ARM-03 BALLAST WATER MANAGEMENT PLAN

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References:

a. ABS Guide for Ballast Water Treatment
b. ABS Ballast Water Treatment Advisory 2014
c. ABS Guidance Notes on Biofouling Management Plans, January 2013
d. Hyde Guardian® HG60 System Flow Schematic, No G500148, Rev O
e. Operation & Maintenance Manual Hyde Guardian® Ballast Water Treatment System, G800012, Revision 1.0
f. Auxiliary Systems Diagram – Bilge, Ballast, Oily Waste, No. 65411-529-01. Rev E
g. IMO Resolution MEPC.127 (53) Guidelines for the Control and Management of Ships Ballast Water
h. IMO Resolution MEPC.153 (55) Guidelines for Ballast Water Reception Facilities (G5)
i. IMO Resolution MEPC.173 (58) Guidelines for Ballast Water Sampling (G2)
j. IMO Circular, BWM.2/Circ.20 entitled *Guidance to ensure safe handling and storage of chemical 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*
k. IMO Circular, BWM.2/Circ.42 "*Guidance on ballast water sampling and analysis for trial use in accordance with the BWM Convention and Guidelines (G2)*".
l. IMO Circular, MSC/Circ.1145 *Precautionary Advice to Masters When Undertaking Ballast Water Exchange Operations*
m. SMS *7.8.1 Confined Space Entry*
n. *SMS 7.8.2 Lockout/ Tag-out*
o. 33 CFR 151.2050 *Additional requirements—nonindigenous species reduction practices.*

All of these references can be found in the ships library or on the "Z" drive under *Z:\ Documents\ 529 Bilge Ballast and Oily Waste Systems*

1. Preamble

This Ballast Water Management Plan (BWMP) has been developed to provide guidance to the Master and the crew of the R/V Armstrong with the procedures to be followed for the operation of the vessel's ballast water management system. This Plan has been prepared to be practical and easy to use with structured and logical actions required in association with ballast water management operations. This Plan has also been written in the working language of the ship's crew.

The following items have been included in this Plan:

- Detailed safety procedures for the vessel and the crew associated with ballast water management procedures
- A detailed description of the actions to be taken to implement the ballast water management procedures
- Detailed procedures for the disposal of sediments at sea and to shore
- Procedures for coordinating the discharge of managed ballast water with Port State authorities
- The designation of a Ballast Water Management Officer who is responsible for the implementation of the BWMP
- The reporting and recording requirements provided for in the Ballast Water Management Convention
- Advice regarding the update of the ballast water management step-by-step procedures, sequences for ballast water management, and additional operational and safety restrictions.
- The Bio-Fouling Management Plan

2. Review and Revision History

On a routine basis, the owners/operators and vessel's crew review the contents of the BWMP. This review is to confirm that the information provided within the Plan is current and contains the information necessary to conduct a ballast water management operation in accordance with the Ballast Water Management Convention and the ABS *Guide for Ballast Water Treatment*. A record of the crew reviews is recorded in the tables in Annex 6 *Ballast Water Training Records.*

3. Table of Contents

Annexes

4. Introduction

This Ballast Water Management Plan (BWMP) is written in accordance with the requirements of Regulation B-1 of the International Convention for the Control and Management of Ship's Ballast Water and Sediments, 2004 (the *Convention*), the associated Guidelines and the ABS Guide to Ballast Water Treatment.

The purpose of the BWMP is to meet the requirements for the control and management of ship's ballast water and sediments in accordance with the Guidelines for Ballast Water Management and the Development of Ballast Water Management Plans as contained in MEPC.127 (53) and the ABS Guide to Ballast Water Treatment. The Plan provides standard operational guidance for the planning and management of vessel's ballast water and sediments and describes safe procedures to be followed.

It is the responsibility of the Vessel's Master to review this Plan on a regular basis and confirm that the information contained herein is accurate and current

5. Vessel Particulars:

Vessel Name	R/V Neil Armstrong
Vessel Type	Research Vessel
Port of Registry	Woods Hole, MA
Flag	US
Gross Tonnage (gt)	2,641
Deadweight (DWT)	1,448.72 LT
IMO Number	9688946
International Call Sign	WARL
Length (Overall)	238' 0"
Length (Between Perpendiculars)	230' 0"
Beam	50' 0"
Summer Draft	15' 0"
Deepest Ballast Drafts (normal & heavy weather)	16.25
Total Ballast Capacity - Gallons/ (m^3)	124, 556/ (471.5)
Number of Ballast Tanks	13
Number of Holds	01
Main Ballast Water Management Methods	
Ballast Water Treatment (Priority Preference)	Hyde Guardian/HG60S, treatment by filtration and UV light sterilization

Ballast Water Exchange (Secondary Preference)	1. Sequential 2. Flow Through 3. Dilution
Classification Society and ID	ABS YY242066
Identification (Rank) of the Appointed Ballast Water Management Officer	2nd Mate

6. Ballast Water System

6.1 Description

The ballast system on the Armstrong is composed of thirteen (13) segregated ballast tanks. The ballast pump is a self-priming, centrifugal, Ampco Z Series 3 x 2 -10, rated at 360 gpm at 230' TDH, and 3,450 rpm. A 40 HP motor drives the pump. The ballast pump motor is powered from the switchboard (P 432). The pump and motor operated valves are remotely controlled from the Pilothouse using the Siemens IAS400 panel. The Pilothouse has master control of the pump and valves. Transfer of control to the Main Control Console (MCC) is required in order to operate from the engine room. Local control is available in the engine room.

Ballast Water Treatment System (BWTS)
A BWTS is installed onboard this vessel for the treatment of ballast water, some general information of the system is given below:

- Hyde Guardian@ HG60
- Treatment by filtration and UV light - The unit consists of 8 parallel stacked housings with 55 micron disk filters and a UV sterilizer.
- Treatment Rated Capacity (TRC) – (60 m^3/hour)
- 480 VAC/ 3 Ph/ 60 Hz

6.2 Plans/Drawings of the Ballast System

Plans, drawings and/or documents of the ballast system have been provided and are appended accordingly to this Plan. The number of plans, drawings or documents provided has been limited to those determined to be necessary and has been reviewed and revised as necessary by the vessel's crew in order to avoid the inclusion of extraneous materials. Refer to Annex 1 *Ballast Water System Drawings and Data* & Annex 2 *Ballast Water Management System Installed on Board* for ship specific information.

The following additional plans or drawings and ship specific documents can be found in the ships library or the on-line library drive Z: under *SWBS No. 529 Bilge Ballast and Oily Waste Systems.*

- Hyde Guardian BWTS HG60 System Flow Schematic Drawing G500148, Rev O (*Includes sampling point*)
- Tank Sounding Tables, Drawing 65411-806-02, Rev A
- Vents, Fills and Soundings, Drawing 65411-506-01, Rev C

- Auxiliary Systems Diagram – Bilge Ballast Oily Waste, 65411-529-01, Rev E
- Ballast/ Fire/ Bilge pump flow curve AMPCO Z Series 3 x 2 – 10
- Hyde Guardian@ Ballast Water Treatment System, Hyde Marine Installation and Operating Manual G800012-001 Rev A
- Hyde Guardian@ Det Norske Veritas – Management System Certificate

7 Ballast Water Sampling Points

7.1 General

Article 9 of the *Ballast Water Management Convention* provides for compliance monitoring by officers duly authorized by a Party to the *Convention* for the purpose of monitoring regulatory compliance. The availability and suitability of ballast water sampling points is an essential component of ballast water management. These sampling points have been provided so as to enable the officers or other interested parties to take samples of ballast water for confirming compliance of regulations or monitoring the required effects of ballast water management.

Sampling requirements for compliance control of Regulations D-1 and D-2 of the *Convention* differ as the two regulations have significantly different parameters.

Sampling of ballast water is primarily a function of the authorized authorities, and it is unlikely that a crew member will be required to take samples unless at the expressed request and under the direct supervision of an authorized Port State inspection officer.

The vessel's Master and crew specifically advise authorized officers of the safety procedures and the precautions to be observed when entering enclosed spaces.

The Master will contact the appropriate Port State authorities to obtain as much notice as possible regarding the intention of the authorized officers to take samples in order to assist in the planning and to provide for the required resources. The Master will provide all reasonable assistance to the authorized officers in support of the function of sampling.

Additional guidance on ballast water sampling can be found in the Annexes to *IMO Resolution MEPC.173 (58) "Guidelines for Ballast Water Sampling (G2)"*.

7.2 Sampling for Compliance with the Exchange Standard (Regulation D-1)

The sampling and analysis methods to test for compliance with D-1 standards may be found in BWM.2/Circ.42 "*Guidance on ballast water sampling and analysis for trial use in accordance with the BWM Convention and Guidelines (G2)*".

For this vessel, the access and sampling point arrangement to ballast tanks is given in the following plans:

- Hyde Guardian BWTS HG60 System Flow Schematic Drawing G500148 Rev O (*Includes sampling point*)
- Vents, Fills and Soundings, Drawing 65411-506-01, Rev C *(when sampling through individual tank sounding tubes if required)*

7.3 Sampling for Compliance with the Performance Standard (Regulation D-2)

Sampling for compliance with the D-2 Performance Standard should be taken from the discharge line as near to the point of discharge as practicable during ballast water discharge whenever possible. Sampling via manholes, sounding pipes or air pipes is not the preferred approach.

The sampling and analysis methods to test for compliance with D-2 standards may be found in BWM.2/Circ.42 "*Guidance on ballast water sampling and analysis for trial use in accordance with the BWM Convention and Guidelines (G2)*".
The location of the sampling and access point for the ballast water tanks can be found in Hyde Guardian@ HG60 System Flow Schematic G500148 and is provided in Annex 1 of this Plan.

8 Operational Information on Ballast Water Management

8.1 General

Ballast Water Management (BWM) means mechanical, physical, chemical and biological 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. Currently, two general practices are recognized by the *Convention*, namely the ballast water exchange for compliance with Regulation B-4 in accordance with Regulation D-1 and the use of ballast water management systems (BWMS) for compliance with Regulation B-3 in accordance with Regulation D-2.
Discharge of ship's ballast to a ballast water reception facility provided by a Port State in accordance with Regulation B-3.6 is also an acceptable ballast water management practice, although there are limited approved ballast water facilities. The *IMO Resolution MEPC.153 (55) Guidelines for ballast water reception facilities (G5)* provides requirements for ballast water reception facilities.

8.2 Ballast Water Treatment

Ballast Water Management System (BWMS) means any system which processes ballast water such that it meets or exceeds the ballast water performance standard in Regulation D-2 of the *Ballast Water Management Convention*. The

BWMS includes ballast water treatment equipment, all associated control equipment, monitoring equipment and sampling facilities.

Hyde Guardian@ HG60 System is equipped with a 55 micron filter bank and UV sterilizer, which in combination, will remove and render harmless, discharge of harmful aquatic organisms and pathogens within ballast water and sediments. The BWMS installed has been type approved in accordance with Regulation D-3 of the *Convention* and should only be operated in accordance with the system design criteria and the manufacturer's operational and maintenance instructions.

The use of this treatment system is detailed in this document. All failures and malfunctions of the system are recorded in the *Ballast Water Record Book*. A record shall also be made in NS5 including all maintenance and repairs performed. Entries of treatment of the vessel's ballast water are made on the *Ballast Water Reporting Form*. Examples of these forms are provided in Annex 4 section 4.b of a *Ballast Water Reporting Form* and in 4.d *Narrative Record of Unusual Events*, this form is required for providing details of the specifics of failures and or malfunctions of the BWTS.

8.3 Ballast Water Exchange

Ballast water exchange can be used for this vessel to meet the performance standard described in Regulation D-1. The exchange practice will only be used when the BWTS is not available or if time is of the essence for safety of the ship.

There are three (3) methods of ballast water exchange recognized by IMO. These are the sequential method, flow-through method and the dilution method. Both of the latter methods are considered as "pump-through" methods. Each of these has particular safety aspects associated with it, which require special considerations when selecting the appropriate method(s) to be used on this vessel. The degree to which a vessel is suited to the sequential method, the flow-through method or the dilution method depends on its design and age.

Regulation B-4 of the *Convention* requires that vessels should conduct ballast water exchange:

- At least 200 nautical miles from the nearest land and in water at least 200 meters in depth; if not possible
- At least 50 nautical miles from the nearest land and in water at least 2000 meters in depth; or
- In sea areas designated by the port State.

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

This vessel shall not be required to deviate from its intended voyage or delay the voyage in order to comply with any particular requirements as indicated above. The voyage should be planned taking into account when ballast water exchange in accordance with the above criteria can be carried out.

Because of the possibility that partial exchange may encourage re-growth of organisms, ballast water exchange will only be commenced in any tank if there is sufficient time to complete the exchange to comply with the standard in Regulation D-1 and the ship can comply with the distance from land and minimum water depth criteria in Regulation B-4. As many complete tanks should be exchanged to the standard in Regulation D-1 as the time available allows. If for any tank the standard in Regulation D-1 cannot fully meet the exchange standard, the exchange should not be commenced for that tank.

In cases where the vessel's Master decides that a ballast exchange would threaten the safety or stability of the ship, its crew or its passenger because of adverse weather, ship design or stress, equipment failure or any other extraordinary condition, the vessel will not be required to comply with the above requirements.

When a vessel is required to conduct ballast water exchange but does not do so in accordance with the regulation, the reasons shall be entered in the vessel's Ballast Water Record Book.

8.3.1 Sequential Method

The sequential method is also known as the "empty-refill exchange" method and entails first pumping out the tank containing coastal water until it is empty, or nearly so, and then refilling the tank with open ocean water to achieve a 95% volumetric exchange. All the ballast water in each tank should be discharged until the pump loses suction to avoid a possible situation where organisms are left in the bottom of the tank and the tank is refilled with new water which may allow re-emergence of organisms.

