MARITIME AND PORT AUTHORITY OF SINGAPORE
SHIPPING CIRCULAR
NO. 3 OF 2018

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Applicable to: Shipowners, shipmanagers, operators, agents and masters of Singapore-registered ships

RESOLUTIONS ADOPTED BY THE 70TH AND 71st SESSION OF THE MARITIME ENVIRONMENT PROTECTION COMMITTEE (MEPC 70 AND MEPC 71) OF THE IMO

1. This circular informs the Shipping Community of the resolutions adopted by MEPC 70 and MEPC 71[1] and urges the shipping community to prepare the implementation of these resolutions

2. The details of the resolutions can be found in the MEPC 70 and MEPC 71 final reports which is available from the MPA website.

3. The mandatory resolutions adopted by **MEPC 70** include the following:

a. Resolution MEPC.276(70) - **Amendments to Annex I of MARPOL 73/78**

*This resolution amends Form B of the IOPP Certificate relating to dedicated Clean Ballast Tanks (CBTs) and Segregated Ballast Tanks (SBTs). The amendments to MARPOL Annex I will enter into force on **1 March 2018**, and will be given effect through amendments to the Prevention of Pollution of the Sea (Oil) Regulations.*

b. Resolution MEPC.277(70) - **Amendments to Annex V of MARPOL 73/78**

This resolution amends MARPOL Annex V to take into consideration the criteria for the classification of substances that are harmful to the marine environment (HME). The form of garbage record book is also amended to provide for the record of cargo residue and e-waste disposal. The

[1] The 70th and 71st session of Maritime Environment Protection Committee (MEPC 70 and MEPC 71) was held in IMO headquarter on 24 to 28 October 2016 and 03 to 07 July 2017 respectively.

*amendments to MARPOL Annex V will enter into force on **1 March 2018**, and will be given effect through amendments to the Prevention of Pollution of the Sea (Garbage) Regulations.*

c. Resolution MEPC.278(70) - **Amendments to Annex VI of MARPOL 73/78**

*The resolution amends MARPOL Annex VI to mandate the data collection and reporting of ship fuel oil consumption data, revision of ship energy efficiency management plan (SEEMP) and issuance of a Statement of Compliance related to fuel oil consumption. The amendments to MARPOL Annex VI will enter into force on **1 March 2018**, and will be given effect through amendments to the Prevention of Pollution of the Sea (Air) Regulations.*

4. **MEPC 70** also adopted the following resolutions:

a. Resolution MEPC.279(70) - **2016 Guidelines For Approval of Ballast Water Management Systems (G8).**

This resolution is intended for the approval of ballast water management systems in order to access whether the systems meet the D-2 standards of the BWM Convention.

The 2016 guidelines superseded the Guidelines for approval of ballast water management systems (G8) adopted by Resolution MEPC.174(58).

b. Resolution MEPC.280(70) - **Effective Date of Implementation of the Fuel Oil Standard in Regulation 14.1.3 of MARPOL Annex VI.**

This resolution notify shipowners, ship operators, refinery industries and any other interested groups on the decision made by MEPC 70 that the fuel oil standard in regulation 14.1.3 of MARPOL Annex VI shall become effective on 1 January 2020.

c. Resolution MEPC.281(70) - **Amendments to the 2014 Guidelines on the Method of Calculation of the Attained Energy Efficiency Design Index (EEDI) for New Ships (Resolution MEPC.245(66), as amended by Resolution MEPC.263(68)).**

This resolution adopted amendments to the method of calculating EEDI for new ships fitted with dual fuel main or auxiliary engines and correction factor (fc) for bulk carriers designed to carry light cargoes.

d. Resolution MEPC.282(70) - **2016 Guidelines for the development of a Ship Energy Efficiency Management Plan (SEEMP).**

The resolution adopts the 2016 guidelines developed to assist with the preparation of the Ship Energy Efficiency Management Plan (SEEMP) required by regulation 22 and regulation 22A of MARPOL Annex VI.

The 2016 guidelines superseded the 2012 guidelines adopted by Resolution MEPC.213(63).

e. Resolution MEPC.283(70) - **Designation of the Jomard Entrance as a Particularly Sensitive Sea Area.**

The Resolution designates the region surrounding Jomard Entrance as a Particularly Sensitive Sea Area.
The Maritime Safety Committee at its ninety-fourth session adopted mandatory routeing systems (four two-way routes and a precautionary area) as the Associated Protective Measures and these routeing systems had entered into force on 1 June 2015.

f. Resolution MEPC.284(70) - **Amendments to the 2012 Guidelines on Implementation of Effluent Standards and Performance Tests for Sewage Treatment Plants (Resolution MEPC.227(64).**

This resolution amended the 2012 Guidelines to align the relevant provisions of MARPOL Annex IV and the effective date of the Baltic Sea Special Area.

g. Resolution MEPC.285(70) - **Amendments to the Revised Guidelines and Specifications for Pollution Prevention Equipment for Machinery Space Bilges of Ships (Resolution MEPC.107(49)).**

This resolution adopted amendments related to checking the accuracy of 15 ppm bilge alarms of ships.

5. The mandatory resolution adopted by **MEPC 71** includes the following:

a. Resolution MEPC.286(71) - **Amendments to MARPOL Annex VI.**

*The resolution adopts amendments to regulation 13 (Nitrogen Oxide) to designate the Baltic Sea and the North Sea as the Emission Control Areas for NOx Tier III and appendix V (format of the bunker delivery note) for the information to be included in the bunker delivery note .The amendments will enter into force on **1 January 2019**, and will be given effect through amendments to the Prevention of Pollution of the Sea (Air) Regulations.*

6. **MEPC 71** also adopted the following resolutions:

a. Resolution MEPC.287(71) - **Implementation of the BWM Convention.**

The resolution relates to MEPC 71 approved draft amendments to regulation B-3 (Installation Timeline) of the BWM Convention. The draft amendments is detailed in annex 2 of document MEPC 71/17 and pending adoption in MEPC 72. This resolution supersedes resolution A.1088(28) on Application of the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004

b. Resolution MEPC.288(71) - **2017 Guidelines for Ballast Water Exchange (G6).**

The resolution adopts the 2017 guidelines with the purpose to provide shipowners and operators with general guidance on the development of ship specific procedures for conducting ballast water exchange. The 2017 guidelines revokes the guidelines adopted by Resolution MEPC.124(53).

c. Resolution MEPC.289(71) - **2017 Guidelines for Risk Assessment under Regulation A-4 of the BWM Convention (G7).**

The resolution adopts the 2017 G7 guidelines with the purpose to assist Parties to ensure that the provisions of regulation A-4 of the BWM Convention are applied in a consistent manner and based on scientifically robust risk assessment, which ensures that the general and specific obligations of a Party to the Convention are achieved. The 2017 guidelines supersedes the guidelines for risk assessment under regulation A-4 of the BWM Convention (G7) adopted by resolution MEPC.162 (56).

d. Resolution MEPC.290(71) - **The Experience-Building Phase Associated with the BWM Convention.**

The resolution adopts an experience-building phase complementary to the "Roadmap" for the implementation of the BWM Convention and "non-penalization" of a ship due to exceeding of the ballast water performance standard described in regulation D-2 of the Convention.

e. Resolution MEPC.291(71) - **2017 Guidelines Addressing Additional Aspects of the NOx Technical Code 2008 with Regard to Particular Requirements Related to Marine Diesel Engines Fitted with Selective Catalytic Reduction (SCR) Systems.**

The resolution adopted the 2017 guidelines that provides guidance in addition to the requirements of the NTC 2008 for design, testing, surveys and certification of marine diesel engines fitted with an SCR system to ensure its compliance with the requirements of regulation 13 of MARPOL Annex VI.

The 2017 guidelines superseded the 2011 Guidelines adopted by Resolution MEPC.198(62) and amended by resolution MEPC.260(68).

f. Resolution MEPC.292(71) - **2017 Guidelines for Administration Verification of Ship Fuel Oil Consumption Data.**

Regulation 22A of MARPOL Annex VI establishes the IMO Ship Fuel Oil Consumption Database, to be administered by the Organization, to which each Administration will submit relevant data for their registered ships of 5,000 gross tonnage (GT) and above. Regulation 22A.7 specifies that "the data shall be verified according to procedures established by the Administration, taking into account guidelines to be developed by the Organization". The resolution adopted the 2017 guidelines to assist Administrations in developing their own verification programme.

g. Resolution MEPC.293(71) - **2017 Guidelines for the Development and Management of the IMO Ship Fuel Oil Consumption Database**

The resolution adopts the 2017 guidelines that provide guidance on the development and management of the IMO Ship Fuel Oil Consumption Database (hereafter "the database"), and describe methods that will be used to anonymize ship data for use by Parties, in accordance with regulation 22A of MARPOL Annex VI, and to ensure the completeness of the database.

h. Resolution MEPC.294(71) - **Designation of the Tubbataha Reefs Natural Park as a Particularly Sensitive Sea Area**

*The resolution designated the region surrounding Tubbataha Reefs Natural Park as a Particularly Sensitive Sea Area. The Maritime Safety Committee, at its ninety-eighth session, adopted the establishment of an area to be avoided as an Associated Protective Measure for the "Tubbataha Reefs Natural Park Particularly Sensitive Sea Area (PSSA) in the Sulu Sea" (SN.1/Circ.335). This routeing measure will be implemented on **1 January 2018.***

i. Resolution MEPC.295(71) - **2017 Guidelines for the Implementation of MARPOL Annex V**

The resolution adopted the 2017 guidelines to align the amendments of MARPOL Annex V, and relevant requirements of the International Code for ships operating in polar waters (Polar Code), adopted by resolution MEPC.264(68).

The 2017 guidelines revokes the 2012 Guidelines for the implementation of MARPOL Annex V adopted by resolution MEPC.219(63), as amended by resolution MEPC.239(65).

7. In addition to the adoption of resolutions, the following Unified Interpretations (UI) of MARPOL was also approved by **MEPC 70** and **MEPC 71**:

a. MEPC.1/Circ.867 – Unified Interpretations of Regulations 1.24, 12, 27 and 28.3.3 of MARPOL Annex I

b. MEPC.1/Circ.872 – Unified Interpretations of Regulations 1.23 and 36.2.10 of MARPOL Annex I

8. The Unified Interpretations (UI) listed in paragraph 7 are acceptable to MPA and should be applied with immediate effect.

10. Any queries relating to this circular should be directed to Mr Ho Sin Gian (Tel: 6375 2424) and Mr Princet Ang (Tel: 6375 6259).

CAPT DAKNASH GANASEN
DIRECTOR OF MARINE
MARITIME AND PORT AUTHORITY OF SINGAPORE

ANNEX 1

RESOLUTION MEPC.276(70)
(Adopted on 28 October 2016)

AMENDMENTS TO THE ANNEX OF THE INTERNATIONAL CONVENTION FOR THE PREVENTION OF POLLUTION FROM SHIPS, 1973, AS MODIFIED BY THE PROTOCOL OF 1978 RELATING THERETO

Amendments to MARPOL Annex I

(Form B of the Supplement to the International Oil Pollution Prevention Certificate)

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

RECALLING Article 38(a) of the Convention on the International Maritime Organization concerning the functions of the Marine Environment Protection Committee conferred upon it by international conventions for the prevention and control of marine pollution from ships,

NOTING article 16 of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL), which specifies the amendment procedure and confers upon the appropriate body of the Organization the function of considering and adopting amendments thereto,

HAVING CONSIDERED, at its seventieth session, proposed amendments to appendix II of MARPOL Annex I concerning the Supplement to the International Oil Pollution Prevention Certificate,

1 ADOPTS, in accordance with article 16(2)(d) of MARPOL, amendments to appendix II of MARPOL Annex I, the text of which is set out in the annex to the present resolution;

2 DETERMINES, in accordance with article 16(2)(f)(iii) of MARPOL, that the amendments shall be deemed to have been accepted on 1 September 2017 unless prior to that date, not less than one third of the Parties or Parties the combined merchant fleets of which constitute not less than 50% of the gross tonnage of the world's merchant fleet, have communicated to the Organization their objection to the amendments;

3 INVITES the Parties to note that, in accordance with article 16(2)(g)(ii) of MARPOL, the said amendments shall enter into force on 1 March 2018 upon their acceptance in accordance with paragraph 2 above;

4 REQUESTS the Secretary-General, for the purposes of article 16(2)(e) of MARPOL, to transmit certified copies of the present resolution and the text of the amendments contained in the annex to all Parties to MARPOL;

5 REQUESTS FURTHER the Secretary-General to transmit copies of the present resolution and its annex to Members of the Organization which are not Parties to MARPOL.

ANNEX

AMENDMENTS TO MARPOL ANNEX I
(Form B of the Supplement to the International Oil Pollution Prevention Certificate)

ANNEX I

REGULATIONS FOR THE PREVENTION OF POLLUTION BY OIL

Appendix II

Form of IOPP Certificate and Supplements

Form B of the Supplement to the International Oil Pollution Prevention Certificate

RECORD OF CONSTRUCTION AND EQUIPMENT FOR OIL TANKERS

Section 1 – Particulars of ship

1 Paragraphs 1.11.8 and 1.11.9 are deleted.

Section 5 – Construction (regulations 18, 19, 20, 21, 22, 23, 26, 27, 28 and 33)

2 Paragraph 5.1 is replaced with the following:

"5.1 In accordance with the requirements of regulation 18, the ship is qualified as a segregated ballast tanker in compliance with regulation 18.9 ……□"

3 Existing paragraphs 5.1.1 to 5.1.6 are deleted.

4 Paragraph 5.2 is replaced with the following:

"5.2 Segregated ballast tanks (SBT) in compliance with regulation 18 are distributed as follows:

Tank	Volume (m^3)	Tank	Volume (m^3)
		Total volume……..……..m^3	

"

5 Existing paragraphs 5.2.1 to 5.2.3, 5.3 and 5.3.1 to 5.3.5 are deleted.

6 Existing paragraphs 5.4 and 5.4.1 to 5.4.4 are renumbered as 5.3 and 5.3.1 to 5.3.4.

7 Existing paragraphs 5.5 and 5.5.1 to 5.5.2 are deleted.

8 All subsequent paragraphs in section 5 are renumbered accordingly.

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ANNEX 2

RESOLUTION MEPC.277(70)
(Adopted on 28 October 2016)

AMENDMENTS TO THE ANNEX OF THE INTERNATIONAL CONVENTION FOR THE PREVENTION OF POLLUTION FROM SHIPS, 1973, AS MODIFIED BY THE PROTOCOL OF 1978 RELATING THERETO

Amendments to MARPOL Annex V

(HME substances and Form of Garbage Record Book)

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

RECALLING Article 38(a) of the Convention on the International Maritime Organization concerning the functions of the Marine Environment Protection Committee conferred upon it by international conventions for the prevention and control of marine pollution from ships,

NOTING article 16 of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL), which specifies the amendment procedure and confers upon the appropriate body of the Organization the function of considering and adopting amendments thereto,

HAVING CONSIDERED, at its seventieth session, proposed amendments to MARPOL Annex V concerning substances that are harmful to the marine environment (HME) and Form of Garbage Record Book,

1 ADOPTS, in accordance with article 16(2)(d) of MARPOL, amendments to MARPOL Annex V, the text of which is set out in the annex to the present resolution;

2 DETERMINES, in accordance with article 16(2)(f)(iii) of MARPOL, that the amendments shall be deemed to have been accepted on 1 September 2017 unless prior to that date, not less than one third of the Parties or Parties the combined merchant fleets of which constitute not less than 50% of the gross tonnage of the world's merchant fleet, have communicated to the Organization their objection to the amendments;

3 INVITES the Parties to note that, in accordance with article 16(2)(g)(ii) of MARPOL, the said amendments shall enter into force on 1 March 2018 upon their acceptance in accordance with paragraph 2 above;

4 REQUESTS the Secretary-General, for the purposes of article 16(2)(e) of MARPOL, to transmit certified copies of the present resolution and the text of the amendments contained in the annex to all Parties to MARPOL;

5 REQUESTS FURTHER the Secretary-General to transmit copies of the present resolution and its annex to Members of the Organization which are not Parties to MARPOL.

ANNEX 5

RESOLUTION MEPC.279(70)
(Adopted on 28 October 2016)

2016 GUIDELINES FOR APPROVAL OF BALLAST WATER MANAGEMENT SYSTEMS (G8)

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

RECALLING Article 38(a) of the Convention on the International Maritime Organization concerning the functions of the Marine Environment Protection Committee conferred upon it by the international conventions for the prevention and control of marine pollution from ships,

RECALLING ALSO that the International Conference on Ballast Water Management for Ships held in February 2004 adopted the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (the Ballast Water Management Convention) together with four conference resolutions,

NOTING that regulation D-3 of the annex to the Ballast Water Management Convention provides that ballast water management systems used to comply with the Convention must be approved by the Administration, taking into account the guidelines developed by the Organization,

NOTING ALSO resolution MEPC.125(53) by which the Committee adopted the *Guidelines for approval of ballast water management systems* (the Guidelines (G8)), and resolution MEPC.174(58), by which the Committee adopted a revision to the Guidelines (G8),

NOTING FURTHER that, by resolution MEPC.174(58), the Committee resolved to keep Guidelines (G8) under review in the light of experience gained,

RECALLING the provisions for non-penalization of early movers contained in the *Roadmap for the implementation of the BWM Convention,* agreed at its sixty-eighth session (MEPC 68/WP.8, annex 2),

NOTING the Organization's established practice with regard to the validity of type approval certification for marine products (MSC.1/Circ.1221) that the Type Approval Certificate itself has no influence on the operational validity of existing ballast water management systems accepted and installed on board a ship and manufactured during the period of validity of the relevant Type Approval Certificate, meaning that the system need not be renewed or replaced due to expiration of such Certificate,

HAVING CONSIDERED, at its seventieth session, the outcome of the Intersessional Working Group on the Review of Guidelines (G8),

1 ADOPTS the *2016 Guidelines for approval of ballast water management systems* (G8), as set out in the annex to this resolution (the 2016 Guidelines (G8));

2 AGREES to keep the 2016 Guidelines (G8) under review in the light of experience gained with their application;

3 RECOMMENDS that Administrations apply the 2016 Guidelines (G8) when approving ballast water management systems as soon as possible, but not later than 28 October 2018;

4 AGREES that ballast water management systems installed on ships on or after 28 October 2020 should be approved taking into account the 2016 Guidelines (G8);

5 AGREES that ballast water management systems installed on board ships prior to 28 October 2020 should be approved taking into account either the Guidelines (G8) as adopted by resolution MEPC.174(58), or preferably the 2016 Guidelines (G8) set out in the annex to this resolution;

6 AGREES that, for the purpose of operative paragraphs 4 and 5 of this resolution, the word "installed" means the contractual date of delivery of the ballast water management system to the ship. In the absence of such a date, the word "installed" means the actual date of delivery of the ballast water management system to the ship;

7 AGREES that the dates referenced in this resolution will be considered in the reviews carried out in accordance with regulation D-5 of the Ballast Water Management Convention, to determine whether a sufficient number of appropriate technologies are approved and available, taking into account the 2016 Guidelines (G8);

8 SUPERSEDES the *Guidelines for approval of ballast water management systems* (G8) adopted by resolution MEPC.174(58).

ANNEX

2016 GUIDELINES FOR APPROVAL OF BALLAST WATER MANAGEMENT SYSTEMS (G8)

Contents

2016 GUIDELINES FOR APPROVAL OF BALLAST WATER MANAGEMENT SYSTEMS (G8)

1 INTRODUCTION

General

1.1 The 2016 Guidelines for approval of ballast water management systems (G8) are aimed primarily at Administrations, or their designated bodies, in order to assess whether ballast water management systems meet the standard as set out in regulation D-2 of the "International Convention for the Control and Management of Ships' Ballast Water and Sediments," hereafter referred to as "the Convention". In addition, these guidelines can be used as guidance for manufacturers and shipowners on the evaluation procedure that equipment will undergo and the requirements placed on ballast water management systems. These Guidelines should be applied in an objective, consistent and transparent way and their application should be evaluated periodically by the Organization.

1.2 Articles and regulations referred to in these Guidelines are those contained in the Convention.

1.3 The Guidelines include general requirements concerning design and construction, technical procedures for evaluation, the procedure for issuance of the Type Approval Certificate of the ballast water management system, and reporting to the Organization.

1.4 These Guidelines are intended to fit within an overall framework for evaluating the performance of systems that includes the experimental shipboard evaluation of prototype systems under the provisions of regulation D-4, approval of ballast water management systems and associated systems that comply fully with the requirements of the Convention, and port State control sampling for compliance under the provisions of article 9 of the Convention.

1.5 The requirements of regulation D-3 stipulate that ballast water management systems used to comply with the Convention must be approved by the Administration, taking into account these Guidelines. In addition to such ballast water management system approval, as set forth in regulation A-2 and regulation B-3, the Convention requires that discharges of ballast water from ships must meet the regulation D-2 performance standard on an on-going basis. Approval of a system is intended to screen-out management systems that would fail to meet the standards prescribed in regulation D-2 of the Convention. Approval of a system, however, does not ensure that a given system will work on all ships or in all situations. To satisfy the Convention, a discharge must comply with the D-2 standard throughout the life of the ship.

1.6 The operation of ballast water management systems should not impair the health and safety of the ship or personnel, nor should it present any unacceptable harm to the environment or to public health.

1.7 Ballast water management systems are required to meet the standards of regulation D-2 and the conditions established in regulation D-3 of the Convention. These Guidelines serve to evaluate the safety, environmental acceptability, practicability and biological effectiveness of the systems designed to meet these standards and conditions. The cost effectiveness of type-approved equipment will be used in determining the need for revisions of these Guidelines.

1.8 These Guidelines contain recommendations regarding the design, installation, performance, testing, environmental acceptability and approval of ballast water management systems.

1.9 To achieve consistency in its application, the approval procedure requires that a uniform manner of testing, analysis of samples, and evaluation of results is developed and applied. These Guidelines should be applied in an objective, consistent, and transparent way; and their suitability should be periodically evaluated and revised as appropriate by the Organization. New versions of these Guidelines should be duly circulated by the Organization. Due consideration should be given to the practicability of the ballast water management systems.

Goal and purpose

1.10 The goal of these Guidelines is to ensure uniform and proper application of the standards contained in the Convention. As such the Guidelines are to be updated as the state of knowledge and technology may require.

1.11 The purpose of these Guidelines is to provide a uniform interpretation and application of the requirements of regulation D-3 and to:

.1 define test and performance requirements for the approval of ballast water management systems;

.2 assist Administrations in determining appropriate design, construction and operational parameters necessary for the approval of ballast water management systems;

.4 provide guidance to Administrations, equipment manufacturers and shipowners in determining the suitability of equipment to meet the requirements of the Convention and of the environmental acceptability of treated water; and

.5 assure that ballast water management systems approved by Administrations are capable of achieving the standard of regulation D-2 in land-based and shipboard evaluations and do not cause unacceptable harm to the ship, crew, the environment or public health.

Applicability

1.12 These Guidelines apply to the approval of ballast water management systems in accordance with the Convention.

1.13 These Guidelines apply to ballast water management systems intended for installation on board all ships required to comply with regulation D-2.

2 BACKGROUND

2.1 The requirements of the Convention relating to approval of ballast water management systems used by ships are set out in regulation D-3.

2.2 Regulation D-2 stipulates that ships meeting the requirements of the Convention by meeting the ballast water performance standard must discharge:

.1 less than 10 viable organisms per cubic metre greater than or equal to 50 micrometres in minimum dimension;

.2 less than 10 viable organisms per millilitre less than 50 micrometres in minimum dimension and greater than or equal to 10 micrometres in minimum dimension; and

.3 less than the following concentrations of indicator microbes, as a human health standard:

.1 Toxicogenic *Vibrio cholerae* (serotypes O1 and O139) with less than 1 Colony Forming Unit (cfu) per 100 millilitres or less than 1 cfu per 1 gramme (wet weight) of zooplankton samples;

.2 *Escherichia coli* less than 250 cfu per 100 millilitres; and

.3 Intestinal Enterococci less than 100 cfu per 100 millilitres.

3 DEFINITIONS

For the purpose of these Guidelines:

3.1 *Active Substance* means a substance or organism, including a virus or a fungus, that has a general or specific action on or against harmful aquatic organisms and pathogens.

3.2 *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. The BWMS includes ballast water treatment equipment, all associated control equipment, piping arrangements as specified by the manufacturer, control and monitoring equipment and sampling facilities. For the purpose of these guidelines, BWMS does not include the ship's ballast water fittings, which may include piping, valves, pumps, etc., that would be required if the BWMS was not fitted.

3.3 *Ballast water management plan* means the document referred to in regulation B-1 of the Convention describing the ballast water management process and procedures implemented on board individual ships.

3.4 *Control and monitoring equipment* means the equipment installed for the effective operation and control of the BWMS and the assessment of its effective operation.

3.5 *The Convention* means the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004.

3.6 *Failed test cycle* is a valid test cycle in which the performance of the BWMS resulted in treated water that is determined to be non-compliant with the standard set within regulation D-2. A failed test cycle interrupts the required consecutive test cycles and terminates the test.

3.7 *Invalid test cycle* is a test cycle in which, due to circumstances outside the control of the BWMS, the requirements for a valid test cycle are not met. When a test cycle is invalid, it does not count as one of the required consecutive test cycles in a test and the test can be continued.

3.8 *Land-based testing* means a test of the BWMS carried out in a laboratory, equipment factory or pilot plant including a moored test barge or test ship, according to Parts 2 and 3 of the annex to these Guidelines, to confirm that the BWMS meets the standard described in regulation D-2 of the Convention.

3.9 *Major components* means those components that directly affect the ability of the system to meet the ballast water performance standard described in regulation D-2.

3.10 *Representative sampling* means sampling that reflects the relative concentrations (chemicals) and numbers and composition of the populations (organisms) in the volume of interest. Samples should be taken in a time-integrated manner and the sampling facility should be installed in accordance with the annex, Part 1 of the *Guidelines on ballast water sampling* (G2).

3.11 *Sampling facilities* refers to the means provided for sampling treated or untreated ballast water as needed in these Guidelines and in the *Guidelines for ballast water sampling (G2)* developed by the Organization.

3.12 *Shipboard testing* means a full-scale test of a complete BWMS carried out on board a ship according to Part 2 of the annex to these Guidelines, to confirm that the system meets the standards set by regulation D-2 of the Convention.

3.13 *Successful test cycle* means a valid test cycle where the BWMS functions to its specifications and treated water is determined to meet the performance standard described in regulation D-2.

3.14 *System Design Limitations* of a BWMS means the water quality and operational parameters, determined in addition to the required type approval testing parameters, that are important to its operation, and, for each such parameter, a low and/or a high value for which the BWMS is designed to achieve the performance standard of regulation D-2. The System Design Limitations should be specific to the processes being employed by the BWMS and should not be limited to parameters otherwise assessed as part of the type approval process. The System Design Limitations should be identified by the manufacturer and validated under the supervision of the Administration in accordance with these Guidelines.

*3.*15 *Test cycle* refers to one testing iteration (to include uptake, treatment, holding and discharge as appropriate) under a given set of requirements used to establish the ability of a BWMS to meet the set standards.

3.16 *Test* means the set of required test cycles.

3.17 *Treatment Rated Capacity (TRC)* means the maximum continuous capacity expressed in cubic metres per hour for which the BWMS is type approved. It states the amount of ballast water that can be treated per unit time by the BWMS to meet the standard in regulation D-2 of the Convention. The TRC is measured at the inlet of the BWMS.

3.18 *Valid test cycle* means a test cycle in which all the required test conditions and arrangements, including challenge conditions, test control, and monitoring arrangements (including piping, mechanical and electrical provisions) and test analytical procedures were achieved by the testing organisation

3.19 *Viable organisms* mean organisms that have the ability to successfully generate new individuals in order to reproduce the species.

4 TECHNICAL SPECIFICATIONS

4.1 This section details the general technical requirements which a BWMS should meet in order to obtain type approval.

General principles for operation

4.2 A BWMS should be effective in meeting the D-2 standard on short voyages and long voyages (i.e. short and long intervals between treatment and discharge), regardless of temperature, unless the system is intentionally constructed for use in specific waters.

4.3 Ballast water discharged following treatment should be safe for the environment on short voyages and long voyages (i.e. short and long intervals between treatment and discharge), regardless of temperature.

4.4 The design of the BWMS should account for the fact that, regardless of the BWMS technology employed, viable organisms remaining after treatment may reproduce in the interval between treatment and discharge.

Ballast water management systems

4.5 The BWMS should be designed and constructed:

.1 for robust and suitable operation in the shipboard environment;

.2 for the service for which it is intended;

.3 to mitigate any danger to persons on board when installed. Equipment that could emit dangerous gases/liquids shall have at least two independent means of detection and shutdown of the BWMS (i.e. hazardous gas level reaching lower explosive limits (LEL) or level of toxic concentrations that can result in severe effects on human health); and

.4 with materials compatible for the substances used, purpose which it is intended, the working conditions to which it will be subjected and the environmental conditions on board.

4.6 The BWMS should not contain or use any substance of a dangerous nature, unless adequate risk mitigation measures are incorporated for storage, application, installation, and safe handling, acceptable to the Administration.

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

4.8 All working parts of the BWMS that are liable to wear or to be damaged should be easily accessible for maintenance. The routine maintenance of the BWMS and troubleshooting procedures should be clearly defined by the manufacturer in the operation, maintenance and safety manual. All maintenance and repairs should be recorded.

4.9 To avoid interference with the BWMS, the following items should be included:

.1 every access of the BWMS beyond the essential requirements of paragraph 4.8, should require the breaking of a seal;

.2 if applicable, the BWMS should be so constructed that a visual indication is always activated whenever the BWMS is in operation for purposes of cleaning, calibration, or repair, and these events should be recorded by the control and monitoring equipment; and

.3 the BWMS should be provided with the necessary connections to ensure that any bypass of the BWMS will activate an alarm, and that the bypass event is recorded by the control and monitoring equipment.

4.10 Facilities should be provided for checking, at the renewal surveys and according to the manufacturer's instructions, the performance of the BWMS components that take measurements. A calibration certificate certifying the date of the last calibration check, should be retained on board for inspection purposes. Only the manufacturer or persons authorized by the manufacturer should perform the accuracy checks.

4.11 The BWMS should be provided with simple and effective means for its operation and control. It should be provided with a control system that should be such that the services needed for the proper operation of the BWMS are ensured through the necessary arrangements.

