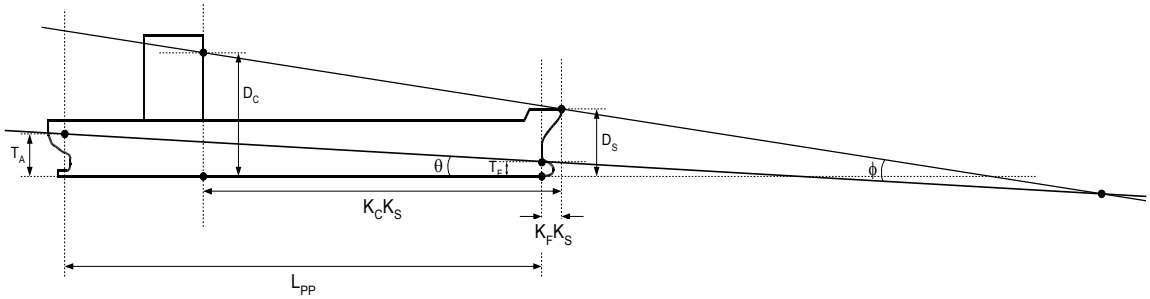
The following information has been extracted from the ship's approved……

[Insert relevant reference and information or sketch]

Bridge visibility forward

When bridge visibility requirements of SOLAS, Chapter V Safety of Navigation, Regulation 22 Navigation bridge visibility cannot be maintained for transition periods during sequential ballast exchange operations ships in service are expected to take into account the precautions and guidance in Section 6.

[The bridge visibility forward will be checked by Lloyd's Register on the basis of the following data]



Length overall	Loa	xxx.x[m]		
Length between perpendiculars	Lpp:	xxx.x	[m]	
Height of conning position	Dc:	xx.x	[m]	
Height of position 'S'	Ds:	xx.x	[m]	
Horizontal distance from conning position to position 'S'	KcKs:	xxx.x	[m]	
Horizontal distance from FP to position 'S'		KfKs:	x.x	[m]

Note: Where there are containers or other cargo on deck, the position 'S' should be considered in respect of worst visibility. If the position 'S' is aft of the fore perpendicular, then KfKs is to be taken as a negative value.

Maximum allowable bridge invisible length forward : xxx [m]

For sequences where bridge visibility forward is affected the master should take into account the guidance in Section 10.

Ballast inertia

[Applicable to Bulk Carriers]

For bulk carriers, the combination of full ballast holds and empty topside and/or hopper side tanks may induce dynamic loads, which could exceed the capability of the sloped bulkhead structures and transverse ring web structures.

[Delete appendix if not applicable]

Sloshing

The use of the sequential method will result in partial filling of ballast tanks or holds which, when contemplated for sea-going conditions, could pose a risk of significant loads due to sloshing induced by the ship motions.

[Insert details of sloshing restrictions]

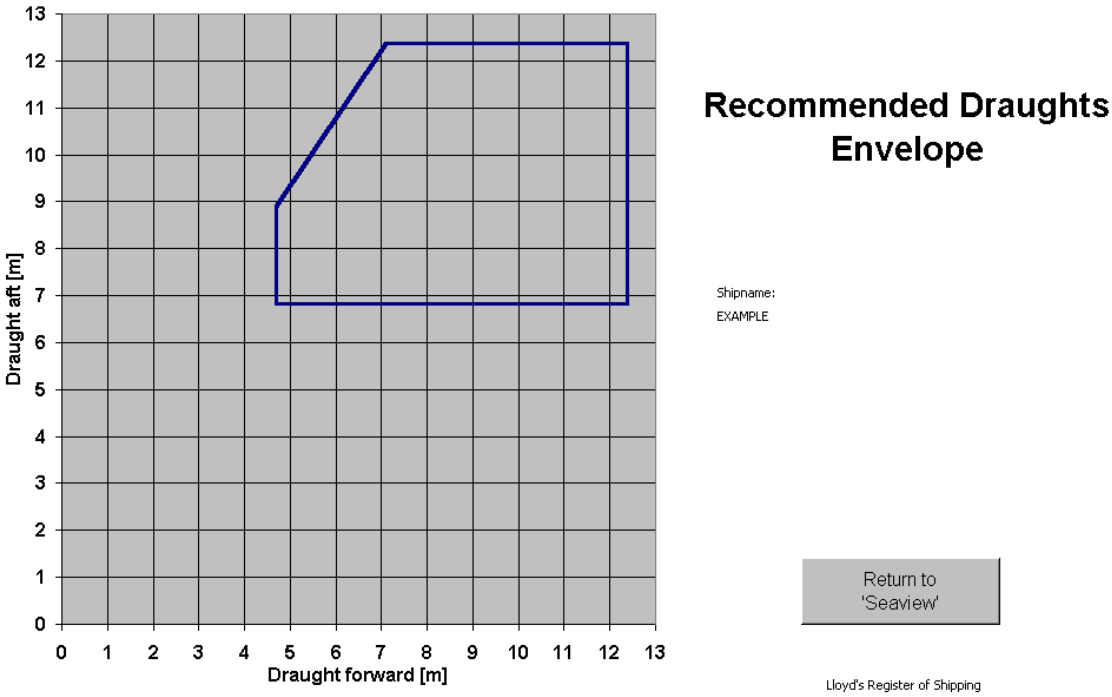
[Delete appendix if not applicable]