The sequential method entails emptying ballast tanks of coastal water and refilling with open ocean water. Emptying of certain tanks may lead to significantly reduced stability, higher vessel structural stresses, high sloshing pressures and/or reduced forward drafts which may then increase probability of bow slamming.

Margins have been provided for stability and strength for all seagoing conditions, as specified in the vessel's approved trim and stability booklet and loading manual. The loading conditions for the selected ballast water exchange method will be taken from the approved loading manual and trim and stability booklet. The following items will be evaluated to mitigate the risks to the vessel when the sequential method is selected for ballast water exchange:

- Intact stability
- Longitudinal strength
- Sloshing
- Forward and aft drafts
- Bottom forward slamming and associated hull vibration
- Propeller immersion
- Over- and under-pressurization of tanks and holds
- Free surface effects
- Bridge visibility

In planning the sequential exchange sequence, the following considerations will be followed:

- The exchange sequence is to be divided into steps
- Each step represents emptying or filling one tank or a pair of tanks and is evaluated as a loading condition by the loading computer to verify conformity with the vessel's operating limits
- The printout results of the loading computer includes a summary ballast water exchange sequence table showing the degree of fill for each tank and the values calculated for various criteria parameters (e.g. estimated drafts, trim, BM, SF propeller immersion, etc.)

8.3.2 Flow-through Method

The flow-through method is accomplished by pumping open ocean water into a full ballast tank and allowing water to overflow the tank from the top or from other overflow arrangements for a length of time that will change the ballast water tank volume three times. Ballast water equal to approximately three times the tank capacity must be pumped through the tank to achieve 95% effectiveness in eliminating aquatic organisms.

The flow-through method does not typically alter stability, hull girder stress and vessel attitude. It therefore eliminates the concerns of exceeding bending moment and shear force limits and concerns related to shallow forward and aft drafts and extreme trims. In those instances where the flow-through method alters stability, hull girder stress or vessel attitude, a ballast water summary sequence table is to be submitted demonstrating that strength and stability have been maintained.

As the flow-through method is not necessarily suitable for all tanks, the following safety issues are evaluated when the flow-through method is selected for ballast water exchange:

- Safe pumping procedures taking into account additional vessel structural stress that may be involved with conducting ballast water exchange
- Over-pressurization of ballast tank or pumping equipment
- Avoid a flow-through that has ballast flowing on decks which can cause a safety hazard to crew
- Inlet and outlet piping connections be located as remotely from each other as practicable.

8.3.3 Dilution Method

The dilution method is similar to the flow-through method but open ocean water is filled through the top of a full ballast tank with simultaneous discharge from the tank bottom at the same flow rate, whereby maintaining a constant level in the tank throughout the ballast exchange operation. As with the flow-through method, ballast water equal to approximately three times the tank capacity must be pumped through the tank to achieve 95% effectiveness in eliminating aquatic organisms.

The dilution method has the advantages of the flow-through method with regard to maintaining the stability, strength and other similar benefits. By discharging water from the bottom of the ballast tanks, sediments are more easily removed. This method avoids the use of air vent and the removal of manhole covers to discharge water over the deck.

The following safety precautions are to be taken when this method is selected for ballast water exchange:

- Arrangements are to be made to automatically maintain the ballast water level in the tanks at a constant level
- High and low water level alarms are to be provided where maintaining a constant level in a tank or hold which is essential to the operational efficiency of the vessel during ballast water exchange
- Over- and under-pressurization because of rapid change in volume of contents of the tank
- Arrangements are to include the provision of a manual emergency stop for any operating ballast pump in case of valve malfunction or incorrect control actions.

8.3.4 Evaluation of Exchange Sequences

For each of the ballast exchange methods determined to be suitable for the vessel, the vessel's loading condition and exchange sequences for the selected methods are to be verified by calculations to show compliance with the applicable requirements for ballast capacity, trim, stability, longitudinal strength and local strength. These approved conditions are included in the vessel's loading manual and/or the trim and stability booklet. The vessel operators use these approved ballast water exchange loading conditions when performing ballast water exchange operations.

8.4 Precautionary Practices

8.4.1 Minimizing 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 sediments that may contain such organisms. The uptake of ballast water will be minimized or where practicable, avoided in areas and situations such as:

- Areas identified by the port States;
- In darkness when organisms may rise up the water column;
- In very shallow water;
- In the vicinity of sewage outfalls;
- Where there is a known outbreak of diseases communicable through ballast water;
- Where the incoming and outgoing tide is known to be more turbid;
- Where the propeller may stir up sediment; or
- Where dredging is occurring or has recently occurred.

8.4.2 Avoiding Unnecessary Discharge of Ballast Water

Where 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 the unnecessary discharge of ballast water that has been taken on in another port.

An annotation is to be provided explaining that any exchanged ballast water which is mixed in a ballast tank with non-exchanged water is no longer considered to be properly exchanged.

9 Safety Procedures for the Vessel and Crew

9.1 General - This section of the BWMP contains the specific safety aspects of the BWMS and/or the ballast water exchange system(s) used onboard the vessel.

9.1.1 Ballast Water Treatment Safety Precautions

In case of any failure compromising the proper operation of the BWMS, audible and visual alarm signals are given at the local control station from which the ballast water operations are controlled and the IAS400 Monitoring system panels located in the MCS, Bridge, chief engineer's & Master's staterooms.

A safety assessment methodology is provided in the IMO Circular, BWM.2/Circ.20 entitled "*Guidance to ensure safe handling and storage of chemical 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"*. The safety assessment has been undertaken by the Owner/vessel's Master in conjunction with the manufacturer of the BWMS and the supplier of the active substance or preparation, taking into consideration the specific design of the vessel, the design of the BWMS and the specific properties and risk of any chemical or preparation either used for the treatment or generated during the treatment process.

Reference has been made to the operating and maintenance manuals of the manufacturer regarding the safety aspects and precautions of the installed ballast water management system.

Reference is made to information regarding the safety aspects of the onboard system before carrying out any operations.

When referring to "Lamps" in the sections listed below these are the UV Lamps used in the disinfection of ballast water.

9.2 Ballast Water Treatment

9.2.1 Electrical Hazards

Electrical hazards are present which may cause personal injury or damage to equipment. Maintenance and repair should only be performed by qualified individuals. Follow all log-out/ tag-out procedures as specified in *SMS 7.8.2 Lockout/ Tag-out* procedures when isolating power. Caution: this system uses multiple sources of power.

9.2.2 Ultraviolet (UV) Light Exposure

This equipment employs powerful sources of ultraviolet radiation in the UV-A, UV-B and UV-C region of the electromagnetic spectrum. Exposure of the eyes or skin to ultraviolet radiation may cause severe damage. Follow all precautions and wear required protective gear including, long-sleeved shirts, gloves and appropriate safety glasses. Do not look directly into a UV lamp that is switched on.

The UV chamber is designed to minimize any exposure to ultraviolet radiation however certain operations will require personal protection.

9.2.3 Mercury within UV Lamps (See MSDS in section 1.7 of reference (e))

Mercury is contained within the UV lamps. If the lamps are broken, there is risk of exposure to mercury liquid or vapor. Carefully remove the mercury after collecting by binding it with sulfur powder. It is recommended that a mercury spill kit and appropriate personal safety equipment be available in the event of a spill. Recovered material is to be taken to a depot for chemical waste in accordance with local regulations.

The greatest probability of a mercury spill will occur during the handling and storage of UV Lamps. Lamps are to be stored in a manner which will prevent them from breaking and use extreme care when handling lamps. If one of the quartz sleeves breaks, shut off the liquid supply pipes immediately and turn the system off. Replace the defective parts and only power the system on again when all respective internal safety procedures have been completed.

If mercury has been released to the air, appropriate safety measures must be taken such as the use of an air purifying respirator (APR) or full evacuation of area until remedial action has been completed.

Lamps must be recycled using an approved recycling facility or disposed of as hazardous waste.

Some local governments have specific regulations applicable to the storage and disposal of lamps containing mercury. Adhere to the specific regulations where applicable.

9.2.5 Contents under Pressure

Release system pressure before servicing. Maintenance and repair should only be performed by qualified and trained engineers or by direction. Lockout, tag-out procedures shall be used as found in *SMS 7.8.2 Lockout/ Tag-out* when isolating valves in a system.

9.2.6 Hot Surfaces

Certain areas of the chamber may contain hot surfaces. Remember UV-Lamps remain hot for a considerable time after they have been turned off. Allow the lamps to cool off after use for at least 30 minutes.

9.3 Ballast Water Exchange at Sea

9.3.1 General

The exchange of ballast water at sea has the potential to be more hazardous than ballast water operations conducted in port. Taking into consideration that adverse weather and sea conditions can be encountered in a short time while underway in an open sea, ballast water exchanges at sea are pre-planned well in advance. Safety procedures aimed at addressing the potential for increases in hull stresses, loss of transverse stability, bottom slamming, adverse effects on the vessel's maneuverability, over- and under-pressurization of ballast tanks, and the effects of sloshing loads on tanks represent only a few of those issues that warrant a heightened awareness from the crew and are included in this section of the BWMP.

Precautions including keeping the hull girder stresses and bending moments within the permissible limits contained therein in the approved loading manual and confirming that the vessel maintains adequate intact stability, as contained in the approved trim and stability booklet, are adhered to throughout the exchange sequence.

Continual monitoring of the ballast water exchange operations is required. The monitoring includes the pumps, levels in tanks, the line and pump pressures, stability and hull girder stresses of the vessel.

Detailed instructions and procedures for crew safety, including but not limited to, proper lighting being provided when the crew is working on deck, procedures for opening sampling points and guidance regarding water on deck (where the flow-through method is used) are addressed.

9.3.2 Safety Considerations

The following general safety considerations are evaluated for each step of the full exchange sequence in the ballast water exchange:

i) Maintenance of adequate intact stability in accordance with an approved trim and stability booklet, taking into account the free surface effects of partially filled ballast tanks;

ii) Operation within acceptable ranges of the forward and aft drafts and trim with particular reference to bridge visibility, propeller immersions and slamming;

iii) Maintaining hull girder loads below the permissible seagoing strength limits of shear forces, bending moments and torsional moments in accordance with an approved loading manual;

iv) Risk of over-and under-pressurization of ballast tanks due to ballast pump capacity and vent size/location;

v) Need for greater margins on stability, strength and drafts in severe weather conditions;

vi) Weather routing in areas seasonally affected by cyclones, typhoons, hurricanes or heavy icing conditions;

vii) Likelihood of sloshing loads in ballast tanks that may be slack at any one time

viii) Safety precautions to be taken when personnel are required to work on deck at night, in heavy weather, when ballast water overflows the deck and in freezing conditions.

ix) Contingency procedures for situations which may affect the ballast water exchange operation including deteriorating weather conditions, pump failure and loss of power

9.3.3 Safety Considerations pertaining to the Specific Ballast Water Exchange Method(s) Selected:

<u>Sequential Method</u>

- Maintaining adequate intact stability
- Means to prevent the longitudinal hull girder stress and, where applicable, torsional hull girder stress level exceeding the permitted values with regard to the prevailing sea conditions

- Measures taken to prevent significant structural loads resulting from sloshing action of partially filled tanks, especially where the partially filled tanks are adjacent to empty tanks
- Maintaining forward and aft drafts and trim to provide for adequate bridge visibility, propeller immersion and minimum forward draft

Flow-Through Method

- Verifying air vent pipes are properly sized and open for continuous overflow
- Avoiding the risk of over-pressurization of ballast tanks and ballast piping
- Avoiding flowing and accumulation of water on the deck

Dilution Method

- Means to automatically maintain the ballast water level in the tanks at a constant level
- Provision of high and low water level alarms in ballast tanks
- Avoiding over- or under-pressurization of ballast water tanks and ballast piping

9.3.4 Precautionary Advice for Planning of Ballast Water Exchange Operation

During ballast water exchanges 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 standard (*SOLAS V/22*);
- Propeller immersion; and
- Minimum draft forward.

In planning a ballast water exchange operation that includes sequences which involve periods when the criteria for propeller immersion, minimum draft and/or trim, and bridge visibility cannot be met, the vessel's Master will assess:

- The duration(s) and time(s) during the operation that any of the criteria will not be met;
- The effects(s) on the navigation and maneuvering capabilities of the vessel; 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 lookout forward with adequate communications with the navigation bridge;
- The maneuverability 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.

9.3.5 Conditions in Which Ballast Water Exchange at Sea should not be undertaken

The BWMP includes a list below of circumstances in which ballast water exchange should not be undertaken. These circumstances may result from critical situations of an exceptional nature, force majeure due to stress of weather, known equipment failures or defects, or any other circumstances in which human life or safety of the vessel is threatened.

- Ballast water exchange at sea will be avoided in freezing weather conditions. However, when it is deemed absolutely necessary, particular attention will 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 accretion of ice on deck.
- Exchange at sea will be avoided when routing in areas seasonally affected by cyclones, typhoons and hurricanes, as well as in areas where short range visibility is crucial for navigation.
- During scientific operations unless directed by the Master.

9.4. Procedures for Safe Tank Entry

Follow all precautions as defined in the SMS *7.8.1 Confined Space Entry*.

10 Operational and Safety Restrictions

Details of specific operational and safety restrictions including those associated with the BWMS which affects the ship and/or the crew including reference to procedures for safe tank entry has been considered.

10.1 General

The implementation of the BWMP is largely dependent on the proper planning and execution of the task contained therein. Thus, pre-planning and training are essential to provide an effective management practice of the vessel's ballast. The detailed safety issues and procedures discussed in Sections 9 and 10 shall be adopted during the development of the ship's voyage plan.

10.2 Ballast Water Treatment System (BWTS)

Operational manuals of the ballast water treatment system (ref e.) have been provided on board the vessel with key procedures included in the vessel's BWMP.

10.3 Exchange at Sea

A ballast handling plan for each voyage will be prepared well in advance, taking into account the safety considerations discussed in Section 10. This section gives guidance on additional operational and safety handling procedures to be followed at sea.