4.12 The BWMS should, if intended to be fitted in hazardous area locations, comply with the relevant safety regulations for such spaces. Any electrical equipment that is part of the BWMS should be based in a non-hazardous area, or should be certified by the Administration as safe for use in a hazardous area. Any moving parts, which are fitted in hazardous areas, should be arranged so as to avoid the formation of static electricity.

4.13 The BWMS should not endanger the health and safety of the crew, interact negatively with the ship's systems and cargo or produce any adverse environmental effects. The BWMS should not create long term impacts on the safety of the ship and crew through corrosive effects in the ballast system and other spaces.

4.14 It should be demonstrated by using mathematical modelling and/or calculations, that any up or down scaling of the BWMS will not affect the functioning and effectiveness on board a ship of the type and size for which the equipment will be certified. In doing so, the manufacturer of the equipment should take into account the relevant guidance developed by the Organization.

4.15 Scaling information should allow the Administration to verify that any scaled model is at least as robust as the land-based-tested model. It is the responsibility of the Administration to verify that the scaling used is appropriate for the operational design of the BWMS.

4.16 At a minimum, the shipboard test unit should be of a capacity that allows for further validation of the mathematical modelling and/or calculations for scaling, and preferably selected at the upper limit of the rated capacity of the BWMS, unless otherwise approved by the Administration.

Control and monitoring equipment

4.17 Administrations should ensure that type approved BWMS have a suitable control and monitoring system that will automatically monitor and record sufficient data to verify correct operation of the system. The control and monitoring equipment should record the proper functioning or failure of the BWMS. Where practical, system design limitation parameters should be monitored and recorded by the BWMS to ensure proper operation.

4.18 The BWMS should incorporate control equipment that automatically monitors and adjusts necessary treatment dosages or intensities or other aspects of the BWMS of the ship, which while not directly affecting treatment, are nonetheless required for proper administration of the necessary treatment.

4.19 The equipment should be able to produce (e.g. display, print or export) a report of the applicable self-monitoring parameters in accordance with Part 5 of the annex for official inspections or maintenance, as required.

4.20 To facilitate compliance with regulation B-2, the control and monitoring equipment should also be able to store data for at least 24 months, In the event the control and monitoring equipment is replaced, means should be provided to ensure the data recorded prior to replacement remains available on board for 24 months.

4.21 For BWMS that could emit dangerous gases, a means of gas detection by redundant safety systems is to be fitted in the space of the BWMS, and an audible and visual alarm is to be activated at a local area and at a manned BWMS control station in case of leakage. The gas detection device is to be designed and tested in accordance with IEC 60079-29-1, or other recognized standards acceptable to the Administration. Monitoring measures for dangerous gases with independent shutdown is to be provided on the BWMS.

4.22 All software changes introduced to the system after the pre-test evaluation shall be done according to a change handling procedure ensuring traceability.

5 TYPE APPROVAL PROCESS

5.1 The type approval requirements for BWMS are as described below.

5.2 The manufacturer of the equipment should submit information regarding the design, construction, operation and functioning of the BWMS in accordance with Part 1 of the annex including information regarding the water quality and operational parameters that are important to the operation of the system. This information should be the basis for a first evaluation of suitability by the Administration.

5.3 Following the Administration's pre-test evaluation, the BWMS should undergo land-based, shipboard, and other tests in accordance with the procedures described in Parts 2 and 3 of the annex. The BWMS tested for type approval should be a final and complete product that meets the requirements of section 4 and it should be constructed using the same materials and procedures that will be used to construct production units.

5.4 Successful fulfilment of the requirements and procedures outlined in Parts 2 and 3 of the annex, as well as all other requirements of these guidelines, should lead to the issuance of a Type Approval Certificate by the Administration in accordance with section 6.

5.5 The limitations of the BWMS, in addition to the required type approval testing parameters identified in paragraphs 2.4.20 and 2.5.1 of the annex, as submitted by its manufacturer and validated by the Administration, should be documented on the Type Approval Certificate. These design limitations do not determine if the equipment may be type approved or not, but provide information on the conditions beyond the type approval testing parameters under which proper functioning of the equipment can be expected.

5.6 When a type approved BWMS is installed on board, an installation survey according to section 8 should be carried out.

5.7 The documentation submitted for approval should include at least the following:

.1 a description and diagrammatic drawings of the BWMS;

.2 operation, maintenance and safety manual;

.4 hazard identification;

.5 environmental and public health impacts; and

.6 System Design Limitations.

6 APPROVAL AND CERTIFICATION PROCEDURES

6.1 A BWMS which in every respect fulfils the requirements of these Guidelines may be approved by the Administration for fitting on board ships. The approval should take the form of a Type Approval Certificate of BWMS, specifying the main particulars of the BWMS and validated System Design Limitations. Such certificate should be issued in accordance with Part 7 of the annex in the format shown in appendix 1.

6.2 A BWMS that in every respect fulfils the requirements of these Guidelines, except that it has not been tested at all the temperatures and salinities set out in Part 2 of the annex, should only be approved by the Administration if corresponding limiting operating conditions are clearly stated on the issued Type Approval Certificate with the description "Limiting Operating Conditions". For the limiting values, the System Design Limitations should be consulted.

6.3 A Type Approval Certificate of BWMS should be issued for the specific application for which the BWMS is approved, e.g. for specific ballast water capacities, flow rates, salinity or temperature regimes, or other limiting operating conditions or circumstances as appropriate.

6.4 A Type Approval Certificate of BWMS should be issued by the Administration based on satisfactory compliance with all the requirements described in Parts 1, 2, 3 and 4 of the annex.

6.5 The System Design Limitations should be specified on the Type Approval Certificate in a table that identifies each water quality and operational parameter together with the validated low and/or high parameter values for which the BWMS is designed to achieve the ballast water performance standard described in regulation D-2.

6.6 An Administration may issue a Type Approval Certificate of BWMS based on testing already carried out under supervision by another Administration.

6.7 A Type Approval Certificate should only be issued to a BWMS that has been determined by the Administration to make use of an Active Substance after it has been approved by the Organization in accordance with regulation D-3.2. In addition, the Administration should ensure that any recommendations that accompanied the Organization's approval have been taken into account before issuing the Type Approval Certificate.

6.8 The Type Approval Certificate should be issued taking into account circular MSC.1/Circ.1221 on *Validity of type approval certification for marine products*.

6.9 An approved BWMS may be type approved by other Administrations for use on their ships. Should a BWMS approved by one country fail type approval in another country, then the two countries concerned should consult one another with a view to reaching a mutually acceptable agreement.

6.10 An Administration approving a BWMS should promptly provide a type approval report to the Organization in accordance with Part 6 of the annex. Upon receipt of a type approval report, the Organization should promptly make it available to the public and Member States by an appropriate means.

6.11 In the case of a type approval based entirely on testing already carried out under supervision by another Administration, the type approval report should be prepared and kept on file and the Organization should be informed of the approval.

6.12 In the case of a BWMS that was previously type-approved by an Administration taking into account the revised Guidelines (G8) adopted by resolution MEPC.174(58), the manufacturer, in seeking a new type approval under these Guidelines, should only be requested to submit to the Administration the additional test reports and documentation set out in these Guidelines.

7 INSTALLATION REQUIREMENTS FOLLOWING TYPE APPROVAL

7.1 The BWMS should be accompanied by sampling facilities as described in *Guidelines on ballast water sampling* (G2), so arranged in order to collect representative samples of the ship's ballast water discharge.

7.2 Suitable bypasses or overrides to protect the safety of the ship and personnel should be installed and used in the event of an emergency and these should be connected to the BWMS so that any bypass of the BWMS should activate an alarm. The bypass event should be recorded by the control and monitoring equipment and within the ballast water record book.

7.3 The requirement in paragraph 7.2 does not apply to internal transfer of ballast water within the ship (e.g. anti-heeling operations). For BWMS that transfer water internally which may affect compliance by the ship with the standard described in regulation D-2 (i.e. circulation or in-tank treatment) the recording in paragraph 7.2 shall identify such internal transfer operations.

8 INSTALLATION SURVEY AND COMMISSIONING PROCEDURES FOLLOWING TYPE APPROVAL

8.1 The additional information outlined in the paragraphs below is intended to facilitate ship operations and inspections and assist ships and Administrations in preparing for the procedures set out in the *Survey Guidelines for the purpose of the International Convention for the Control and Management of Ships' Ballast Water and Sediments under the Harmonized System of Survey and Certification*[1], developed by the Organization, which describe the examination of plans and designs and the various surveys required under regulation E-1 of the Convention.

[1] Refer to resolution A.1104(29) on *Survey Guidelines under the harmonized system of survey and certification (HSSC) 2015*, as amended.

8.2 The Administration issuing the International Ballast Water Management Certificate should verify that the following documentation is on board in a suitable format:

.1 for the purpose of information, a copy of the Type Approval Certificate of BWMS;

.2 the operation, maintenance and safety manual of the BWMS;

.3 the ballast water management plan of the ship;

.4 installation specifications, e.g. installation drawing, Piping and Instrumentation diagrams, etc.; and

.5 installation commissioning procedures.

8.3 Prior to issuance of the International Ballast Water Management Certificate, following the installation of a BWMS, the Administration should verify that:

.1 the BWMS installation has been carried out in accordance with the technical installation specification referred to in paragraph 8.2.4;

.2 the BWMS is in conformity with the relevant Type Approval Certificate of BWMS;

.3 the installation of the complete BWMS has been carried out in accordance with the manufacturer's equipment specification;

.4 any operational inlets and outlets are located in the positions indicated on the drawing of the pumping and piping arrangements;

.5 the workmanship of the installation is satisfactory and, in particular, that any bulkhead penetrations or penetrations of the ballast system piping are to the relevant approved standards; and

.6 the installation commissioning procedures have been completed.

ANNEX

PART 1 – SPECIFICATIONS FOR PRE-TEST EVALUATION OF SYSTEM DOCUMENTATION

1.1 Adequate documentation should be prepared and submitted to the Administration and be shared with the testing organization as part of the approval process well in advance of the intended approval testing of a BWMS. Approval of the submitted documentation should be a pre-requisite for carrying out independent approval tests.

1.2 Documentation should be provided by the manufacturer/developer for two primary purposes: evaluating the readiness of the BWMS for undergoing approval testing, and evaluating the manufacturer's proposed System Design Limitations and validation procedures.

Documentation

1.3 The documentation to be submitted as a part of the readiness evaluation should include at least the following:

.1 a BWMS technical specification, including at least:

.1 a description of the BWMS and treatment processes it employs and details of any required permits;

.2 adequate information including descriptions and diagrammatic drawings of the pumping and piping arrangements, electrical/electronic wiring, monitoring system, waste streams and sampling points. Such information should enable fault finding;

.3 details of major components and materials used (including certificates where appropriate);

.4 an equipment list showing all components subject to testing including specifications, materials and serial numbers;

.5 an installation specification in accordance with manufacturers installation criteria requirements for the location and mounting of components, arrangements for maintaining the integrity of the boundary between safe and hazardous spaces and the arrangement of the sample piping;

.6 information regarding the characteristics and arrangements in which the system is to be installed, including scope of the ships (sizes, types and operation) for which the system is intended. This information may form the link between the system and the ship's ballast water management plan; and

.7 a description of BWMS side streams (e.g. filtered material, centrifugal concentrate, waste or residual chemicals) including a description of the actions planned to properly manage and dispose of such wastes;

.2 operation, maintenance and safety manuals – These should at least include:

.1 instructions for the correct operation of the BWMS, including procedures for the discharge of untreated water in the event of malfunction of the ballast water treatment equipment;

.2 instructions for the correct arrangement of the BWMS;

.3 maintenance and safety instructions and the need to keep records;

.4 trouble shooting procedures;

.5 emergency procedures necessary for securing the ship;

.6 any supplementary information considered necessary for the safe and efficient operation of the BWMS, e.g. documentation provided for approval under the *Procedure (G9) for approval of ballast water management systems that make use of Active Substances*; and

.7 calibration procedures;

.3 information on any hazard identification conducted to identify potential hazards and define appropriate control measures, if the BWMS or the storage tanks for processing chemicals could emit dangerous gases or liquids;

.4 information regarding environmental and public health impacts including:

.1 identification of potential hazards to the environment based on environmental studies performed to the extent necessary to assure that no harmful effects are to be expected;

.2 in the case of BWMS that make use of Active Substances or Preparations containing one or more Active Substances, the dosage of any Active Substances used and the maximum allowable discharge concentrations;

.3 in the case of BWMS that do not make use of Active Substances or Preparations, but which could reasonably be expected to result in changes to the chemical composition of the treated water such that adverse impacts to receiving waters might occur upon discharge, the documentation should include results of toxicity tests of treated water as described in paragraph 2.4.11 of these Guidelines; and

.4 sufficient information to enable the test organization to identify any potential health or environmental safety problems, unusual operating requirements (labour or materials), and any issues related to the disposal of treatment by products or waste streams;

.5 information regarding System Design Limitations including:

.1 the identification of all known parameters to which the design of the BWMS is sensitive;

.2 for each parameter the manufacturer should claim a low and/or a high value for which the BWMS is capable of achieving the performance standard of regulation D-2; and

.3 the proposed method for validating each claimed system design limitation should be set out, together with information on the source, suitability and reliability of the method;

.6 software change handling and revision control document including:

.1 all software changes introduced to the system after the pre-test evaluation shall be done according to a change handling procedure ensuring traceability. Therefore, the manufacturer shall present a procedure describing how changes are to be handled and how revision control is maintained. As a minimum for a modification request, the following types of information should be produced and logged:

.1 reason for modification;

.2 specification of the proposed change;

.3 authorization of modification; and

.4 test record;

.7 functional description including a textual description with necessary supporting drawings, diagrams and figures to cover:

.1 system configuration and arrangement;

.2 scope of supply;

.3 system functionality covering control, monitoring, alarm and safety functions;

.4 self-diagnostics and alarming functionalities; and

.5 safe states for each function implemented.

1.4 The documentation may include specific information relevant to the test set-up to be used for land-based testing according to these Guidelines. Such information should include the sampling needed to ensure proper functioning and any other relevant information needed to ensure proper evaluation of the efficacy and effects of the equipment. The information provided should also address general compliance with applicable environment, health and safety standards during the type approval procedure.

Readiness evaluation

1.5 During the readiness evaluation, the Administration should ensure that each technical specification set out in section 4 of the body of these Guidelines has been met, other than those that will be assessed during later testing.

1.6 The readiness evaluation should examine the design and construction of the BWMS to determine whether there are any fundamental problems that might constrain the ability of the BWMS to manage ballast water as proposed by the manufacturer, or to operate safely, on board ships.

1.7 Administrations should ensure adequate risk assessments including the implementation of preventative actions, have been undertaken relating to the safe operation of BWMS.

1.8 As a first step the manufacturer should provide information regarding the requirements and procedures for installing, calibrating, and operating (including maintenance requirements) the BWMS during a test. This evaluation should help the test organization to identify any potential health or environmental safety problems, unusual operating requirements (labour or materials), and any issues related to the disposal of treatment by-products or waste streams.

1.9 The test facility should have a procedure to deal with deviations that occur prior to testing and an evaluation process which includes an assessment and validation process to address any unforeseen deviations that may occur during testing. Deviations from the testing procedure should be fully reported.

1.10 During the readiness evaluation the major components of the BWMS should be identified. Major components are considered to be those components that directly affect the ability of the system to meet the performance standard described in regulation D-2. Upgrades or changes to major components should not take place during type approval testing. A change to a major component should require a new submission of the test proposal and should involve a new evaluation and repeating of the land-based and shipboard tests.

1.11 The Administration may allow replacements of non-major components of equivalent specification (independently approved to a recognized and equal operational standard) during type approval. Replacements of non-major components during testing should be reported.

1.12 Upgrades of the BWMS that relate to the safe operation of that system may be allowed during and after type approval and should be reported. If such safety upgrades directly affect the ability of the system to meet the standard described in regulation D-2, it should be treated as a change of a major component, as per paragraph 1.10 above.

1.13 The evaluation should identify consumable components in the BWMS. The Administration may allow replacement of like for like consumable components, during type approval testing and all replacements should be reported.

System Design Limitation evaluation

1.14 The System Design Limitation evaluation should be undertaken by the Administration. It should assess the basis for the manufacturer's claim that the System Design Limitations include all known water quality and operational parameters to which the design of the BWMS is sensitive that are important to its ability to achieve the performance standard described in regulation D-2.

1.15 The Administration should also evaluate the suitability and reliability of the methods proposed for validating the claimed low and/or high values for each System Design Limitation. These methods may include tests to be undertaken during land-based, shipboard or bench-scale testing and/or the use of appropriate existing data and/or models.

PART 2 – TEST AND PERFORMANCE SPECIFICATIONS FOR APPROVAL OF BALLAST WATER MANAGEMENT SYSTEMS

The Administration decides the sequence of land-based and shipboard testing. The BWMS used for testing must be verified by the Administration to be the same as the BWMS described under Part 1 of the annex with major components as described in paragraphs 1.3.1.3 and 1.3.1.4.

2.1 Quality Assurance and Quality Control Procedures

2.1.1 The testing facility should demonstrate its competency in conducting valid type approval tests in two ways: (1) have implemented a rigorous quality control/quality assurance program, approved, certified and audited by an independent accreditation body, or to the satisfaction of the Administration, and (2) be able to demonstrate its ability to conduct valid test cycles with appropriate challenge water, sample collection, sample analysis, and method detection limits. It is the responsibility of the Administration, or its authorized delegate, to determine the acceptability of the test facility.

2.1.2 The test facility's quality control/quality assurance program should consist of:

.1 a Quality Management Plan (QMP), which addresses the quality control management structure and policies of the testing body (including subcontractors and outside laboratories);

.2 a Quality Assurance Project Plan (QAPP), which defines the methods, procedures, and quality assurance and quality control (QA/QC) protocols used by the test facility for testing BWMS in general. It identifies the test team members, and it includes all relevant standard operating procedures (SOPs), typically as appendices; and

.3 a Test/Quality Assurance Plan (TQAP), that provides specific details for conducting a test of a given BWMS at a given site and time. The TQAP includes detailed plans for commissioning the BWMS, the experimental plan, decommissioning, and reporting the results. The TQAP identifies all organizations involved in the test and includes the BWMS vendor's documentation and performance claims. The TQAP also identifies the data to be recorded, operational and challenge parameters that define a valid test cycle, data analyses to be presented in the verification report, and a schedule for testing. Appropriate statistical distributions should be considered and used to analyse data.

2.1.3 The testing facility performing the BWMS tests should be independent. It should not be owned or affiliated with the manufacturer or vendor of any BWMS, by the manufacturer or supplier of the major components of that equipment.

2.2 Avoiding sampling bias

The sampling protocol must ensure organism mortality is minimized, e.g. by using appropriate valves and flow rates for flow control in the sampling facility, submerging nets during sampling collection, using appropriate sampling duration and handling times, and appropriate concentrating methodology. All methods should be validated to the satisfaction of the Administration.

2.3 Shipboard tests

2.3.1 A shipboard test cycle includes:

.1 the uptake of ballast water of the ship;

.2 treatment of the ballast water in accordance with paragraph 2.3.3.4 by the BWMS;

.3 the storage of ballast water on the ship during a voyage; and

.4 the discharge of ballast water from the ship.

2.3.2 Shipboard testing of BWMS should be conducted by the test facility, independent of the BWMS manufacturer, with the system being operated and maintained by the ships' crew as per the operational manual.

Success criteria for shipboard testing

2.3.3 In evaluating the performance of BWMS installation(s) on a ship or ships, the following information and results should be supplied to the satisfaction of the Administration:

.1 test plan to be provided prior to testing;

.2 documentation that an inline BWMS is of a capacity to reflect the flow rate of the ballast water pump for the full rated capacity range of the BWMS;

.3 documentation that an in-tank BWMS is of a capacity to reflect the ballast water volume that it is intended to treat within a specified period of time;

.4 the amount of ballast water tested in the test cycle on board should be consistent with the normal ballast operations of the ship and the BWMS should be operated at the treatment rated capacity for which it is intended to be approved;

.5 documentation showing that the discharge of each valid test cycle was in compliance with regulation D-2;

.6 for a test to be valid, the uptake water for the ballast water to be treated should contain a density of viable organisms exceeding 10 times the maximum permitted values in regulation D-2.1;

.7 sampling regime and volumes for analysis:

.1 for the enumeration of viable organisms greater than or equal to 50 micrometres or more in minimum dimension:

.1 influent water should be collected over the duration of uptake as one, time-integrated sample. The sample should be collected as a single, continuous sample or a composite of sequential samples, e.g. collected at intervals during the beginning, middle and end of the operation. The total sample volume should be at least one cubic metre. If smaller volume is validated to ensure representative sampling of organisms, it may be used;

.2 treated discharged water should be collected as one time-integrated sample over the duration of discharge from the tank(s). The sample may be collected as a single, continuous sample or a composite of sequential samples, e.g. collected throughout the beginning, middle and end the operation. The total sample volume should be at least three cubic metres;

.3 if samples are concentrated for enumeration, the organisms should be concentrated using a mesh with holes no greater than 50 micrometres in the diagonal dimension. Only organisms greater than 50 micrometres in minimum dimension should be enumerated; and

.4 the full volume of the sample should be analysed unless the total number of organisms is high, e.g. 100. In this case, the average density may be extrapolated based on a well-mixed subsample using a validated method.

.2 for the enumeration of viable organisms greater than or equal to 10 micrometres and less than 50 micrometres in minimum dimension:

.1 influent water should be collected over the duration of uptake as one, time-integrated sample. The sample should be collected as a single, continuous sample or a composite of sequential samples, e.g. collected at intervals during the beginning, middle and end of the operation. A sample of at least 10 litres should be collected, and a fraction may be subsampled for transport to the laboratory, provided it is representative of the sample and is a minimum of 1 litre. A minimum of three, 1-millilitre sub-samples should be analysed in full to enumerate organisms;

.2 treated discharged water should be collected as one time-integrated sample over the duration of discharge from the tank(s). The sample may be collected as a single, continuous sample or a composite of sequential samples, e.g. collected throughout the beginning, middle and end the operation. A sample of at least 10 litres should be collected, and a fraction may be subsampled for transport to the laboratory, provided it is representative of the sample and is a minimum of 1 litre. A minimum of six, 1-millilitre sub-samples should be analysed in full to enumerate organisms;

.3 the sample may not be concentrated for analysis unless the procedure is validated. Only organisms greater than 10 micrometres and less than 50 micrometres in minimum dimension should be enumerated; and

.4 the full volume of the sample should be analysed unless the total number of organisms is high, e.g. 100. In this case, the average density may be extrapolated based on a well-mixed subsample using a validated method.

.3 for the evaluation of bacteria:

.1 for the influent and discharge samples, the minimum 10-litre sample referred to in paragraph 2.3.3.7.2.2, or another sample at least 10 litres in volume and collected in a similar manner, a sub-sample of minimum 1 litre may be transferred to a sterile container for analysis;

.2 a minimum of three, subsamples of appropriate volume taken from the 1 litre subsample described above should be analysed for colony forming units of bacteria listed in regulation D-2; and

.3 the toxicogenic test requirements should be conducted in an appropriately approved laboratory. If no approved laboratory is available, the analysis method may be validated to the satisfaction of the Administration.

.8 the test cycles including invalid test cycles are to span a period of not less than six months;

.9 the applicant is requested to perform three consecutive test cycles in compliance with regulation D-2. Any invalid test cycle does not affect the consecutive sequence;

.10 the six-month shipboard test period starts and ends with the completion of a successful test cycle or invalid test cycle that meets the D-2 standard. The three consecutive and valid test cycles that are required in paragraph 2.3.3.9 must be suitably separated across the six-month period;

.11 the source water for test cycles shall be characterized by measurement of salinity, temperature, particulate organic carbon, total suspended solids and dissolved organic carbon;

.12 for system operation throughout the test period, the following information should also be provided:

.1 documentation of all ballast water operations including volumes and locations of uptake and discharge, and if heavy weather was encountered and where;

.2 documentation that the BWMS was operated continuously throughout the test period for all ballasting and deballasting of the ship;

.3 documentation detailing water quality parameters identified by the testing organisation, should be measured as appropriate and practicable;

.4 the possible reasons for an unsuccessful test cycle, or a test cycle discharge failing the D-2 standard should be investigated and reported to the Administration;

.5 documentation of scheduled maintenance performed on the system during the test period;

.6 documentation of unscheduled maintenance and repair performed on the system during the test period;

.7 documentation of engineering parameters monitored as appropriate to the specific system; and

.8 a report detailing the functioning of the control and monitoring equipment.

2.4 Land-based testing

2.4.1 The land-based testing provides data to determine the biological efficacy and environmental acceptability of the BWMS under consideration for type approval. The approval testing aims to ensure replicability and comparability to other treatment equipment.

2.4.2 Any limitations imposed by the BWMS on the testing procedure described here should be duly noted and evaluated by the Administration.

2.4.3 The test set-up including the BWMS should operate as described in the provided operation, maintenance and safety manual during at least five consecutive successful test cycles in each salinity.

2.4.4 A land-based test cycle should include the uptake of ballast water by pumping, the storage of ballast water, treatment of ballast water within the BWMS (except in control tanks), and the discharge of ballast water by pumping. The order will be dependent on the BWMS.

2.4.5 At least two test cycles in each salinity should be conducted in order to evaluate compliance with the D-2 standard at the minimum holding time specified by the BWMS manufacturer.

2.4.6 In accordance with the *Procedure for approval of ballast water management systems that make use of Active Substances* (G9), test facilities carrying out identification of Relevant Chemicals and toxicity testing of the treated ballast water from test cycles with a storage time which is shorter or longer than five days, should ensure that sufficient volumes of treated water are collected after five days or are reserved after the efficacy testing to permit the requirements of Procedure (G9) to be assessed for at least one test cycle per salinity.

2.4.7 Land-based testing of BWMS should be independent of the system manufacturer.

2.4.8 Testing should occur using different water conditions sequentially as provided for in paragraphs 2.4.20 and 2.4.22.

2.4.9 The BWMS should be tested at its rated capacity or as given in paragraphs 2.4.16 to 2.4.19 for each test cycle. The equipment should function to specifications during this test.

2.4.10 The analysis of treated water discharge from each test cycle should determine if the treated discharge meets regulation D-2 of the Convention.

2.4.11 The analysis of treated water discharge from the relevant test cycle(s) should also be used to evaluate the formation of Relevant Chemicals as well as the toxicity of the discharged water for BWMS that make use of Active Substances. The same evaluation should be conducted for those BWMS that do not make use of Active Substances or Preparations but which could reasonably be expected to result in changes to the chemical composition of the treated water such that adverse impacts to receiving waters might occur upon discharge. Toxicity tests of the treated water discharge should be conducted in accordance with paragraphs 5.2.3 to 5.2.7 of the *Procedure for approval of ballast water management systems that make use of Active Substances* (G9), as revised.

Land-based testing set-up

2.4.12 The test set-up for approval tests should be representative of the characteristics and arrangements of the types of ships in which the equipment is intended to be installed. The test set-up should therefore include at least the following:

.1 the complete BWMS to be tested;

.2 piping and pumping arrangements; and

.3 the storage tank that simulates a ballast tank, constructed such that the water in the tank should be completely shielded from light.

2.4.13 The control and treated simulated ballast tanks should each include:

.1 a minimum capacity of 200 m^3;

.2 normal internal structures, including lightening and drainage holes;

.3 standard industry practices for design and construction for ships; surface coatings should be in accordance with Performance standard for protective coatings of dedicated seawater ballast tanks on all new ships and of double-sided skin spaces of bulk carriers (PSPC); and

.4 the minimum modifications required for structural integrity on land.

2.4.14 The test set-up should be pressure-washed with tap water, dried and swept to remove loose debris, organisms and other matter before starting testing procedures, and between test cycles.

2.4.15 The test set-up will include facilities to allow sampling as described in paragraphs 2.4.31 and 2.4.32 and provisions to supply influents to the system, as specified in paragraphs 2.4.20, 2.4.21, 2.4.24 and 2.4.25. The installation arrangements should conform in each case with those specified and approved under the procedure outlined in section 7 of the main body to these Guidelines.

Ballast water management system scaling

2.4.16 Scaling of the BWMS should be in accordance with the *Guidance on scaling of ballast water management systems* developed by the Organization. The Administration should verify that the scaling used is appropriate for the operational design of the BWMS.

2.4.17 BWMS with at least one model with a TRC equal to or smaller than 200 m^3/h should not be downscaled.

2.4.18 For BWMS with at least one model that has a higher capacity than 200 m^3/h or 1000 m^3/h the following must be observed for land-based testing. In-line treatment equipment may be downsized for land-based testing, but only when the following criteria are taken into account:

.1 BWMS with at least one model with a TRC larger than 200 m^3/h but smaller than 1,000 m^3/h may be downscaled to a maximum of 1:5 scale, but may not be smaller than 200 m^3/h; and

.2 BWMS with at least one model with a TRC equal to, or larger than, 1,000 m^3/h may be downscaled to a maximum of 1:100 scale, but may not be smaller than 200 m^3/h.

2.4.19 In-tank treatment equipment should be tested on a scale that allows verification of full-scale effectiveness. The suitability of the test set-up should be evaluated by the manufacturer and approved by the Administration.

Land-based test design – inlet and outlet criteria

2.4.20 For any given set of test cycles (five are considered a set) a salinity range should be chosen for each cycle. Given the salinity of the test set up for a test cycle in fresh, brackish and marine water, each should have dissolved and particulate content in one of the following combinations:

	Salinity		
	Marine 28 – 36 PSU	Brackish 10 – 20 PSU	Fresh < 1 PSU
Dissolved Organic Carbon (DOC)	> 1 mg/l	> 5 mg/l	> 5 mg/l
Particulate Organic Carbon (POC)	> 1 mg/l	> 5 mg/l	> 5 mg/l
Total Suspended Solids (TSS)	> 1 mg/l	> 50 mg/l	> 50 mg/l

2.4.21 Test water should be natural water. Any augmentation of test water with dissolved organic carbon (DOC), particulate organic carbon (POC) or total suspended solids (TSS) to achieve the minimum required content should be validated and approved by the Administration. As natural DOC constituents are complex and primarily of aromatic character, the type of added DOC is particularly critical to the evaluation of BWMS performance. The validation should ensure that relevant properties of the augmented water (such as the oxidant demand/TRO decay and UV absorption in the range of 200 to 280 nm, the production of disinfectant by-products and the particle size distribution of suspended solids) are equivalent, on a mg/L basis, to that of natural water that would quantitatively meet the challenge conditions. In addition, the validation should ensure that augmentation does not bias a test for or against any specific treatment process. The test report should include the basis for the selection, use and validation of augmentation.