Envelope of recommended draughts

The envelope of recommended draughts is based on the required view of the sea surface forward from the conning position, minimum draught forward, summer draught and propeller immersion, and is provided for reference.

[The envelope of recommended draughts covering the required view of the sea surface forward from the conning position, minimum draught forward, summer draught and propeller immersion will be advised by Lloyd's Register]

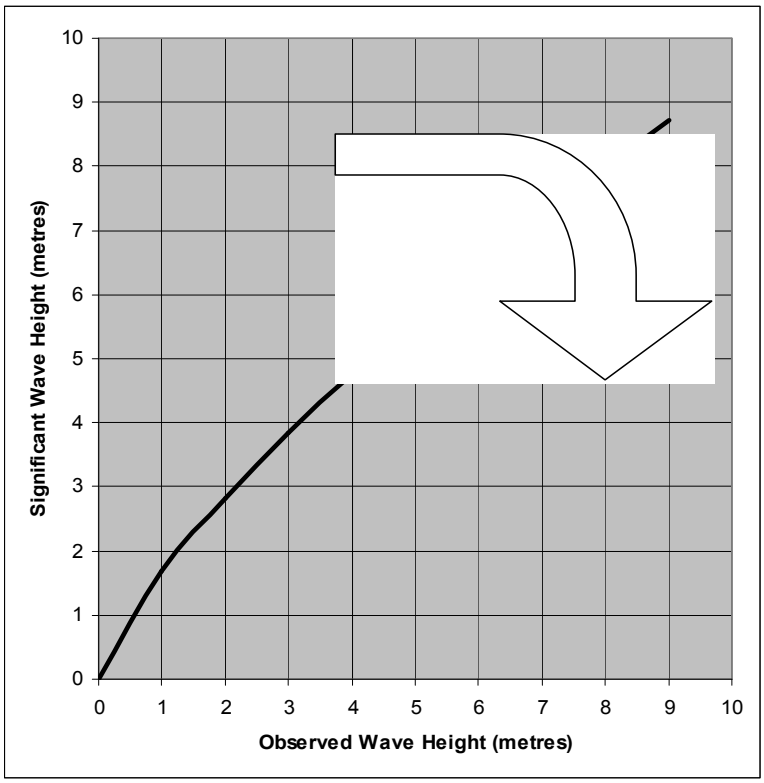
[A typical example is shown below]



Definition of sea state according to WMO

Sea state code	Description	Range of significant wave height (metres)
0	Calm (glassy)	0
1	Calm (rippled)	0 – 0,1
2	Smooth (wavelets)	0,1 – 0,5
3	Slight	0,5 – 1,25
4	Moderate	1,25 – 2,5
5	Rough	2,5 – 4,0
6	Very Rough	4,0 – 6,0
7	High	6,0 – 9,0
8	Very High	9,0 – 14,0
9	Phenomenal	> 14,0

The significant wave height can be transformed into an observed wave height using the figure below:



Appendix 3 – Ballast exchange sequences

(Applicable until a treatment system is required to be installed under regulation B-3 of the BWM Convention)

[Insert ballast exchange sequences]

Example format of exchange sequences:

W.B.T	W.B.T	W.B.T	W.B.T	W.B.T	W.B.T	W.B.T	W.B.T	W.B.T	FO/DO/ LO/FW										
A.P.T.	Tank ID	Tank ID	Tank ID	Tank ID	Tank ID	Tank ID	Tank ID	F.P.T.		Draft Aft	Trim	Draft Fwd	Stability Criteria	S.W. B.M.	S.W. S.F.	Prop. Imm.	Invisible Length	Estimated Time	Remarks
	P / S	P / S	C	P / S	C	P / S	P / S		MT	m	m	>x.xx		%	%	>xx	<xxx m	hours	
Initial Condition:																			
STEP 1: Pump out …Tank(s) ID … - Ballast Pump No … used																			
STEP 2: Pump out … Tank(s) ID …OR Refill …Tank(s) ID … - Ballast Pump No … used																			
																			See Note(s)...
STEP 3:																			
																			See Note(s)...
STEP 4:																			
STEP XX:																			
STEP XXX:																			
																		Total Time (h)	
PRESENTAGE OF TANK LEVEL OR SYMBOLS SUCH AS THOSE PRESENTED BELOW COULD BE USED AS NECESSARY.								**Min Values**											
								Max Values											

e	Empty at start	f	Full at start	WHERE GREATER DETAIL IS REQUIRED, ADDITIONAL SYMBOLS CAN BE DEFINED
f	Filling	E	Discharging	
F	Full at end	E	Empty at end	THE COLOURING OF THE CELLS WHERE THE CRITERIA ARE NOT SATISFIED CAN ENHANCE THE UNDERSTANDING OF THE BEP

Note 1: The Master is advised that the propeller will not be fully immersed during this step/sequence.

Note 2: The Master is advised that bridge visibility forward will be reduced during this step/sequence.

Note 3: This step/sequence is to be carried out in calm seas, i.e. zero sea state.

Note 4: This step/sequence is to be carried out up to moderate sea.

Note 5: This step/sequence is to be carried out up to rough sea.

	Pump No …		Pump No …	
	…… m^3/hr		…… m^3/hr	
Tank ID	3 x Vol.	4 x Vol.	3 x Vol.	4 x Vol.
…	…	…	…	…
…	…	…	…	…
…	…	…	…	…
…	…	…	…	…

Note 6: In the critical fill range 70%-95% this step/sequence is to be carried out up to moderate sea.

Note 7: The Master is advised to verify that tanks shown as "e" or "E" are totally empty and tanks shown as "f" or "F" are totally full, at the start and end of the step/sequence.

Note 8: Where two ballast pumps are used for filling purposes, when the fill level reaches 80% - 90%, then one of the pumps is to be deployed.

Note 9: The indicative times for ballast exchange by flow-through method of … Tank(s) ID … are provided separately.

PLEASE RETAIN OR DELETE OR AMEND THE NOTES AS APPROPRIATE

FOR CONSERVATIVE REASONS, WHERE AT THE END OF A STEP / SEQUENCE A TANK REMAINS PARTIALLY FILLED, ADDITIONAL CONDITIONS AT ± 10 % OF THE PARTIAL FILL LEVEL SHOULD ALSO BE ASSESSED, SINCE IT IS PRACTICALLY DIFFICULT TO MATCH THE SPECIFIED PARTIAL FILL LEVEL WHILST SHIP MOTIONS ARE EXPERIENCED

AIM TO DEVELOP SEQUENCES WHERE THE STILL WATER BENDING MOMENTS AND SHEAR FORCES DO NOT EXCEED 85% OF THE PERMISSIBLE VALUES, IN ORDER TO ACCOUNT FOR SMALL DEVIATIONS IN SERVICE, SO THAT THE MASTER AND THE APPOINTED BALLAST WATER MANAGEMENT OFFICER CAN HAVE CONFIDENCE IN FOLLOWING THE PROPOSED SEQUENCES

Appendix 4 – Ballast water treatment

(When a treatment system is required to be installed under regulation B-3 of the BWM Convention)

[This section should contain an overview of the operation of the system and operational aspects of such systems should be detailed in this section or reference should be made to the manufacturer's operational manual

The information on the overview of the operation of the treatment system shall include the following:

- make/model of the system
- treatment rated capacity (TRC)
- description of the treatment method(s) used
- power requirement (kWh)
- holding time (if applicable)
- description (or reference to the manufacturer's operational manual) of the arrangement of the system including piping, controls, alarms, by-passes etc.
- description (or reference to the manufacturer's operational manual) of the recording and monitoring equipment
- factors that may affect the system's performance (temperature, salinity, turbidity etc.)
- location of sampling point(s)
- other.]