Ballast exchange procedures, regardless of the method selected, are complex and may require a prolonged period, sometimes lasting days, to complete. Detailed training for all crew members that may participate in the exchange of ballast water are conducted so that the crew can safely perform the routine duties that are expected of them and respond to an emergency should it occur.

Operational limits defined for specific ballast exchange conditions will be adhered to during ballast operations.

When conducting ballast water exchange, the vessel's Master, Ballast Water Management Officer and crew will maintain a diligent watch in order to respond to power failures, ballast pump or pipe failures or structural

failures. Should any of these events occur, they will be reported immediately to the company's safety office in accordance with established procedures.

Some shipping lanes may not comply with the requirements concerning the minimum distance and water depth that are required by the *Convention*. The vessel in such regions will use a rule-based risk assessment, making use of the exemptions or designated ballast water exchange zone in the region.

11 Method(s) Used on board for Ballast Water Management and Sediment Control

11.1 General

This section of the BWMP identifies the specific method or methods of ballast water management utilized onboard the vessel. Details of the method(s) including the step-by-step procedures of operation of the management practices are provided.

A ballast handling plan for a voyage will be planned in advance, in a similar manner to the preparation of a cargo plan, with the same degree of thoroughness. The pre-planning is necessary in order to maintain safety in case of compliance with the ballast water exchange, ballast treatment or other BWM options. The safety information and operation/safety restrictions are taken into account when preparing the ballast handling plan.

11.2 Procedures for Ballast Water Treatment

The Hyde Guardian® Ballast Water Treatment System installed onboard R/V Neil Armstrong is used as the vessel's primary ballast water management practice in the normal operation of the vessel. The treatment process is a two-stage process: during ballasting, water is processed first by filtration to remove any particles of larger than 50 microns in size it then passes through the UV treatment to disinfect the organisms then to the vessel's ballast tanks. When discharging ballast water, the system will again pass the ballast water through the UV chamber to disinfect prior to going overboard. Filtration is not required in this stage of the process.

11.2.1 Particulars and Specification of the Treatment System

- Model: Guardian®/HG60S, Manufacturer: Hyde Marine
- Process: Treatment by mechanical filtration and UV light sterilization (biological disinfection)
- The Guardian Filter System (GFS) is made up of modules containing "stacked disk" filter elements that capture and store solids. The filter is designed to automatically backwash at the end of each ballasting operation and, when necessary, cleans one module at a time using filtered water from the remaining modules. This allows for immediate discharge of filtered material back to the ballast water source.

11.2.2 Operation of the Ballast Water Management System - The two primary operations of the system are:

1. Ballasting - The flow path and valve line up during ballasting procedure is as follows:

IAS-400 # Designation	BWTS Valve #	Valve # Designation	Description	Position	Type Valve
n/a	n/a	529-VL-001	Valve at Sea Chest	Open	5" Gate, Manual
529-02-03	n/a	529-VL-002	Ballast Pump Overboard Suction	Open	5" Motor Controlled
529-02-04	n/a	529-VL-003	Ballast Suction (to manifolds fwd. & Aft)	Closed	5" Motor Controlled
529-02-01 Ballast Pump Suction					
n/a	n/a	529-VL-004	Ballast Pump Discharge	Open	4" Butterfly Valve, Manual
n/a	n/a	529-VL-005	Check Valve	n/a	4" Check Valve
n/a	n/a	529-VL-008	Ballast water supply to BWTS	Open	4" Butterfly Valve, Manual
n/a	n/a	529-VL-007	Backup Supply to Fire-main	Closed	4" Butterfly Valve, Manual
n/a	n/a	529-VL-009	Treatment Bypass	Closed	Normally Closed Valve
n/a	V2	n/a	Bypass around filter [2]	Auto (NC)	4" Pneumatically controlled valve

n/a	V1	n/a	Supply to filter unit [2]	Auto	4" Pneumatically controlled valve
Filter Unit & UV Chamber					
n/a	V3	n/a	UV Cooling Valve & Back flush	Auto	2 ½" Pneumatically controlled valve
n/a	V4	n/a	Discharge from UV Chamber	Open	4" Pneumatically controlled valve
529-04-03	n/a	529-VL-010	To Ballast Fill Main	Open	4" Motor Operated Valve
529-04-04	n/a	529-VL-011	To Overboard	Closed	4" Motor Operated Valve
See Note[1]	n/a	See Note[1]	Selected manifold and valve to discharge into designated tank[1]	Open	3" Motor Operated Butterfly Valve

2. De-ballasting - The flow path and valve line up during de-ballasting procedure is as follows:

IAS-400 Valve #	**BWTS Valve #**	**Valve # Designation**	**Description**	**Position**	**Type Valve**
See Note[1]	n/a	See Note[1]	Selected manifold and valve to discharge into designated tank[1]	Open	Motor Operated Valve
n/a	n/a	529-VL-001	Valve at Sea Chest	Closed	5" Manual Gate Valve
529-02-03		529-VL-002	Ballast System Remote Controlled	Closed	5" Motor Controlled Butterfly Valve
529-02-04	n/a	529-VL-003	Ballast Suction (to manifolds fwd. & Aft)	Open	5" Motor Controlled Butterfly Valve
n/a	n/a	529-VL-007_	Backup Supply to Fire-main	Closed	4" Butterfly Valve
529-02-01 Ballast Pump Suction					
n/a	n/a	529-VL-008	Ballast water supply to BWTS	Open	
n/a	V2	n/a	Bypass around filter [2,3]	Auto (NC)	4" Pneumatically controlled valve
n/a	n/a	529-VL-009	Treatment Bypass	Closed	4" Normally Closed Valve
UV Chamber3					
n/a	V3	n/a	UV Cooling Valve & Back flush	Auto	2 ½" Pneumatically controlled valve
n/a	V4	n/a	Discharge from UV Chamber	Open	4" Pneumatically controlled valve
529-04-04	n/a	529-VL-011	To Overboard	Closed	4" Motor Controlled Butterfly Valve
n/a	n/a	529-VL-012	Overboard Check Valve	n/a	4" Check Valve
n/a	n/a	529-VL-013	Overboard Valve	Open	4" Butterfly Valve, Manual

[1] See 'Table No. 2 Ballast Manifold Valve Arrangement'
[2] Automatically controlled by BWMS,
[3] There is no need for water to be directed through the filter system during de-ballasting.

Additionally, there are two secondary operations:

1.) Filter Backwashing

2.) Stripping

Secondary Flow Paths –

Filter Backwashing

Filter elements over time will start to clog with sediment and larger organisms causing differential pressure across the filter to increase. The BWTS will continuously monitor the differential pressure across the filters. When the differential pressure reaches a set point automatic backwashing will occur. Backwash water is discharged overboard.

Ballast Tank Stripping

No permanent ballast water stripping pumps are installed on the R/V Neil Armstrong. If stripping is required caution should be used as the UV chamber must be installed vertically to insure that air does

not build up in the chamber and cause damage. Positive displacement pumps should be used when stripping tanks.

11.2.3 Control and Monitoring Equipment

The control equipment has the capability of automatically monitoring and adjusting necessary treatment aspects of the BWMS of the vessel. The equipment also incorporates a continuous self-monitoring function during the period in which the BWMS is in operation. The control aspects of the system are as follows:

UV Power Level Control – there are 2 power levels. The system starts running at power level 1. The system is designed to deliver satisfactory UV dose down to 70%. If the level falls below 70% the following actions are taken:

- A wipe cycle is performed to clean the quartz sleeves and UV Sensor
- If the relative intensity remains below 70% the lamps are switched to power level 2
- If the relative intensity still remains below 70%, a low UV alarm is set
- The UV system will remain at power level 2 (highest) until the system is stopped and reset

Backwash Cycle

Data Logging - The Guardian Control System (GCS) continuously logs the status of the treatment system. This log is kept on the PLC's memory cartridge. monitoring equipment records the proper functioning or failure of the BWMS and the control equipment will be able to store data for at least 24 months, and will display and print a record for official inspections as required. In the event of the control equipment being replaced, means are provided so that the data recorded prior to the replacement remains available on board for 24 months.

- Guardian S7-200 Control System and Explorer Data Log – Detailed instructions for using the LCD based Operator Interface Terminal (OIT) can be found in Chapter 6 of the Hyde *Guardian Ballast Water Treatment System Manual.* This screen can only be accessed at the ballast water treatment plant on the starboard side of the upper platform in the main engine room.
- IAS 400 System Functions – Summary alarms are given on the IAS400 Alarm System. The following indications can be found on the Ballast Systems page:
    - Ballast Water Treatment Unit - General Systems Warning
    - Ballast Water Treatment Unit - General Systems Alarm

11.2.4 Safety and Emergency Procedures

In case of any failure compromising the proper operation of the BWMS, audible and visual alarm signals will be given at all stations from which the ballast water operations are controlled.

Chapter 5.1.3 of the Hyde Guardian BWT System Operating and Maintenance Manual provides specific instructions for operating the BWMS for emergency ballasting or de-ballasting operations of the vessel in case of alarm condition. In case of ALARM condition or VESSEL EMERGENCY, the BWTS can be bypassed. This is accomplished by opening the BWTS Bypass Valve. Opening the BWTS Bypass Valve:

• Provides a flow path around the filters and UV chamber.
• Closes all other valves when the system is in the Ballasting, De-ballasting or Stripping Modes

11.2.5 Maintenance

The maintenance of the system has been included in the vessel's NS5 planned maintenance system, supplemented by individual maintenance plans for the main components. Procedures of the PMS and the execution of the maintenance plans of the system and the individual main components are detailed in Chapter 7 of the *Hyde Guardian Ballast Water Treatment System, Operating and Maintenance Manual*.

The Ballast Water Management Officer will routinely check the maintenance schedule sheet and the equipment history to verify whether inspection/maintenance has been executed as planned.

11.3 Procedures for Ballast Water Exchange

When ballast water exchange is designated as the primary ballast water management practice for a voyage, the ballast exchange method on R/V Neil Armstrong is to be the sequential method.
The sequential method entails completely emptying the ballast tanks of coastal waters and refilling with open-ocean water. Emptying of certain tanks may lead to significantly reduced stability, higher vessel structural stresses, high sloshing pressures and/or reduced forward drafts which may then increase the probability of bow slamming. At all times during the ballast water exchange sequence, the calculated stability and strength limits defined for the vessel as documented in the vessel's loading manual or trim and stability booklet must be adhered to.

The following preparations will be made prior to the commencement of the exchange:

i) Assess the impact of the weather on the exchange operation for the duration of the exchange sequence

ii) Verify that the departure or initial ballast condition as given in the plan is similar to the actual condition. If the actual initial loading condition does not compare well with the corresponding initial load case provided in the loading manual or trim and stability booklet, the ballast exchange sequence should be re-computed using the onboard loading program to verify conformity with all operating limits

iii) Verify the vessel is in deep water and in the open ocean - at least 200 nautical miles from shore and 200 meters of water depth

iv) Verify that there is sufficient time to complete the exchange while in deep water/open ocean. Exchange should only be commenced in any tank if there is sufficient time to complete the exchange.

v) After departing port and when in the appropriate open ocean location, proceed with the ballast sequence(s) given in Annex 6 of this Plan. These steps may be used as guidance in performing a ballast exchange sequence.

12 Sediment Management

12.1 General

In addition to the added weight, the carriage of sediments provides a suitable environment for aquatic organisms and pathogens to survive for extended periods of time after the water they were originally in has been discharged. The re-introduction of ballast water may enable the organisms to redevelop and subsequently, upon discharge into another port or area, cause injury or damage to the local aquatic environment. This section provides instructions and procedures for the disposal of sediments both at sea via the use of features incorporated into the vessel's design or while in a port or shipyard to shore-based facilities.

Regulation B-5 of the *Convention* requires that the vessels should, without compromising safety or operational efficiency, be designed and constructed with a view to:

- Minimize the uptake and undesirable entrapment of sediments,
- Facilitate the removal of sediments, and
- Provide safe access to allow for sediment removal and sampling.

As discussed in 9.4.1, practical steps are to be taken during ballast water uptake to avoid the accumulation of sediments. However, it is recognized that sediments will be taken onboard and will settle on tank surfaces. The amount of sediment accumulation is directly related to:

- The vessel's trading pattern,
- Ballast tank design and configuration,
- The frequency in which the ballast is taken on board,
- The frequency of removal and
- The availability of reception facilities.

As the ballast water treatment system utilizes 55 micron filter banks while ballasting, the accumulation of sediment should be insignificant however, if there are occurrences where the filters are bypassed for a significant period of time the tanks affected shall be inspected prior to returning to normal use. Additionally, ballast tanks requiring periodic survey inspection will be inspected for sediment and cleaned as required. Ballast tanks requiring cleaning will be cleaned in a timely manner and under controlled arrangements in port, at a repair facility or in dry dock or as necessary.

Additionally, fouling organisms should be removed from the hull and piping on a regular basis. Anchors and anchor chains should be rinsed upon retrieval to remove organisms and sediments at their point of origin.

The safety of the crew and the vessel should not be risked by any sediment control and handling practices.

12.2 Disposal of Sediments at Sea

Where sediment has accumulated in ballast tanks and disposal is to be made at sea, consideration should be given to flushing the tank bottoms and other surfaces in suitable locations, such as more than 200 nautical miles from the nearest land in waters having a depth over 200 meters, or in areas designated for ballast water exchange by the port or coastal State.

It is recognized that flushing with sea water or conducting ballast water exchange in open sea may only serve to suspend sediment or remove only a limited amount of the sediment. Therefore, the scheduling of in-tank cleaning of the ballast tanks shall be incorporated in the vessel's NS5 maintenance program schedule. Appropriate entries of the sediment disposal event should be made using the applicable form and kept in the Ballast Water Record Book.