2.4.22 The BWMS must be tested in conditions for which it will be approved. For a BWMS to achieve an unlimited Type Approval Certificate with respect to salinity, one set of test cycles should be conducted within each of the three salinity ranges with the associated dissolved and particulate content as prescribed in paragraph 2.4.20. Tests under adjacent salinity ranges in the above table should be separated by at least 10 PSU.

2.4.23 Use of standard test organisms (STO):

.1 the use of standard test organisms (STO) is permissible if the challenge levels in naturally occurring water at the test facility require supplementation. The use of STO should not be considered standard practice and the Administration should in every case review that the selection, number and use of supplementary STOs ensures that the challenge posed to the BWMS provides an adequately robust test. The use of STOs should not bias a test for or against any specific treatment process. They should be locally isolated to ensure that the risk to the local environment is minimised; non indigenous organisms which have the potential to cause harm to the environment should not be used;

.2 procedures, processes and guidance for the use of STO should be based on the most relevant and up to date available scientific data. Such procedures, processes and guidance should form a part of the testing facilities quality assurance regimes; and

.3 the use of STO, including concentrations and species, should be recorded within the test report. The test report should include information pertaining to the evaluation and justification for the use of STO, an assessment of the impact of their use on other test parameters and potential impacts on the test being undertaken. The information contained within the report should reflect both the positive and negative impacts of the use of STO.

2.4.24 The influent water should include:

.1 test organisms of greater than or equal to 50 micrometres or more in minimum dimension should be present in a total density of preferably 10^6 but not less than 10^5 individuals per cubic metre, and should consist of at least 5 species from at least 3 different phyla/divisions;

.2 test organisms greater than or equal to 10 micrometres and less than 50 micrometres in minimum dimension should be present in a total density of preferably 10^4 but not less than 10^3 individuals per millilitre, and should consist of at least 5 species from at least 3 different phyla/divisions;

.3 heterotrophic bacteria should be present in a density of at least 10^4 living bacteria per millilitre; and

.4 the variety of organisms in the test water should be documented according to the size classes mentioned above regardless if natural organism assemblages or cultured organisms were used to meet the density and organism variety requirements.

2.4.25 The following bacteria do not need to be added to the influent water, but should be measured at the influent and at the time of discharge:

.1 coliform;

.2 Enterococcus group;

.3 *Vibrio cholerae*; and

.4 heterotrophic bacteria.

2.4.26 If cultured test organisms are used, then it should be ensured that local applicable quarantine regulations are taken into account during culturing and discharge.

Land-based monitoring and sampling

2.4.27 Change of numbers of test organisms by treatment and during storage in the simulated ballast tank should be measured using methods described in Part 4 of the annex, paragraphs 4.5 to 4.7.

2.4.28 It should be verified that the treatment equipment performs within its specified parameters, such as power consumption and flow rate, during the test cycle.

2.4.29 The range of operational flow rates that a BWMS is expected to achieve in service, at the maximum and minimum operational flow rates (where it is appropriate for that technology), should be verified after the filter on the discharge side of the pump. The range of flow rate may be derived from empirical testing or from computational modelling. Where appropriate for the technology, demonstration of system efficacy at low flow rates should reflect the need for flow reduction during the final stages of ballast operations.

2.4.30 Environmental parameters such as pH, temperature, salinity, dissolved oxygen, TSS, DOC, POC and turbidity (NTU)[2] should be measured at the same time that the samples described are taken.

2.4.31 Samples during the test for the purposes of determining biological efficacy should be taken at the following times and locations: immediately before the treatment equipment, immediately after the treatment equipment and upon discharge after the appropriate holding time.

2.4.32 The control and treatment cycles may be run simultaneously or sequentially. Control samples are to be taken in the same manner as the equipment test as prescribed in paragraph 2.4.31 and upon influent and discharge.

2.4.33 Facilities or arrangements for sampling should be provided to ensure representative samples of treated and control water can be taken that introduce as little adverse effects as possible on the organisms.

2.4.34 Samples described in paragraphs 2.4.31 and 2.4.32 should be collected with the following sampling regime and volumes for analysis:

.1 for the enumeration of viable organisms greater than or equal to 50 micrometres or more in minimum dimension:

.1 influent water should be collected over the duration of uptake as one, time-integrated sample. The sample should be collected as a single, continuous sample or a composite of sequential samples, e.g. collected at intervals during the beginning, middle and end of the operation. The total sample volume should be at least one cubic metre. If smaller volume is validated to ensure representative sampling of organisms, it may be used;

[2] NTU=Nominal Turbidity Unit.

.2 control and treated discharged water should be collected as one time-integrated sample over the duration of discharge from the tank(s). The sample may be collected as a single, continuous sample or a composite of sequential samples, e.g. collected throughout the beginning, middle and end the operation. The total sample volume should be at least three cubic metres;

.3 if samples are concentrated for enumeration, the organisms should be concentrated using a mesh with holes no greater than 50 micrometres in the diagonal dimension. Only organisms greater than 50 micrometres in minimum dimension should be enumerated; and

.4 the full volume of the sample should be analysed unless the total number of organisms is high, e.g. 100. In this case, the average density may be extrapolated based on a well-mixed subsample using a validated method;

.2 for the enumeration of viable organisms greater than or equal to 10 micrometres and less than 50 micrometres in minimum dimension:

.1 influent water should be collected over the duration of uptake as one, time-integrated sample. The sample should be collected as a single, continuous sample or a composite of sequential samples, e.g. collected at intervals during the beginning, middle and end of the operation. A sample of at least 10 litres should be collected, and a fraction may be subsampled for transport to the laboratory, provided it is representative of the sample and is a minimum of 1 litre. A minimum of three, 1-millilitre sub-samples should be analysed in full to enumerate organisms.

.2 control and treated discharged water should be collected as one time-integrated sample over the duration of discharge from the tank(s). The sample may be collected as a single, continuous sample or a composite of sequential samples, e.g. collected throughout the beginning, middle and end the operation. A sample of at least 10 litres should be collected, and a fraction may be subsampled for transport to the laboratory, provided it is representative of the sample and is a minimum of 1 litre. A minimum of six, 1-millilitre sub-samples should be analysed in full to enumerate organisms.

.3 the sample may not be concentrated for analysis unless the procedure is validated. Only organisms greater than 10 micrometres and less than 50 micrometres in minimum dimension should be enumerated;

.4 the full volume of the sample should be analysed unless the total number of organisms is high, e.g. 100. In this case, the average density may be extrapolated based on a well-mixed subsample using a validated method;

.3 for the evaluation of bacteria:

.1 for the influent and discharge samples, a minimum 10-litre sample referred to in paragraph 2.3.3.7.2.2, or another sample at least 10 litres in volume and collected in a similar manner, a sub-sample of minimum 1 litre may be transferred to a sterile container for analysis;

.2 a minimum of three, subsamples of appropriate volume taken from the 1 litre subsample described above should be analysed for colony forming units of bacteria listed in regulation D-2; and

.3 the toxicogenic test requirements should be conducted in an appropriately approved laboratory. If no approved laboratory is available, the analysis method may be validated to the satisfaction of the Administration.

2.4.35 The samples should be analysed as soon as possible after sampling, and analysed live within six hours or treated in such a way so as to ensure that proper analysis can be performed.

2.4.36 If in any test cycle the discharge results from the control water is a concentration less than or equal to 10 times the values in regulation D-2.1, the test cycle is invalid.

2.5 Temperature

2.5.1 The effective performance of BWMS through a ballast water temperature range of 0°C to 40°C (2°C to 40°C for fresh water) and a mid-range temperature of 10°C to 20°C should be the subject of an assessment verified by the Administration.

2.5.2 This assessment may include:

.1 testing during land-based, shipboard, laboratory or bench-scale testing; and/or

.2 the use of existing data and/or models, provided that their source, suitability and reliability is reported.

2.5.3 The report submitted to the Administration should contain all documentation (including procedures, methods, data, models, results, explanations and remarks) associated with the temperature assessment. The report should include at least the information identified in paragraph 2.7.2 of this annex.

2.6 Evaluation of regrowth

2.6.1 The evaluation of the regrowth of organisms should be undertaken to the satisfaction of the Administration in land-based and/or shipboard testing in at least two test cycles in each salinity.

2.6.2 In the case of land-based testing being performed with a holding time of less than five days, a sufficient volume of treated uptake water should be held under conditions similar to conditions in the relevant holding tank. In the case of shipboard testing, water should be retained on board for the evaluation of regrowth during a shipboard test cycle. Additional bench-scale testing may be used to supplement the land-based and/or shipboard testing.

2.6.3 In the case of a BWMS that includes mechanical, physical, chemical, and/or biological processes intended to kill, render harmless, or remove organisms within ballast water at the time of discharge or continuously between the time of uptake and discharge, regrowth should be assessed in accordance with section 2.3 or 2.4 of this annex with a holding time of at least five days.

2.6.4 Otherwise, the enumeration of organisms to assess regrowth should be undertaken at least five days after the completion of all of the mechanical, physical, chemical, and/or biological processes intended to kill, render harmless, or remove organisms within ballast water.

2.6.5 Any neutralization of ballast water required by the BWMS should occur at the end of the holding time, and immediately before the enumeration of organisms.

2.6.6 The evaluation of regrowth is not intended to evaluate contamination in ballast tanks or piping, such as may arise from the presence of untreated water or residual sediments.

2.6.7 A report should be submitted to the Administration containing all documentation (including procedures, methods, data, models, results, explanations and remarks) associated with the evaluation of regrowth. The report should include at least the information identified in paragraph 2.7.2 of this annex.

2.7 Reporting of test results

2.7.1 After approval tests have been completed, a report should be submitted to the Administration. This report should include information regarding the test design, methods of analysis and the results of these analyses for each test cycle (including invalid test cycles), BWMS maintenance logs and any observed effects of the BWMS on the ballast system of the ship (e.g. pumps, pipes, tanks, valves). Shipboard test reports should include information on the total and continuous operating time of the BWMS.

2.7.2 The reports submitted in accordance with paragraph 2.7.1 should contain at least the following information:

1 the name and address of the laboratory performing or supervising the inspections, tests or evaluations, and its national accreditation or quality management certification, if appropriate;

.2 the name of the manufacturer;

.3 the trade name, product designation (such as model numbers), and a detailed description of the equipment or material inspected, tested or evaluated;

.4 the time, date, and place of each approval inspection, test or evaluation;

.5 the name and title of each person performing, supervising, and witnessing the tests and evaluations;

.6 executive summary;

.7 introduction and background;

.8 for each test cycle, inspection or evaluation conducted, summary descriptions of:

.1 experimental design;

.2 methods and procedures;

.3 results and discussion, including a description of any invalid test cycle (in the case of a report referred to in Part 2 of this annex) and a comparison to the expected performance; and

.4 in the case of land-based testing, test conditions including details on challenge water preparation in line with paragraph 2.4.21;

.9 a description or photographs of the procedures and apparatus used in the inspections, tests or evaluation, or a reference to another document that contains an appropriate description or photographs;

.10 at least one photograph that shows an overall view of the equipment or material tested, inspected or evaluated and other photographs that show:

.1 design details; and

.2 each occurrence of damage or deformation to the equipment or material that occurred during the approval tests or evaluations;

.11 the operational safety requirements of the BWMS and all safety related findings that have been made during the inspections, tests or evaluations

.12 an attestation that the inspections, tests or evaluations were conducted as required and that the report contains no known errors, omissions, or false statements. The attestation must be signed by:

.1 the manufacturer or manufacturer's representative, if the inspection, tests or evaluations are conducted by the manufacturer; or

.2 the chief officer of the laboratory, or the chief officer's representative, if the Inspection or tests were conducted by an independent laboratory;

.13 appendices, including:

.1 the complete test plan and the data generated during tests and evaluations reported under subparagraph 2.7.2.8 above, including at least:

.1 for land-based tests, whether ambient, cultured or a mixture of test organisms have been used (including a species-level identification for cultured organisms, and an identification to the lowest possible taxonomic level for ambient organisms);

.2 for shipboard tests, the operating parameters of the system during successful treatment operations (e.g. dosage rates, ultraviolet intensity and the energy consumption of the BWMS under normal or tested Treatment Rated Capacity, if available);

.3 for System Design Limitations, details of all procedures, methods, data, models, results, explanations and remarks, leading to validation; and

.4 invalid test information;

.2 the QMP, the QAPP and Quality Assurance and Quality Control records;

.3 maintenance logs including a record of any consumable components that were replaced; and

.4 relevant records and tests results maintained or created during testing.

2.7.3 The results of biological efficacy testing of the BWMS should be accepted if during the land-based and shipboard testing conducted as specified in sections 2.3 and 2.4 of this annex it is shown that the system has met the standard in regulation D-2 and that the uptake water quality requirements were met in all individual test cycles as provided in paragraph 4.7 below.

2.7.4 The test report shall include all test runs during land-based and shipboard tests, including failed and invalid tests with the explanation required in paragraph 2.3.3.12.4 for both shipboard and land-based tests.

2.7.5 The Administration should identify and redact commercially sensitive information (information that is proprietary and not related to the BWMS performance) and make all other information available to interested parties and the Organization. The information should include all of the test reports, including failed tests from both land-based and shipboard testing.

PART 3 – SPECIFICATION FOR ENVIRONMENTAL TESTING FOR APPROVAL OF BALLAST WATER MANAGEMENT SYSTEMS

3.1 The electrical and electronic sections of the BWMS in the standard production configuration should be subject to the relevant tests specified in paragraph 3.3 below at a laboratory approved for the purpose by the Administration or by the accreditation body of the laboratory, where the scope of the accreditation covers ISO/IEC 17025 and the relevant test standards.

3.2 Evidence of successful compliance with the environmental tests below should be submitted to the Administration by the manufacturer together with the application for type approval.

3.3 Equipment is to be tested in accordance with IACS UR E10, Rev.6, October 2014 – Test Specification for Type Approval.

3.4 A report on environmental tests should be submitted to the Administration in accordance with paragraph 2.7.2.

PART 4 – SAMPLE ANALYSIS METHODS FOR THE DETERMINATION OF BIOLOGICAL CONSTITUENTS IN BALLAST WATER

Sample processing and analysis

4.1 Samples taken during testing of BWMS are likely to contain a wide taxonomic diversity of organisms, varying greatly in size and susceptibilities to damage from sampling and analysis.

4.2 When available, widely accepted standard methods for the collection, handling (including concentration), storage, and analysis of samples should be used. These methods should be clearly cited and described in test plans and reports. This includes methods for detecting, enumerating, and determining minimum dimension of and identifying organisms and for determining viability (as defined in these Guidelines).

4.3 When standard methods are not available for particular organisms or taxonomic groups, methods that are developed for use should be described in detail in test plans and reports. The descriptive documentation should include any experiments needed to validate the use of the methods.

4.4 Given the complexity in samples of natural and treated water, the required rarity of organisms in treated samples under regulation D-2, and the expense and time requirements of current standard methods, it is likely that several new approaches will be developed for the analyses of the composition, concentration, and viability of organisms in samples of ballast water. Administrations/Parties are encouraged to share information concerning methods for the analysis of ballast water samples, using existing scientific venues, and papers distributed through the Organization.

Sample analysis for determining efficacy in meeting the discharge standard

4.5 Sample analysis is meant to determine the species composition and the number of viable organisms in the sample. Different samples may be taken for determination of viability and for species composition.

4.6 The viability of organisms should be determined using a method that has been accepted by the Organization as appropriate to the ballast water treatment technology being tested. Acceptable methods should provide assurance that organisms not removed from ballast water have been killed or rendered harmless to the environment, human health, property and resources. Viability may be established by assessing the presence of one or more essential characteristics of life, such as structural integrity, metabolism, reproduction, motility, or response to stimuli.

4.7 A treatment test cycle should be deemed successful if:

.1 it is valid in accordance with paragraph 2.3.3.6 (shipboard) or 2.4.20, 2.4.21, 2.4.24 and 2.4.36 (land-based testing) as appropriate;

.2 the density of organisms greater than or equal to 50 micrometres in minimum diameter in the replicate samples is less than 10 viable organisms per cubic metre;

.3 the density of organisms less than 50 micrometres and greater than or equal to 10 micrometres in minimum diameter in the replicate samples is less than 10 viable organisms per millilitre;

.4 the density of *Vibrio cholerae* (serotypes O1 and O139) is less than 1 cfu per 100 millilitres, or less than 1 cfu per 1 gramme (wet weight) zooplankton samples;

.5 the density of *E. coli* in the replicate samples is less than 250 cfu per 100 millilitres;

.6 the density of intestinal Enterococci in the replicate samples is less than 100 cfu per 100 millilitres; and

.7 no averaging of test runs, or the discounting of failed test runs has occurred.

4.8 It is recommended that a non-exhaustive list of standard methods and innovative research techniques be considered[3].

Sample analysis for determining eco-toxicological acceptability of discharge

4.9 Toxicity tests of the treated water discharge should be conducted in accordance with paragraphs 5.2.3 to 5.2.7 of the *Procedure for approval of ballast water management systems that make use of Active Substances* (G9) as revised.

PART 5 – SELF MONITORING

Introduction

5.1 BWMS should monitor and store a minimum number of parameters for detailed evaluation. In addition, all system indications and alerts should be stored and available for inspection. Data storage and retrieval should follow common standards. This Part gives an overview of the minimum required self-monitoring parameters.

Monitoring of parameters

5.2 The applicable self-monitoring parameters listed below should be recorded for every BWMS[4]. Any additional parameters that are necessary to ascertain system performance and safety should be determined by the Administration and stored in the system. If a parameter is not applicable due to the particulars of the system, the Administration may waive the requirement to record that parameter. Limiting operating conditions on the operation of the BWMS should be determined by the manufacturer and approved by the Administration.

[3] Suggested sources may include but not be limited to:

.1 The Handbook of Standard Methods for the Analysis of Water and Waste Water.
.2 ISO standard methods.
.3 UNESCO standard methods.
.4 World Health Organization.
.5 American Society of Testing and Materials (ASTM) standard methods.
.6 United States EPA standard methods.
.7 Research papers published in peer-reviewed scientific journals.
.8 MEPC documents.

[4] Associated guidance for a template on technical details of the monitoring parameters and record intervals to be developed by the Organization.

General information for all systems

5.3 The information and applicable self-monitoring parameters to be recorded for all systems should include, inter alia:

1. general information: ship name, IMO number, BWMS manufacturer and type designation, BWMS serial number, date of BWMS installation on ship, BWMS treatment rated capacity (TRC), principle of treatment (in-line/in-tank);

2. operational parameters: all recorded parameters should be time tagged if applicable: BWMS operational modes and any transition modes, including bypass operations (e.g. uptake, discharge, warming-up, cleaning and start up), Ballast water pump in operation (yes/no – if information is available from ship), flow-rate at system outlet, Indication of the ballast water tank that is involved in the ballast water operation when practicable;

3. it is recommended that positional information on ballast water operations and on the holding time should be recorded automatically. Otherwise it should be entered manually in the ballast water record book as appropriate. Administrations are encouraged to apply automatic position information recording to ships which install BWMS during ship's building to the greatest extent possible;

4. system alerts and indications: all systems should have an alert regime. Every alert should be logged and time stamped. To assist the inspections it would be helpful to record an alert summary after each ballast water operation automatically, if possible;

5. general alerts include: shutdown of system while in operation, when maintenance is required, BWMS bypass valve status, status of BWMS valves representing system operational mode as appropriate;

6. operational alerts: whenever a relevant parameter exceeds the acceptable range approved by the Administration, the system should give an alert. In addition, an alert should be logged and time stamped also when a combination of relevant parameters exceeds system specifications, even if each single parameter does not exceed its approved range. If a safety relevant parameter (safety for crew, cargo and/or the ship) related to the BWMS exceeds approved limits, an alert/alarm should be mandatory (e.g. hydrogen level at appropriate measurement point(s));

7. the Administration may require additional alerts depending on the design of the system and for future developments; and

8. the System Design Limitation parameters and their corresponding data such as e.g. range, alarm limit, alert delay etc. be password protected on a level above what is required for normal operation and maintenance, i.e. on a system administrator level. Change of any data or parameters which are password protected and interruption of the measurement (wire break, signal out of range) shall be automatically logged and retrievable on a maintenance access level.

Data storage and retrieval

5.4 Storage of data should follow the requirements taking into account paragraphs 4.17 to 4.21 in the main body of these Guidelines. The equipment should be able to store a minimum number of self-monitoring parameters following common standards determined by the Organization.

5.5 The control and monitoring equipment should automatically record the proper functioning or failure of a BWMS without user interaction and add a time stamp to every entry. Additionally, the system should have a tool to produce summary text files for each ballast water operation on demand to support inspections work.

5.6 The system should store the required data in an acceptable format to be able to display, print or export the data for official inspections. An acceptable format could be:

.1 an internationally standardized readable format (e.g. text format, pdf, MS Excel); or

.2 the extensible mark-up language (xml).

5.7 The equipment should be so designed that, as far as is practical, it will not be possible to manipulate either the data being stored by the system or the data which has already been recorded. Any attempt to interfere with the integrity of the data should be recorded.

5.8 Permanent deletion of recordings should not be possible. The system should be capable of storing recorded data for at least 24 months to facilitate compliance with regulation B-2 of the BWM Convention. Where navigation equipment is connected to the monitoring system to provide data for recording, the interfaces should comply with applicable parts of International Standard IEC 61162.

PART 6 – VALIDATION OF SYSTEM DESIGN LIMITATIONS

6.1 The objective of the System Design Limitations approach is twofold. First, it ensures that the performance of the BWMS has been transparently assessed with respect to the known water quality and operational parameters that are important to its operation, including those that may not be specifically provided for in these Guidelines. Second, it provides transparent oversight of manufacturer BWMS performance claims that may go beyond specific criteria in these Guidelines. Although the validation of System Design Limitations yields transparent information that is reported on the Type Approval Certificate, this information does not affect the eligibility of a BWMS to receive type approval.

6.2 The low and/or high parameter values for each system design limitation should be validated to the satisfaction of the Administration as follows:

.1 the validation should be overseen by the Administration and should consist of a rigorous evidence-based assessment of a specific claim by the BWMS manufacturer that the equipment will operate as intended between pre-stated parameter values;

.2 tests to validate System Design Limitations should be undertaken in accordance with section 2.1 of this annex. Such tests may be combined with land-based and/or shipboard testing if the QAPP establishes that the validation tests will not interfere with the specific procedures in Part 2 of this annex. Laboratory or bench-scale testing may also be used in the validation of System Design Limitations;

.3 methods other than testing, such as the use of existing data and/or models, may be used in the validation of System Design Limitations. The source, suitability and reliability of such methods should be reported; and

.4 validation is not intended as a stress-test of the BWMS or as a procedure for identifying equipment failure points. Validation should be undertaken independently of the BWMS manufacturer and should be separate from BWMS research and development activities. Data and models may be supplied by manufacturer when appropriate but should be independently assessed.

6.3 Claims of open-ended performance (expressed as the lack of either a low or a high parameter value for a system design limitation) should also be validated.

6.4 BWMS manufacturers may include a margin of error in claiming System Design Limitations. For this reason, System Design Limitations should not necessarily be interpreted as the exact parameter values beyond which the BWMS is incapable of operation. The Administration should take this into account in considering whether to include any additional restrictions on the Type Approval Certificate in connection with the validation of System Design Limitations.

6.5 System Design Limitations should be established for all known parameters to which the design of the BWMS is sensitive that are important to the operation of the BWMS. In the case of system design limitation parameters that are also subject to specific criteria in Part 2 of this annex, the procedure set out in Part 2 should be followed. For such parameters, the approach in paragraph 6.2 may be used only to the extent that the performance claim goes beyond the specific criteria in Part 2.

6.6 A report should be submitted to the Administration containing all documentation (including procedures, methods, data, models, results, explanations and remarks) associated with the validation of System Design Limitations. The report should include at least the information identified in paragraph 2.7.2 of this annex.

PART 7 – TYPE APPROVAL CERTIFICATE AND TYPE APPROVAL REPORT

Type Approval Certificate

7.1 The Type Approval Certificate of BWMS should:

.1 identify the type and model of the BWMS to which it applies and identify equipment assembly drawings, duly dated;

.2 identify pertinent drawings bearing model specification numbers or equivalent identification details;

.3 include a reference to the full performance test protocol on which it is based;

.4 identify if it was issued by an Administration based on a Type Approval Certificate previously issued by another Administration. Such a certificate should identify the Administration that supervised conduction of the tests on the BWMS and a copy of the original test results should be attached to the Type Approval Certificate of BWMS;

.5 identify all conditions and limitations for the installation of BWMS on board the ship;

.6 include the System Design Limitations, which should be listed under the heading "This equipment has been designed for operation in the following conditions";

.7 include any restrictions imposed by the Administration due to the minimum holding time or in accordance with paragraph 6.4 of this annex; such restrictions should include any applicable environmental conditions (e.g. UV transmittance, etc.) and/or system operational parameters (e.g. min/max pressure, pressure differentials, min/max Total Residual Oxidants (TRO) if applicable, etc.); and

.8 an appendix containing test results of each land-based and shipboard test run. Such test results should include at least the numerical salinity, temperature, flow rates, and where appropriate UV transmittance. In addition, these test results should include all other relevant variables. The Type Approval Certificate should list any identified system design limitation parameters.

Type approval report

7.2 The type approval report should be submitted to the Organization and made available to the public and Member States by an appropriate means. It should contain at least:

.1 information on the type approval of the BWMS, including:

.1 the approval date;

.2 the name of the Administration;

.3 the name of the manufacturer;

.4 the trade name and product designation (such as model numbers) of the BWMS; and

.5 a copy of the Type Approval Certificate including its appendices, annexes or other attachments;

.2 an executive summary;

.3 a description of the BWMS, including, in the case of BWMS using Active Substances, the following information:

.1 the name of the Active Substance(s) or Preparation employed; and

.2 identification of the specific MEPC report and paragraph number granting Final Approval in accordance with the *Procedure for approval of ballast water management systems that make use of Active Substances* (G9), as revised;

.4 an overview of the process undertaken by the Administration to evaluate the BWMS, including the name and role of each test facility, subcontractor, and test organization involved in testing and approving the BWMS, the role of each report in the type approval decision, and a summary of the Administration's approach to overall quality assurance and quality control;

.5 the executive summary of each test report prepared in accordance with paragraphs 2.5.3, 2.6.7, 2.7.1, 2.7.2, 3.4 and 6.6 of this annex;

.6 the operational safety requirements of the BWMS and all safety related findings that have been made during the type approval process;

.7 a discussion section explaining the Administration's assessment that the BWMS:

.1 in every respect fulfilled the requirements of these Guidelines, including demonstrating under the procedures and conditions specified for both land-based and shipboard testing that it met the ballast water performance standard of described in regulation D-2;

.2 is designed and manufactured according to requirements and standards;

.3 is in compliance with all applicable requirements;

.4 has been approved taking into account the recommendations provided by the MEPC in the Final Approval of the BWMS, if any;

.5 operates within the System Design Limitations at the rated capacity, performance, and reliability as specified by the manufacturer;

.6 contains control and monitoring equipment that operates correctly;

.7 was installed in accordance with the technical installation specification of the manufacturer for all tests; and

.8 was used to treat volumes and flow rates of ballast water during the shipboard tests consistent with the normal ballast operations of the ship; and

.8 the following annexes:

.1 appropriate information on quality control and assurance; and

.2 each complete test report prepared in accordance with paragraphs 2.5.3, 2.6.7, 2.7.1, 2.7.2, 3.4 and 6.6 of this annex.

7.3 The Administration should redact proprietary information of the manufacturer from the type approval report before submitting it to the Organization.

7.4 The Type Approval Certificate and the type approval report (including their entire contents and all annexes, appendices or other attachments) should be accompanied by a translation into English, French or Spanish if not written in one of those languages.

7.5 Documents should not be incorporated by reference into the Type Approval Certificate. The Administration may incorporate an annex by reference into the type approval report if the reference (e.g. Internet URL) is expected to remain permanently valid. Upon any reference becoming invalid, the Administration should promptly re-submit the type approval report to the Organization and include the referenced document or an updated reference to it; the Organization should promptly make the revised report available to the public and Member States through an appropriate means.

APPENDIX

BADGE OR CIPHER **(Limiting Operating Conditions Apply)**
(delete as appropriate)

NAME OF ADMINISTRATION

TYPE APPROVAL CERTIFICATE OF BALLAST WATER MANAGEMENT SYSTEM

This is to certify that the ballast water management system listed below has been examined and tested in accordance with the requirements of the specifications contained in the Guidelines contained in IMO resolution MEPC.279(70). This certificate is valid only for the Ballast Water Management System referred to below.

Name of Ballast Water Management System: .....

Ballast Water Management System manufactured by: .....

Under type and model designation(s) .....
and incorporating:

To equipment/assembly drawing No.: ..... date: .....

Other equipment manufactured by : .....

To equipment/assembly drawing No.: ..... date: .....

Treatment Rated Capacity (m^3/h): .....

A copy of this Type Approval Certificate, should be carried on board a ship fitted with this Ballast Water Management System. A reference to the test protocol and a copy of the test results should be available for inspection on board the ship. If the Type Approval Certificate is issued based on approval by another Administration, reference to that Type Approval Certificate shall be made.

Limiting Operating Conditions imposed are described in this document.

(Temperature / Salinity)

Other restrictions imposed include the following:

This equipment has been designed for operation in the following conditions:
(insert System Design Limitations)

Official stamp

Signed .....
Administration of .....
Issued this ..... day of ..... 20 .....
Valid until this……day of …….. 20…..

Enc. Copy of the original test results.