Appendix 5 – National or local requirements

National or local requirements for the control and management of ship's ballast water and sediments, including report forms (where applicable).

This section should be maintained up-to-date by the Ballast Water Management Officer.

[Insert national and local requirements]

Example ballast water reporting form

(To be provided to the port state authority on request)

Guidelines for completing the ballast water reporting form

Section 1: ship information

Ship's name: Print the name of the ship.

Owner: The registered owners or operators of the ship.

Flag: Country or port of registry.

Last port and country: Last port and country at which the ship called before arrival in the current port – no abbreviations please.

Next port and country: Next port and country at which the ship will call, upon departure from the current port – no abbreviations please.

Type: List specific ship type – write out or use the following abbreviations: bulk(bc); ro-ro(rr); container(cs); tanker(tk); passenger(pa); oil/bulk ore(ob); general cargo(gc). Write out any additional ship types.

GT: Gross tonnage.

Arrival date: Arrival date at current port. Please use the European date format (DDMMYY).

IMO Number: identification number of the ship used by the International Maritime Organization.

Call Sign: Official call sign.

Agent: Agent used for this voyage.

Arrival port: This is the current port – no abbreviations please.

Section 2: ballast water

(**Note:** segregated ballast water = clean, non-oily ballast)

Total ballast water on board: Total segregated ballast water upon arrival at current port – with units.

Total ballast water capacity: Total volume of all ballastable tanks or holds – with units.

Section 3: ballast water tanks

(Note: count all tanks and holds separately e.g., port and starboard tanks should be counted separately)

Total number of tanks on board: Count all tanks and holds that can carry segregated ballast water.

Ballast Water Management Plan on board? Do you have a Ballast Water Management Plan specific to your ship on board? Circle Yes or No.

Management Plan implemented? Do you follow the above Plan? Circle Yes or No.

Number of tanks in ballast: Number of segregated ballast water tanks and holds with ballast at the start of the voyage to the current port. If you have no ballast water on board go to Section 5.

Number of tanks exchanged: This refers only to tanks and holds with ballast at the start of the voyage to the current port.

Number of tanks not exchanged: This refers only to tanks and holds with ballast at the start of the voyage to the current port.

Section 4: ballast water history

Ballast water history: Please list all tanks and holds that you have discharged or plan to discharge in this port. Carefully write out, or use the codes listed below the table. Follow each tank across the page, listing all source(s), exchange events, and/or discharge events separately. If the ballast water history is identical (i.e., the same source, exchange and discharge dates and locations) sets of tanks can be combined (e.g., wing tank1 with wing tank 2, both water from Belgium, exchanged 02.11.07, mid ocean). Please use an additional page if you need to, being careful to include the arrival date, ship's name and IMO number at the top.

Ballast water source:

Date: Date of ballast water uptake. Please use the European date format (DDMMYY).

Port or latitude/longitude: Location of ballast water uptake.

Volume: Volume of ballast water uptake – with units.

Temperature: Water temperature at the time of ballast water uptake, in degrees centigrade (Celsius).

Ballast water exchange: Indicate exchange method. Circle either Empty/Refill or Flow Through.

Date: Date of ballast water exchange. Please use the European date format (DDMMYY).

Endpoint or latitude/longitude: Location of ballast water exchange. If it occurred over an extended distance, list the end point latitude or longitude.

Volume: Volume of ballast water exchanged – with units.

Percent exchanged: Percentage of ballast water exchanged. Calculate this by dividing the number of units of water exchanged by the original volume of ballast water in the tank. If necessary, estimate this based on pump rate. (Note: for effective flow through exchange this value should be at least 300%).

Sea Height (m): Record the sea height in metres at the time of the ballast exchange. (Note: this is the combined height of the wind seas and swell, measured from crest to trough. It does not refer to the depth).

Ballast water discharge:

Date: Date of ballast water discharge. Please use the European date format (DDMMYY).

Port or latitude/longitude: Location of ballast water discharge – no abbreviations for ports please.

Volume: Volume of ballast water discharged – with units.

Salinity: Record salinity of ballast water at the time of discharge – with units (i.e. specific gravity (sg) or parts per thousand (ppt)).

If exchanges were not conducted, state other control action(s) taken: If exchanges were not made on all tanks and holds to be discharged, what other actions were taken (e.g. transfer of water to a land-based holding facility, or other approved treatment)?