12.3 Disposal of Sediments to Shore

Removal of sediment from ballast tanks 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 this is available, reasonable and practicable. A certificate concerning such disposal should be obtained from the reception facility and appropriate entries shall be made using the applicable form and kept in the Ballast Water Record Book.

Additionally, tank sediments removed from the vessel under controlled arrangements in port or in dry dock may be disposed of in an approved upland disposal facility in accordance with local and national law.

Under normal circumstances all removal of sediment will be performed as part of the periodic dry dock periods and will be handled by the contracted shipyard. Contracting shipyards shall provide documentation of proper disposal and those records will remain on board in the Ballast Water Record Book.

12.4 Biofouling

Biofouling is the attachment and accumulation of aquatic organisms on a metal surface or structure in contact with water for a period of time. Biofouling takes place in two different forms: micro-fouling and macro-fouling. Micro-fouling occurs when microscopic organisms attach and adhere to the immersed surfaces. These organisms can be bacteria to slimes and algae. Macro-fouling occurs when larger macro organisms attach to the immersed surfaces. Such macro organisms can be barnacles, seaweed, mollusks and any other organisms.
Biofouling control is not required by the Ballast Water Management Convention. It is however generally recognized that biofouling on a vessel can also result in the transfer and establishment of invasive aquatic species that may pose threats to local ecosystems and aquatic environments, similar to ballast water carried by a vessel. While there is currently no requirement for the BWMP to include maintenance procedures addressing biofouling, some Flag Administrations and local coastal states have amended or issued regulations on ballast water management plans incorporating biofouling maintenance and recordkeeping requirements. For example, the amended U.S. Coast Guard regulation on ballast water management which entered into force 21 June 2012 requires the biofouling maintenance and sediment removal procedures be included in the vessel's BWMP under USCG 33 CFR 151.2050(g).
When a vessel-specific Biofouling Management Plan has been prepared in accordance with the guidelines in MEPC.207 (62) (see also *ABS Guidance Notes on Biofouling Management Plan, January 2013* and the Biofouling Management Plan Template) and kept on board, this is considered fulfilling the requirements in USCG 33 CFR 151.2050(g). A reference to this Biofouling Management Plan in the vessel's BWMP is then considered acceptable.

13 Methods of Communication

The quick and effective communication between the vessel and the Port State and local authorities regarding the discharge of ballast water is a significant component in the management of ballast water.

(a) Ballast water reporting requirements exist for each vessel bound for ports or places in the United States regardless of whether a vessel operated outside of the EEZ.

(b) The Master, owner, operator, agent or person-in-charge of a vessel to whom this section applies must provide the information required by 33 CFR 151.2045 in electronic or written form to the Commandant, Coast Guard or appropriate COTP as follows:

1) For any vessel bound for the Great Lakes from outside the EEZ
   i. You must fax the required information at least 24 hours before the vessel arrives in Montreal, Quebec to either the USCG COTP Buffalo, Massena Detachment (315-769-5032), or the St. Lawrence Seaway Development (315-764-3250).
2) For any vessel bound for the Hudson River north of the George Washington Bridge entering from outside the EEZ (which includes the equivalent zone of Canada). You must fax the information to the COTP New York (718-354-4249) at least 24 hours before the vessel enters New York, New York.

3) For any vessel not addressed above, if your voyage is less than 24 hours, you must report before departing your port or place of departure. If your voyage exceeds 24 hours, you must report at least 24 hours, before arrival at your port or place of arrival at your port or place of destination. All required information is to be sent to the National Ballast Information Clearinghouse (NBIC) using only one of the following means:
   i. Internet at: http://invasions.si.edu/NBIC/bwform.html;
   ii. E-mail to NBIC@BALLASTREPORT.ORG;
   iii. Fax to 301-261-4319; or
   iv. Mail to U.S. Coast Guard, c/o SERC (Smithsonian Environmental Research Center), P.O. Box, 28, Edgewater, MD 21037-0028.

(c) If the information submitted changes, you must submit an amended form before the vessel departs the waters of the United States.

For the purposes of this procedure, the Master is responsible for the submission of this report. The preferred method for submitting the report is via e-mail. The Port Office shall be made an info addressee on that email (portoffice@whoi.edu). If any other submission method is necessary, the Port Office is to be advised of that method in an email sent to that same address.

When entering the State of California, a copy of this form shall also be sent to the State Lands Commission before the vessel departs from the first port of call in California. A copy shall be kept on board in the Ballast Water Log and retained for three years. The address for the California State Lands Commission is as follows:

California State Lands Commission
100 Howe Avenue, Suite 100 South
Sacramento, CA 95825-8202

The Master is responsible for signing the Ballast Water Reporting Form. In his absence, a person in charge of the vessel designated by the Port Office shall sign the form.

13.1 Coastal State with Specific Procedures/Requirements for Discharge of Ballast Water

The actions to be taken by the vessel are:

- Follow the agreed-upon reporting procedure
- Contact the vessel's agent to ascertain the latest information on ballast discharge requirements in the water of the respective state
- Create a timely plan for all the above actions such that safety and operational restrictions are met
- Keep proper records and have them readily available for possible examination

13.2 Coastal State with No Specific Procedures/Requirements for Discharge of Ballast Water

The actions to be taken by the vessel are:

- Contact the vessel's agent and/or company to obtain the latest information on the discharge requirements at the port State territory
- Carry out the discharge of ballast water as per the ballast exchange sequence or by the use of a 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 examination

14 Duties of Designated Ballast Water Management Officer and Vessel's Master

The responsibility for the execution and recordkeeping associated with the management of ballast water is to be assigned to the second officer as the *responsible member of the vessel's crew*. This section of the Plan provides guidance on those duties associated with ballast water management to be performed by the Ballast Water Management Officer and the vessel's Master. Vessel-specific listings of responsibilities are to be carefully identified and included in this section of the Ballast Water Management Plan.

14.1 Duties of Ballast Water Management Officer

Duties of the officer in charge of ballast water management may include:

i) Follow the applicable Ballast Water Management Plan or develop a new Ballast Water Management Plan on the basis of the vessel's safety criteria, equipment availability and weather forecast

ii) Proper implementation of the Ballast Water Management Plan including availability of personnel and equipment

iii) Informing the shore management, the owner or operator of the commencement/interruption/ completion of ballast water management

iv) Maintaining the Ballast Water Record Book

v) Verify the required ballast water management recordkeeping records and logs

vi) Prepare the appropriate national or port Ballast Water Reporting Form prior to the arrival at port

vii) Assisting the Port State control or quarantine officers with any sampling that may need to be performed

viii) Providing crew training and familiarization in ballast water management requirements and applicable shipboard systems and procedures

ix) Other duties specified by the vessel's owners/operators

The Ballast Water Management Officer must periodically keep the vessel's Master advised on the progress of the Plan. If there is any doubt or if the management plan does not keep to the schedule, the Master is to be advised accordingly. Additionally, the appointed Ballast Water Management Officer is to inform the Master when commencing/stopping ballast operations at each stage.

14.2 Vessel's Master

Duties of the vessel's Master include:

- Confirmation that the Ballast Water Management Plan is clearly understood by the appointed Ballast Water Management Officer and by the other responsible officers who may be involved, and that all operations strictly conform to the safety procedures and parameters.
- When ballast water exchange is used, the Master shall consider the *Precautionary Advice to Masters When Undertaking Ballast Water Exchange Operations (MSC/Circ.1145)*. Where transitory deviations of bridge visibility (SOLAS V22), propeller immersion and minimum draft forward during ballast water exchange are acceptable, the Master is to be notified by a note placed in the Ballast Water Management Plan.
- Coordinate communications with coastal and Port State authorities through established procedures. Such communications may include, but may not be limited to, submission of ballast water reporting forms, coordinating inspections of ballast water logs and sampling of ballast water, local restrictions or

instructions related to the discharge of ballast water, designated areas for discharge of ballast water in the event that the vessel was unable to discharge the ballast water due to weather or mechanical failures.

15 Recording Requirements

15.1 General Requirements

In accordance with Regulation B-2 of the Annex to the Convention, a record is to be kept of each ballast water and sediment management operation. This includes discharges at sea and to the reception facilities. The designated Ballast Water Management Officer is responsible for facilitating the administration of ballast water management and treatment procedures on board the vessel, maintaining appropriate log sheets and records, and verifying that ballast water management and/or treatment procedures are followed, properly recorded and kept up-to-date.

The vessel's ballast water records should be accessible and readily available for examination by port State authorities at all reasonable times, and in case of an unmanned vessel under tow, it may be kept on the towing vessel.

15.2 Ballast Water Record Book

In accordance with Regulation B-2, each ship is to have on board a ship-specific ballast record book that may be an electronic record system, or that may be integrated into another record book or system. Entries in the Ballast Water Record Book shall be made on each of the following occasions:

a) When ballast water is taken on board:

- Date, time and location of port or facility of uptake (port or lat./long.) Depth if outside port
- Estimated volume of uptake in cubic meters
- Signature of officer in charge of the operation

b) Whenever ballast water is circulated or treated for ballast water management purpose:

- Date and time of operation
- Estimated volume circulated or treated in cubic meters
- Whether conducted in accordance with the BWMP
- Signature of the officer in charge of the operation

c) When ballast water is discharged into the sea:

- Date, time and location of port or facility of discharge (port or lat./long.)
- Estimated volume of discharged in cubic meters plus remaining volume in cubic meters
- Whether approved ballast water management plan had been implemented prior to discharge
- signature of the officer in charge of the operation

d) When ballast water is discharged to a reception facility:

- Date, time and location of uptake
- Date, time and location of discharge
- Estimated volume discharged or taken up, in cubic meters

- Whether approved ballast water management plan had been implemented prior to discharge
- Signature of the officer in charge of the operation

e) Accidental or other exceptional uptake or discharge of ballast water:

- Date and time of occurrence
- Port or position of the ship at the time of occurrence
- Estimated volume of ballast water uptake or discharged
- Circumstances of uptake, discharge, escape or loss, the reason therefor and general remarks
- Whether approved ballast water management plan had been implemented prior to discharge
- Signature of the officer in charge of the operation

15.3 Record-keeping Forms

15.3.1 Ballast Water Reporting Form

The Ballast Water Reporting Form is to be used when reporting ballast water management to a national or local authority that requests information in advance. When ballast water exchange is used as the ballast water management practice, the *Ballast Water Reporting Form* is to be used based on IMO Assembly Resolution A.868 (20). When a treatment system is used on board for managing the ballast water, the example form given in Annex 4.b is to be used
Communication with the coastal and port States will be made to obtain a copy of any reporting forms and/or instructions which may be unique to that State. Prior to entering into US Waters, the US *Ballast Water Reporting Forms* from the NBIC (National Ballast Information Clearinghouse) via the NBIC website at http://invasions.si.edu/NBIC/bwform.html will be obtained. The completed form will be submitted directly to NBIC in accordance with the instructions provided on the website. When this vessel uses its ballast water treatment system accepted under the USCG Alternative Management Systems (AMS) in California waters, a "Ballast Water Treatment Supplemental Reporting Form" will be submitted in addition to the "standard" US Ballast Water Reporting Form.

15.3.2 Ballast Water Handling Records

In compliance with Regulation B-2.5, each operation concerning ballast water shall be fully recorded without delay in the Ballast Water Record Book and each entry shall be signed by the officer in charge of the operation concerned and each completed sheet be signed by the Master. Recordkeeping of the ballast water management activities covering the occasions in 16.2 is accomplished by the use of the following log forms:

i) A Ballast Water Handling Form outlining the ballast water management activities onboard; and

ii) A Narrative Record of Unusual Events.

These two forms can be found in Annex 4.c and 4.d. These forms serve as a guide for recording the information concerning the source of the ballast water on board and what ballast water operations have been undertaken during the voyage. It is to be noted that the "narrative record of unusual events" form is also applicable for use in record keeping of activities related to sediment removal during dry dock or by tank flushing at sea.

Even when the vessel is not currently trading in an area where ballast water information is required to be reported, this vessel will have these forms completed, documenting the history of what water has been carried and the ballast water operations undertaken on board.

When the concerned coastal or Port State has its own ballast water handling form, then those forms will be used. When this vessel intends to enter the waters of the State of California, the required ballast water log will be completed. This is a separate log that outlines the ballast water management activities of each tank onboard a vessel.

16 Crew Training and Familiarization

To assist in the implementation of the Ballast Water Management Plan, the vessel's crew is trained and familiar with the tasks expected of them. The training, together with an understanding as to the reasons why ballast water management is necessary, will promote the effective and efficient operations in accordance with this BWMP.

Training and familiarization of the vessel's crew is essential in the management of ballast water and sediments. Specifically, the training includes instructions on the requirements of the Ballast Water Management Convention, the implementation of the Ballast Water Management Plan, ballast water and sediment management procedures, the recordkeeping requirements of ballast water operations, the Ballast Water Record Book and log forms, and reporting functions. This training is particularly sensitive to those matters concerned with the safety of the vessel and the crew. Records of conducted training are included in Annex 6.

Where a treatment system is installed on board and is used as the main ballast water management practice, the vessel's Master and crew, as appropriate, are to be trained in the operation, handling procedures and maintenance of the installed treatment system, particularly with regard to the operational or safety aspects associated with the treatment system.

The vessel's Master and the crew engaged in the ballast water exchange at sea are trained and familiar with the following as appropriate:

i. The vessel's ballast pumping and piping arrangements, positions of associated air and sounding pipes, positions of compartment and tank suctions and pipelines connecting them to the vessel's ballast pumps and, when using the flow-through method, the openings used for release of water from the top of the tank, together with overboard discharge arrangements

ii. The method of confirming that sounding pipes are clear and that air pipes and their non-return devices are in good working order

iii. The different times required to undertake the various ballast water exchange operations, including the time to complete individual tanks

iv. The location of and access to sampling points

v. The method(s) in use for ballast water exchange at sea with particular reference to the required safety precautions

vi. The need to continually monitor ballast water exchange operations

vii. The method used onboard for ballast recordkeeping, reporting and recording of routine soundings of the ballast tanks

Provisions for crew training and familiarization 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 the installed ballast water treatment systems
- The safety aspects associated with the particular systems and procedures used on board the vessel which affect the safety and health of crew and passengers and/or the safety of the vessel
- Precautions for entering tanks for sediment control
- Procedures for the safe handling and packaging of sediments
- Storage of sediments

The vessel's Master and Ballast Water Management Officer regularly verify that the personnel assigned to key responsibilities in ballast water management practice(s) are suitable and well trained according to the above, special attention being given to the safety aspects related to the subject procedures.