***

ANNEX 6

RESOLUTION MEPC.280(70)
(Adopted on 28 October 2016)

EFFECTIVE DATE OF IMPLEMENTATION OF THE FUEL OIL STANDARD IN REGULATION 14.1.3 OF MARPOL ANNEX VI

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

RECALLING Article 38(a) of the Convention on the International Maritime Organization concerning the functions of the Marine Environment Protection Committee conferred upon it by international conventions for the prevention and control of marine pollution from ships,

RECALLING ALSO that the revised MARPOL Annex VI entered into force on 1 July 2010,

RECALLING FURTHER that regulation 14.1.3 of MARPOL Annex VI stipulates that the sulphur content of any fuel oil used on board ships shall not exceed 0.50% m/m on or after 1 January 2020,

RECALLING that regulations 14.8 to 14.10 of MARPOL Annex VI require that a review shall be completed by 2018 to determine the availability of fuel oil to comply with the fuel oil standard set forth in regulation 14.1.3 of MARPOL Annex VI,

NOTING that an assessment of fuel oil availability has been completed to inform the decision to be taken by the Parties to MARPOL Annex VI in accordance with regulation 14.10 of MARPOL Annex VI,

HAVING CONSIDERED, at its seventieth session, based on the aforementioned assessment of fuel oil availability, whether it is possible for ships to comply with the implementation date in regulation 14.1.3 of MARPOL Annex VI,

1 DECIDES that the fuel oil standard in regulation 14.1.3 of MARPOL Annex VI shall become effective on 1 January 2020;

2 REQUESTS the Parties to MARPOL Annex VI and other Member Governments to bring this decision to the attention of shipowners, ship operators, refinery industries and any other interested groups;

3 REQUESTS the Secretary-General to notify all Parties to MARPOL Annex VI of the aforementioned decision;

4 REQUESTS ALSO the Secretary-General to notify all Members of the Organization which are not Parties to MARPOL Annex VI of the aforementioned decision.

***

ANNEX 9

RESOLUTION MEPC.281(70)
(Adopted on 28 October 2016)

AMENDMENTS TO THE 2014 GUIDELINES ON THE METHOD OF CALCULATION OF THE ATTAINED ENERGY EFFICIENCY DESIGN INDEX (EEDI) FOR NEW SHIPS (RESOLUTION MEPC.245(66), AS AMENDED BY RESOLUTION MEPC.263(68))

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

RECALLING article 38(a) of the Convention on the International Maritime Organization concerning the functions of the Marine Environment Protection Committee (the Committee) conferred upon it by international conventions for the prevention and control of marine pollution from ships,

RECALLING ALSO that it adopted, by resolution MEPC.203(62), Amendments to the annex of the Protocol of 1997 to amend the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (inclusion of regulations on energy efficiency for ships in MARPOL Annex VI),

NOTING that the aforementioned amendments to MARPOL Annex VI entered into force on 1 January 2013,

NOTING ALSO that regulation 20 (Attained Energy Efficiency Design Index (attained EEDI)) of MARPOL Annex VI, as amended, requires that the EEDI shall be calculated taking into account the guidelines developed by the Organization,

NOTING the *2012 Guidelines on the method of calculation of the attained Energy Efficiency Design Index (EEDI) for new ships*, adopted by resolution MEPC.212(63), and, the amendments thereto, adopted by resolution MEPC.224(64),

NOTING FURTHER that it adopted, by resolution MEPC.245(66), the *2014 Guidelines on the method of calculation of the attained Energy Efficiency Design Index (EEDI) for new ships*, and by resolution MEPC.263(68), amendments thereto,

RECOGNIZING that the aforementioned amendments to MARPOL Annex VI require relevant guidelines for the smooth and uniform implementation of the regulations,

HAVING CONSIDERED, at its seventieth session, proposed amendments to the *2014 Guidelines on the method of calculation of the attained Energy Efficiency Design Index (EEDI) for new ships*, as amended,

1 ADOPTS amendments to the *2014 Guidelines on the method of calculation of the attained Energy Efficiency Design Index (EEDI) for new ships, as amended*, as set out in the annex to the present resolution;

2 INVITES Administrations to take the aforementioned amendments into account when developing and enacting national laws which give force to and implement provisions set forth in regulation 20 of MARPOL Annex VI, as amended;

3 REQUESTS the Parties to MARPOL Annex VI and other Member Governments to bring the amendments to the attention of shipowners, ship operators, shipbuilders, ship designers and any other interested parties;

4 AGREES to keep these Guidelines, as amended, under review, in the light of experience gained with their implementation.

ANNEX

AMENDMENTS TO THE 2014 GUIDELINES ON THE METHOD OF CALCULATION OF THE ATTAINED ENERGY EFFICIENCY DESIGN INDEX (EEDI) FOR NEW SHIPS (RESOLUTION MEPC.245(66), AS AMENDED BY RESOLUTION MEPC.263(68))

1 The following text is added after 2.12.3 in the table of contents:

"2.12.4 $f_{c\ bulk\ carriers\ designed\ to\ carry\ light\ cargoes}$; wood chip carriers"

2 Paragraph 2.1 is replaced with the following:

".1 C_F is a non-dimensional conversion factor between fuel consumption measured in g and CO_2 emission also measured in g based on carbon content. The subscripts $_{ME(i)}$ and $_{AE(i)}$ refer to the main and auxiliary engine(s) respectively. C_F corresponds to the fuel used when determining *SFC* listed in the applicable test report included in a Technical File as defined in paragraph 1.3.15 of NO_X Technical Code ("test report included in a NO_X technical file" hereafter). The value of C_F is as follows:

Type of fuel	Reference	Lower calorific value (kJ/kg)	Carbon content	C_F (t-CO_2/t-Fuel)
1 Diesel/Gas Oil	ISO 8217 Grades DMX through DMB	42,700	0.8744	3.206
2 Light Fuel Oil (LFO)	ISO 8217 Grades RMA through RMD	41,200	0.8594	3.151
3 Heavy Fuel Oil (HFO)	ISO 8217 Grades RME through RMK	40,200	0.8493	3.114
4 Liquefied Petroleum Gas (LPG)	Propane	46,300	0.8182	3.000
	Butane	45,700	0.8264	3.030
5 Liquefied Natural Gas (LNG)		48,000	0.7500	2.750
6 Methanol		19,900	0.3750	1.375
7 Ethanol		26,800	0.5217	1.913

In case of a ship equipped with a dual-fuel main or auxiliary engine, the C_F-factor for gas fuel and the C_F-factor for fuel oil should apply and be multiplied with the specific fuel oil consumption of each fuel at the relevant EEDI load point. Meanwhile, gas fuel should be identified whether it is regarded as the "primary fuel" in accordance with the formula below:

$$f_{DFgas} = \frac{\sum_{i=1}^{ntotal} P_{total(i)}}{\sum_{i=1}^{ngasfuel} P_{gasfuel(i)}} \times \frac{V_{gas} \times \rho_{gas} \times LCV_{gas} \times K_{gas}}{\left(\sum_{i=1}^{nLiquid} V_{liquid(i)} \times \rho_{liquid(i)} \times LCV_{liquid(i)} \times K_{liquid(i)} \right) + V_{gas} \times \rho_{gas} \times LCV_{gas} \times K_{gas}}$$

where,

f_{DFgas} is the fuel availability ratio of gas fuel corrected for the power ratio of gas engines to total engines, f_{DFgas} should not be greater than 1;

V_{gas} is the total net gas fuel capacity on board in m^3. If other arrangements, like exchangeable (specialized) LNG tank-containers and/or arrangements allowing frequent gas refuelling are used, the capacity of the whole LNG fuelling system should be used for V_{gas}. The boil-off rate (BOR) of gas cargo tanks can be calculated and included to V_{gas} if it is connected to the fuel gas supply system (FGSS);

V_{liquid} is the total net liquid fuel capacity on board in m^3 of liquid fuel tanks permanently connected to the ship's fuel system. If one fuel tank is disconnected by permanent sealing valves, V_{liquid} of the fuel tank can be ignored;

ρ_{gas} is the density of gas fuel in kg/m^3;

ρ_{liquid} is the density of each liquid fuel in kg/m^3;

LCV_{gas} is the low calorific value of gas fuel in kJ/kg;

LCV_{liquid} is the low calorific value of liquid fuel in kJ/kg;

K_{gas} is the filling rate for gas fuel tanks;

K_{liquid} is the filling rate for liquid fuel tanks;

P_{total} *is* the total installed engine power, P_{ME} *and* P_{AE} in kW;

$P_{gasfuel}$ *is* the dual fuel engine installed power, P_{ME} *and* P_{AE} in kW;

.1 If the total gas fuel capacity is at least 50% of the fuel capacity dedicated to the dual fuel engines , namely $f_{DFgas} \geq 0.5$, then gas fuel is regarded as the "Primary fuel," and $f_{DFgas} = 1$ and $f_{DFliquid} = 0$ for each dual fuel engine.

.2 If $f_{DFgas} < 0.5$, gas fuel is not regarded as the "primary fuel." The C_F and SFC in the EEDI calculation for each dual fuel engine (both main and auxiliary engines) should be calculated as the weighted average of C_F and SFC for liquid and gas mode, according to f_{DFgas} and $f_{DFliquid}$, such as the original item of $P_{ME(i)} \cdot C_{FME(i)} \cdot SFC_{ME(i)}$ in the EEDI calculation is to be replaced by the formula below.

$$P_{ME(i)} \cdot (f_{DFgas(i)} \cdot (C_{FME\ pilot\ fuel(i)} \cdot SFC_{ME\ pilot\ fuel(i)} + C_{FME\ gas(i)} \cdot SFC_{ME\ gas(i)}) + f_{DFliquid(i)} \cdot C_{FME\ liquid(i)} \cdot SFC_{ME\ liquid(i)})$$ "

3 The following sentences are added at the end of existing paragraph 2.7.1:

"Reference lower calorific values of additional fuels are given in the table in paragraph 2.1 of these Guidelines. The reference lower calorific value corresponding to the conversion factor of the respective fuel should be used for calculation."

4 A new paragraph 2.12.4 is added after the existing paragraph 2.12.3 as follows:

".4 For bulk carriers having *R* of less than 0.55 (e.g. wood chip carriers), the following cubic capacity correction factor, fc bulk carriers designed to carry light cargoes, should apply:

$$f_{c\ bulk\ carriers\ designed\ to\ carry\ light\ cargoes} = R^{-0.15}$$

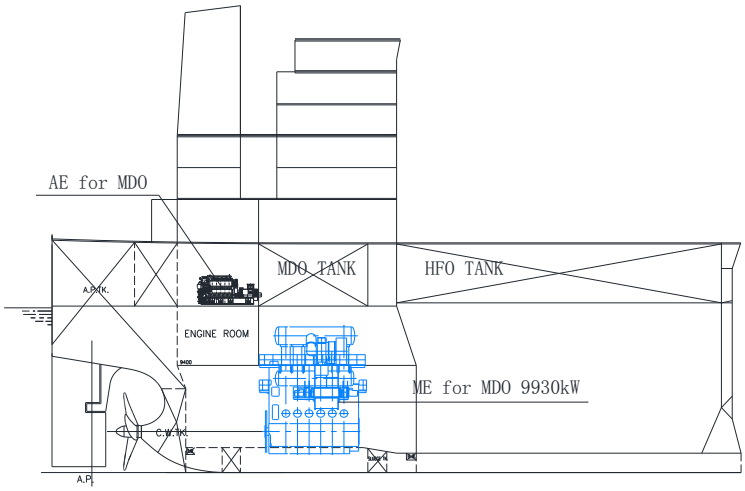
where: *R* is the capacity ratio of the deadweight of the ship (tonnes) as determined by paragraph 2.4 divided by the total cubic capacity of the cargo holds of the ship (m^3)."

5 Appendix 4 is replaced with the following:

"APPENDIX 4

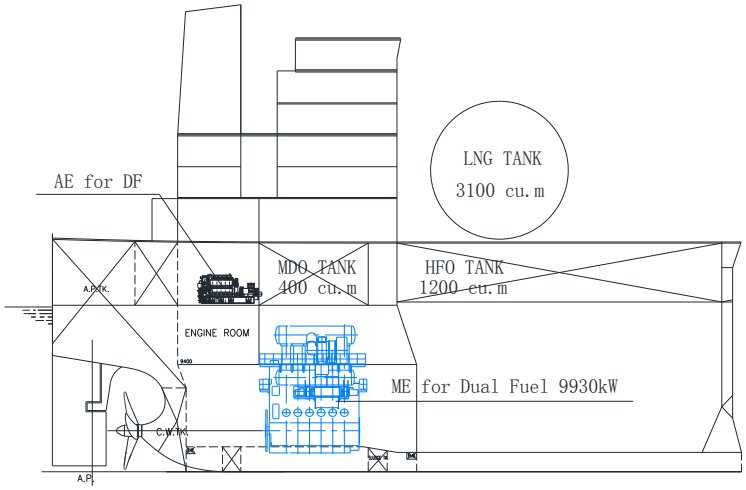
EEDI CALCULATION EXAMPLES FOR USE OF DUAL FUEL ENGINES

Case 1: Standard Kamsarmax ship, one main engine (MDO), standard auxiliary engines (MDO), no shaft generator:



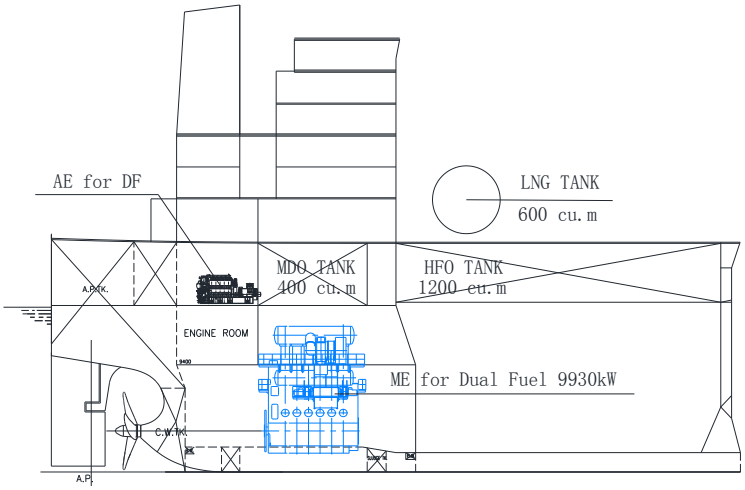
S/N	Parameter	Formula or Source	Unit	Value
1	MCR_{ME}	MCR rating of main engine	kW	9930
2	Capacity	Deadweight of the ship at summer load draft	DWT	81200
3	V_{ref}	Ships speed as defined in EEDI regulation	kn	14
4	P_{ME}	0.75 x MCR_{ME}	kW	7447.5
5	P_{AE}	0.05 x MCR_{ME}	kW	496.5
6	C_{FME}	C_F factor of Main engine using MDO	-	3.206
7	C_{FAE}	C_F factor of Auxiliary engine using MDO	-	3.206
8	SFC_{ME}	Specific fuel consumption of at P_{ME}	g/kWh	165
9	SFC_{AE}	Specific fuel consumption of at P_{AE}	g/kWh	210
10	EEDI	$((P_{ME} x C_{F\ ME} \text{ x } SFC_{ME}) + (P_{AE} \text{ x } C_{FAE} \text{ x } SFC_{AE})) / (v_{ref} \text{ x } Capacity)$	gCO_2/tnm	3.76

Case 2: LNG is regarded as the "primary fuel" if dual-fuel main engine and dual-fuel auxiliary engine (LNG, pilot fuel MDO; no shaft generator) are equipped with bigger LNG tanks



S/N	Parameter	Formula or Source	Unit	Value
1	MCR_{ME}	MCR rating of main engine	kW	9930
2	Capacity	Deadweight of the ship at summer load draft	DWT	81200
3	V_{ref}	Ships speed as defined in EEDI regulation	kn	14
4	P_{ME}	0.75 x MCR_{ME}	kW	7447.5
5	P_{AE}	0.05 x MCR_{ME}	kW	496.5
6	$CF_{Pilotfuel}$	C_F factor of pilot fuel for dual fuel ME using MDO	-	3.206
7	$CF_{AE\ Plilotfuel}$	C_F factor of pilot fuel for Auxiliary engine using MDO	-	3.206
8	CF_{LNG}	C_F factor of dual fuel engine using LNG	-	2.75
9	$SFC_{MEPilotfuel}$	Specific fuel consumption of pilot fuel for dual fuel ME at P_{ME}	g/kWh	6
10	$SFC_{AE\ Pilotfuel}$	Specific fuel consumption of pilot fuel for dual fuel AE at P_{AE}	g/kWh	7
11	$SFC_{ME\ LNG}$	Specific fuel consumption of ME using LNG at P_{ME}	g/kWh	136
12	$SFC_{AE\ LNG}$	Specific fuel consumption of AE using LNG at P_{AE}	g/kWh	160
13	V_{LNG}	LNG tank capacity on board	m^3	3100
14	V_{HFO}	Heavy fuel oil tank capacity on board	m^3	1200
15	V_{MDO}	Marine diesel oil tank capacity on board	m^3	400
16	ρ_{LNG}	Density of LNG	kg/m^3	450
17	ρ_{HFO}	Density of heavy fuel oil	kg/m^3	991
18	ρ_{MDO}	Density of Marine diesel oil	kg/m^3	900
19	LCV_{LNG}	Low calorific value of LNG	kJ/kg	48000
20	LCV_{HFO}	Low calorific value of heavy fuel oil	kJ/kg	40200
21	LCV_{MDO}	Low calorific value of marine diesel oil	kJ/kg	42700
22	K_{LNG}	Filling rate of LNG tank	-	0.95
23	K_{HFO}	Filling rate of heavy fuel tank	-	0.98
24	K_{MDO}	Filling rate of marine diesel tank	-	0.98
25	f_{DFgas}	$\frac{P_{ME}+P_{AE}}{P_{ME}+P_{AE}} \times \frac{V_{LNG} \times \rho_{LNG} \times LCV_{LNG} \times K_{LNG}}{V_{HFO} \times \rho_{HFO} \times LCV_{HFO} \times K_{HFO} + V_{MDO} \times \rho_{MDO} \times LCV_{MDO} \times K_{MDO} + V_{LNG} \times \rho_{LNG} \times LCV_{LNG} \times K_{LNG}}$	-	0.5068
26	EEDI	(P_{ME} x ($C_{F\ Pilotfuel}$ x $SFC_{ME\ Pilotfuel}$ + $C_{F\ LNG}$ x $SFC_{ME\ LNG}$) + P_{AE} x ($C_{F\ Pilotfuel}$ x $SFC_{AE\ Pilotfuel}$ + $C_{F\ LNG}$ x $SFC_{AE\ LNG}$)) / (V_{ref} x *Capacity*)	gCO_2/tnm	2.78

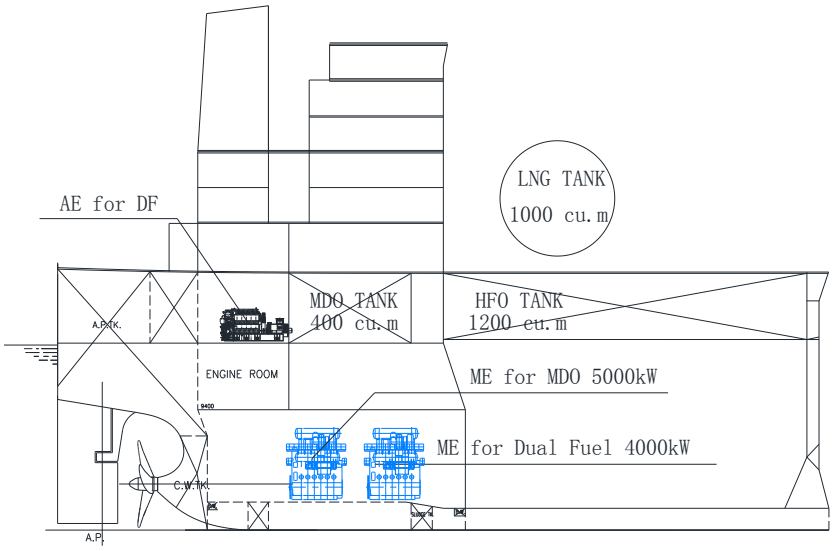
Case 3: LNG is not regarded as the "primary fuel" if dual-fuel main engine and dual-fuel auxiliary engine (LNG, pilot fuel MDO; no shaft generator) are equipped with smaller LNG tanks



S/N	Parameter	Formula or Source	Unit	Value
1	MCR_{ME}	MCR rating of main engine	kW	9930
2	Capacity	Deadweight of the ship at summer load draft	DWT	81200
3	V_{ref}	Ships speed as defined in EEDI regulation	kn	14
4	P_{ME}	0.75 x MCR_{ME}	kW	7447.5
5	P_{AE}	0.05 x MCR_{ME}	kW	496.5
6	$C_{FPilotfuel}$	C_F factor of pilot fuel for dual fuel ME using MDO	-	3.206
7	$C_{FAE\ Plilotfuel}$	C_F factor of pilot fuel for Auxiliary engine using MDO	-	3.206
8	C_{FLNG}	C_F factor of dual fuel engine using LNG	-	2.75
9	C_{FMDO}	C_F factor of dual fuel ME/AE engine using MDO	-	3.206
10	$SFC_{MEPilotfuel}$	Specific fuel consumption of pilot fuel for dual fuel ME at P_{ME}	g/kWh	6
11	$SFC_{AE\ Pilotfuel}$	Specific fuel consumption of pilot fuel for dual fuel AE at P_{AE}	g/kWh	7
12	$SFC_{ME\ LNG}$	Specific fuel consumption of ME using LNG at P_{ME}	g/kWh	136
13	$SFC_{AE\ LNG}$	Specific fuel consumption of AE using LNG at P_{AE}	g/kWh	160
14	$SFC_{ME\ MDO}$	Specific fuel consumption of dual fuel ME using MDO at P_{ME}	g/kWh	165
15	$SFC_{AE\ MDO}$	Specific fuel consumption of dual fuel AE using MDO at P_{AE}	g/kWh	187
16	V_{LNG}	LNG tank capacity on board	m^3	600
17	V_{HFO}	Heavy fuel oil tank capacity on board	m^3	1800
18	V_{MDO}	Marine diesel oil tank capacity on board	m^3	400
19	ρ_{LNG}	Density of LNG	kg/m^3	450
20	ρ_{HFO}	Density of heavy fuel oil	kg/m^3	991
21	ρ_{MDO}	Density of Marine diesel oil	kg/m^3	900
22	LCV_{LNG}	Low calorific value of LNG	kJ/kg	48000
24	LCV_{HFO}	Low calorific value of heavy fuel oil	kJ/kg	40200
25	LCV_{MDO}	Low calorific value of marine diesel oil	kJ/kg	42700
26	K_{LNG}	Filling rate of LNG tank	-	0.95
27	K_{HFO}	Filling rate of heavy fuel tank	-	0.98

S/N	Parameter	Formula or Source	Unit	Value
28	K_{MDO}	Filling rate of marine diesel tank	-	0.98
29	f_{DFgas}	$\frac{P_{ME}+P_{AE}}{P_{ME}+P_{AE}} \times \frac{V_{LNG} \times \rho_{LNG} \times LCV_{LNG} \times K_{LNG}}{V_{HFO} \times \rho_{HFO} \times LCV_{HFO} \times K_{HFO} + V_{MDO} \times \rho_{MDO} \times LCV_{MDO} \times K_{MDO} + V_{LNG} \times \rho_{LNG} \times LCV_{LNG} \times K_{LNG}}$	-	0.1261
30	$f_{DFliquid}$	1- f_{DFgas}	-	0.8739
31	EEDI	$(P_{ME}$ x $(\mathbf{f_{DFgas}}$ x $(C_{F\ Pilotfuel}$ x $SFC_{ME\ Pilotfuel} + C_{F\ LNG}$ x $SFC_{ME\ LNG})$ + $\mathbf{f_{DFliquid}}$ xC_{FMDO} x $SFC_{ME\ MDO})$ + P_{AE} x$(\mathbf{f_{DFgas}}$ x $(C_{FAE\ Pilotfuel}$ x $SFC_{AE\ Pilotfuel} + C_{F\ LNG}$ x $SFC_{AE\ LNG})$+$\mathbf{f_{DFliquid}}$ xC_{FMDO} x $SFC_{AE\ MDO}))$ / $(v_{ref}$ x $Capacity)$	gCO_2/tnm	3.61

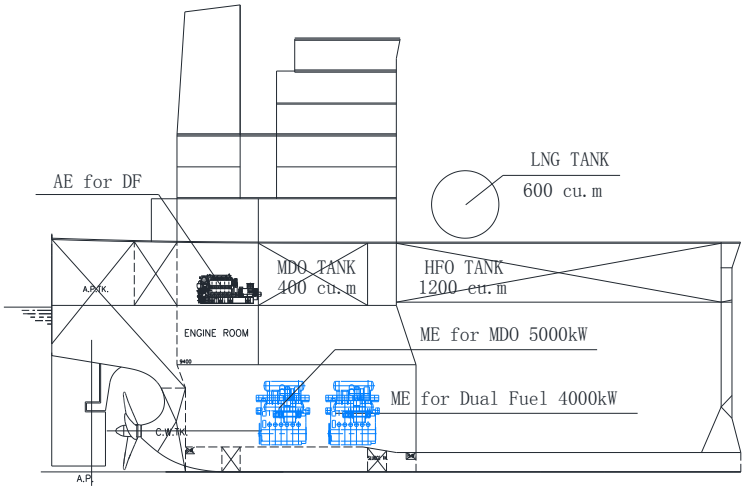
Case 4: One dual-fuel main engine (LNG, pilot fuel MDO) and one main engine (MDO) and dual-fuel auxiliary engine (LNG, pilot fuel MDO, no shaft generator) which LNG could be regarded as "primary fuel" only for the dual-fuel main engine.



S/N	Parameter	Formula or Source	Unit	Value
1	MCR_{MEMDO}	MCR rating of main engine using only MDO	kW	5000
2	MCR_{MELNG}	MCR rating of main engine using dual fuel	kW	4000
3	Capacity	Deadweight of the ship at summer load draft	DWT	81200
4	V_{ref}	Ships speed	kn	14
5	P_{MEMDO}	0.75 x MCR_{MEMDO}	kW	3750
6	P_{MELNG}	0.75 x MCR_{MELNG}	kW	3000
7	P_{AE}	0.05 x (MCR_{MEMDO} + MCR_{MELNG})	kW	450
8	$C_{FPilotfuel}$	C_F factor of pilot fuel for dual fuel ME using MDO	-	3.206
9	$C_{FAE\ Plilotfuel}$	C_F factor of pilot fuel for Auxiliary engine using MDO	-	3.206
10	C_{FLNG}	C_F factor of dual fuel engine using LNG	-	2.75
11	C_{FMDO}	C_F factor of dual fuel ME/AE engine using MDO	-	3.206
12	$SFC_{MEPilotfuel}$	Specific fuel consumption of pilot fuel for dual fuel ME at P_{ME}	g/kWh	6
13	$SFC_{AE\ Pilotfuel}$	Specific fuel consumption of pilot fuel for dual fuel AE at P_{AE}	g/kWh	7
14	$SFC_{DF\ LNG}$	Specific fuel consumption of dual fuel ME using LNG at P_{ME}	g/kWh	158
15	$SFC_{AE\ LNG}$	Specific fuel consumption of AE using LNG at P_{AE}	g/kWh	160
16	$SFC_{ME\ MDO}$	Specific fuel consumption of single fuel ME at P_{ME}	g/kWh	180
17	V_{LNG}	LNG tank capacity on board	m^3	1000
18	V_{HFO}	Heavy fuel oil tank capacity on board	m^3	1200

S/N	Parameter	Formula or Source	Unit	Value
19	V_{MDO}	Marine diesel oil tank capacity on board	m^3	400
20	ρ_{LNG}	Density of LNG	kg/m^3	450
21	ρ_{HFO}	Density of heavy fuel oil	kg/m^3	991
22	ρ_{MDO}	Density of Marine diesel oil	kg/m^3	900
23	LCV_{LNG}	Low calorific value of LNG	kJ/kg	48000
24	LCV_{HFO}	Low calorific value of heavy fuel oil	kJ/kg	40200
25	LCV_{MDO}	Low calorific value of marine diesel oil	kJ/kg	42700
26	K_{LNG}	Filling rate of LNG tank	-	0.95
27	K_{HFO}	Filling rate of heavy fuel tank	-	0.98
28	K_{MDO}	Filling rate of Lmarine diesel tank	-	0.98
29	f_{DFgas}	$\frac{P_{MEMDO}+P_{MELNG}+P_{AE}}{P_{MELNG}+P_{AE}} \times \frac{V_{LNG}\times\rho_{LNG}\times LCV_{LNG}\times K_{LNG}}{V_{HFO}\times\rho_{HFO}\times LCV_{HFO}\times K_{HFO}+V_{MDO}\times\rho_{MDO}\times LCV_{MDO}\times K_{MDO}+V_{LNG}\times\rho_{LNG}\times LCV_{LNG}\times K_{LNG}}$	-	0.5195
30	EEDI	$(P_{MELNG}$ x ($C_{F\ Pilotfuel}$ x $SFC_{ME\ Pilotfuel}$ + $C_{F\ LNG}$ x $SFC_{DF\ LNG}$) + P_{MEMDO} x $C_{F\ MDO}$ x $SFC_{ME\ MDO}$ + P_{AE} x ($C_{FAE\ Pilotfuel}$ x $SFC_{AE\ Pilotfuel}$ + $C_{F\ LNG}$ x $SFC_{AE\ LNG}$)) / (v_{ref} x *Capacity*)	gCO_2/tnm	3.28

Case 5: One dual-fuel main engine (LNG, pilot fuel MDO) and one main engine (MDO) and dual-fuel auxiliary engine (LNG, pilot fuel MDO, no shaft generator) which LNG could not be regarded as "primary fuel" for the dual- fuel main engine.