If none, state reasons why not: List specific reasons why ballast exchange was not done. This applies to all tanks and holds being discharged.

Section 5:

IMO Ballast Water Convention and IMO Guidelines on board? Do you have a copy of the Convention and Guidelines on board? Circle Yes or No.

Responsible Officer's name, title and signature: The Responsible Officer (e.g. the First Mate, Captain or Chief Engineer) must PRINT their name and title and sign the form.

Appendix 6 – Reference documents

[Insert a list of reference documents, for example:

- The International Convention for the Control and Management of Ships' Ballast Water and Sediments 2004
- Resolution MEPC.127(53) – Guidelines for Ballast Water Management and Development of Ballast Water Management Plans
- Resolution MEPC.124(53) – Guidelines for Ballast Water Exchange
- Resolution MEPC.173(58) – Guidelines for Ballast Water Sampling
- BWM.2/Circ.20 – Guidance to ensure safe handling and storage of chemicals and preparations used to treat ballast water and the development of safety procedures for risks to the ship and crew resulting from the treatment process
- other documents.]

Appendix 7 – Ballast Water Record Book

International Convention for the Control and Management of Ships' Ballast Water and Sediments

Period From: …… To: .....

Name of ship: .....

Registration number[2]: .....

Gross tonnage: .....

Flag: .....

Total ballast water capacity (in cubic metres): ……..

The ship is provided with a Ballast Water Management Plan: (Y/N)

Diagram of ship indicating ballast tanks:

[2] Registration number = IMO number and/or other registration numbers.

1. Introduction

In accordance with regulation B-2 of the Annex to the International Convention for the Control and Management of Ships' Ballast Water and Sediments, a record is to be kept of each ballast water operation. This includes discharges at sea and to reception facilities.

2. Ballast water and ballast water management

"Ballast water" means water with its suspended matter taken on board a ship to control trim, list, draught, stability, or stresses of a ship. Management of ballast water shall be in accordance with an approved Ballast Water Management Plan and take into account Guidelines developed by the IMO.

3. Entries in the Ballast Water Record Book

Entries in the Ballast Water Record Book shall be made on each of the following occasions:

3.1 When Ballast Water is taken on board:

1. date, time and location port or facility of uptake (port or lat/long), depth if outside port
2. estimated volume of uptake in cubic metres
3. signature of the officer in charge of the operation.

3.2 Whenever Ballast Water is circulated or treated for Ballast Water Management purposes:

1. date and time of operation
2. estimated volume circulated or treated (in cubic metres)
3. WI-tether conducted in accordance with the Ballast Water Management plan
4. signature of the officer in charge of the operation.

3.3 When ballast water is discharged into the sea:

1. date, time and location port or facility of discharge (port or lat/long)
2. estimated volume discharged in cubic metres plus remaining volume in cubic metres
3. whether approved Ballast Water Management plan had been implemented prior to discharge.
4. signature of the officer in charge of the operation.

3.4 When ballast water is discharged to a reception facility:

1. date, time, and location of uptake
2. date, time, and location of discharge
3. port or facility
4. estimated volume discharged or taken up, in cubic metres
5. whether approved Ballast Water Management plan had been implemented prior to discharge
6. signature of officer in charge of the operation

3.5 Accidental or other exceptional uptake or discharges of Ballast Water:

1. date and time of occurrence
2. port or position of the ship at time of occurrence
3. estimated volume of Ballast Water discharged
4. circumstances of uptake, discharge, escape or loss, the reason therefore and general remarks.
5. whether approved Ballast Water Management Plan had been implemented prior to discharge

6. signature of officer in charge of the operation

3.6 Additional operational procedure and general remarks:

4. Volume of ballast water

The volume of ballast water on board should be estimated in cubic metres. The Ballast Water Record Book contains many references to estimated volume of ballast water. It is recognized that the accuracy of estimating volumes of ballast is left to interpretation.

Record of ballast water management actions

Sample Ballast Water Record Book page

Name of ship: …….

Registration number: ……...

Date	Item (number)	Record of management actions	Signature of officer in charge

Signature of Master: ……

Lloyd's Register Marine

For further information about this template, please contact:
marine-environment@lr.org

For more information about ballast water management please visit:
www.lr.org/bwm
www.lr.org/environment

For more information about the contents of this plan, please contact the plan author.

www.lr.org

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