Training records are maintained with this Ballast Water Management Plan.

Vessels operating in the waters of the United States are to maintain onboard a standalone training plan or other documentation, owners/operators must maintain a written training plan describing the training to be provided and a record of the date of training provided to each person trained. (Final VGP 2013/2.2.3.1).

17 Exemptions

17.1 General

Exemptions may be granted to a vessel from Regulations B-3 (with respect to the application of Ballast Water Management for Ships) or C-1 (with respect to Additional Measures) by a party or parties under regulation A-4 of the *Convention* as follows:

- Application for an exemption is to be supported by a risk assessment based on the Guidelines for risk assessment under Regulation A-4 of the BWM Convention (G7), MEPC.162(56)
- Exemptions granted shall be effective only after communication with the IMO and circulation of relevant information to the Parties
- Any exemptions granted to this vessel are recorded here in the BWMP and the vessel's Ballast Water Record Book

18 Supporting Documentation

See ANNEX 5: Table of Supporting Documents

Ballast Water System Drawings and Data

Ballast Tank Arrangement (profile and plan views)

FIGURE 1
Ballast Tank Arrangement – Profile View

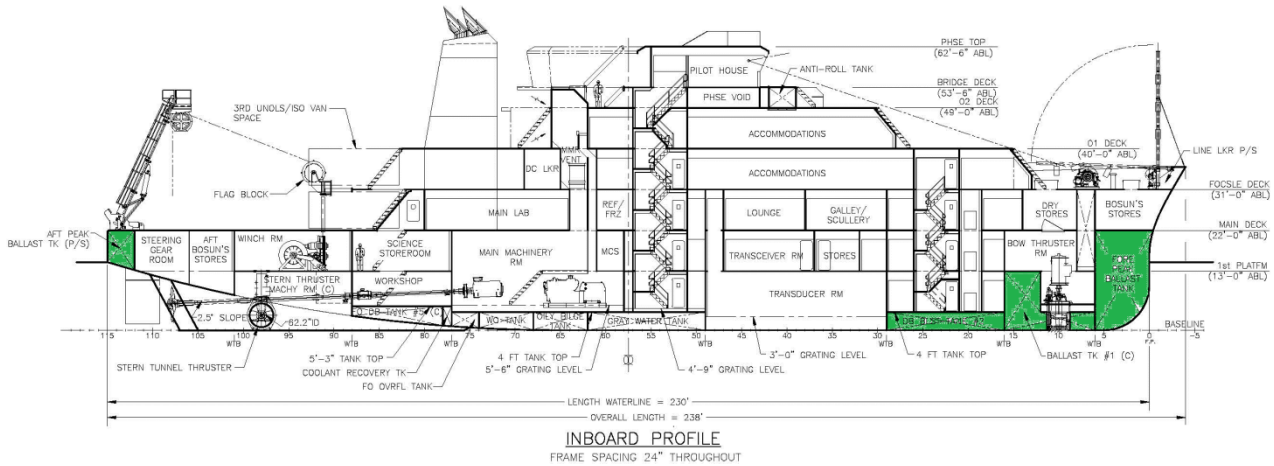


FIGURE 2
Ballast Tank Arrangement – Plan Views

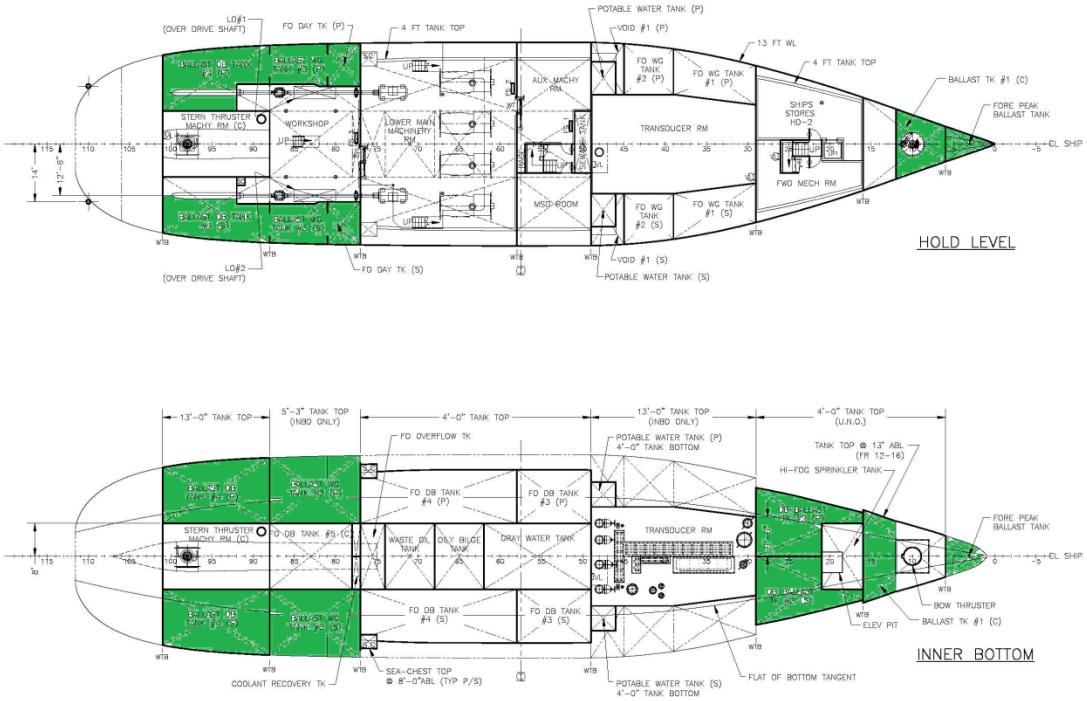


TABLE 1 - Ballast Water Tank Capacity

Tank Number	Location/Frame Number	Capacity Gal (m^3)
Forepeak Ballast Tank (Center)	0-6	10,233 (38.7)
Ballast Tank No. 1 (Center)	6 -16	16,933 (64.0)
DB Ballast Tank No. 2 (P)	16 - 29	7,195 (27.2)
DB Ballast Tank No. 2 (S)	16 - 29	7,195 (27.2)
Ballast Wing Tank No. 3 (P)	77 – 88	11,906 (45.0)
Ballast Wing Tank No. 3 (S)	77 – 88	11,906 (45.0)
DB Ballast Tank No. 4 (P)	88 - 101	14,500 (54.9)
DB Ballast Tank No. 4 (S)	88 - 101	14,447 (54.7)
Ballast Wing Tank No. 5 (P)	101 - 112	4,380 (16.6)
Ballast Wing Tank No. 5 (S)	101 - 112	4,380 (16.6)
Aft Peak Ballast Tank (S)	112 - transom	6,782 (25.7)
Aft Peak Ballast Tank (P)	112 - transom	6,782 (25.7)
Anti-Roll Ballast Tank (C)	39 - 42	7,917 (29.9)
Total Capacity		**124,556 (471.5)**

TABLE 2 - Ballast Manifold Valve Arrangement

Forward Ballast Manifold:

Tank Valve Designation	Discharge Valve No. (DCI/ Siemens)	Suction Valve No.
Anti-Roll Tank	529-VL-024 / 529-06-09	529-VL-025 / 529-06-10
Ballast No. 2 Port	529-VL-022 / 529-06-06	529-VL-023 / 529-06-05
Forepeak Ballast	529-VL-020 / 529-06-02	529-VL-021 / 529-06-01
Ballast No. 1 Centerline	529-VL-018 / 529-06-04	529-VL-019 / 529-06-03
Ballast No. 2 Starboard	529-VL-016 / 529-06-08	529-VL-017 / 529-06-07

Aft Ballast Manifold:

Tank Valve Designation	Discharge Valve No. (DCI/ Siemens)	Suction Valve No.
Ballast No. 3 Starboard	529-VL-027 / 529-05-04	529-VL-026 / 529-05-03
Ballast No. 4 Starboard	529-VL-029 / 529-05-08	529-VL-028 / 529-05-07
Ballast No. 4 Port	529-VL-031 / 529-05-06	529-VL-030 / 529-05-05
Ballast No. 5 Starboard	529-VL-033 / 529-05-12	529-VL-032 / 529-05-11
Aft Peak Ballast Starboard	529-VL-035 / 529-05-16	529-VL-034 / 529-05-15
Aft Peak ballast Port	529-VL-037 / 529-05-14	529-VL-036 / 529-05-13
Ballast No. 5 Port	529-VL-039 / 529-05-10	529-VL-038 / 529-05-09
Ballast No. 3 Port	529-VL-041 / 529-05-02	529-VL-040 / 529-05-01

Other Valves

The ballast pump can discharge overboard through a solenoid-operated valve controlled at the MCCS and powered from the motor operated valve distribution panel.

Ballast Water Piping and Pumping Arrangement

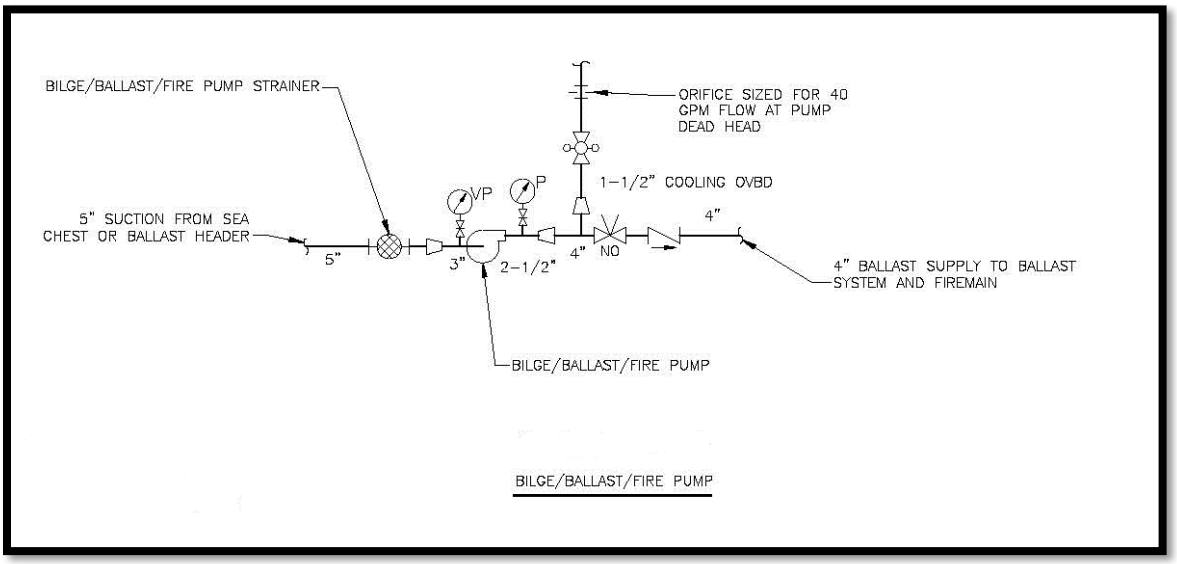


TABLE 3 -Ballast Pump Data

The ballast pump is a self-priming, centrifugal, Ampco Z Series 3 x 2 -10, rated at 360 gpm at 230' TDH, and 3,450 rpm. A 40 HP motor drives the pump. The ballast pump motor is powered from the switchboard (P432).

Pump Name	Rated Capacity Gals/min (m3/hour)	Type	Location
Bilge Ballast Fire Pump	360 (98.2)	self-priming, centrifugal, Ampco Z Series 3 x 2 -10	Lower main machinery room (LMMR)