S/N	Parameter	Formula or Source	Unit	Value
1	MCR_{MEMDO}	MCR rating of main engine using only MDO	kW	5000
2	MCR_{MELNG}	MCR rating of main engine using dual fuel	kW	4000
3	Capacity	Deadweight of the ship at summer load draft	DWT	81200
4	V_{ref}	Ships speed	kn	14
5	P_{MEMDO}	0.75 x MCR_{MEMDO}	kW	3750
6	P_{MELNG}	0.75 x MCR_{MELNG}	kW	3000
7	P_{AE}	0.05 x (MCR_{MEMDO} + MCR_{MELNG})	kW	450
8	$C_{FPilotfuel}$	C_F factor of pilot fuel for dual fuel ME using MDO	-	3.206
9	$C_{FAE\ Plilotfuel}$	C_F factor of pilot fuel for Auxiliary engine using MDO	-	3.206
10	C_{FLNG}	C_F factor of dual fuel engine using LNG	-	2.75
11	C_{FMDO}	C_F factor of dual fuel ME/AE engine using MDO	-	2.75
12	$SFC_{MEPilotfuel}$	Specific fuel consumption of pilot fuel for dual fuel ME at P_{ME}	g/kWh	6
13	$SFC_{AE\ Pilotfuel}$	Specific fuel consumption of pilot fuel for dual fuel AE at P_{AE}	g/kWh	7

S/N	Parameter	Formula or Source	Unit	Value
14	$SFC_{DF\ LNG}$	Specific fuel consumption of dual fuel ME using LNG at P_{ME}	g/kWh	158
15	$SFC_{AE\ LNG}$	Specific fuel consumption of AE using LNG at P_{AE}	g/kWh	160
16	$SFC_{DF\ MDO}$	Specific fuel consumption of dual fuel ME using MDO at P_{ME}	g/kWh	185
17	$SFC_{ME\ MDO}$	Specific fuel consumption of single fuel ME at P_{ME}	g/kWh	180
18	$SFC_{AE\ MDO}$	Specific fuel consumption of AE using MDO at P_{AE}	g/kWh	187
19	V_{LNG}	LNG tank capacity on board	m^3	600
20	V_{HFO}	Heavy fuel oil tank capacity on board	m^3	1200
21	V_{MDO}	Marine diesel oil tank capacity on board	m^3	400
22	ρ_{LNG}	Density of LNG	kg/m^3	450
23	ρ_{HFO}	Density of heavy fuel oil	kg/m^3	991
24	ρ_{MDO}	Density of Marine diesel oil	kg/m^3	900
25	LCV_{LNG}	Low calorific value of LNG	kJ/kg	48000
26	LCV_{HFO}	Low calorific value of heavy fuel oil	kJ/kg	40200
27	LCV_{MDO}	Low calorific value of marine diesel oil	kJ/kg	42700
28	K_{LNG}	Filling rate of LNG tank	-	0.95
29	K_{HFO}	Filling rate of heavy fuel tank	-	0.98
30	K_{MDO}	Filling rate of marine diesel tank	-	0.98
31	f_{DFgas}	$\frac{P_{MEMDO}+P_{MELNG}+P_{AE}}{P_{MELNG}+P_{AE}} \times \frac{V_{LNG} \times \rho_{LNG} \times LCV_{LNG} \times K_{LNG}}{V_{HFO} \times \rho_{HFO} \times LCV_{HFO} \times K_{HFO} + V_{MDO} \times \rho_{MDO} \times LCV_{MDO} \times K_{MDO} + V_{LNG} \times \rho_{LNG} \times LCV_{LNG} \times K_{LNG}}$	-	0.3462
32	$f_{DFliquid}$	1- f_{DFgas}	-	0.6538
33	EEDI	(P_{MELNG} x ($\mathbf{f_{DFgas}}$ x ($C_{F\ Pilotfuel}$ x $SFC_{ME\ Pilotfuel}$ + $C_{F\ LNG}$ x $SFC_{DF\ LNG}$) + $\mathbf{f_{DFliquid}}$ x C_{FMDO} x $SFC_{DF\ MDO}$))+ P_{MEMDO} x $C_{F\ MDO}$ x $SFC_{ME\ MDO}$ + P_{AE} x ($\mathbf{f_{DFgas}}$ x ($C_{FAE\ Pilotfuel}$ x $SFC_{AE\ Pilotfuel}$ + $C_{F\ LNG}$ x $SFC_{AE\ LNG}$) + $\mathbf{f_{DFliquid}}$ xC_{FMDO} x $SFC_{AE\ MDO}$)) / (v_{ref} x *Capacity*)	gCO_2/tnm	3.54

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ANNEX 10

RESOLUTION MEPC.282(70)
(Adopted on 28 October 2016)

2016 GUIDELINES FOR THE DEVELOPMENT OF A SHIP ENERGY EFFICIENCY MANAGEMENT PLAN (SEEMP)

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

RECALLING article 38(a) of the Convention on the International Maritime Organization concerning the functions of the Marine Environment Protection Committee (the Committee) conferred upon it by international conventions for the prevention and control of marine pollution from ships,

RECALLING ALSO that it adopted, by resolution MEPC.203(62), Amendments to the annex of the Protocol of 1997 to amend the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (inclusion of regulations on energy efficiency for ships in MARPOL Annex VI),

NOTING that the aforementioned amendments to MARPOL Annex VI, which included a new chapter 4 on regulations on energy efficiency for ships in Annex VI, entered into force on 1 January 2013,

NOTING ALSO that regulation 22 of MARPOL Annex VI, as amended, requires each ship to keep on board a ship specific Ship Energy Efficiency Management Plan, taking into account guidelines developed by the Organization,

NOTING FURTHER that it adopted, by resolution MEPC.278(70), amendments to MARPOL Annex VI related to the data collection system for fuel oil consumption which are expected to enter into force on 1 March 2018 upon their deemed acceptance on 1 September 2017,

RECOGNIZING that the aforementioned amendments to MARPOL Annex VI require the adoption of relevant guidelines for uniform and effective implementation of the regulations and to provide sufficient lead time for industry to prepare,

HAVING CONSIDERED, at its seventieth session, draft *2016* Guidelines for the development of a Ship Energy Efficiency Management Plan *(SEEMP)*,

1 ADOPTS the *2016 Guidelines for the development of a Ship Energy Efficiency Management Plan (SEEMP)* (the 2016 Guidelines), as set out in the annex to the present resolution;

2 INVITES Administrations to take the annexed 2016 Guidelines into account when developing and enacting national laws which give force to and implement requirements set forth in regulations 22 and 22A of MARPOL Annex VI, as amended;

3 REQUESTS the Parties to MARPOL Annex VI and other Member Governments to bring the annexed 2016 Guidelines to the attention of masters, seafarers, shipowners, ship operators and any other interested groups;

4 AGREES to keep the 2016 Guidelines under review in light of the experience gained with their implementation;

5 SUPERSEDES the *2012 Guidelines for the development of a Ship Energy Efficiency Management Plan (SEEMP),* adopted by resolution MEPC.213(63).

ANNEX

2016 GUIDELINES FOR THE DEVELOPMENT OF A SHIP ENERGY EFFICIENCY MANAGEMENT PLAN (SEEMP)

CONTENTS

1 INTRODUCTION

1.1 The *Guidelines for the development of a Ship Energy Efficiency Management Plan* have been developed to assist with the preparation of the Ship Energy Efficiency Management Plan (SEEMP) required by regulation 22 of MARPOL Annex VI.

1.2 There are two parts to a SEEMP. Part I provides a possible approach for monitoring ship and fleet efficiency performance over time and some options to be considered when seeking to optimize the performance of the ship. Part II provides the methodologies ships of 5,000 gross tonnage and above should use to collect the data required pursuant to regulation 22A of MARPOL Annex VI and the processes that the ship should use to report the data to the ship's Administration or any organization duly authorized by it.

1.3 A sample form of the SEEMP is presented in appendices 1 and 2 for illustrative purposes. A standardized data reporting format for the data collection system is presented in appendix 3.

2 DEFINITIONS

2.1 For the purpose of these Guidelines, the definitions in MARPOL Annex VI apply.

2.2 "Ship fuel oil consumption data" means the data required to be collected on an annual basis and reported as specified in appendix IX to MARPOL Annex VI.

2.3 "Safety management system" means a structured and documented system enabling company personnel to implement effectively the company safety and environmental protection policy, as defined in paragraph 1.1 of International Safety Management Code.

PART I OF THE SEEMP: SHIP MANAGEMENT PLAN TO IMPROVE ENERGY EFFICIENCY

3 GENERAL

3.1 In global terms it should be recognized that operational efficiencies delivered by a large number of ship operators will make an invaluable contribution to reducing global carbon emissions.

3.2 The purpose of part I of the SEEMP is to establish a mechanism for a company and/or a ship to improve the energy efficiency of a ship's operation. Preferably, this aspect of the ship-specific SEEMP is linked to a broader corporate energy management policy for the company that owns, operates or controls the ship, recognizing that no two shipping companies are the same, and that ships operate under a wide range of different conditions.

3.3 Many companies will already have an environmental management system (EMS) in place under ISO 14001 which contains procedures for selecting the best measures for particular vessels and then setting objectives for the measurement of relevant parameters, along with relevant control and feedback features. Monitoring of operational environmental efficiency should therefore be treated as an integral element of broader company management systems.

3.4 In addition, many companies already develop, implement and maintain a Safety Management System. In such case, part I of the SEEMP may form part of the ship's Safety Management System.

3.5 This section provides guidance for the development of part I of the SEEMP that should be adjusted to the characteristics and needs of individual companies and ships. Part I is intended to be a management tool to assist a company in managing the ongoing environmental performance of its vessels and as such, it is recommended that a company develops procedures for implementing the plan in a manner which limits any on-board administrative burden to the minimum necessary.

3.6 Part I of the SEEMP should be developed as a ship-specific plan by the company, and should reflect efforts to improve a ship's energy efficiency through four steps: planning, implementation, monitoring, and self-evaluation and improvement. These components play a critical role in the continuous cycle to improve ship energy efficiency management. With each iteration of the cycle, some elements of part I will necessarily change while others may remain as before.

3.7 At all times safety considerations should be paramount. The trade a ship is engaged in may determine the feasibility of the efficiency measures under consideration. For example, ships that perform services at sea (pipe laying, seismic survey, OSVs, dredgers, etc.) may choose different methods of improving energy efficiency when compared to conventional cargo carriers. The nature of operations and influence of prevailing weather conditions, tides and currents combined with the necessity of maintaining safe operations may require adjustment of general procedures to maintain the efficiency of the operation, for example the ships which are dynamically positioned. The length of voyage may also be an important parameter as may trade specific safety considerations.

4 FRAMEWORK AND STRUCTURE OF PART I OF THE SEEMP

4.1 Planning

4.1.1 Planning is the most crucial stage of part I of the SEEMP, in that it primarily determines both the current status of ship energy usage and the expected improvement of ship energy efficiency. Therefore, it is encouraged to devote sufficient time to planning so that the most appropriate, effective and implementable plan can be developed.

Ship-specific measures

4.1.2 Recognizing that there are a variety of options to improve efficiency – speed optimization, weather routing and hull maintenance, for example – and that the best package of measures for a ship to improve efficiency differs to a great extent depending upon ship type, cargoes, routes and other factors, the specific measures for the ship to improve energy efficiency should be identified in the first place. These measures should be listed as a package of measures to be implemented, thus providing the overview of the actions to be taken for that ship.

4.1.3 During this process, therefore, it is important to determine and understand the ship's current status of energy usage. Part I of the SEEMP should identify energy-saving measures that have been undertaken, and should determines how effective these measures are in terms of improving energy efficiency. Part I also should identify what measures can be adopted to further improve the energy efficiency of the ship. It should be noted, however, that not all measures can be applied to all ships, or even to the same ship under different operating conditions and that some of them are mutually exclusive. Ideally, initial measures could yield energy (and cost) saving results that then can be reinvested into more difficult or expensive efficiency upgrades identified by part I.

4.1.4 Guidance on best practices for fuel-efficient operation of ships, set out in chapter 5, can be used to facilitate this part of the planning phase. Also, in the planning process, particular consideration should be given to minimize any on-board administrative burden.

Company-specific measures

4.1.5 The improvement of energy efficiency of ship operation does not necessarily depend on single ship management only. Rather, it may depend on many stakeholders including ship repair yards, shipowners, operators, charterers, cargo owners, ports and traffic management services. For example, "Just in time" – as explained in paragraph 5.2.4 – requires good early communication among operators, ports and traffic management service. The better coordination among such stakeholders is, the more improvement can be expected. In most cases, such coordination or total management is better made by a company rather than by a ship. In this sense, it is recommended that a company also establish an energy management plan to manage its fleet (should it not have one in place already) and make necessary coordination among stakeholders.

Human resource development

4.1.6 For effective and steady implementation of the adopted measures, raising awareness of and providing necessary training for personnel both on shore and on board are an important element. Such human resource development is encouraged and should be considered as an important component of planning as well as a critical element of implementation.

Goal setting

4.1.7 The last part of planning is goal setting. It should be emphasized that the goal setting is voluntary, that there is no need to announce the goal or the result to the public, and that neither a company nor a ship are subject to external inspection. The purpose of goal setting is to serve as a signal which involved people should be conscious of, to create a good incentive for proper implementation, and then to increase commitment to the improvement of energy efficiency. The goal can take any form, such as the annual fuel consumption or a specific target of Energy Efficiency Operational Indicator (EEOI). Whatever the goal is, the goal should be measurable and easy to understand.

4.2 **Implementation**

Establishment of implementation system

4.2.1 After a ship and a company identify the measures to be implemented, it is essential to establish a system for implementation of the identified and selected measures by developing the procedures for energy management, by defining tasks and by assigning them to qualified personnel. Thus, part I of the SEEMP should describe how each measure should be implemented and who the responsible person(s) is. The implementation period (start and end dates) of each selected measure should be indicated. The development of such a system can be considered as a part of planning, and therefore may be completed at the planning stage.

Implementation and record-keeping

4.2.2 The planned measures should be carried out in accordance with the predetermined implementation system. Record-keeping for the implementation of each measure is beneficial for self-evaluation at a later stage and should be encouraged. If any identified measure cannot be implemented for any reason(s), the reason(s) should be recorded for internal use.

4.3 Monitoring

Monitoring tools

4.3.1 The energy efficiency of a ship should be monitored quantitatively. This should be done by an established method, preferably by an international standard. The EEOI developed by the Organization is one of the internationally established tools to obtain a quantitative indicator of energy efficiency of a ship and/or fleet in operation, and can be used for this purpose. Therefore, EEOI could be considered as the primary monitoring tool, although other quantitative measures also may be appropriate.

4.3.2 If used, it is recommended that the EEOI is calculated in accordance with the *Guidelines for the development of a Ship Energy Efficiency Management Plan* (MEPC.1/Circ.684) developed by the Organization, adjusted, as necessary, to a specific ship and trade.

4.3.3 In addition to the EEOI, if convenient and/or beneficial for a ship or a company, other measurement tools can be utilized. In the case where other monitoring tools are used, the concept of the tool and the method of monitoring may be determined at the planning stage.

Establishment of monitoring system

4.3.4 It should be noted that whatever measurement tools are used, continuous and consistent data collection is the foundation of monitoring. To allow for meaningful and consistent monitoring, the monitoring system, including the procedures for collecting data and the assignment of responsible personnel, should be developed. The development of such a system can be considered as a part of planning, and therefore should be completed at the planning stage.

4.3.5 It should be noted that, in order to avoid unnecessary administrative burdens on ships' staff, monitoring should be carried out as far as possible by shore staff, utilizing data obtained from existing required records such as the official and engineering log-books and oil record books, etc. Additional data could be obtained as appropriate.

Search and rescue

4.3.6 When a ship diverts from its scheduled passage to engage in search and rescue operations, it is recommended that data obtained during such operations is not used in ship energy efficiency monitoring, and that such data may be recorded separately.

4.4 Self-evaluation and improvement

4.4.1 Self-evaluation and improvement is the final phase of the management cycle. This phase should produce meaningful feedback for the coming first stage, i.e. planning stage of the next improvement cycle.

4.4.2 The purpose of self-evaluation is to evaluate the effectiveness of the planned measures and of their implementation, to deepen the understanding on the overall characteristics of the ship's operation such as what types of measures can/cannot function effectively, and how and/or why, to comprehend the trend of the efficiency improvement of that ship and to develop the improved management plan for the next cycle.

4.4.3 For this process, procedures for self-evaluation of ship energy management should be developed. Furthermore, self-evaluation should be implemented periodically by using data collected through monitoring. In addition, it is recommended to invest time in identifying the cause-and-effect of the performance during the evaluated period for improving the next stage of the management plan.

5 GUIDANCE ON BEST PRACTICES FOR FUEL-EFFICIENT OPERATION OF SHIPS

5.1 The search for efficiency across the entire transport chain takes responsibility beyond what can be delivered by the owner/operator alone. A list of all the possible stakeholders in the efficiency of a single voyage is long; obvious parties are designers, shipyards and engine manufacturers for the characteristics of the ship, and charterers, ports and vessel traffic management services, etc., for the specific voyage. All involved parties should consider the inclusion of efficiency measures in their operations both individually and collectively.

5.2 Fuel-efficient operations

Improved voyage planning

5.2.1 The optimum route and improved efficiency can be achieved through the careful planning and execution of voyages. Thorough voyage planning needs time, but a number of different software tools are available for planning purposes.

5.2.2 The *Guidelines for voyage planning,* adopted by resolution A.893(21), provide essential guidance for the ship's crew and voyage planners.

Weather routeing

5.2.3 Weather routeing has a high potential for efficiency savings on specific routes. It is commercially available for all types of ship and for many trade areas. Significant savings can be achieved, but conversely weather routeing may also increase fuel consumption for a given voyage.

Just in time

5.2.4 Good early communication with the next port should be an aim in order to give maximum notice of berth availability and facilitate the use of optimum speed where port operational procedures support this approach.

5.2.5 Optimized port operation could involve a change in procedures involving different handling arrangements in ports. Port authorities should be encouraged to maximize efficiency and minimize delay.

Speed optimization

5. 2.6 Speed optimization can produce significant savings. However, optimum speed means the speed at which the fuel used per tonne mile is at a minimum level for that voyage. It does not mean minimum speed; in fact, sailing at less than optimum speed will consume more fuel

rather than less. Reference should be made to the engine manufacturer's power/consumption curve and the ship's propeller curve. Possible adverse consequences of slow speed operation may include increased vibration and problems with soot deposits in combustion chambers and exhaust systems. These possible consequences should be taken into account.

5. 2.7 As part of the speed optimization process, due account may need to be taken of the need to coordinate arrival times with the availability of loading/discharge berths, etc. The number of ships engaged in a particular trade route may need to be taken into account when considering speed optimization.

5. 2.8 A gradual increase in speed when leaving a port or estuary whilst keeping the engine load within certain limits may help to reduce fuel consumption.

5. 2.9 It is recognized that under many charter parties the speed of the vessel is determined by the charterer and not the operator. Efforts should be made when agreeing charter party terms to encourage the ship to operate at optimum speed in order to maximize energy efficiency.

Optimized shaft power

5. 2.10 Operation at constant shaft RPM can be more efficient than continuously adjusting speed through engine power (see paragraph 5.7). The use of automated engine management systems to control speed rather than relying on human intervention may be beneficial.

5.3 Optimized ship handling

Optimum trim

5.3.1 Most ships are designed to carry a designated amount of cargo at a certain speed for a certain fuel consumption. This implies the specification of set trim conditions. Loaded or unloaded, trim has a significant influence on the resistance of the ship through the water and optimizing trim can deliver significant fuel savings. For any given draft there is a trim condition that gives minimum resistance. In some ships, it is possible to assess optimum trim conditions for fuel efficiency continuously throughout the voyage. Design or safety factors may preclude full use of trim optimization.

Optimum ballast

5.3.2 Ballast should be adjusted taking into consideration the requirements to meet optimum trim and steering conditions and optimum ballast conditions achieved through good cargo planning.

5.3.3 When determining the optimum ballast conditions, the limits, conditions and ballast management arrangements set out in the ship's Ballast Water Management Plan are to be observed for that ship.

5.3.4 Ballast conditions have a significant impact on steering conditions and autopilot settings and it needs to be noted that less ballast water does not necessarily mean the highest efficiency.

Optimum propeller and propeller inflow considerations

5.3.5 Selection of the propeller is normally determined at the design and construction stage of a ship's life but new developments in propeller design have made it possible for retrofitting of later designs to deliver greater fuel economy. Whilst it is certainly for consideration, the propeller is but one part of the propulsion train and a change of propeller in isolation may have no effect on efficiency and may even increase fuel consumption.

5.3.6 Improvements to the water inflow to the propeller using arrangements such as fins and/or nozzles could increase propulsive efficiency power and hence reduce fuel consumption.

Optimum use of rudder and heading control systems (autopilots)

5.3.7 There have been large improvements in automated heading and steering control systems technology. Whilst originally developed to make the bridge team more effective, modern autopilots can achieve much more. An integrated Navigation and Command System can achieve significant fuel savings by simply reducing the distance sailed "off track". The principle is simple; better course control through less frequent and smaller corrections will minimize losses due to rudder resistance. Retrofitting of a more efficient autopilot to existing ships could be considered.

5.3.8 During approaches to ports and pilot stations the autopilot cannot always be used efficiently as the rudder has to respond quickly to given commands. Furthermore at certain stages of the voyage it may have to be deactivated or very carefully adjusted, i.e. heavy weather and approaches to ports.

5.3.9 Consideration may be given to the retrofitting of improved rudder blade design (e.g. "twist-flow" rudder).

Hull maintenance

5.3.10 Docking intervals should be integrated with ship operator's ongoing assessment of ship performance. Hull resistance can be optimized by new technology-coating systems, possibly in combination with cleaning intervals. Regular in-water inspection of the condition of the hull is recommended.

5.3.11 Propeller cleaning and polishing or even appropriate coating may significantly increase fuel efficiency. The need for ships to maintain efficiency through in-water hull cleaning should be recognized and facilitated by port States.

5.3.12 Consideration may be given to the possibility of timely full removal and replacement of underwater paint systems to avoid the increased hull roughness caused by repeated spot blasting and repairs over multiple dockings.

5.3.13 Generally, the smoother the hull, the better the fuel efficiency.

Propulsion system

5.3.14 Marine diesel engines have a very high thermal efficiency (~50%). This excellent performance is only exceeded by fuel cell technology with an average thermal efficiency of 60%. This is due to the systematic minimization of heat and mechanical loss. In particular, the new breed of electronic controlled engines can provide efficiency gains. However, specific training for relevant staff may need to be considered to maximize the benefits.

Propulsion system maintenance

5.3.15 Maintenance in accordance with manufacturers' instructions in the company's planned maintenance schedule will also maintain efficiency. The use of engine condition monitoring can be a useful tool to maintain high efficiency.

5.3.16 Additional means to improve engine efficiency might include use of fuel additives; adjustment of cylinder lubrication oil consumption; valve improvements; torque analysis; and automated engine monitoring systems.

5.4 Waste heat recovery

5.4.1 Waste heat recovery is now a commercially available technology for some ships. Waste heat recovery systems use thermal heat losses from the exhaust gas for either electricity generation or additional propulsion with a shaft motor.

5.4.2 It may not be possible to retrofit such systems into existing ships. However, they may be a beneficial option for new ships. Shipbuilders should be encouraged to incorporate new technology into their designs.

5.5 Improved fleet management

5.5.1 Better utilization of fleet capacity can often be achieved by improvements in fleet planning. For example, it may be possible to avoid or reduce long ballast voyages through improved fleet planning. There is opportunity here for charterers to promote efficiency. This can be closely related to the concept of "just in time" arrivals.

5.5.2 Efficiency, reliability and maintenance-oriented data sharing within a company can be used to promote best practice among ships within a company and should be actively encouraged.

5.6 Improved cargo handling

Cargo handling is in most cases under the control of the port and optimum solutions matched to ship and port requirements should be explored.

5.7 Energy management

5.7.1 A review of electrical services on board can reveal the potential for unexpected efficiency gains. However care should be taken to avoid the creation of new safety hazards when turning off electrical services (e.g. lighting). Thermal insulation is an obvious means of saving energy. Also see comment below on shore power.

5.7.2 Optimization of reefer container stowage locations may be beneficial in reducing the effect of heat transfer from compressor units. This might be combined as appropriate with cargo tank heating, ventilation, etc. The use of water-cooled reefer plant with lower energy consumption might also be considered.

5.8 Fuel type

The use of emerging alternative fuels may be considered as a CO_2 reduction method but availability will often determine the applicability.

5.9 Other measures

5.9.1 Development of computer software for the calculation of fuel consumption, for the establishment of an emissions "footprint," to optimize operations, and the establishment of goals for improvement and tracking of progress may be considered.

5.9.2 Renewable energy sources, such as wind, solar (or photovoltaic) cell technology, have improved enormously in the recent years and should be considered for on-board application.

5.9.3 In some ports shore power may be available for some ships but this is generally aimed at improving air quality in the port area. If the shore-based power source is carbon efficient, there may be a net efficiency benefit. Ships may consider using onshore power if available.

5.9.4 Even wind assisted propulsion may be worthy of consideration.

5.9.5 Efforts could be made to source fuel of improved quality in order to minimize the amount of fuel required to provide a given power output.

5.10 Compatibility of measures

5.10.1 These Guidelines indicate a wide variety of possibilities for energy efficiency improvements for the existing fleet. While there are many options available, they are not necessarily cumulative, are often area and trade dependent and likely to require the agreement and support of a number of different stakeholders if they are to be utilized most effectively.

Age and operational service life of a ship

5.10.2 All measures identified in this document are potentially cost-effective as a result of high oil prices. Measures previously considered unaffordable or commercially unattractive may now be feasible and worthy of fresh consideration. Clearly, this equation is heavily influenced by the remaining service life of a ship and the cost of fuel.

Trade and sailing area

5.10.3 The feasibility of many of the measures described in this guidance will be dependent on the trade and sailing area of the ship. Sometimes ships will change their trade areas as a result of a change in chartering requirements but this cannot be taken as a general assumption. For example, wind-enhanced power sources might not be feasible for short sea shipping as these ships generally sail in areas with high traffic densities or in restricted waterways. Another aspect is that the world's oceans and seas each have characteristic conditions and so ships designed for specific routes and trades may not obtain the same benefit by adopting the same measures or combination of measures as other ships. It is also likely that some measures will have a greater or lesser effect in different sailing areas.

5.10.4 The trade a ship is engaged in may determine the feasibility of the efficiency measures under consideration. For example, ships that perform services at sea (pipe laying, seismic survey, OSVs, dredgers, etc.) may choose different methods of improving energy efficiency when compared to conventional cargo carriers. The length of voyage may also be an important parameter as may trade specific safety considerations. The pathway to the most efficient combination of measures will be unique to each vessel within each shipping company.

PART II OF THE SEEMP: SHIP FUEL OIL CONSUMPTION DATA COLLECTION PLAN

6 GENERAL

6.1 Regulation 22.2 of MARPOL Annex VI specifies that, "On or before 31 December 2018, in the case of a ship of 5,000 gross tonnage and above, the SEEMP shall include a description of the methodology that will be used to collect the data required by regulation 22A.1 of this Annex and the processes that will be used to report the data to the ship's Administration." Part II of the SEEMP, the Ship Fuel Oil Consumption Data Collection Plan (hereinafter referred to as "Data Collection Plan") contains such methodology and processes.

6.2 With respect to part II of the SEEMP, these Guidelines provide guidance for developing a ship-specific method to collect, aggregate, and report ship data with regard to annual fuel oil consumption, distance travelled, hours underway and other data required by regulation 22A of MARPOL Annex VI to be reported to the Administration.

6.3 Pursuant to regulation 5.4.5 of MARPOL Annex VI, the Administration should ensure that each ship's SEEMP complies with regulation 22.2 of MARPOL Annex VI prior to collecting any data.

7 GUIDANCE ON METHODOLOGY FOR COLLECTING DATA ON FUEL OIL CONSUMPTION, DISTANCE TRAVELLED AND HOURS UNDERWAY

Fuel oil[1] consumption

7.1 Fuel oil consumption should include all the fuel oil consumed on board including but not limited to the fuel oil consumed by the main engines, auxiliary engines, gas turbines, boilers and inert gas generator, for each type of fuel oil consumed, regardless of whether a ship is underway or not. Methods for collecting data on annual fuel oil consumption in metric tonnes include (in no particular order):

.1 method using bunker delivery notes (BDNs):

This method determines the annual total amount of fuel oil used based on BDNs, which are required for fuel oil for combustion purposes delivered to and used on board a ship in accordance with regulation 18 of MARPOL Annex VI; BDNs are required to be retained on board for three years after the fuel oil has been delivered. The Data Collection Plan should set out how the ship will operationalize the summation of BDN information and conduct tank readings. The main components of this approach are as follows:

.1 annual fuel oil consumption would be the total mass of fuel oil used on board the vessel as reflected in the BDNs. In this method, the BDN fuel oil quantities would be used to determine the annual total mass of fuel oil consumption, plus the amount of fuel oil left over from the last calendar year period and less the amount of fuel oil carried over to the next calendar year period;

[1] Regulation 2.9 of MARPOL Annex VI defines "fuel oil" as "fuel oil means any fuel delivered to and intended for combustion purposes for propulsion or operation on board a ship, including gas, distillate and residual fuels."

.2 to determine the difference between the amount of remaining tank oil before and after the period, the tank reading should be carried out at the beginning and the end of the period;

.3 in the case of a voyage that extends across the data reporting period, the tank reading should occur by tank monitoring at the ports of departure and arrival of the voyage and by statistical methods such as rolling average using voyage days;

.4 fuel oil tank readings should be carried out by appropriate methods such as automated systems, soundings and dip tapes. The method for tank readings should be specified in the Data Collection Plan;

.5 the amount of any fuel oil offloaded should be subtracted from the fuel oil consumption of that reporting period. This amount should be based on the records of the ship's oil record book; and

.6 any supplemental data used for closing identified difference in bunker quantity should be supported with documentary evidence;

.2 method using flow meters:

This method determines the annual total amount of fuel oil consumption by measuring fuel oil flows on board by using flow meters. In case of the breakdown of flow meters, manual tank readings or other alternative methods will be conducted instead. The Data Collection Plan should set out information about the ship's flow meters and how the data will be collected and summarized, as well as how necessary tank readings should be conducted:

.1 annual fuel oil consumption may be the sum of daily fuel oil consumption data of all relevant fuel oil consuming processes on board measured by flow meters;

.2 the flow meters applied to monitoring should be located so as to measure all fuel oil consumption on board. The flow meters and their link to specific fuel oil consumers should be described in the Data Collection Plan;

.3 note that it should not be necessary to correct this fuel oil measurement method for sludge if the flow meter is installed after the daily tank as sludge will be removed from the fuel oil prior to the daily tank;

.4 the flow meters applied to monitoring fuel oil flow should be identified in the Data Collection Plan. Any consumer not monitored with a flow meter should be clearly identified, and an alternative fuel oil consumption measurement method should be included; and

.5 calibration of the flow meters should be specified. Calibration and maintenance records should be available on board;

.3 method using bunker fuel oil tank monitoring on board:

.1 to determine the annual fuel oil consumption, the amount of daily fuel oil consumption data measured by tank readings which are carried out by appropriate methods such as automated systems, soundings and dip tapes will be aggregated. The tank readings will normally occur daily when the ship is at sea and each time the ship is bunkering or de-bunkering; and

.2 the summary of monitoring data containing records of measured fuel oil consumption should be available on board.