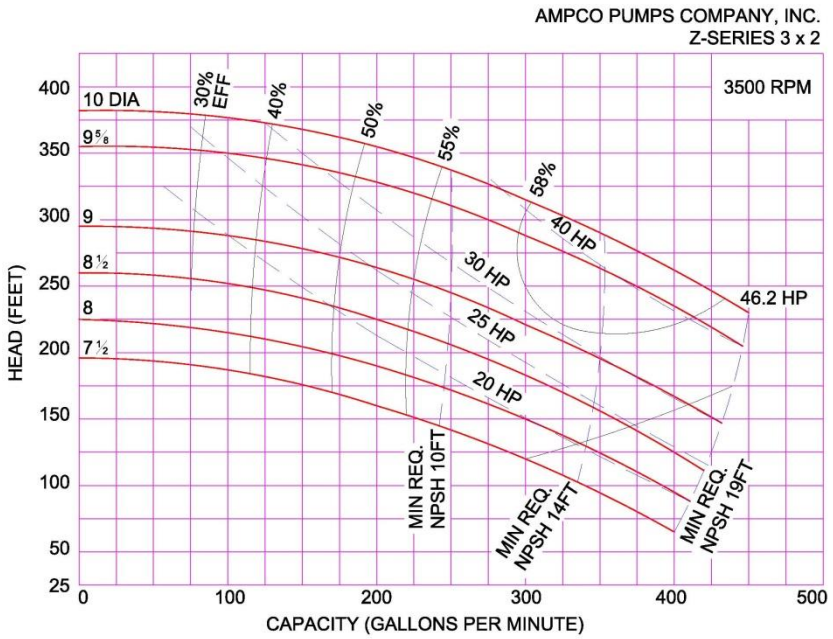
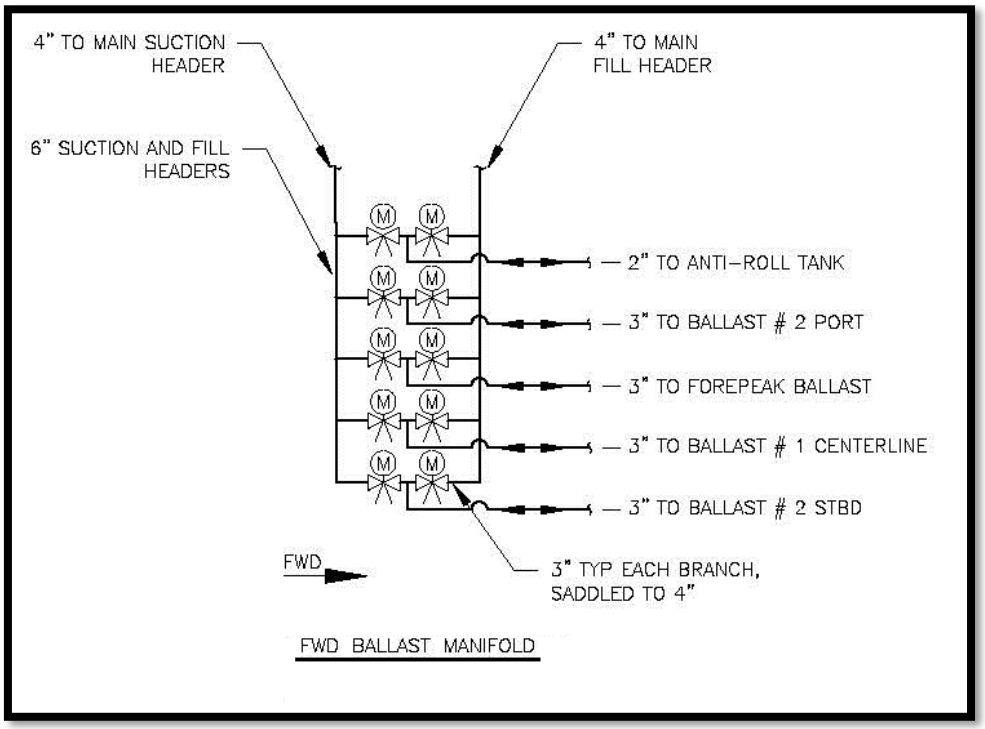


TABLE 4 – Overflow, Filling and Suction Line Data

Number of overflow lines per tank (air vents or overflow lines per tank)….. 1

Overflow line nominal diameter…….……..…….…….……4”

Filling line nominal diameter ……..……..…… 3”



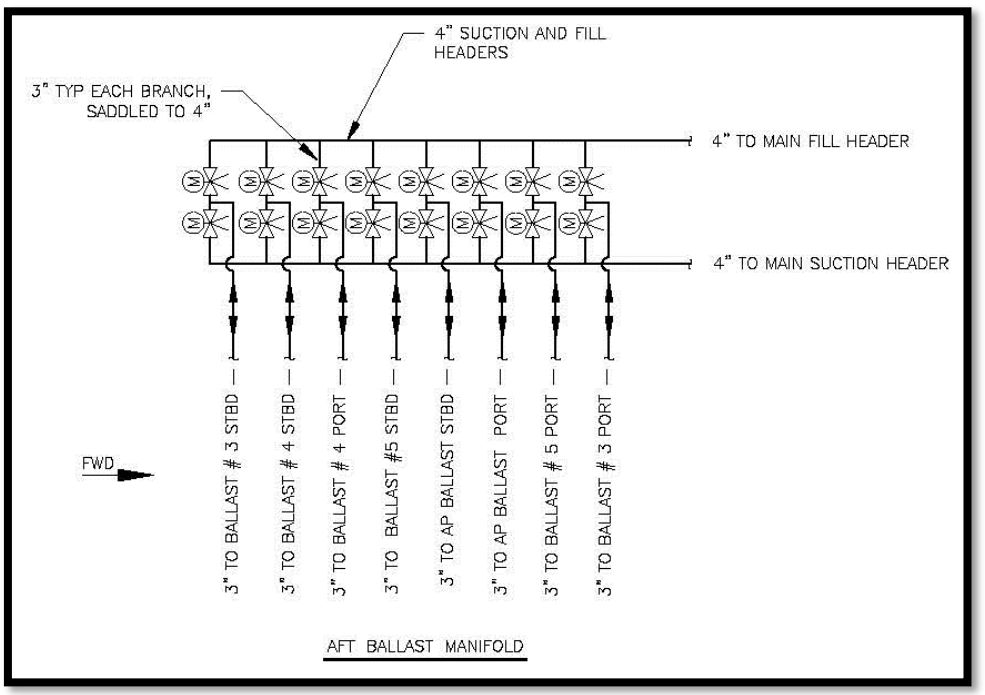
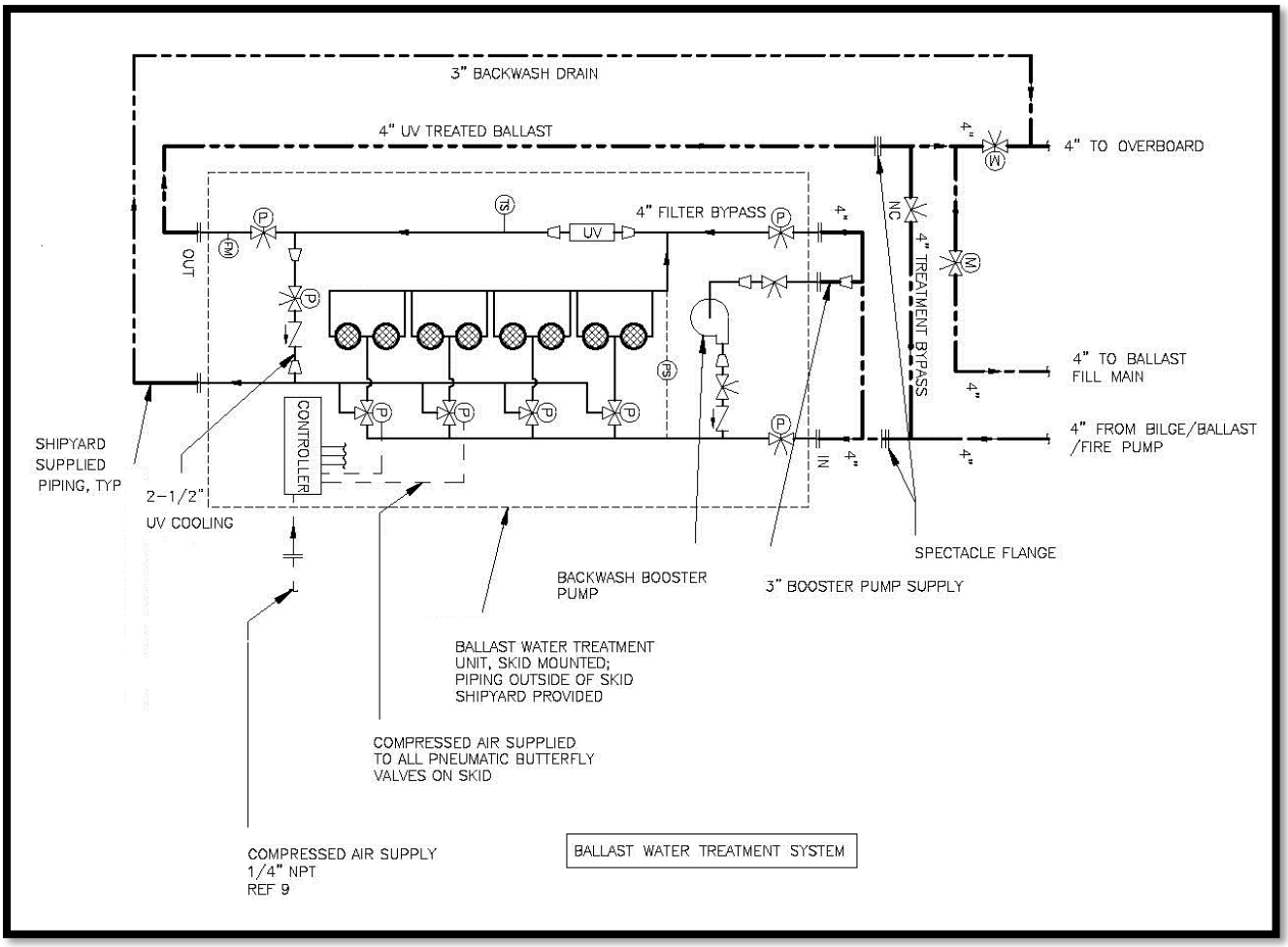


Diagram of BWMS



1. General

- Mfg: Hyde Guardian® HG60
- Type: Stacked disk filter, UV sterilization,
- Rated capacity: 60 M^3/ hr
- Power requirement – 10 min/15 max kW, 440 VAC
- Approval certificate USCG/ABS Approved IMO Compliant
- Major components of the treatment system
  - Filter System
  - UV Chamber
  - Automatic Pneumatic Valves
- Description of the ballast water treatment system, can be found in section 6 of this plan
- Location of sample point: At ballast overboard discharge, port upper engine room – prior to overboard valve 529-VL-013

2. System Manuals –

Operation & Maintenance Manual Hyde Guardian® Ballast Water Treatment System, G800012, Revision 1.0 – this manual can be found in the ships library or on line library 'Z' drive under SWBS No. 529

Material Safety Data Sheets

UV Lamp Material Safety Data Sheet (MSDS) – see attached

Type Approval Certificate of Ballast Water Management System – see attached

Annex 3 – Reserved for Future use

ANNEX 4 Ballast Water Recordkeeping Forms

Ballast Water Record keeping Forms – The following forms are provided as a guide and for information only. Any forms that are currently in use and meet the requirements should continue to be utilized

4. a Ballast Water Reporting Form for Ballast Water Exchange

4. b Ballast Water Reporting Form including Ballast Water Treatment

4. c Form of Ballast Water Handing Log

4. d Form of Narrative Record of Unusual Events

4. a Ballast Water Reporting Form for Ballast Water Exchange

BALLAST WATER REPORTING FORM

(Based on IMO Resolution A.868 (20), Appendix 1)

1. VESSEL INFORMATION

2. BALLAST WATER

Vessel Name: R/V Neil Armstrong	Type:	IMO Number: 9688946	Specify Units: m^3. MT, LT, ST
Owner:	GT:	Call Sign:	Total Ballast Water Onboard:
Flag:	Arrival Date:	Agent:	
Last Port and Country:		Arrival Port:	Total Ballast Water Capacity:
Next Port and Country:			

3. BALLAST WATER TANKS

Ballast Water Management Plan onboard? Yes [ ] No [ ]

Total number of tanks onboard: _____ Number of tanks in ballast: _____ If none in ballast go to #5

Number of tanks exchanged: _____ Number of tanks not exchanged: _____

4. BALLAST WATER HISTORY

a) Ballast Water Exchange History

Record all tanks that will be de-ballasted in port State of arrival (one tank per line). If none, go to #5. (Use additional sheets as needed)

Tanks/ Holds	Ballast Water Source				Ballast Water Exchange							Ballast Water Discharge				Remarks	Officer in Charge		
	Date/ Time (dd-mm-yy/ hh:mm)	Port/ Facility or Lat./Long.	Volume of Uptake (m^3)	Temp, (°C)	Date/ Time (dd-mm-yy/ hh:mm)	End Point Lat./Long.	Volume of Ballast Exchanged (m^3)	Estimated Volume Ballast Remaining (m^3)	% Exch.	Method (ER, FT or ALT)	Sea Height (m)	Date/ Time (dd-mm-yy/ hh:mm)	Location of Discharge, Port or Lat./Long.	Volume of Ballast Discharged (m^3)	Salinity (s.g.)		Name	Signature	Rank

Ballast Water Tank Codes: Fore Peak = FP, Aft Peak = AP, Double Bottom = DB, Wing Tank = WT, Center Tank = CT, Topside Tank = TS, Cargo Hold = CH, Other = O

If exchanges were not conducted, state other control action(s) taken: _____

_____

If none, state reasons why not: _____

_____

5. IMO BALLAST WATER GUIDELINES AND THE INTERNATIONAL CONVENTION ONBOARD? Yes [ ] No [ ]

RESPONSIBLE OFFICER:

NAME ________________________________ (PRINTED)

TITLE _________________________________ (PRINTED)

SIGNATURE _____________________________ Date ________________________

Guidance for Completing the Ballast Water Reporting Form

Please fill out in English and make every effort to PRINT clearly

Section 1: Vessel information

Vessel name: Print the name of the vessel.

Owner: The registered owner(s) or operator(s) of the vessel.

Flag: Country under which the ship normally operates. Write the full name Do not use abbreviations.

Last port and country: Last port and country at which the vessel called before arrival in the current port. Write the country and port names in full. Do not use abbreviations.

Next port and country: Next port and country at which the vessel will call, upon departure from the current port. Write the country and port names in full. Do not use abbreviations.

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

GT: Gross tonnage.

Arrival date: Arrival date to current port. Use European date format (DDMMYY).

IMO number: Identification number of the vessel used by the International Maritime Organization.

Call sign: Official call sign.

Agent: Agent used for this voyage.

Arrival port: This is the current port. Write the name in full. Do not use an abbreviation.

Section 2: Ballast water

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

Total ballast water onboard: Total segregated ballast water upon arrival to current port, with units.

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

Section 3: Ballast water tanks

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

Total no. of tanks onboard: Count all tanks and holds that can carry segregated ballast water.

Ballast water management plan: Do you have a ballast water management plan specific to your vessel onboard? Check Yes or No.

Use of Management plan: Do you follow the above management plan? Check Yes or No.

No. of tanks in ballast: Number of segregated ballast water tanks and holds with ballast at the onset of the voyage to the current port. If you have no ballast water onboard, go to section 5.

No. of tanks exchanged: This refers only to tanks and holds with ballast at the onset of the voyage to the current port.