7.2 Any corrections, e.g. density, temperature, if applied, should be documented[2].

Conversion factor C_F

7.3 If fuel oils are used that do not fall into one of the categories as described in the *2014 Guidelines on the method of calculation of the attained Energy Efficiency Design Index (EEDI) for new ships* (resolution MEPC.245(66)), as amended, and have no C_F-factor assigned (e.g. some "hybrid fuel oils"), the fuel oil supplier should provide a C_F-factor for the respective product supported by documentary evidence.

Distance travelled

7.4 Appendix IX of MARPOL Annex VI specifies that distance travelled should be submitted to the Administration and:

.1 distance travelled over ground in nautical miles should be recorded in the log-book in accordance with SOLAS regulation V/28.1[3];

.2 the distance travelled while the ship is underway under its own propulsion should be included into the aggregated data of distance travelled for the calendar year; and

.3 other methods to measure distance travelled accepted by the Administration may be applied. In any case, the method applied should be described in detail in the Data Collection Plan.

Hours underway

7.5 Appendix IX of MARPOL Annex VI specifies that hours underway should be submitted to the Administration. Hours underway should be an aggregated duration while the ship is underway under its own propulsion.

Data quality

7.6 The Data Collection Plan should include data quality control measures which should be incorporated into the existing shipboard safety management system. Additional measures to be considered could include:

.1 the procedure for identification of data gaps and correction thereof; and

[2] For example, ISO 8217 provides a method for liquid fuel.

[3] Distance travelled measured using satellite data is distance travelled over the ground.

.2 the procedure to address data gaps if monitoring data is missing, for example, flow meter malfunctions.

A standardized data reporting format

7.7 Regulation 22A.3 of MARPOL Annex VI states that the data specified in appendix IX of the Annex are to be communicated electronically using a standardized form developed by the Organization. The collected data should be reported to the Administration in the standardized format shown in appendix 3.

8 DIRECT CO_2 EMISSIONS MEASUREMENT

8.1 Direct CO_2 emission measurement is not required by regulation 22A of MARPOL Annex VI.

8.2 Direct CO_2 emissions measurement, if used, should be carried out as follows:

.1 this method is based on the determination of CO_2 emission flows in exhaust gas stacks by multiplying the CO_2 concentration of the exhaust gas with the exhaust gas flow. In case of the absence or/and breakdown of direct CO_2 emissions measurement equipment, manual tank readings will be conducted instead;

.2 the direct CO_2 emissions measurement equipment applied to monitoring is located exhaustively so as to measure all CO_2 emissions in the ship. The locations of all equipment applied are described in this monitoring plan; and

.3 calibration of the CO_2 emissions measurement equipment should be specified. Calibration and maintenance records should be available on board.

APPENDIX 1

SAMPLE FORM OF SHIP MANAGEMENT PLAN TO IMPROVE ENERGY EFFICIENCY (PART I OF THE SEEMP)

Name of ship:		Gross tonnage:	
Ship type:		Capacity:	

Date of development:		Developed by:	
Implementation period:	From: Until:	Implemented by:	
Planned date of next evaluation:			

1 MEASURES

Energy efficiency measures	**Implementation** (including the starting date)	**Responsible personnel**
Weather routing	<Example> Contracted with (Service providers) to use their weather routing system and start using on trial basis as of 1 July 2012.	<Example> The master is responsible for selecting the optimum route based on the information provided by (Service providers).
Speed optimization	While the design speed (85% MCR) is 19.0 kt, the maximum speed is set at 17.0 kt as of 1 July 2012.	The master is responsible for keeping the ship's speed. The log-book entry should be checked every day.

2 MONITORING

Description of monitoring tools

3 GOAL

Measurable goals

4 EVALUATION

Procedures of evaluation

APPENDIX 2

SAMPLE FORM OF SHIP FUEL OIL CONSUMPTION DATA COLLECTION PLAN (PART II OF THE SEEMP)

1 Ship particulars

Name of ship	
IMO number	
Company	
Flag	
Ship type	
Gross tonnage	
NT	
DWT	
EEDI (if applicable)	
Ice class	

2 Record of revision of Fuel Oil Consumption Data Collection Plan

Date of revision	Revised provision

3 Ship engines and other fuel oil consumers and fuel oil types used

	Engines or other fuel oil consumers	Power	Fuel oil types
1	Type/model of main engine	(kW)	
2	Type/model of auxiliary engine	(kW)	
3	Boiler	(…)	
4	Inert gas generator	(…)	

4 Emission factor

C_F is a non-dimensional conversion factor between fuel oil consumption and CO_2 emission in the *2014 Guidelines on the method of calculation of the attained Energy Efficiency Design Index (EEDI) for new ships* (resolution MEPC.245(66)), as amended. The annual total amount of CO_2 is calculated by multiplying annual fuel oil consumption and C_F for the type of fuel.

Fuel oil Type	C_F (t-CO_2 / t-Fuel)
Diesel/Gas oil (e.g. ISO 8217 grades DMX through DMB)	3.206
Light fuel oil (LFO) (e.g. ISO 8217 grades RMA through RMD)	3.151
Heavy fuel oil (HFO) (e.g. ISO 8217 grades RME through RMK)	3.114
Liquefied petroleum gas (LPG) (Propane)	3.000
Liquefied petroleum gas (LPG) (Butane)	3.030
Liquefied natural gas (LNG)	2.750

Fuel oil Type	C_F (t-CO_2 / t-Fuel)
Methanol	1.375
Ethanol	1.913
Other (……)	

5 Method to measure fuel oil consumption

The applied method for measurement for this ship is given below. The description explains the procedure for measuring data and calculating annual values, measurement equipment involved, etc.

Method	Description

6 Method to measure distance travelled

Description

7 Method to measure hours underway

Description

8 Processes that will be used to report the data to the Administration

Description

9 Data quality

Description

APPENDIX 3

STANDARDIZED DATA REPORTING FORMAT FOR THE DATA COLLECTION SYSTEM

Method used to measure fuel oil consumption[9]	Fuel oil consumption (t)										Hours underway (h)	Distance Travelled (nm)	Power output (rated power) (kW)[8]		Ice class[7] (if applicable)	EEDI (if applicable)[6] (gCO_2/t.nm)	DWT[5]	NT[4]	Gross tonnage[3]	Ship type[2]	IMO number[1]	End date (dd/mm/yyyy)	Start date (dd/mm/yyyy)
	Other(……..)	(C_f ;…..)	Ethanol (C_f: 1.913)	Methanol (C_f: 1.375)	LNG (C_f: 2.750)	LPG (Butane) (C_f: 3.030)	LPG (Propane)	HFO (C_f: 3.114)	LFO (C_f: 3.151)	Diesel/Gas Oil (C_f: 3.206)			Auxiliary Engine(s)	Main Propulsion Power									

1 In accordance with the *IMO Ship Identification Number Scheme*, adopted by the Organization by resolution A.1078(28).
2 As defined in regulation 2 of MARPOL Annex VI or other (to be stated).
3 Gross tonnage should be calculated in accordance with the International Convention on Tonnage Measurement of Ships, 1969.
4 NT should be calculated in accordance with the International Convention on Tonnage Measurement of Ships, 1969. If not applicable, note "N/A".
5 DWT means the difference in tonnes between the displacement of a ship in water of relative density of 1025 kg/m^3 at the summer load draught and the lightweight of the ship. The summer load draught should be taken as the maximum summer draught as certified in the stability booklet approved by the Administration or an organization recognized by it.
6 EEDI should be calculated in accordance with the *2014 Guidelines on the method of calculation of the attained Energy Efficiency Design Index (EEDI) for new ships*, as amended, adopted by resolution MEPC 245(66). If not applicable, note "N/A".
7 Ice class should be consistent with the definition set out in the *International Code for ships operating in polar waters (Polar Code)*, adopted by resolutions MEPC.264(68) and MSC.385(94)). If not applicable, note "N/A".
8 Power output (rated power) of main and auxiliary reciprocating internal combustion engines over 130 kW (to be stated in kW). Rated power means the maximum continuous rated power as specified on the nameplate of the engine.
9 Method used to measure fuel oil consumption: 1: method using BDNs, 2: method using flow meters, 3: method using bunker fuel oil tank monitoring

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ANNEX 12

RESOLUTION MEPC.283(70)
(Adopted on 28 October 2016)

DESIGNATION OF THE JOMARD ENTRANCE AS A PARTICULARLY SENSITIVE SEA AREA

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

RECALLING Article 38(a) of the Convention on the International Maritime Organization concerning the functions of the Marine Environment Protection Committee conferred upon it by international conventions for the prevention and control of marine pollution from ships,

BEING AWARE of the ecological criteria, in particular the criteria relating to uniqueness or rarity, critical habitat, and diversity, and the social, economic, cultural and scientific attributes of the region surrounding the Jomard Entrance[1] as well as its vulnerability to damage by international shipping activities and the steps taken by Papua New Guinea to address that vulnerability,

NOTING the *Revised Guidelines for the Identification and Designation of Particularly Sensitive Sea Areas,* adopted by resolution A.982(24), as amended by resolution MEPC.267(68), (Revised PSSA Guidelines), and the *Revised Guidance Document for Submission of PSSA Proposals to IMO* set forth in MEPC.1/Circ.510,

HAVING AGREED that the criteria for the identification and designation of a PSSA provided in the revised PSSA Guidelines are fulfilled for the Jomard Entrance,

HAVING NOTED that the Jomard Entrance includes newly established routeing systems (four two-way routes and a precautionary area), adopted by the Maritime Safety Committee at its ninety-fourth session, as the Associated Protective Measures to improve the safety of navigation and the protection of the marine environment, and that these routeing systems entered into force on 1 June 2015,

1 DESIGNATES the region surrounding Jomard Entrance as defined in annex 1 to the present resolution as a Particularly Sensitive Sea Area;

2 INVITES Member Governments to recognize the ecological, social, cultural, economic and scientific attributes of the Jomard Entrance area, set forth in annex 2 to the present resolution, as well as its vulnerability to damage by international shipping activities, as described in annex 3 to the present resolution;

3 FURTHER INVITES Member Governments to note the associated protective measures established to address the area's vulnerability, the details of which are set out in annex 4 to the present resolution.

[1] Part of the Louisiade Archipelago at the south eastern extent of Milne Bay Province, Papua New Guinea.

ANNEX 1

DESCRIPTION OF JOMARD ENTRANCE PARTICULARLY SENSITIVE SEA AREA*

Description of the Particularly Sensitive Sea Area

To minimize the risk of damage from ship groundings and pollution damage by international shipping activities and to protect the area's unique and threatened species as well as to preserve as far as practicable its critical habitat and diversity, mariners should exercise extreme care when navigating in the area bounded by the geographical coordinates of the Particularly Sensitive Sea Area, provided below, and adhere to the Associated Protective Measures set out in annex 4.

All geographical positions are based on WGS 84. Listed number refer to figure 1.

No.	Latitude	Longitude
1	11°10.00'S	151°53.00'E
2	11°26.00'S	151°59.90'E
3	11°26.00'S	152°08.24'E
4	11°23.00'S	152°13.00'E
5	11°10.00'S	152°13.00'E

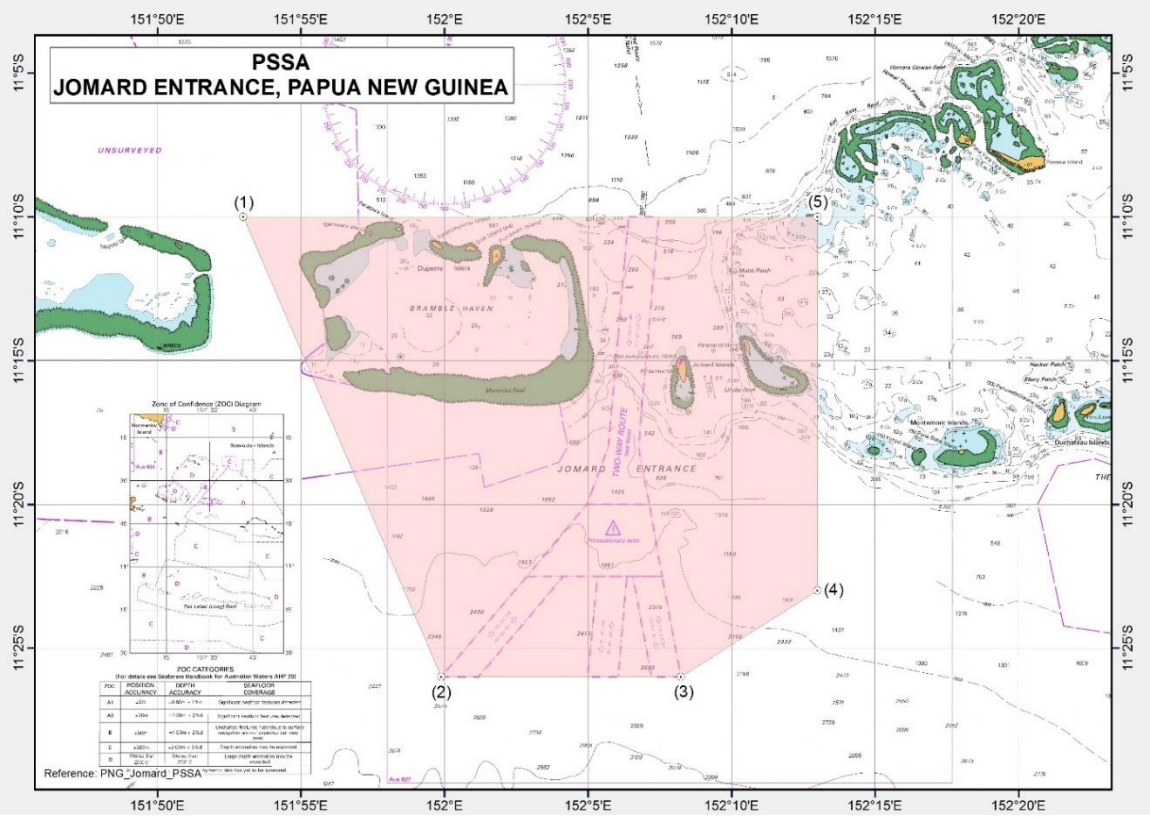


Figure 1 – Map showing the PSSA and newly established IMO routeing systems

* The text in this annex is drawn from Papua New Guinea's submission contained in document MEPC 70/8. All references in this resolution are from annex 2 of MEPC 70/8.

ANNEX 2

ECOLOGICAL, SOCIO-ECONOMIC, AND SCIENTIFIC CRITERIA OF THE JOMARD ENTRANCE PARTICULARLY SENSITIVE SEA AREA*

1 INTRODUCTION – THE JOMARD ENTRANCE ECOSYSTEM

1.1 The Jomard Islands consist of two small uninhabited coral cay islands – Jomard Island (also called the Panuwaiyayapuna Island, meaning "long island") and Panarairai Island (also called Panadaludalu, meaning "island of dolphins"). The islands are located on raised reef flats and are fringed by coral reefs of significant size. The morphology of the fringing reef varies from site to site due to the different physical processes that take place on different parts of the island (e.g. wind and wave action). Without the current protection provided by the fringing reefs, the physical processes evident would ultimately erode the islands away. The fringing reef of Jomard Island also provides a significant habitat for marine species such as fish, crustaceans, corals, bivalves and other marine organisms. The marine life surrounding Jomard Island is extremely diverse in nature.

1.2 The beaches at Jomard Island are made up of fine sands and coral rubble. Ground vegetation lines the upper limits of the beach providing stability and protection from eroding processes, while the littoral zone (intertidal zone) is home to corals that have adapted to withstand intense ultraviolet radiation, desiccation and high salinities. The reefs surrounding Jomard Island provides very good shelter for foraging and mating activities for turtles. Furthermore, these diverse reef systems support other marine species like fish, rays, clam and sea cucumber which seek food, refuge and thrive in this healthy ecosystem. The beaches of Jomard Island and its fringing reefs accommodate a number of globally endangered species.

1.3 The terrestrial environment provides shelter for various species of birds like pigeons, crows and sea eagles. Jomard Island has been identified to have the largest turtle-nesting rookery in the southern part of Milne Bay Province. All six species of turtles that may be found in the region are currently listed in Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) as species threatened with extinction, and are also listed in Appendix I and/or Appendix II of the Convention on the Conservation of Migratory Species of Wild Animals. The IUCN Red List of Threatened Species currently lists the Loggerhead, Leatherback and Olive Ridley turtles as Vulnerable; the Green turtle as Endangered; and the Hawksbill turtle as Critically Endangered.

1.4 Bramble Haven lies to the north-west of the Jomard Islands and consists of a total of five coral cay islands namely, Punawan, Siva, Pananimunimu, Panapwa and Awanagamwana Islands. These islands are important habitat to marine fauna and flora and lie on a reef platform of approximate depth range of 2 metres to 25 meters. The southern part of this group of islands consists of moderately exposed fringing and lagoonal reefs with sand and coral bommies in the shallows and coral ridges running horizontally across the slope. These drop off into deep water. The islands harbour marine species of turtles, giant clam, bumphead parrotfish (*Bolbometopon muricatum*) and humphead (maori) wrasse (*Cheilinus undulates*) that are on the IUCN Red list of threatened species. Green and hawksbill turtles often utilize these areas for nesting, mating and foraging, while loggerhead turtles transit through the region. This area is commercially exploited at a very low level. Factors that contributes toward this include the location of these islands in relation to human settlement.

* The text in this annex is drawn from Papua New Guinea's submission contained in document MEPC 70/8.

1.5 As the PSSA is part of the Louisiade Archipelago, Milne Bay Province, and is also within the Coral Triangle, the critical habitat, diversity and biogeographic importance criteria are applicable throughout the PSSA. The uniqueness or rarity and fragility criteria apply particularly in the vicinity of the Jomard Islands, with the naturalness criteria particularly applicable around Bramble Haven. The social or economic dependency and human dependency criteria are also applicable in both the Bramble Haven and Jomard Islands. Further details are provided below.

2 ECOLOGICAL CRITERIA

Uniqueness or rarity

2.1 Six of the world's seven marine turtle species can be found in the waters off PNG. These include Hawksbill, Green Turtle, Leatherback, Flatback, Loggerhead and Olive Ridley. (Kinch, J., 2003). Of these, the first three are commonly found in the vicinity of Jomard Entrance. Scientific surveys and anecdotal evidence suggest that PNG has some of the largest remaining populations of these three turtle species in the world today. There is an informal tagging programme for turtle management and conservation at Jomard Islands, as the turtles have been nesting there annually for generations.

2.2 In terms of rarity, all six species of turtles that may be found in the region are currently listed in Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) as species threatened with extinction, and are also listed in Appendix I and/or Appendix II of the Convention on the Conservation of Migratory Species of Wild Animals. The IUCN Red List of Threatened Species (http://iucn-mtsg.org/) currently lists the Loggerhead, Leatherback and Olive Ridley turtles as Vulnerable; the Green turtle as Endangered; and the Hawksbill as Critically Endangered (see below).

Turtle Type	IUCN Status List
Loggerhead Turtle (*Caretta caretta*)	Vulnerable
Green turtle (*Chelonia mydas*)	Endangered
Leatherback turtle (*Dermochelys coriacea*)	Vulnerable
Hawksbill turtle (*Eretmochelys imbricata*)	Critically Endangered
Flatback turtle (*Natator depressus*)	Data Deficient
Olive ridley turtle (*Lepidochelys olivacea*)	Vulnerable

Critical habitat

2.3 Fifteen marine sub-regions were identified within the Milne Bay Province by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) Ocean Flagships, the Louisiade Archipelago has the largest area of reef or reef associated (deep lagoon) habitat, with approximately 800,000 ha, representing 58% of the Archipelago (Skewes et al., 2003 and Skewes et al., 2011).

2.4 As noted above, the area provides a critical habitat for the Hawksbill, Green and Leatherback turtles. According to the IUCN, the overall global decline of the Hawksbill in particular has been in excess of 80% (Mortimer and Donnelly, 2008). In addition to these turtle species, both Bramble Haven and Jomard Island provide habitats for migratory marine and shore birds nesting sites, as well as for all giant clam species (Allen et al., 2003).

2.5 The fringing reef of Jomard Island provides a significant habitat for marine species such as fish, crustaceans, corals, bivalves and other marine organisms (UNESCO, 2016). The marine life surrounding Jomard Island is extremely diverse in nature. These habitats are sensitive to any shipping impact (e.g. oil spills, introduction of harmful marine species, marine debris and physical harm caused by groundings). Jomard Island has been identified to have the largest turtle-nesting rookery in the southern part of Milne Bay Province (UNESCO, 2016).

Representativeness

2.6 The Jomard Entrance ecosystem include pristine reefs with high species endemism that are relatively undisturbed or only commercially exploited at a very low level (see Reef Condition Index value in paragraph 16 below).

Diversity

2.7 Papua New Guinea (PNG) is located in the "Coral Triangle", an epicentre of rich marine biodiversity, see figure 1, and is home to 76% of all know coral species, 37% of all known coral-reef fish species, and 53% of the world's coral reefs. The area is of ecological and scientific significance and has great natural beauty and diversity, as seen in its pristine islands and reefs. Its waters host over 500 species of hard coral, 44 species of mangroves and 14 species of seagrass. PNG's Fourth National Report to the Convention on Biological Diversity (UNEP GEF 2016) notes that:

> "PNG provides one of the last opportunities for the conservation of significant areas of coral reefs in the western Pacific region of maximum marine biodiversity. Few other locations offer the combination of large areas of high diversity reefs mostly undamaged by human activity; relatively low population size in most coastal areas; a scientific and management community that is committed to sustainable use of marine resources, and a customary land tenure system that can be used to enhance conservation efforts."

2.8 The Conservation International 2000 Rapid Marine Biodiversity Assessment (Allen et al. 2003) of the Milne Bay Province listed Punawan Island at Bramble Haven as the fifth most coral diverse of the 57 sites surveyed, with 107 coral species observed. The assessment also listed both Punawan and Jomard Islands as among the best sites in Milne Bay with a rich combination of coral and fish diversity, as well as being relatively free of damage and disease.

2.9 The 2000 Assessment also assessed reef condition at 57 sites in Milne Bay Province. Reef condition is a term pertaining to the general "health" of a particular site as determined by assessment of key variables including natural and human-induced environmental damage and general biodiversity as defined by major indicator groups (corals and fishes). A Reef Condition Index (RCI) value – derived from three components: coral diversity, fish diversity, and relative damage from human and natural causes – as calculated for each site. The results of this analysis indicated that the Louisiade Archipelago is included in the geographical area with the highest ranking Reef Condition Index. Overall, the RCI for the Milne Bay Province was significantly greater that the values obtained at previously surveyed reefs in other parts of the Coral Triangle.

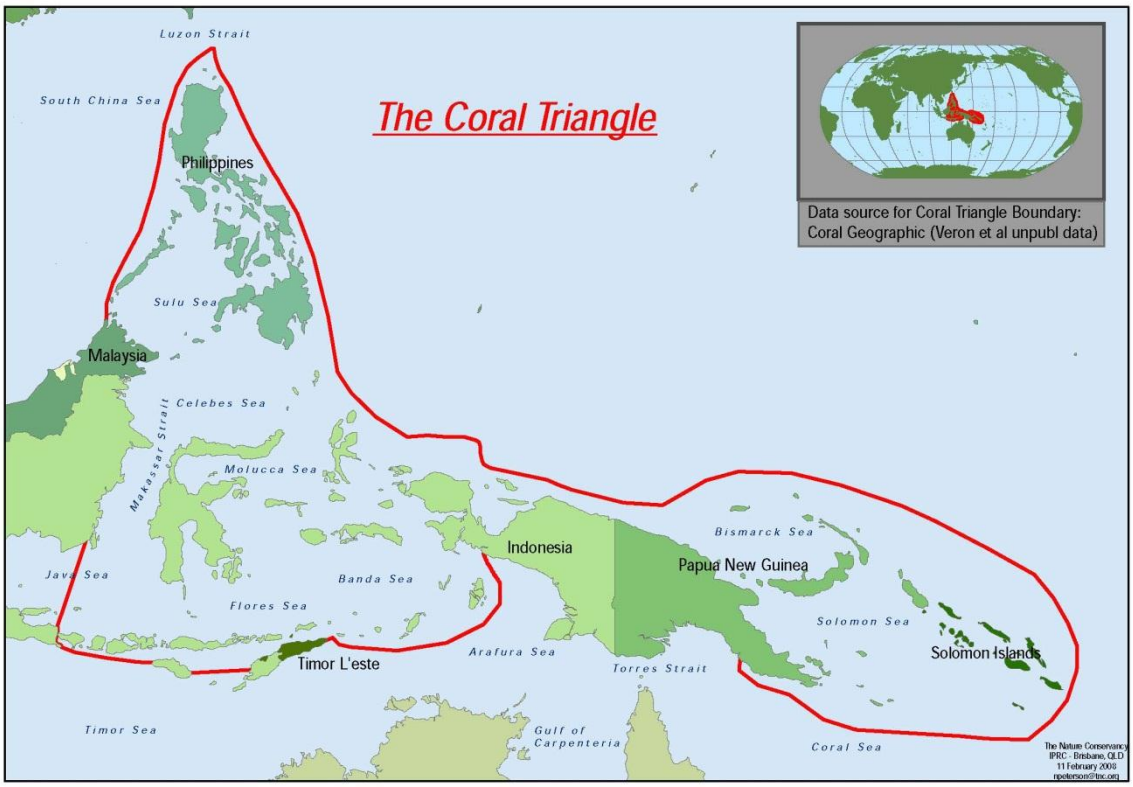


Figure 1 – Map showing Coral Triangle

Naturalness

2.10 The 2000 Rapid Marine Biodiversity Assessment of Milne Pay Province (Allen et al. 2003) concluded that Punawan Island at Bramble Haven was one of the six sites in the Province (from a total of 57 sites surveyed) that rated highly from an aesthetic point of view (good diversity, pristine condition, extensive cover, and good visibility). Most indicators show that Milne Bay's reefs are in remarkably good condition, especially compared to other areas in the Coral Triangle. While coral bleaching has occurred several times in limited areas of Milne Bay, this has mostly been limited to the northern areas of less than 10 degrees south.

Fragility

2.11 Jomard Island is a small coral cay island constructed on reef platforms, which have reached sea level during the Holocene. The island is fringed by a coral reef of significant size. The morphology of the fringing reef varies from site to site due to the different physical processes that take place on different parts of the island (e.g. wind and wave action). Without the current protection provided by the fringing reef, the physical processes evident will ultimately erode the island away (UNESCO, 2016).

2.12 A 2011 assessment of the coastal and marine ecosystem assets of Milne Bay found that the Louisiade Archipelago would be one of the subregions most impacted, taking into account sensitivity, exposure and weighting of ecosystem assets, climate change and human pressures (Skewes et al., 2001).

Bio-geographic importance

2.13 Milne Bay by nature of being a series of variable island chains in close proximity to the large island of New Guinea has led to very high levels of endemism across virtually all taxa. These islands are a part of the Woodlark and Pocklington Rises that are separated by active seabed floor spreading. The islands range from mountainous volcanic chains through to coralline, makateas, atolls and sand cays, and their associated sea mounts and shelf; sunken, fringing and barrier reefs. Milne Bay has disproportionate biodiversity richness and endemism for its size (Andréfouët et al., 2006).

3 SOCIAL, CULTURAL AND ECONOMIC CRITERIA

Social or economic dependency

3.1 PNG's human population (~10 million inhabitants, 2016) has strong economic, social and cultural ties with the sea. PNG's marine resources are an important source of economic livelihood in the extensive rural portions of the country's islands and coastal areas. They support a private sector fishing industry that is a significant source of government revenue. (Asian Development Bank, 2016).

3.2 Tuna and shrimp are the major commodities comprising PNG's commercial fisheries. The 2010 tuna catch totalled 799,000 tons, while the shrimp catch has averaged about US$10.5 million in recent years. Within the PSSA Panuwaiyayapuna and Panarairai Islands are both important sites for subsistence artisanal fishing and diving for commercially valuable resources, while Punaman Island is an important site of sea cucumbers for beche-de-mer and trochus harvesting.

Human dependency

3.3 PNG's waters are vital to the subsistence of its inhabitants and the nation's economy, with the sea acting as a "supermarket" for coastal community residents. Fish is a major source of dietary protein, particularly in island and coastal areas, evident in the relatively high annual per capita fish consumption of coastal community residents, which is estimated at 53.3 kilograms (Asian Development Bank, 2016).

3.4 Marine resource use in the Louisiade Islands is artisanal in nature, providing for subsistence needs as well as limited small-scale commercial production. Because of a lack of regularly scheduled cargo transport and the absence of refrigeration facilities, commercial harvesting primarily targets non-perishable, high-value invertebrate products. Residents of some of the smaller islands are especially dependent on income from harvesting resources such as sea cucumbers for beche-de-mer.

Cultural heritage

3.5 Traditional shell "money", locally known as "bagi" made from *Spondylus* shell is also extensively extracted and manufactured in the Louisiade Islands. These bagi flow along the Louisiade Archipelago and are eventually modified and fed into Kula Ring.

3.6 With the importance of the marine resources for islanders' wellbeing, many traditional legends, dances and hymns are linked to it. Many still ply the waters to these islands in either traditional sailing canoes or dinghies maintaining their seamanship and navigational skills in doing so (Smaalders and Kinch, 2003).

4 SCIENTIFIC AND EDUCATIONAL CRITERIA

Research

4.1 CSIRO Division of Marine Research, PNG National Fisheries Authority and Conservation International conducted a joint marine stock assessment of the abundance of reef resources and sustainable use of beche-de-mer resources for Milne Bay in 2001. This included the islands of the Jomard Passage (Skewes et al., 2002)

Baseline for monitoring studies

4.2 Geo-referenced dive sites from the Conservational International Marine RAP of 2000, the stock assessment mentioned in paragraph 28, ongoing turtle monitoring and tag retrieval data held by SPREP (Secretariat of the Pacific Regional Environment Program) and Queensland National Parks and Wildlife Service as well as 2015 National Maritime Safety Authority Surveys are current baselines. Permanent transects need to be established to establish a standardized baseline.

ANNEX 3

VULNERABILITY TO DAMAGE BY INTERNATIONAL SHIPPING ACTIVITIES

1 VESSEL TRAFFIC CHARACTERISTICS

Operational factors

1.1 Fishing vessels, local trade vessels, local sailing canoes, tourist and recreational craft can be encountered anywhere in the Jomard Entrance area.