No. of tanks not exchanged: This refers only to tanks and holds with ballast at the onset of the voyage to the current port.

Section 4: Ballast water history

Ballast water source: List all tanks and holds that you have discharged or plan to discharge in this port (carefully write out, or use 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), like tanks can be combined (example: wing tank 1 with wing tank 2 both water from Belgium, exchanged Oct. 3rd, mid ocean – can be combined. See first line of the table in the sample form). Use an additional page if necessary. Include ship name, date and IMO number at the top of each page.

Date/Time: Date and time of ballast water uptake. Use European format (DDMMYY) and (HHMMSS).

Port or latitude/longitude: Location of ballast water uptake. If carried out in port, write the port name in full.

Volume: Volume of ballast water uptake, with units.

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

Ballast water exchange: Indicate exchange method: Circle empty/refill or flow through.

Date/Time: Date and time of ballast water exchange. Use European format (DDMMYY) and (HHMMSS).

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

Volume: Volume of ballast water exchanged, with units.

Percentage 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 based on pump rate. (Note: For effective flow-through exchange this value should be at least 300%).

Sea height (m): Document the sea height in meters at the time of the ballast exchange (Note: this is the combined height of the wind seas and swell, measured from crest to trough).

Ballast water discharge:

Date/Time: Date and time of ballast water discharge. Use European format (DDMMYY) and (HHMMSS).

Port or latitude/longitude: Location of ballast water discharge. If discharged in a port, write the name of the port in full.

Volume: Volume of ballast water discharged, with units.

Salinity: Document 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? (i.e., transfer of water to a land-based holding facility or other approved treatment).

If none, state reason 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

IMO Ballast Water Convention and IMO Guidelines onboard. Is a copy of the IMO Convention and Guidelines on board? Check Yes or No.

Responsible officer's name and title (printed) and signature: e.g., Master, chief officer or chief engineer must PRINT their name and title and sign the form.

4.b Ballast Water Reporting Form Including Ballast Water Treatment

BALLAST WATER REPORTING FORM

(Modified form based on Resolution A.868 (20))

1. VESSEL INFORMATION

2. BALLAST WATER

Vessel Name:	Type:	IMO Number:	Specify Units: m^3. MT, LT, ST
Owner:	GT:	Call Sign:	Total Ballast Water Onboard:
Flag:	Arrival Date:	Agent:	
Last Port and Country:		Arrival Port:	Total Ballast Water Capacity:
Next Port and Country:			

3. BALLAST WATER TANKS

Ballast Water Management Plan onboard? Yes [ ] No [ ]

Total number of tanks onboard: _____ Number of tanks in ballast: _____ If none in ballast go to #5

Number of tanks exchanged: _____ Number of tanks not exchanged: _____ Number of tanks underwent treatment: _____

4. BALLAST WATER HISTORY

a) Ballast Water Exchange History

Record all tanks that will be deballasted in port State of arrival (one tank per line). If none, go to #4.b. (Use additional sheets as needed)

Tanks/ Holds	**Ballast Water Source**				**Ballast Water Exchange**							**Ballast Water Discharge**				Remarks	**Officer in Charge**		
	Date/ Time (dd-mm-yy/ hh:mm)	Port/ Facility or Lat./Long.	Volume of Uptake (m^3)	Temp, (°C)	Date/ Time (dd-mm-yy/ hh:mm)	End Point Lat./Long.	Volume of Ballast Exchanged (m^3)	Estimated Volume Ballast Remaining (m^3)	% Exch.	Method (ER, FT or ALT)	Sea Height (m)	Date/ Time (dd-mm-yy/ hh:mm)	Location of Discharge, Port or Lat./Long.	Volume of Ballast Discharged (m^3)	Salinity (s.g.)		Name	Signature	Rank

Ballast Water Tank Codes: Fore Peak = FP, Aft Peak = AP, Double Bottom = DB, Wing Tank = WT, Center Tank = CT, Topside Tank = TS, Cargo Hold = CH, Other = O

If exchanges were not conducted, state other control action(s) taken: _____

_____

If none, state reasons why not: _____

_____

b) Ballast Water Treatment History

If vessel does not use treatment system on ballast water, go to #5

Treatment System Treatment Method: _____

Make/Model: _____

i) Did the treatment system experience any failure/malfunction that affected the treatment of ballast water to be discharged at this arrival port?

Yes [ ], provide the following information:

Date (dd-mm-yyyy) of failure/malfunction: _____

Explain the failure/malfunction: _____

_____

If applicable, how was the situation resolved? _____

No [ ]

ii) Record all tanks that will be deballasted in port State of arrival (one tank per line); if none go to #5 (Use additional sheets as needed)

Tanks/ Holds	**Ballast Water Source**				**Ballast Water Treatment**							**Ballast Water Discharge**				Remarks	**Officer in Charge**		
	Date/ Time (dd-mm-yy/ hh:mm)	Port/ Facility or Lat./Long.	Volume of Uptake (m^3)	Temp, (°C)	Date/ Time (dd-mm-yy/ hh:mm)	End Point Lat./Long.	Volume of Ballast Exchanged (m^3)	Estimated Volume Ballast Remaining (m^3)	% Exch.	Method (ER, FT or ALT)	Sea Height (m)	Date/ Time (dd-mm-yy/ hh:mm)	Location of Discharge, Port or Lat./Long.	Volume of Ballast Discharged (m^3)	Salinity (s.g.)		Name	Signature	Rank

Ballast Water Tank Codes: Fore Peak = FP, Aft Peak = AP, Double Bottom = DB, Wing Tank = WT, Center Tank = CT, Topside Tank = TS, Cargo Hold = CH, Other = O

5. IMO BALLAST WATER GUIDELINES AND THE INTERNATIONAL CONVENTION ONBOARD Yes [ ] No [ ]

RESPONSIBLE OFFICER:

NAME ___________________________________ (PRINTED)

TITLE _____________________________________(PRINTED)

SIGNATURE _______________________________ Date _________________________

4. c Form for Ballast Water Handling Log

Name of Vessel _____ Flag _____

IMO Number _____ Call Sign _____

Date	Time	Location Port or Facility of Uptake (Port or Lat./Long.)	Estimated Volume of Uptake (in cubic meters)	Location of the Exchange Operation (Port or Lat./Long.)	Depth of Water at Exchange Location (in meters)	Estimated Volume of Ballast Water Discharged at Sea (in cubic meters	Estimated Volume of Ballast Remaining (in cubic meters)	Estimated Volume of Ballast Water Discharge in Port or Facility (in cubic meters).	Signature of Officer in Charge	Rank

Note: Any accidental or other exception uptake or discharge of Ballast Water shall also be recorded. The circumstances associated with the accidental or other exceptional uptake, discharge, escape or loss and the reason therefore and any general remarks associated with such an event shall also be recorded.

Responsible Officer

Name _____ (Printed) Title _____ (Printed)

Signature _____ Date _____

4. d Form of Narrative Record of Events Related to Ballast Water Management Onboard

Name of Vessel - R/**V Neil Armstrong**_____ IMO Number __**9688946**_____ Gross Tonnage _____

Flag _____ Total Ballast Water Capacity (in cubic meters) _____

Record events which are relevant to ballast water management and which are likely to be of interest to quarantine officers, such as sediment removal during dry-dock, or tank flushing at sea. Each entry should be completed with the signature and the rank of the officer making the entry.

Date	*Activities*	*Comments*	*Signature*

Responsible Officer

Name _____ (Printed) Title _____ (Printed)

Signature _____ Date _____

ANNEX 5 Supporting Documents

Document	Doc number	Revision
Hyde Guardian BWTS HG60 System Flow Schematic Drawing	G500148	O
R/V Armstrong Tank Sounding Tables	65411-806-02	A
Vents, Fills and Soundings	65411-506-01	C
Auxiliary Systems Diagram – Bilge Ballast Oily Waste	65411-529-01	E
Ballast/ Fire/ Bilge Pump Flow Curve AMPCO Z Series 3 x 2 – 10	N/A	N/A
Hyde Guardian@ Ballast Water Treatment System, Hyde Marine Installation and Operating Manual	G800012-001	A
Hyde Guardian@ Det Norske Veritas – Management System Certificate		
The International Convention for the Control and Management of Ship's Ballast Water and Sediments		February 2004
IMO Resolution A.868(20), Guidelines for Control and Management of Ship's Ballast Water to Minimize the Transfer of Harmful Aquatic Organism and Pathogens		
BWM.2/Circ.42 "Guidance on ballast water sampling and analysis for trial use in accordance with the BWM Convention and Guidelines (G2)		

Ballast Water Management Training Records

Insert copies of applicable documents (i.e., description of training) Refer to A5-2/17.

Name	Position/Rank	Date of Training	Trainers Name, Position/Rank, Signature

ARM 7.5.7 Quality of Potable Water

Originator:	Approved By:
Gary McGrath	Albert F. Suchy

1. Purpose

The purpose of this procedure is to set forth the guidelines for the quality of potable water aboard the R/V Armstrong.

2. References

a. Drawing 65411-532-01, Auxiliary Systems Drawing, Potable Water
b. Technical Manual – Chem-Free Water Treatment Systems Model CD-18-0/WQA

3. Responsibility

It is the responsibility of the Chief Engineer to maintain adequate potable water quality.

3. General

Armstrong is equipped with 2 independent potable water tanks with a total water capacity of 14,629 gallons. The tanks are located between frames 46 – 49 port and starboard. The tanks extend from the inner bottom, hold level to the 1st platform. The gauge glass for the port tank can be viewed in the aft outboard section of the transformer room extending down into the transducer room. The starboard gauge glass can be viewed from the aft, outboard corner of the transceiver room extending down to the transducer room.

Ozone is provided to the potable water tanks from a Chem-Free Purification Systems unit, Model CD-18-0/WQA2,
(CD – Corona Discharge, 18 – output class – approximately 14 g/h of run time). This system relies on an external source of pure oxygen for process gas as denoted by '0'. Consequently, an external oxygen concentrator OXU-85 is used. WQA stands for water quality assurance and the '2' indicates it can treat and maintain water quality in two separate holding tanks. External ozone injector booster pumps located in the transducer room draw water from a low point in the tank and returns it to a point higher in the tank. Ozone is injected into the circulating potable water. This circulation helps reduce the areas of static, untreated water. The system cycles between the two tanks to reach the required level of ozone.

It is important to regularly monitor the concentration of dissolved ozone in the potable water. Determining the level of ozone output can be measured using an Oxygen Reduction Potential (ORP) meter. Ozone concentration is measured and is expressed in mV. The World Health Organization (WHO) standard for potable water is an ORP value of at least 650 mV. This monitoring ensures that the ozone supply units are functioning as designed thereby keeping the water well dosed to kill off any harmful organisms. On Armstrong, the test is performed with a hand held ORP meter. Test strips that read in parts per million (PPM) are available for determining Ozone levels and may also be used. The conversion table is provided below:

Conversion Table for PPM of Ozone to mV:

200 – 400 millivolts = <0.06 Ozone PPM
500 – 600 millivolts = <0.15 Ozone PPM
600 – 800 millivolts = <0.4 Ozone PPM

Additionally a UV sterilizer, located in the Elec/Mech. Room on the main deck, is utilized in the potable water system prior to potable water distribution.

Perform all required periodic maintenance in accordance with ref b) and as prescribed in the shipboard maintenance system NS5.

4. Sampling and Reporting Procedure

ARM 7.5.7 Quality of Potable Water

Originator:	Approved By:
Gary McGrath	Albert F. Suchy

In accordance with ISM Procedure 7.5.7, Quality of Potable Water, a sample of water in each tank is to be tested and recorded weekly. On Armstrong, the procedure below is to be followed for each tank:

1. Secure the isolation valve at the top of the sight glass.
2. Open the bottom most petcock and allow 1 gallon of water to flow into a container.
3. Using a different container, draw and test a sample in accordance with ORP meter technical manual
4. Record the test results in NS5 in the Standard Job.
5. Open the upper isolation valve and secure the area.

ARM 7.5.8 R/V ARMSTRONG WASTE OIL- SEWAGE-TRASH

Originator:	Approved By:
Kent Sheasley	Al Suchy

1. Purpose

The purpose of this procedure is to standardize Waste Oil, Sewage and Trash stowage procedures as well as trash disposal aboard R/V Neil Armstrong.

2. Responsibility

With the knowledge and approval of the Master;

A. The Chief Engineer is responsible for waste oil management and disposal.
B. The Chief Engineer is responsible for management, treatment and disposal of sewage.
C. The Chief Mate is responsible for management, stowage and/or incinerating of trash.

3. References

A. CFR 46 Subchapter U, and applicable sections
B. RVOC Safety Training manual
C. MARPOL 73/78 and Annex V Regulations
D. R/V Neil Armstrong Waste Management Plan

4. General

When disposing of waste oil, sewage and trash on board R/V Neil Armstrong, refer to the references listed above;

A. Waste Oil – MARPOL 73/78 Regulations

1. Waste Oil Tank – Product in:

a. Main engine oil, pumped directly to waste oil tank
b. Fuel oil purifier service, @ 5 gallons
c. Various machinery sump oil and hydraulic tank oil
d. Oily Water Separator, direct discharge to waste oil tank

2. Waste Oil Tank product out:

a. Line up valves in Engine Room and Main Deck forward hanger. Discharge to the shore-based facility using Waste Oil Transfer pump.

B. Sewage – Marine Sanitation Device & Holding Tank
1. 12 miles or less from shore – grey water & sewage to MSD

C. Trash

1. Adhere to MARPOL Annex V regulations for dumping of food. All other garbage must be retained aboard for stowage or incineration.

SEE R/V Neil Armstrong Waste Management Plan

5. Reporting (See R/V Neil Armstrong Waste Management Plan)

Engineers shall record entries for waste oil in the Ship's Oil Record Book. This book shall remain in the engine room.

A Refuse Log is maintained and kept on the bridge. Permission must be obtained from the watch officer before dumping of food or incinerating of garbage is allowed in order to ensure compliance with regulations and to prevent harm to the science project.