1.2 There are currently no existing activities or foreseeable developments of offshore exploration or exploitation of the seabed. Nautilus Mining previously held Exploration Licence Tenements in the Solomon Sea, however these lapsed. Similarly, there are no offshore structures other than those used to provide aids to navigation in the region.

Vessel types

1.3 There is a wide variety of vessels operating in this area, including large bulk carriers, timber carriers, LNG, oil and chemical tankers, passenger ships, cruise liners and third generation container ships.

1.4 Since July 2014, LNG has become one of the primary commodities exported by PNG. It is predicted that around 110 LNG ships will call at PNG ports each year for the first three years, with this number forecast to double by 2020. All LNG ships will use Jomard Entrance as their primary route to/from Japan, which is contracted to import around 85% of PNG's LNG. There is a second LNG project within PNG that will likely be developed in the near future.

1.5 Papua New Guinea (PNG) is experiencing significant growth in marine tourism. Cruise industry sources reveal that up to 100 ship calls per annum are expected each year for the next five years, following which a further growth of 34% is estimated for the next five years.

Traffic characteristics

1.6 PNG is experiencing a marked increase in the volume of international ship traffic passing through its waters. It is estimated that some 9,200 ships transited its waters in 2013. Many ships in ballast drift near the southern approaches to Jomard Entrance awaiting their turn to load at Australian ports. Some 90% of the ships carrying commodities exported by Australia's eastern coast ports to north Asian markets (including China, Japan and the Republic of Korea) use this most direct route through PNG's waters.

1.7 Over the last decade and a half, commodity exports have been a key driver of economic activity in Australia, driven by strong growth in demand from emerging economies in Asia. Substantial resource exports (mainly coal and Liquefied Natural Gas (LNG)) from Australian ports have contributed to increased traffic through PNG's waters. This trend is predicted to continue for some time to come.

1.8 Coal exports from the state of Queensland in Australia will be the biggest driver of increased shipping through Jomard Entrance, through which northbound ships loaded with coal from the ports of Hay Point, Abbot Point and Gladstone will traverse. The coal port of Newcastle on the central coast of New South Wales also contributes to the significant traffic through Jomard Entrance.

1.9 As an example, the number of ships calling at the Australian coal exporting port of Abbot Point each year is forecast to grow from 172 (in 2012) to 1,640 (in 2032) – almost a tenfold increase. Likewise, annual traffic from Hay Point in central Queensland is forecast to grow from 809 ships to 2,380 ships in the same period.

1.10 Concurrently, strong growth in PNG's mining and resource sectors has led to it becoming one of the world's fastest growing economies. As noted above, a variety of ship types transit PNG's pristine and reef-littered waters, the majority along well-used routes, see figure 1.

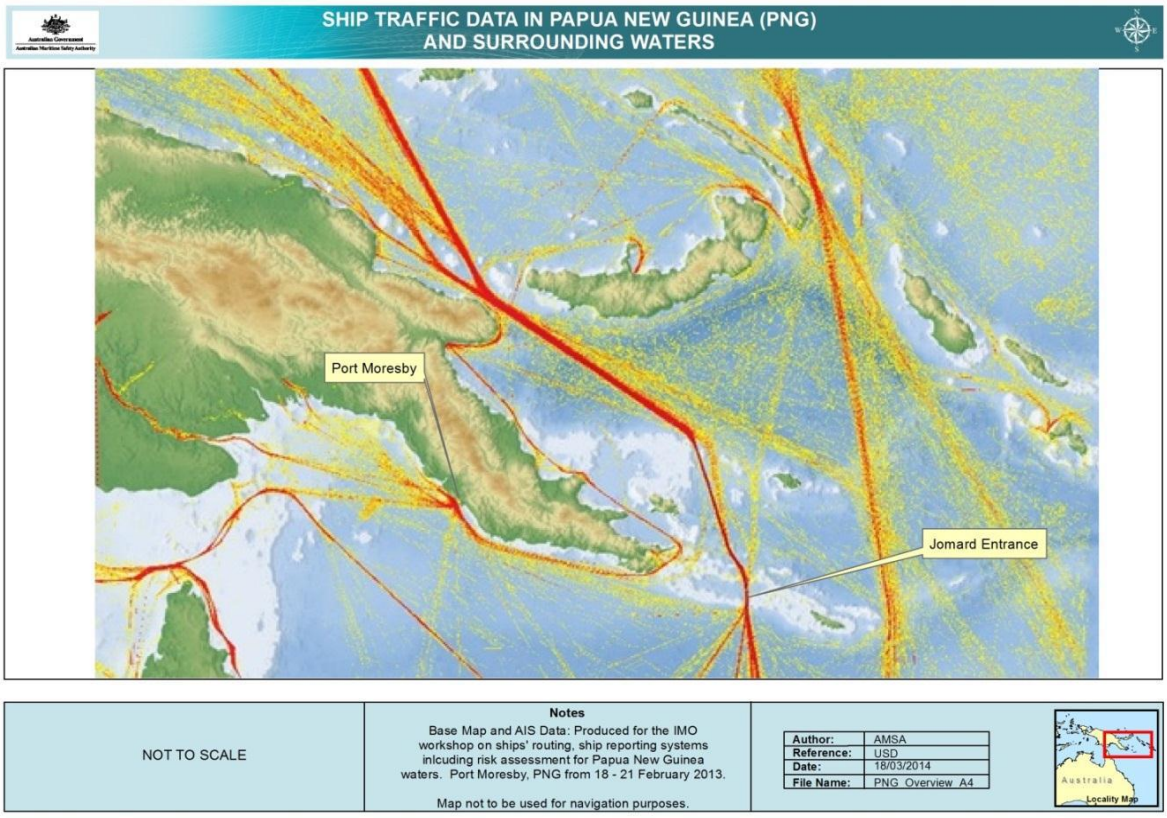


Figure 1 – Shipping traffic patterns in and around PNG waters

1.11 Taking into account the current and project levels of international shipping traffic, a risk assessment conducted using the IALA Waterways Risk Assessment Program Mk2 in February 2013 found that the introduction of a two-way route could reduce the frequency of potential collisions from the one every seven years to one every 14 years – a reduction of 50% in the number of potential collisions.

Harmful substances carried

1.12 Vessels transiting Jomard Entrance are primarily bulk carriers, however there are also significant numbers of oil, chemical/products and LNG tankers.

2 NATURAL FACTORS

Hydrographical

2.1 Hydrographic surveys in the immediate area of the Two-way routes are to Zone of Confidence (ZOC) B. These surveys confirm existing charted depths and depiction of reef edges and are to be incorporated in a new 1:75,000 large scale chart in 2014 – 15. Areas outside the limits of these surveys are to ZOC C. Notably, the reefs defining Jomard Entrance are fronted by deep water which considerably exceeds the maximum draught of any surface vessel which could conceivably use the route.

2.2 It is worth noting that through extensive use by commercial shipping over an extended period of time, bathymetric surveys in the region of the Two-way route have been proven as adequate for safe navigation.

2.3 Electronic Navigation Chart (ENC) coverage of the area is provided as ENC AU412152, Edition 2, at a nominal scale of 1:90,000. This was updated to include larger scale coverage to the limits shown in Chartlet 1 (see annex 4) prior to the establishment of the Two-way route. Smaller scale approach coverage of the Coral and Solomon Seas is provided by AU220150 Edition 3. Additionally, smaller scale ENC are also available for planning. All ENC are metric and referenced to WGS84 and Lowest Astronomical Tide (LAT).

2.4 Paper chart coverage of Jomard Entrance is available in a new chart at a scale of 1:75,000 with limits and extent as shown in Chartlet 1 in annex 4. The entrance is also depicted on existing smaller scale charts, ranging from 1:150,000 for navigation and at smaller scales for planning. All charts are metric and referenced to WGS84 and LAT.

Meteorological

2.5 The Jomard Passage is in a tropical cyclone prone zone. Though cyclone frequency is expected to decrease with climate change projections, the severity is expected to increase when they do occur. The main shipping routes are heavily exposed to prevailing south-east trade winds, which have a fetch of hundreds of nautical miles.

Oceanographic

2.6 Previous research has shown evidence of surface and deep boundary currents flowing around the southern end of the Louisiade Archipelago, with leakage of surface water from the Coral Sea through the Louisiade Archipelago.

3 OTHER INFORMATION

History of groundings, collisions or spills

Groundings

3.1 Chart Aus 510 shows four wrecks (visible at chart datum) on the immediate reefs in and around Jomard Entrance. In the early 2000s, several longliners ran aground in the Jomard and Bramble Haven area, with three running aground in 2000. In 2006, a bulk carrier grounded on Long Reef near Jomard Entrance, spilling oil and raw sugar. In 2011, the total loss of engine power by a container ship in the same area led to the Royal Australian Navy providing assistance by way of a patrol boat (which happened to be on exercise in PNG at the time). A tow line attached to the stricken ship prevented it from grounding on nearby reefs and potentially causing reef damage and pollution of the area.

Marine Debris

3.2 A marine debris survey conducted in 2012 on four islands within the PSSA – Jomard, Panarairai, Punawan and Siva – reported that marine debris is accumulating in significant amounts on these islands (Raaymakers et al., 2012). While further work would be needed to establish with any certainty the proportion of debris contributed by shipping, it is hoped that the revised MARPOL Annex V, which entered into force on 1 January 2013, will result in a reduction in marine debris from shipping within the PSSA.

Intervention and response

3.3 The length and remoteness of PNG's coastline poses major challenges to any response to an accident and containing any resulting pollution. These challenges are also compounded due to limited response capabilities in the region. As noted above, the main shipping routes are heavily exposed to prevailing south-east trade winds. A casualty in such circumstances will make any salvage and recovery task challenging. The closest tugs and oil spill response equipment are located at Port Moresby, which is approximately 330 nautical miles away. Therefore, it is vital to avoid incidents in the region.

ANNEX 4

ASSOCIATED PROTECTIVE MEASURES FOR THE JOMARD ENTRANCE PSSA

Associated Protective Measures (APMs)

1 The newly established routeing systems (four two-way routes and a precautionary area) at Jomard Entrance are the APMs, as follows:

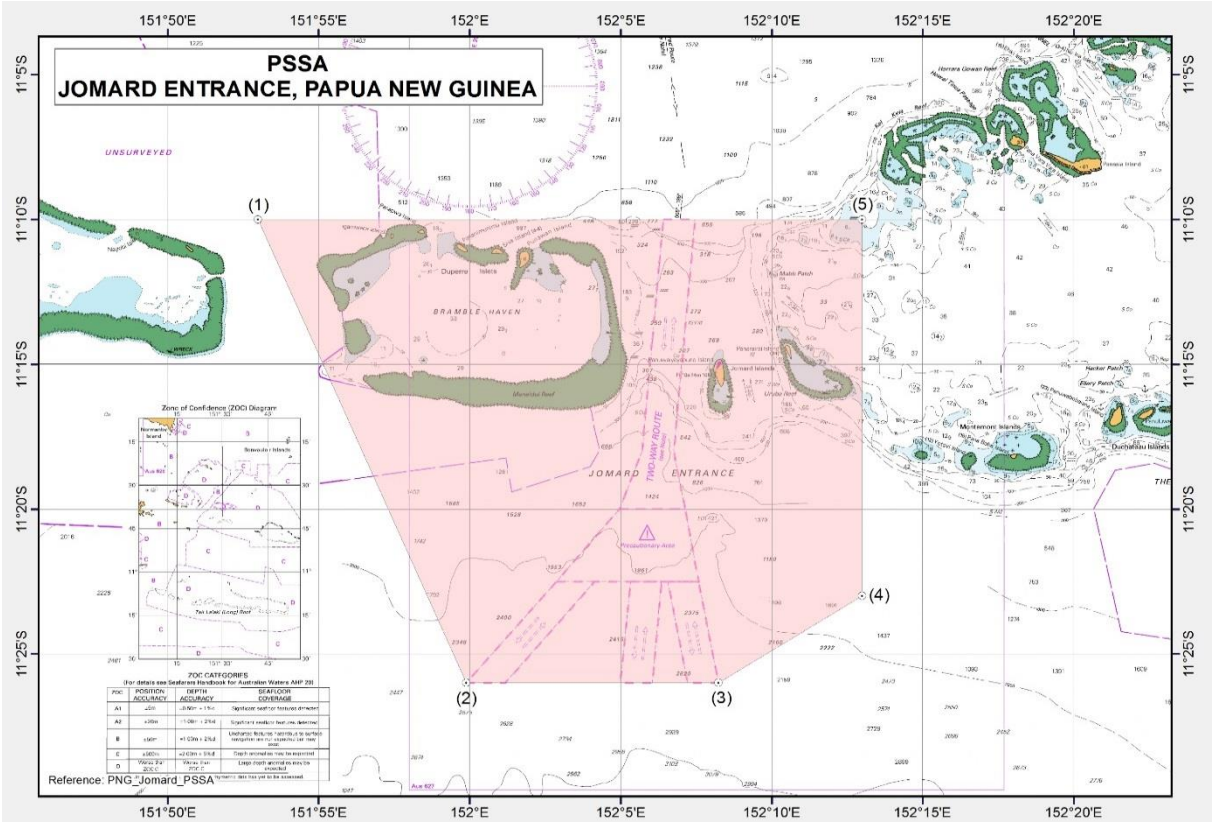
.1 a one nautical mile wide Two-way route to the north of Jomard Entrance, which extends approximately 20 nautical miles from the northern boundary of the precautionary area, see Chartlets, below;

.2 three 1 nautical mile wide Two-way routes to the south of Jomard Entrance, each aligned with the general traffic pattern to/from ports on the east coast of Australia. The routes extend approximately 3.5 nautical miles from the southern boundary of the precautionary area, see Chartlets, below; and

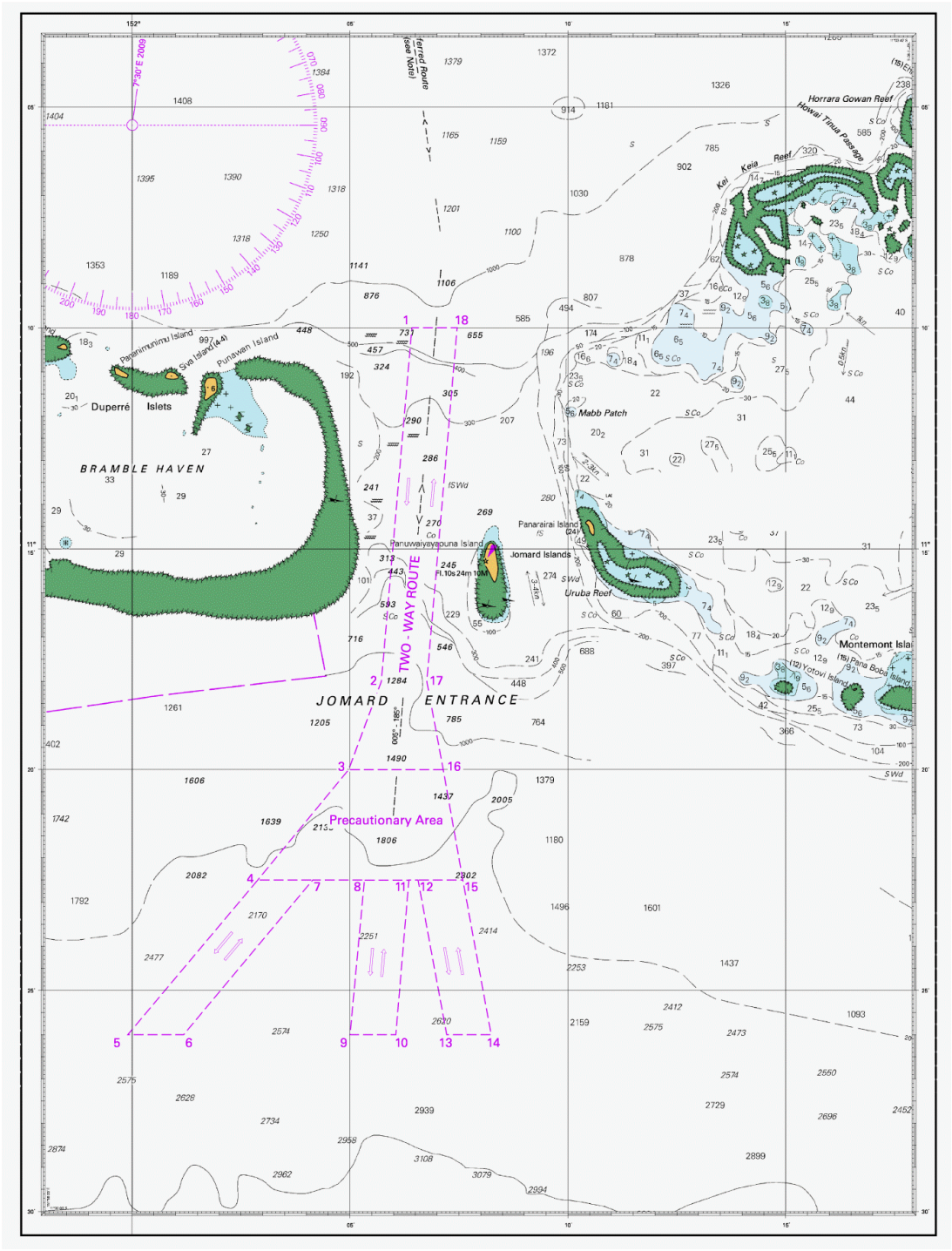
.3 a quadrilateral-shaped precautionary area that lies between the northern and southern two-way routes described above, see Chartlets, below.

2 The two-way routes and precautionary area can be used by all ships navigating in the area.

(Note: These routeing systems were approved at the first session of the Sub-Committee on Navigation, Communications and Search and Rescue (NCSR 1/3/8), subsequently adopted by MSC 94 and entered into force on 1 June 2015.)



Chartlet 1 – Map showing the PSSA and newly established IMO routeing systems



Chartlet 2 – The four Two-way routes and precautionary area at Jomard entrance, approved by MSC 94

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ANNEX 20

RESOLUTION MEPC.284.(70)
(Adopted on 28 October 2016)

AMENDMENTS TO THE 2012 GUIDELINES ON IMPLEMENTATION OF EFFLUENT STANDARDS AND PERFORMANCE TESTS FOR SEWAGE TREATMENT PLANTS (RESOLUTION MEPC.227(64))

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

RECALLING Article 38(a) of the Convention on the International Maritime Organization concerning the functions of the Marine Environment Protection Committee (the Committee) conferred upon it by the international conventions for the prevention and control of marine pollution from ships,

NOTING resolution MEPC.227(64), by which it adopted the *2012 Guidelines on implementation of effluent standards and performance tests for sewage treatment plants* (2012 Guidelines),

NOTING ALSO resolution MEPC.274(69), by which it adopted amendments to MARPOL Annex IV concerning the Baltic Sea Special Area and the Form of the International Sewage Pollution Prevention Certificate, which are expected to enter into force on 1 September 2017,

NOTING FURTHER resolution MEPC.275(69), by which it established the date on which the discharge requirements of regulation 11.3 of MARPOL Annex IV in respect of the Baltic Sea Special Area shall take effect,

RECOGNIZING the need to align the relevant provisions of the 2012 Guidelines with the above-mentioned amendments to MARPOL Annex IV and the effective date of the Baltic Sea Special Area,

HAVING CONSIDERED, at its seventieth session, proposed amendments to the 2012 Guidelines,

1 ADOPTS amendments to the *2012 Guidelines on implementation of effluent standards and performance tests for sewage treatment plants*, the text of which is set out in the annex to the present resolution;

2 RECOMMENDS Governments to apply the 2012 Guidelines, as amended, during testing and type approval of sewage treatment plants;

3 AGREES to keep the 2012 Guidelines, as amended, under review in light of experience gained with their application.

ANNEX

AMENDMENTS TO THE 2012 GUIDELINES ON IMPLEMENTATION OF EFFLUENT STANDARDS AND PERFORMANCE TESTS FOR SEWAGE TREATMENT PLANTS

Table of content

1 The words "ANNEX Form of Certificate of Type Approval for Sewage Treatment Plants and appendix" is replaced by the following:

"Annex 1 – FORM OF CERTIFICATE OF TYPE APPROVAL FOR SEWAGE TREATMENT PLANTS AND APPENDIX (MEETING RESOLUTION MEPC.227(64), INCLUDING PARAGRAPH 4.2 OF THE ANNEX TO THIS RESOLUTION)

Annex 2 – FORM OF CERTIFICATE OF TYPE APPROVAL FOR SEWAGE TREATMENT PLANTS AND APPENDIX (MEETING RESOLUTION MEPC.227(64), EXCEPT FOR PARAGRAPH 4.2 OF THE ANNEX TO THIS RESOLUTION)

1 – Introduction

2 A new paragraph 1.1.3 is added as follows:

"1.1.3 MEPC 69 adopted resolution MEPC. 274(69) amending regulations 1 and 11 of MARPOL Annex IV concerning the Baltic Sea Special Area as well as the appendix to MARPOL Annex IV concerning the Form of the International Sewage Pollution Prevention."

3 A new subparagraph 1.2.2.3 is added as follows:

".3 the phrase "installed on or after 1 January 2016" means:

.1 installations on board ships the keels of which are laid or which are at a similar stage of construction on or after 1 January 2016; and

.2 for other ships, installations with a contractual delivery date to the ship on or after 1 January 2016 or, in the absence of a contractual delivery date, the actual delivery of the equipment to the ship on or after 1 January 2016."

4 Paragraph 1.2.3 is replaced by the following:

"1.2.3 The requirements of these Guidelines, including those in section 4.2, will apply to sewage treatment plants on:

.1 new passenger ships[1] when operating in Baltic Sea Special Area and intending to discharge treated sewage effluent into the sea on or after 1 June 2019;

[1] A new passenger ship is a passenger ship:

.1 for which the building contract is placed, or in the absence of a building contract, the keel of which is laid, or which is in similar stage of construction, on or after 1 June 2019; or

.2 the delivery of which is on or after 1 June 2021.

.2 existing passenger ships, other than those specified in sub-paragraph .3 below, when operating in Baltic Sea Special Area and intending to discharge treated sewage effluent into the sea on or after 1 June 2021; and

.3 1 June 2023 for existing passenger ships en route directly to or from a port located outside Baltic Sea Special Area and to or from a port located east of longitude 28˚10' E within the special area that do not make any other port calls within the special area and intending to discharge treated sewage effluent into the sea."

2 – Definitions

5 Paragraph 2.1 is replaced by the following:

"2.1 Annex IV – the revised Annex IV of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the 1978 and 1997 Protocols (MARPOL), as amended by resolutions MEPC.115(51), MEPC.200(62) MEPC.216(63), MEPC.246(66), MEPC.265(68) and MEPC.274(69)."

4 – Technical specification

6 Paragraphs 4.4 and 4.5 are deleted.

5 – Testing considerations

7 The last sentence of paragraph 5.4.2 is replaced by the following:

"The forms of the Certificate of Type Approval and its appendix are set out in the annexes 1 and 2 to these Guidelines."

Annex – FORM OF CERTIFICATE OF TYPE APPROVAL FOR SEWAGE TREATMENT PLANTS AND APPENDIX

8 The existing annex is renumbered as annex 1 and the title is replaced with the following:

Annex 1

"FORM OF CERTIFICATE OF TYPE APPROVAL FOR SEWAGE TREATMENT PLANTS AND APPENDIX (MEETING RESOLUTION MEPC.227(64), INCLUDING PARAGRAPH 4.2 OF THE ANNEX TO THIS RESOLUTION)"

9 The first paragraph is replaced with the following:

"This is to certify that the sewage treatment plant, type....., having a designed hydraulic loading of ..... cubic metres per day, (m^3/day), an organic loading of ..... kg per day biochemical oxygen demand without nitrification (BOD5 without nitrification) and of the design shown on drawings Nos. .....manufactured by ..... has been examined and satisfactorily tested in accordance with the International Maritime Organization resolution MEPC.227(64) (including paragraph 4.2) to meet the operational requirements referred to in regulations 9.1.1 and 9.2.1 of MARPOL Annex IV, as amended."

10 The mark "**"after .7 and its associated footnote are deleted.

11 In the "APPENIDX TO CERTIFICATE OF TYPE APPROVAL SEWAGE TREATMENT PLANTS", the marks "*" on the following entries are deleted:

"Total nitrogen influent quality.....mg/l as nitrogen*
Total phosphorus influent quality.....mg/l as phosphorus*

12 A new annex 2 is added as follows:

Annex 2

FORM OF CERTIFICATE OF TYPE APPROVAL FOR SEWAGE TREATMENT PLANTS AND APPENDIX (MEETING RESOLUTION MEPC.227(64), EXCEPT FOR PARAGRAPH 4.2 OF THE ANNEX TO THIS RESOLUTION)

BADGE OR CIPHER

NAME OF ADMINISTRATION

CERTIFICATE OF TYPE APPROVAL FOR SEWAGE TREATMENT PLANTS

This is to certify that the sewage treatment plant, type ....., having a designed hydraulic loading of ..... cubic metres per day, (m^3/day), an organic loading of ..... kg per day biochemical oxygen demand without nitrification (BOD_5 without nitrification) and of the design shown on drawings Nos. .....
manufactured by .....
has been examined and satisfactorily tested in accordance with the International Maritime Organization resolution MEPC.227(64) (except for paragraph 4.2) to meet the operational requirements referred to in regulations 9.1.1 of MARPOL Annex IV, as amended.

The tests on the sewage treatment plant were carried out
ashore at* .....
on board at*.....
and completed on .....

The sewage treatment plant was tested and produced an effluent which, on analysis, produces:

.1 a geometric mean of no more than 100 thermotolerant coliforms/100 ml;

.2 a geometric mean of total suspended solids of 35 Qi/Qe mg/l if tested ashore or the maximum total suspended solids not exceeding (35 plus *x) Qi/Qe* mg/l for the ambient water used for flushing purposes if tested on board;

.3 a geometric mean of 5-day biochemical oxygen demand without nitrification (BOD_5 without nitrification) of no more than 25 Qi/Qe mg/l;

.4 a geometric mean of chemical oxygen demand (COD) of no more than 125 Qi/Qe mg/l; and

.5 pH between 6 and 8.5.

The Administration confirms that the sewage treatment plant can operate at angles of inclination of 22.5° in any plane from the normal operating position.

* Delete as appropriate.

Details of the tests and the results obtained are shown on the appendix to this Certificate.

A plate or durable label containing data of the manufacturer's name, type and serial numbers, hydraulic loading and date of manufacture should be fitted on each sewage treatment plant.

A copy of this certificate should be carried on board any ship equipped with the above described sewage treatment plant.

Official stamp Signed .....

Administration of …….....

Dated this …….....… day of..…….....……..… 20…….....

APPENDIX TO
CERTIFICATE OF TYPE APPROVAL FOR SEWAGE TREATMENT PLANTS

BADGE OR CIPHER

Test results and details of tests conducted on samples from the sewage treatment plant in accordance with resolution MEPC.227(64), as amended, (exception for section 4.2):

Sewage treatment plant, Type .....
Manufactured by .....
Organization conducting the test .....
Designed hydraulic loading ....m^3/day
Designed organic loading ..... kg/day BOD

Number of effluent samples tested .....
Number of influent samples tested .....
Total suspended solids influent quality ....mg/l

BOD_5 without nitrification influent quality.....mg/l
Maximum hydraulic loading ..... m^3/day
Minimum hydraulic loading ..... m^3/day
Average hydraulic loading (Qi) ..... m^3/day
Effluent flow (Qe)..... m^3/day
Dilution compensation factor (Qi/Qe)…….
Geometric mean of total suspended solids .....mg/l
Geometric mean of the thermotolerant coliform count..... coliforms/100 ml
Geometric mean of BOD_5 without nitrification..... mg/l
Geometric mean of COD …….……mg/l
Maximum pH: ……

Minimum pH:………………………………………………………..………………..
Type of disinfectant used ....
If Chlorine - residual Chlorine:

Maximum .... mg/l
Minimum .... mg/l
Geometric Mean .... mg/l

Was the sewage treatment plant tested with:

Fresh water flushing? .... Yes/No*
Salt water flushing? .... Yes/No*
Fresh and salt water flushing? .... Yes/No*
Grey water added? .... Yes – proportion: /No*

Was the sewage treatment plant tested against the environmental conditions specified in section 5.9 of resolution MEPC.227(64):

Temperature ....Yes/No*
Humidity ....Yes/No*
Inclination ....Yes/No*
Vibration ....Yes/No*
Reliability of Electrical and Electronic Equipment ....Yes/No*

Limitations and the conditions of operation are imposed:

Salinity ....
Temperature ....
Humidity ....
Inclination...
Vibration ....

Results of other parameters tested ....

Official stamp Signed ....

Administration of ……………………………….......

Dated this ……........……..…. day of..……...…...…..… 20…....….

* Delete as appropriate."

***

ANNEX 21

RESOLUTION MEPC .285(70)
(Adopted on 28 October 2016)

AMENDMENTS TO THE REVISED GUIDELINES AND SPECIFICATIONS FOR POLLUTION PREVENTION EQUIPMENT FOR MACHINERY SPACE BILGES OF SHIPS (RESOLUTION MEPC.107(49))

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

RECALLING Article 38(a) of the Convention on the International Maritime Organization concerning the functions of the Marine Environment Protection Committee (the Committee) conferred upon it by the international conventions for the prevention and control of marine pollution from ships,

NOTING resolution MEPC.107(49) by which it adopted, at its forty-ninth session, the *Revised Guidelines and Specifications for pollution prevention equipment for machinery space bilges of ships*,

HAVING CONSIDERED, at its seventieth session, proposed amendments to the above-mentioned Revised Guidelines and Specifications, concerning specifications related to 15 ppm bilge alarms,

1 ADOPTS amendments to the *Revised Guidelines and specifications for pollution prevention equipment for machinery space bilges of ships*, the text of which is set out in the annex to this resolution;

2 RECOMMENDS Governments to apply the annexed amendments when checking the accuracy of 15 ppm bilge alarms.

ANNEX

AMENDMENTS TO THE REVISED GUIDELINES AND SPECIFICATIONS FOR POLLUTION PREVENTION EQUIPMENT FOR MACHINERY SPACE BILGES OF SHIPS

1 In paragraphs 1.2.1, 1.2.2.1, 2.1 and 3.1, the references to "regulation 16" are replaced with "regulation 14".

2 In paragraphs 2.2 and 3.3 and appendix 2, the references to "regulation 16(5)" are replaced with "regulation 14.7".

3 Section 4.2.11 is replaced by the following:

"4.2.11 The validity of calibration certificates should be checked at IOPP annual/intermediate/renewal surveys. The accuracy of 15 ppm bilge alarms is to be checked by calibration and testing of the equipment conducted by a manufacturer or persons authorized by the manufacturer and should be done at intervals not exceeding five years after its commissioning, or within the term specified in the manufacturer's instructions, whichever is shorter. Alternatively the unit may be replaced by a calibrated 15 ppm bilge alarm. The calibration certificate for the 15 ppm bilge alarm, certifying the date of the last calibration check, should be retained on board for inspection purposes.