WASTE MANAGEMENT PLAN

DESIGNATED PERSON IN CHARGE

The Master has designated the Chief Mate as the person in charge of the Waste Management Plan. As such, the Chief Mate shall develop a plan that complies with all rules and regulations governing shipboard refuse to the satisfaction of the Master. The Chief Mate shall be responsible for administering the plan and ensuring that this vessel remains in compliance at all times with regard to the discharge, burning, and record keeping of all shipboard refuse. The Waste Management Plan shall be posted in conspicuous locations throughout the vessel.

CREW AWARENESS

All crew members and science party members shall be familiar with and comply with the Waste Management Plan at all times. Any questions concerning this plan shall be addressed to the Chief Mate. Keep in mind that intentional and/or unintentional violations of federal regulations with regard to shipboard refuse could lead to significant financial fines (up to $25,000) levied against the vessel.

Each department head (Chief Mate, Chief Engineer, Chief Steward, Expedition Leader, and Chief Scientist) shall see to it that the Waste Management Plan is adhered to within their respective departments and that all federal regulations are adhered to.

The Waste Management Plan is necessary to keep Atlantis safe and sanitary. It is also required by law. Your full cooperation is expected.

ARTHUR D. COLBURN, III
MASTER, R/V ATLANTIS

R/V ATLANTIS

WASTE MANAGEMENT PLAN

1. The laws governing shipboard refuse are very clear on what and when trash can be discarded at sea. All other refuse must be either retained on board or incinerated.

2. When trash is discarded at sea, the Mate on Watch is required to log:

    - The time/s of the overboard discharge and/or incineration.
    - The type of trash incinerated, food waste overboard, and trash disposed ashore.
    - The amount of food waste overboard, trash incinerated, and trash disposed ashore.
    - The location of the ship.

    1

3. At no time shall food waste be thrown overboard unless the Mate on Watch is notified beforehand.

4. At no time shall food waste be thrown overboard during Alvin Operations or when Atlantis is within six (6) miles of a dive site.

5. Only crewmembers are authorized to discard food waste over the side.

6. The separation of shipboard refuse is imperative if Atlantis is to remain in compliance with federal regulations.

7. It is each individual's responsibility to separate his/her own trash as the mixing of trash is not permitted. This extends to any and all trash that accumulates in staterooms, labs, deck spaces, engine spaces and shop areas. There are no exceptions.

8. The fact that the ship has an incinerator onboard does not eliminate the need to separate the trash. The mixing of trash for the incinerator shall be done by the persons responsible for burning the trash. They will not be responsible for separating trash. That is each individual's responsibility.

9. Because it is standard company policy to recycle wherever practicable, any shipboard environmentally harmful anti-freeze that needs to be recycled shall be collected in DOT barrels until reaching port (preferably WHOI). The Port Office will need to be informed to contact an environmentally friendly recycling company. Once in port, the recycling company will exchange empty DOT barrels for those containing the anti-freeze to be recycled.

See the attached separation scheme and trash bin location.

TYPES OF TRASH

All trash shall be separated as follows:

Biodegradable (for disposal at sea)

- Food Waste – all food waste. (i.e. leftovers, scraps, snacks)

Burnable (to be incinerated)

- Plastics – all plastics, rubber, styrofoam, and synthetic non-biodegradable materials
- Paper – all paper products including wood

Non-Burnable: (for disposal ashore)

- Cans – all cans except paint cans, oil cans, and aerosol cans
- Glass – broken and unbroken glass of all types
- Steel

Hazardous (HazMat disposal ashore)

- Flammable Waste
- Explosives
- Dirty / Oily Rags
- Fuel / Oil Filters
- Fuel / Oil Cans
- Paint – Brushes, Cans, Roller
- Aerosol Cans

Chemical / Radioactive Waste

- All science parties are responsible for the safe storage and removal of any chemical and/or radioactive waste that they bring aboard or generate.
- A list that includes the type, location and volume of all chemicals brought on board shall be provided to the Chief Mate.
- Material safety data sheets (MSDS) for all chemicals shall also be provided to the Chief Mate.

Peter T. Leonard Jr
Chief Mate, R/V ATLANTIS

SUMMARY OF RESTRICTIONS TO THE DISCHARGE OF GARBAGE INTO THE SEA UNDER REGULATIONS 4, 5 AND 6 OF MARPOL ANNEX V

Note: The following table is intended as a summary reference. The provisions in MARPOL Annex V, not the table below, prevail.

Garbage Type [1]	All ships except platforms [4]		Offshore platforms located more than 12 nm from nearest land and ships when alongside or within 500 meters of such platforms [4] Regulation 5
	Outside special areas Regulation 4 (Distances are from the nearest land)	Within special areas Regulation 6 (Distances are from nearest land or ice-shelf)	
Food waste comminuted or ground [2]	≥ 3 nm, en route and as far as practicable	≥ 12 nm, en route and as far as practicable [3]	Discharge permitted
Food waste not comminuted or ground	≥ 12 nm, en route and as far as practicable	Discharge prohibited	Discharge prohibited
Cargo residues [5,6] not contained in wash water	≥ 12 nm, en route and as far as practicable	Discharge prohibited	Discharge prohibited
Cargo residues [5,6] contained in wash water		≥ 12 nm, en route and as far as practicable (subject to conditions in regulation 6.1.2)	
Cleaning agents and additives [6] contained in cargo hold wash water	Discharge permitted	≥ 12 nm, en route and as far as practicable (subject to conditions in regulation 6.1.2)	Discharge prohibited
Cleaning agents and additives [6] in deck and external surfaces wash water		Discharge permitted	Discharge prohibited
Animal carcasses (should be split or otherwise treated to ensure the carcasses will sink immediately)	Must be en route and as far from the nearest land as possible. Should be > 100 nm and maximum water depth	Discharge prohibited	Discharge prohibited
All other garbage including plastics, synthetic ropes, fishing gear, plastic garbage bags, incinerator ashes, clinkers, cooking oil, floating dunnage, lining and packing materials, paper, rags, glass, metal, bottles, crockery and similar refuse	Discharge prohibited	Discharge prohibited	Discharge prohibited

1 When garbage is mixed with or contaminated by other harmful substances prohibited from discharge or having different requirements, the more stringent requirements shall apply.
2 Comminuted or ground food wastes must be able to pass through a screen with mesh no larger than 25 millimeters (one inch).
3 The discharge of introduced avian products in the Antarctic area is not permitted unless incinerated, autoclaved or otherwise treated to be made sterile.
4 Offshore platforms located 12 nautical miles from nearest land and associated ships include all fixed or floating platforms engaged in exploration or exploitation or associated processing or seabed mineral resources, and all ships alongside or within 500 meters (1650 feet) of such platforms.
5 Cargo residues means only those cargo residues that cannot be recovered using commonly available methods for unloading.
6 These substances must not be harmful to the marine environment.

WASTE MANAGEMENT PLAN

DESIGNATED PERSON IN CHARGE

The Master has designated the Chief Mate as the person in charge of the Waste Management Plan. As such, the Chief Mate shall develop a plan that complies with all rules and regulations governing shipboard refuse to the satisfaction of the Master. The Chief Mate shall be responsible for administering the plan and ensuring that this vessel remains in compliance at all times with regard to the discharge, burning, and record keeping of all shipboard refuse. The Waste Management Plan shall be posted in conspicuous locations throughout the vessel.

CREW AWARENESS

All crew members and science party members shall be familiar with and comply with the Waste Management Plan at all times. Any questions concerning this plan shall be addressed to the Chief Mate. Keep in mind that intentional and/or unintentional violations of federal regulations with regard to shipboard refuse could lead to significant financial fines (up to $25,000) levied against the vessel.

Each department head (Chief Mate, Chief Engineer, Chief Steward, Expedition Leader, and Chief Scientist) shall see to it that the Waste Management Plan is adhered to within their respective departments and that all federal regulations are adhered to.

The Waste Management Plan is necessary to keep Atlantis safe and sanitary. It is also required by law. Your full cooperation is expected.

/S/ ARTHUR D. COLBURN, III
MASTER, R/V ATLANTIS

WASTE MANAGEMENT PLAN

1. The laws governing shipboard refuse are very clear on what and when trash can be discarded at sea. All other refuse must be either retained on board or incinerated.

2. When trash is discarded at sea, the Mate on Watch is required to log:

    - The time/s of the overboard discharge and/or incineration
    - The type of trash discarded and/or incinerated
    - The amount of trash discarded and/or incinerated
    - The location of the ship

    1

3. At no time shall trash be thrown overboard unless the Mate on Watch is notified beforehand.

4. At no time shall trash be thrown overboard during Alvin Operations or when Atlantis is within six (6) miles of a dive site.

5. Only crewmembers are authorized to discard trash over the side.

6. The separation of shipboard refuse is imperative if Atlantis is to remain in compliance with federal regulations.

7. It is each individual's responsibility to separate his/her own trash as the mixing of trash is not permitted. This extends to any and all trash that accumulates in staterooms, labs, deck spaces, engine spaces and shop areas. There are no exceptions.

8. The fact that the ship has an incinerator onboard does not eliminate the need to separate the trash. The mixing of trash for the incinerator shall be done by the person/s responsible for burning the trash. They will not be responsible for separating trash. That is each individual's responsibility.

9. Because it is standard company policy to recycle wherever practicable, any shipboard environmentally harmful anti-freeze that needs to be recycled shall be collected in DOT barrels until reaching port (preferably WHOI). The Port Office will need to be informed to contact an environmentally friendly recycling company. Once in port, the recycling company will exchange empty DOT barrels for those containing the anti-freeze to be recycled.

See the attached color coded separation scheme and trash bin location.

Thank you for your conscientious efforts and cooperation.

CHIEF MATE, R/V ATLANTIS

TYPES OF TRASH

All trash shall be separated as follows

Biodegradable (Green):

- Paper – all paper products including wood
- Food Waste – all food waste. (i.e. leftovers, scraps, snacks)
- Cans – all cans except paint cans, oil cans, and aerosol cans
- Glass – broken and unbroken glass of all types

Plastics (Blue):

- Plastics – all plastics, rubber, styrofoam, and synthetic non biodegradable materials

Hazardous (Red):

- Flammable Waste
- Explosives
- Dirty / Oily Rags
- Fuel / Oil Filters
- Fuel / Oil Cans
- Paint – Brushes, Cans, Roller
- Aerosol Cans

Chemical / Radioactive Waste (Yellow):

- All science parties are responsible for the safe storage and removal of any chemical and/or radioactive waste that they bring aboard or generate.
- A list that includes the type, location and volume of all chemicals brought on board shall be provided to the Chief Mate.
- Material safety data sheets (MSDS) for all chemicals shall also be provided to the Chief Mate.

CHIEF MATE, R/V ATLANTIS

ARM 8.10 R/V Armstrong Hazmat Spills/Clean-up

Originator:	Approved By:
Kent Sheasley	Al Suchy

1 Purpose

The purpose of this procedure is to set forth the guidelines for handling hazardous materials on board R/V Armstrong.

2. Responsibility

It is the responsibility of the Master to see that all Hazardous Materials (HazMats) are properly handled, stowed and marked in compliance with CFR and DOT regulations. Within the scope of the regulations, the Chief Scientist may supervise the embarked science party in laboratory safety and the chemical storeroom with the knowledge and approval of the Master. The Primary Investigator (PI) using isotopes is responsible to see that all safety precautions are observed. The Chief Engineer is responsible for the transfer of fuel oil per CFR and the SOPEP guide. The Chief Mate will serve as the safety and compliance officer for the vessel.

3. References

SMM Procedure 7.8.4 HazMat Operations

4. General

All hazardous materials shall have a Material Safety Data Sheet (MSDS) on board. Chemicals shall be stored in the appropriate storeroom as defined in 46CFR194.20 and in compliance with recommended compatibility segregation standards. The quantity of chemicals for use in the laboratory shall comply with guidelines set forth in 46CFR194.05. Laboratory safety and protocol has been established in the WHOI Safety Manual while the use of isotopes is incorporated in the Isotope User's Manual. Ship's hazardous stores must be stowed in compliance with 46CFR147 and 49CFR171, 172, and 176.

Response to a HazMat incident will be under the supervision and direction of the Chief Mate. The Chief Mate shall ensure that appropriate response equipment and supplies are available and that personnel have been briefed on the proper clean-up and waste disposal methods.

5. Procedure for HazMat spills and clean-up

A. Upon declaration of a spill or incident:
   1. Evacuate the space immediately
   2. Secure all lab operations
   3. Notify the bridge
   4. Call out the response team
   5. Secure the perimeter
   6. Close all doors/ports

7. Secure all ventilation systems

B. Take precautions to eliminate ignition if applicable.

C. Attend to any injuries.
   1. Consult MSDS for procedures.
   2. First aid, emergency eyewash/shower
   3. Remove contaminated clothing etc.
   4. If necessary, continue with call to MAS (Medical Health Provider via SAT communications/cell/radio.)

D. Call 800 number/Chemical Response Center/USCG/ other agencies (as required) for HazMat involved.
   1. Fill out HazMat report while info is current (form to be generated and provided to all ships in compliance with all applicable requirements).

E. Commence cleanup procedures, complete reports, monitor injuries/illness

F. Continue procedures as directed by health authorities.

G. Once the situation is stabilized, an investigation must be conducted to determine the cause and what measures are to be taken to prevent re-occurrence.

All HazMat residues, cleanup materials and contaminated items shall be placed in approved HazMat containers or bags prior to approved disposal. The Port Office shall make arrangements with an approved shore side disposal unit either locally or thru the ship's agent. Proper documentation from the disposal unit must be maintained in order to show evidence of receipt and proper disposal of contaminated materials.

5. **Records**

- Material Safety Data Sheets (MSDS) will be on board for on all chemicals that are classified as hazardous. The Port Office will provide current MSDS in CD-Rom form.