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ANNEX 1

RESOLUTION MEPC.286(71)
(adopted on 7 July 2017)

AMENDMENTS TO THE ANNEX OF THE PROTOCOL OF 1997 TO AMEND THE INTERNATIONAL CONVENTION FOR THE PREVENTION OF POLLUTION FROM SHIPS, 1973, AS MODIFIED BY THE PROTOCOL OF 1978 RELATING THERETO

Amendments to MARPOL Annex VI

(Designation of the Baltic Sea and the North Sea Emission Control Areas for NO_X Tier III control)
(Information to be included in the bunker delivery note)

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

RECALLING Article 38(a) of the Convention on the International Maritime Organization concerning the functions of the Marine Environment Protection Committee conferred upon it by international conventions for the prevention and control of marine pollution from ships,

NOTING article 16 of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocols of 1978 and 1997 relating thereto (MARPOL), which specifies the amendment procedure and confers upon the appropriate body of the Organization the function of considering and adopting amendments thereto,

HAVING CONSIDERED, at its seventy-first session, proposed amendments to MARPOL Annex VI concerning the designation of the Baltic Sea and the North Sea Emission Control Areas for NO_X Tier III control and the information to be included in the bunker delivery note,

1 ADOPTS, in accordance with article 16(2)(d) of MARPOL, amendments to MARPOL Annex VI, the text of which is set out in the annex to the present resolution;

2 DETERMINES, in accordance with article 16(2)(f)(iii) of MARPOL, that the amendments shall be deemed to have been accepted on 1 July 2018 unless prior to that date, not less than one third of the Parties or Parties the combined merchant fleets of which constitute not less than 50% of the gross tonnage of the world's merchant fleet, have communicated to the Organization their objection to the amendments;

3 INVITES the Parties to note that, in accordance with article 16(2)(g)(ii) of MARPOL, the said amendments shall enter into force on 1 January 2019 upon their acceptance in accordance with paragraph 2 above;

4 REQUESTS the Secretary-General, for the purposes of article 16(2)(e) of MARPOL, to transmit certified copies of the present resolution and the text of the amendments contained in the annex to all Parties to MARPOL;

5 REQUESTS FURTHER the Secretary-General to transmit copies of the present resolution and its annex to Members of the Organization which are not Parties to MARPOL.

ANNEX

AMENDMENTS TO MARPOL ANNEX VI

(Designation of the Baltic Sea and the North Sea Emission Control Areas for NO_X Tier III control)
(Information to be included in the bunker delivery note)

ANNEX VI

REGULATIONS FOR THE PREVENTION OF AIR POLLUTION FROM SHIPS

Regulation 13
Nitrogen oxides (NO_X)

1 In paragraph 5.1 after the words "an emission control area designated for Tier III NO_X control under paragraph 6 of this regulation" insert the words "(NO_X Tier III emission control area)".

2 The existing text of paragraph 5.1.2 is replaced by the following:

.2 that ship is constructed on or after:

.1 1 January 2016 and is operating in the North American Emission Control Area or the United States Caribbean Sea Emission Control Area;

.2 1 January 2021 and is operating in the Baltic Sea Emission Control Area or the North Sea Emission Control Area;

3 Between paragraph 5.1.2 and 5.1.3 the word "when" is deleted.

4 In paragraph 5.1.3 the words "an emission control area designated for Tier III NO_X control under paragraph 6 of this regulation" are replaced by "a NO_X Tier III emission control area".

5 In paragraph 5.2.3 the word "convention" is replaced by "Convention" and the expression "24 m" is replaced by "24 metres".

6 Insert new paragraphs 5.4 and 5.5, as follows:

"5.4 Emissions of nitrogen oxides from a marine diesel engine subject to paragraph 5.1 of this regulation that occur immediately following building and sea trials of a newly constructed ship, or before and following converting, repairing, and/or maintaining the ship, or maintenance or repair of a Tier II engine or a dual fuel engine when the ship is required to not have gas fuel or gas cargo on board due to safety requirements, for which activities take place in a shipyard or other repair facility located in a NO_X Tier III emission control area are temporarily exempted provided the following conditions are met:

.1 the engine meets the Tier II NO_X limits; and

.2 the ship sails directly to or from the shipyard or other repair facility, does not load or unload cargo during the duration of the exemption, and follows any additional specific routing requirements indicated by the port State in which the shipyard or other repair facility is located, if applicable.

5.5 The exemption described in paragraph 5.4 of this regulation applies only for the following period:

.1 for a newly constructed ship, the period beginning at the time the ship is delivered from the shipyard, including sea trials, and ending at the time the ship directly exits the NO_X Tier III emission control area(s) or, with regard to a ship fitted with a dual fuel engine, the ship directly exits the NO_X Tier III emission control area(s) or proceeds directly to the nearest gas fuel bunkering facility appropriate to the ship located in the NO_X Tier III emission control area(s);

.2 for a ship with a Tier II engine undergoing conversion, maintenance or repair, the period beginning at the time the ship enters the NO_X Tier III emission control area(s) and proceeds directly to the shipyard or other repair facility, and ending at the time the ship is released from the shipyard or other repair facility and directly exits the NO_X Tier III emission control area (s) after performing sea trials, if applicable; or

.3 for a ship with a dual fuel engine undergoing conversion, maintenance or repair, when the ship is required to not have gas fuel or gas cargo on board due to safety requirements, the period beginning at the time the ship enters the NO_X Tier III emission control area(s) or when it is degassed in the NO_X Tier III emission control area(s) and proceeds directly to the shipyard or other repair facility, and ending at the time when the ship is released from the shipyard or other repair facility and directly exits the NO_X Tier III emission control area(s) or proceeds directly to the nearest gas fuel bunkering facility appropriate to the ship located in the NO_X Tier III emission control area(s)."

7 The existing text of paragraph 6 is replaced by the following:

"6 For the purposes of this regulation, a NO_X Tier III emission control area shall be any sea area, including any port area, designated by the Organization in accordance with the criteria and procedures set forth in appendix III to this Annex. The NO_X Tier III emission control areas are:

.1 the North American Emission Control Area, which means the area described by the coordinates provided in appendix VII to this Annex;

.2 the United States Caribbean Sea Emission Control Area, which means the area described by the coordinates provided in appendix VII to this Annex;

.3 the Baltic Sea Emission Control Area as defined in regulation 1.11.2 of Annex I of the present Convention; and

.4 the North Sea Emission Control Area as defined in regulation 1.14.6 of Annex V of the present Convention."

Appendix V
Information to be included in the bunker delivery note (regulation 18.5)

8 The items listed in the Appendix are numbered from 1 to 9.

9 In item 7, the comma after "15°C" is deleted and the expression "kg/m^3" is replaced by "(kg/m^3)".

10 Item 9 is replaced with the following:

"A declaration signed and certified by the fuel oil supplier's representative that the fuel oil supplied is in conformity with regulation 18.3 of this Annex and that the sulphur content of the fuel oil supplied does not exceed:

☐ the limit value given by regulation 14.1 of this Annex;

☐ the limit value given by regulation 14.4 of this Annex; or

☐ the purchaser's specified limit value of _____ (% m/m), as completed by the fuel oil supplier's representative and on the basis of the purchaser's notification that the fuel oil is intended to be used:

.1 in combination with an equivalent means of compliance in accordance with regulation 4 of this Annex; or

.2 is subject to a relevant exemption for a ship to conduct trials for sulphur oxides emission reduction and control technology research in accordance with regulation 3.2 of this Annex.

The declaration shall be completed by the fuel oil supplier's representative by marking the applicable box(es) with a cross (x)."

***

ANNEX 4

RESOLUTION MEPC.287(71)
(adopted on 7 July 2017)

IMPLEMENTATION OF THE BWM CONVENTION

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

RECALLING Article 38(a) of the Convention on the International Maritime Organization concerning the functions of the Marine Environment Protection Committee conferred upon it by international conventions for the prevention and control of marine pollution from ships,

RECALLING ALSO that the International Conference on Ballast Water Management for Ships held in February 2004 adopted the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (the Convention) together with four conference resolutions,

NOTING that the entry-into-force conditions of the Convention were met on 8 September 2016 and that it will consequently enter into force on 8 September 2017,

BEING COGNIZANT of the fact that by the date of its entry into force more than 13 years will have elapsed since the adoption of the Convention,

NOTING that 60 States, the combined merchants fleets of which constitute approximately 68% of the gross tonnage of the world's merchant shipping, have acceded to the Convention as of 7 July 2017,

BEING CONSCIOUS of the need to provide certainty and confidence in the application of the Convention, thereby assisting shipping companies, shipowners, managers and operators, as well as the shipbuilding and equipment manufacturing industries, in the timely planning of their operations, and to encourage the early installation of ballast water management systems,

BEARING IN MIND that the International Conference on Ballast Water Management for Ships adopted regulation B-3 (Ballast water management for ships) of the Convention to ensure a smooth transition to the ballast water performance standard described in regulation D-2 between the years 2009 and 2019,

RECOGNIZING that time has elapsed since adoption of the Convention, which has resulted in uncertainty for ships regarding the application of regulation B-3 and that such uncertainty can be mitigated through the application of an appropriate timeline for implementing regulations D-1 (Ballast water exchange standard) and D-2 (Ballast water performance standard), upon entry into force of the Convention,

RECALLING that the Assembly, at its twenty-eighth session, adopted resolution A.1088(28) on *Application of the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004,* and requested it to keep the resolution under review and report back to the Assembly as appropriate,

HAVING APPROVED, at its seventy-first session, draft amendments to regulation B-3 of the Convention (MEPC 71/17, annex 2) with a view to adoption at its seventy-second session,

1 REQUESTS the Secretary-General to circulate the draft amendments to regulation B-3, in accordance with Article 19 of the Convention, to all Parties to the Convention and to all Members of the Organization immediately after the entry into force of the Convention;

2 RESOLVES that, in lieu of the implementation schedule recommended in resolution A.1088(28) and notwithstanding the schedule set forth in regulation B-3 of the Convention, the Parties should implement the amended regulation B-3 (MEPC 71/17, annex 2) immediately after entry into force of the Convention, with a view to avoiding the creation of a dual treaty regime during the time period between the entry into force of the Convention and the entry into force of the amended regulation B-3;

3 URGES States which have not yet acceded to the Convention to do so as soon as possible, in the understanding that the requirements of the amended regulation B-3 will be implemented upon the entry into force of the Convention;

4 REAFFIRMS the agreement reached at its sixty-eighth session, as contained in the Roadmap for the implementation of the Convention, regarding the provisions for non-penalization of early movers that have installed ballast water management systems approved in accordance with the *Guidelines for approval of ballast water management systems* (G8) (resolution MEPC.174(58), subsequently superseded by resolution MEPC.279(70)).

5 AGREES that this resolution supersedes resolution A.1088(28) on *Application of the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004.*

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ANNEX 9

RESOLUTION MEPC.288(71)
(adopted on 7 July 2017)

2017 GUIDELINES FOR BALLAST WATER EXCHANGE (G6)

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

RECALLING Article 38(a) of the Convention on the International Maritime Organization concerning the functions of the Marine Environment Protection Committee conferred upon it by international conventions for the prevention and control of marine pollution from ships,

RECALLING ALSO that the International Conference on Ballast Water Management for Ships held in February 2004 adopted the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (the Convention) together with four Conference resolutions,

NOTING that regulation A-2 of the Convention requires that discharge of ballast water shall only be conducted through ballast water management in accordance with the provisions of the Annex to the Convention,

NOTING ALSO that regulation B-4 of the Annex to the Convention addresses the conditions under which ballast water exchange should be conducted, taking into account Guidelines developed by the Organization,

NOTING FURTHER resolution MEPC.124(53) by which the Committee adopted the *Guidelines for ballast water exchange (G6)* and resolved to keep them under review,

HAVING AGREED, at its seventieth session, to revise the Guidelines (G6) to incorporate the ballast water reporting form set out in appendix 1 of the *Guidelines for the control and management of ships' ballast water to minimize the transfer of harmful aquatic organisms and pathogens* (resolution A.868(20)),

HAVING CONSIDERED, at its seventy-first session, draft revised *Guidelines for ballast water exchange (G6),*

1 ADOPTS the *2017 Guidelines for ballast water exchange (G6)* (the 2017 Guidelines (G6)), as set out in the annex to this resolution;

2 INVITES Governments to apply the 2017 Guidelines (G6) as soon as possible, or when the Convention becomes applicable to them;

3 AGREES to keep the 2017 Guidelines (G6) under review in light of experience gained with their application;

4 REVOKES the Guidelines adopted by resolution MEPC.124(53).

ANNEX

2017 GUIDELINES FOR BALLAST WATER EXCHANGE (G6)

1 INTRODUCTION

1.1 The purpose of these Guidelines is to provide shipowners and operators with general guidance on the development of ship specific procedures for conducting ballast water exchange. Whenever possible shipowners and operators should enlist the assistance of classification societies or qualified marine surveyors in tailoring ballast exchange practices for various conditions of weather, cargo and stability. The application of processes and procedures concerning ballast water management are at the core of the solution to prevent, minimize and ultimately eliminate the introduction of harmful aquatic organisms and pathogens. Ballast water exchange offers a means, when used in conjunction with good ballast water management practices, to assist in achieving this solution.

1.2 Ballast water exchange introduces a number of safety issues, which affect both the ship and its crew. These Guidelines are intended to provide guidance on the safety and operational aspects of ballast water exchange at sea.

1.3 Given that there are different types of ships which may be required to undertake ballast water exchange at sea, it is impractical to provide specific guidelines for each ship type. Shipowners are cautioned that they should consider the many variables that apply to their ships. Some of these variables include type and size of ship, ballast tank configurations and associated pumping systems, trading routes and associated weather conditions, port State requirements and manning.

Application

1.4 The Guidelines apply to all those involved with ballast water exchange, including shipowners and operators, designers, classification societies and shipbuilders. Operational procedures and guidance reflecting the issues raised in these Guidelines should be reflected in the ship's ballast water management plan.

2 DEFINITIONS

For the purposes of these Guidelines, the definitions in the International Convention for the Control and Management of Ships' Ballast Water and Sediments (the Convention) apply and "ballast water tank" means any tank, hold or space used for the carriage of ballast water.

3 RESPONSIBILITIES

3.1 Shipowners and operators should ensure, prior to undertaking ballast water exchange, that all the safety aspects associated with the ballast water exchange method or methods used on board have been considered and that suitably trained personnel are on board. A review of the safety aspects, the suitability of the exchange methods being used and the aspects of crew training should be undertaken at regular intervals.

3.2 The ballast water management plan should include the duties of key shipboard control personnel undertaking ballast water exchange at sea. Such personnel should be fully conversant with the safety aspects of ballast water exchange and in particular the method of exchange used on board their ship and the particular safety aspects associated with the method used.

3.3 In accordance with regulation B-4.4 of the Convention, if the master reasonably decides that to perform ballast water exchange would threaten the safety or stability of the ship, its crew or its passengers, because of adverse weather, the ship's design, stress, equipment failure, or any other extraordinary condition, a ship shall not be required to comply with regulations B-4.1 and B-4.2.

.1 When a ship does not undertake ballast water exchange for the reasons stated above, the reasons shall be entered in the ballast water record book.

.2 The port or coastal State concerned may require that the discharge of ballast water must be in accordance with procedures determined by them, taking into account the *Guidelines for additional measures including emergency situations (G13).*

3.4 Where a port State requires specific information regarding the management of ballast water on a ship bound for a port, offshore terminal or anchorage area in that port State, a completed ballast water reporting form as set out in the appendix may be submitted prior to entry into that port State in a timeframe required by that port State.

4 BALLAST WATER EXCHANGE REQUIREMENTS

4.1 Exchange of ballast water in deep ocean areas or open seas offers a means of limiting the probability that harmful aquatic organisms and pathogens be transferred in ships' ballast water.

4.2 Regulation D-1 of the Convention requires that:

.1 ships performing ballast water exchange in accordance with this regulation shall do so with an efficiency of at least 95% volumetric exchange of ballast water; and

.2 for ships exchanging ballast water by the pumping-through method, pumping through three times the volume of each ballast water tank shall be considered to meet the standard described in paragraph 1. Pumping through less than three times the volume may be accepted provided the ship can demonstrate that at least 95% volumetric exchange is met.

4.3 There are three methods of ballast water exchange which have been evaluated and accepted by the Organization. The three methods are the sequential method, the flow-through method and the dilution method. The flow-through method and the dilution method are considered as "pump through" methods.

4.4 The three accepted methods can be described as follows:

.1 **Sequential method** – a process by which a ballast tank intended for the carriage of ballast water is first emptied and then refilled with replacement ballast water to achieve at least a 95% volumetric exchange.

.2 **Flow-through method** – a process by which replacement ballast water is pumped into a ballast tank intended for the carriage of ballast water, allowing water to flow through overflow or other arrangements.

.3 **Dilution method** – a process by which replacement ballast water is filled through the top of the ballast tank intended for the carriage of ballast water

with simultaneous discharge from the bottom at the same flow rate and maintaining a constant level in the tank throughout the ballast exchange operation.

5 SAFETY PRECAUTIONS ASSOCIATED WITH BALLAST WATER EXCHANGE

5.1 Three methods of carrying out ballast water exchange at sea have been identified as acceptable by the Organization. Each has particular safety aspects associated with it that should be considered when selecting the method(s) to be used on a particular ship.

5.2 When identifying the ballast water exchange method(s) for the first time for a particular ship, an evaluation should be made which should include:

.1 the safety margins for stability and strength contained in allowable seagoing conditions, as specified in the approved trim and stability booklet and the loading manual relevant to individual types of ships. Account should also be taken of the loading conditions and the envisaged ballast water exchange method or methods to be used;

.2 the ballast pumping and piping system taking account of the number of ballast pumps and their capacities, size and arrangements of ballast water tanks; and

.3 the availability and capacity of tank vents and overflow arrangements, for the flow through method, the availability and capacity of tank overflow points, prevention of under and over pressurization of the ballast tanks.

5.3 Particular account should be taken of the following:

.1 stability which is to be maintained at all times and not less than those values recommended by the Organization or required by the Administration;

.2 longitudinal stress, and where applicable torsional stress values, not to exceed permitted values with regard to prevailing sea conditions;

.3 exchange of ballast in tanks where significant structural loads may be generated by sloshing action in the partially filled tank to be carried out in favourable sea and swell conditions such that the risk of structural damage is minimized;

.4 wave-induced hull vibrations when carrying out ballast water exchange;

.5 limitations of the available methods of ballast water exchange in respect of sea and weather conditions;

.6 forward and aft draughts and trim, with particular reference to bridge visibility, slamming, propeller immersion and minimum forward draft; and

.7 additional workloads on the master and crew.

5.4 Having undertaken an evaluation for a particular ship and the exchange method or methods to be used, the ship should be provided with procedures, advice and information appropriate to the exchange method(s) identified and ship type in the ballast water management plan. The procedures, advice and information in the ballast water management plan may include but are not limited to the following:

.1 avoidance of over and under-pressurization of ballast tanks;

.2 free surface effects on stability and sloshing loads in tanks that may be slack at any one time;

.3 maintain adequate intact stability in accordance with an approved trim and stability booklet;

.4 permissible seagoing strength limits of shear forces and bending moments in accordance with an approved loading manual;

.5 torsional forces;

.6 forward and aft draughts and trim, with particular reference to bridge visibility, propeller immersion and minimum forward draft;

.7 wave-induced hull vibrations when performing ballast water exchange;

.8 watertight and weather-tight closures (e.g. manholes) which may have to be opened during ballast exchange must be re-secured;

.9 maximum pumping/flow rates – to ensure the tank is not subjected to a pressure greater than that for which it has been designed;

.10 internal transfers of ballast;

.11 admissible weather conditions;

.12 weather routeing in areas seasonably affected by cyclones, typhoons, hurricanes, or heavy icing conditions;

.13 documented records of ballasting and/or de-ballasting and/or internal transfers of ballast;

.14 contingency procedures for situations which may affect ballast water exchange at sea, including deteriorating weather conditions, pump failure and loss of power;

.15 time to complete the ballast water exchange for each tank or an appropriate sequence thereof;

.16 continual monitoring of the ballast water operation; monitoring should include pumps, levels in tanks, line and pump pressures, stability and stresses;

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

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

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

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

.1 bridge visibility standards (SOLAS regulation V/22);

.2 propeller immersion; and

.3 minimum draft forward.

5.6 As the choice of acceptable ballast water exchange sequences is limited for most ships, it is not always practicable to dismiss from consideration those sequences where transitory non-compliance may occur. The practical alternative would be to accept such sequences provided an appropriate note is placed in the ballast water management plan to alert the ship's master. The note would advise the master of the nature of the transitory non-compliance, that additional planning may be required and that adequate precautions need to be taken when using such sequences.

5.7 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 master should assess:

.1 the duration(s) and time(s) during the operation that any of the criteria will not be met;

.2 the effect(s) on the navigational and manoeuvring capabilities of the ship; and

.3 the time to complete the operation.

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

.1 the ship will be in open water;

.2 the traffic density will be low;

.3 an enhanced navigational watch will be maintained including if necessary an additional look out forward with adequate communications with the navigation bridge;

.4 the manoeuvrability of the vessel will not be unduly impaired by the draft and trim and or propeller immersion during the transitory period; and

.5 the general weather and sea-state conditions will be suitable and unlikely to deteriorate.

5.9 On oil tankers, segregated ballast and clean ballast may be discharged below the water line at sea by pumps if the ballast water exchange is performed under the provisions of regulation D-1.1 of the Convention, provided that the surface of the ballast water has been examined either visually or by other means immediately before the discharge to ensure that no contamination with oil has taken place.

6 CREW TRAINING AND FAMILIARIZATION

6.1 Appropriate training for ships' masters and crews should include instructions on the safety issues associated with ballast water exchange based upon the information contained in these Guidelines. Instruction should be provided on the ships' ballast water management plan including the completion of required records.

6.2 Ships' officers and crew engaged in ballast water exchange at sea should be trained in and be familiar with the following as appropriate:

.1 the ship's ballast pumping and piping arrangements, positions of associated air and sounding pipes, positions of all compartment and tank suctions and pipelines connecting them to ship's ballast pumps and, in the case of use of the flow through method of ballast water exchange, the openings used for release of water from the top of the tank together with overboard discharge arrangements;

.2 the method of ensuring that sounding pipes are clear, and that air pipes and their non-return devices are in good order;

.3 the different times required to undertake the various ballast water exchange operations including the time to complete individual tanks;

.4 the method(s) in use for ballast water exchange at sea if applicable with particular reference to required safety precautions; and

.5 the need to continually monitor ballast water exchange operations.

7 FUTURE CONSIDERATIONS IN RELATION TO BALLAST WATER EXCHANGE

These Guidelines may be revised and updated in the light of possible technical evolutions with the ballast water exchange methods and of new ballast water management options.

APPENDIX

EXAMPLE BALLAST WATER REPORTING FORM

Date of Submission (DD/MM/YYYY):_____ Time of Submission (24:00 GST): _____ **AMENDED FORM: Yes ☐ No ☐**

1. SHIP INFORMATION	**2. VOYAGE INFORMATION**	**3. BALLAST WATER USAGE AND CAPACITY**		
Ship Name:	Arrival Port:			
IMO Number:	Arrival Date (DD/MM/YYYY):	Total Ballast Water on Board:		
Owner:	Agent:	Volume	Units	No. of Tanks and Holds in Ballast
Type:	Last Port: Country:		***m³***	
GT:	Next Port: Country:	Total Ballast Water Capacity:		
Date of Construction (DD/MM/YYYY):	Next Port (2): Country:	Volume	Units	Total No. of Ballast Tanks and Holds on Ship
Flag:	Next Port (3): Country:		***m³***	

4. BALLAST WATER MANAGEMENT

Total No. Ballast Water Tanks to be discharged: ☐

Of tanks to be discharged, how many: underwent exchange: ☐ were treated using a Ballast Water Management System: ☐

Please specify Ballast Water Management System used, if any (Manufacturer, Model):_____

If no Ballast Water Management conducted, state reason why not: _____

Approved Ballast Water Management plan on board? YES ☐ NO ☐ Management plan implemented? YES ☐ NO ☐

Ballast water record book on board? YES ☐ NO ☐

Does ship carry an International Ballast Water Management Certificate: YES ☐ NO ☐

Date of issue (DD/MM/YYYY): _____ Expiry Date (DD/MM/YYYY): _____

Authority that issued Certificate: _____ Place of issue: _____

Date Required to Meet Regulation D-2 (DD/MM/YYYY): _____

5. BALLAST WATER HISTORY: RECORD ALL TANKS/ HOLDS containing water taken on board to control trim, list, draught, stability or stresses of the ship, regardless of ballast water discharge intentions, on page 2. Note: BW Sources are the last BW uptakes prior to any Ballast Water Management practices.

6. RESPONSIBLE OFFICER'S NAME AND TITLE:

Ship Name IMO Number Arrival Date:

Tanks/Holds List multiple sources/ tanks separately	**TANK CAPACITY**	**BW SOURCES**		**CURRENT**	**BW MANAGEMENT PRACTICES**							**PROPOSED BW DISCHARGE**			
		DATE DD/MM/YYYY	PORT or LAT. LONG.	VOLUME (m^3)	DATE DD/MM/YYYY	Start Point* Lat. & Long.	End Point* Lat. & Long.	VOLUME Used* (m^3)	% Exch*	METHOD (DM/SM/ FM, T)	SALINITY (PSU)	DATE DD/MM/YYYY	PORT or LAT. LONG.	VOLUME (m^3)	SALINITY (PSU)

Ballast Water Tank Codes: Forepeak = FP, Aftpeak = AP, Double Bottom = DB, Wing = WT, Topside = TS, Cargo Hold = CH, Other = O.
Methods: DM= Dilution, SM=Sequential, FM= Flow Through , T=Treatment.
Complete columns with (*) only if exchange was conducted.

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ANNEX 10

RESOLUTION MEPC.289(71)
(adopted on 7 July 2017)

2017 GUIDELINES FOR RISK ASSESSMENT UNDER REGULATION A-4 OF THE BWM CONVENTION (G7)

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

RECALLING Article 38(a) of the Convention on the International Maritime Organization concerning the functions of the Marine Environment Protection Committee conferred upon it by international conventions for the prevention and control of marine pollution from ships,

RECALLING ALSO that the International Conference on Ballast Water Management for Ships held in February 2004 adopted the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (the Convention) together with four Conference resolutions,

NOTING that regulation A-2 of the Convention requires that discharge of ballast water shall only be conducted through ballast water management in accordance with the provisions of the annex to the Convention,

NOTING ALSO that regulation A-4 of the Convention stipulates that a Party or Parties, in waters under their jurisdiction, may grant exemptions to any requirements to apply regulation B-3 or C-1, in addition to those exemptions contained elsewhere in this Convention, but only when they are, inter alia, granted based on the guidelines on risk assessment developed by the Organization,

NOTING FURTHER resolution MEPC.162(56) by which it adopted *Guidelines for risk assessment under regulation A-4 of the BWM Convention (G7),*

RECALLING that, at its seventieth session, it endorsed the view of the Ballast Water Review Group that the same risk area (SRA) concept was in line with the Guidelines (G7); that no further guidance on the matter was necessary; and that Administrations may grant exemptions in accordance with regulation A-4 of the Convention based on the SRA concept, subject to consultation and agreement between States that may be affected by such exemptions,

RECALLING ALSO that in this regard, at its seventieth session, it invited proposals for minor amendments to the Guidelines (G7), in order to better clarify the relationship between the Guidelines and the SRA concept, to its seventy-first session,

HAVING CONSIDERED, at its seventy-first session, draft amendments to the Guidelines (G7) to introduce the SRA concept,

1 ADOPTS the *2017 Guidelines for risk assessment under regulation A-4 of the BWM Convention (G7)* (the 2017 Guidelines (G7)), as set out in the annex to this resolution;

2 INVITES Governments to apply the 2017 Guidelines (G7) as soon as possible, or when the Convention becomes applicable to them;

3 AGREES to keep the 2017 Guidelines (G7) under review;

4 SUPERSEDES the *Guidelines for risk assessment under regulation A-4 of the BWM Convention (G7)* adopted by resolution MEPC.162(56).

ANNEX

GUIDELINES FOR RISK ASSESSMENT UNDER REGULATION A-4 OF THE BWM CONVENTION (G7)

1 PURPOSE

1.1 The purpose of these Guidelines is to assist Parties to ensure that the provisions of regulation A-4 of the Convention are applied in a consistent manner and based on scientifically robust risk assessment, which ensures that the general and specific obligations of a Party to the Convention are achieved.

1.2 An additional purpose is to provide assurance to affected States that exemptions granted by a Party meet the regulation A-4.3 obligations.

1.3 These Guidelines outline three risk assessment methods that will enable Parties to identify unacceptable high risk scenarios and acceptable low risk scenarios, and advise Parties on procedures for granting and withdrawing exemptions in accordance with regulation A-4.

2 INTRODUCTION

2.1 Regulation A-4 of the Convention states that a Party or Parties, in waters under their jurisdiction may grant exemptions to any requirements to apply regulation B-3 or C-1, in addition to those exemptions contained elsewhere in the Convention, but only when they are:

.1 granted to a ship or ships on a voyage or voyages between specified ports or locations; or to a ship which operates exclusively between specified ports or locations;

.2 effective for a period of no more than five years subject to intermediate review;

.3 granted to ships that do not mix ballast water or sediments other than between the ports or locations specified in paragraph 2.1.1; and

.4 granted based on the Guidelines for risk assessment developed by the Organization.

2.2 These Guidelines provide advice and information regarding risk assessment principles and methods, data needs, advice on application of risk assessment methods, procedures for granting exemptions, consultation and communication processes, information for reviewing exemptions and advice regarding technical assistance, co-operation and regional co-operation.

2.3 These Guidelines also provide advice regarding the roles of the Organization, the shipping industry, port States and other States that might be affected by granting an exemption in accordance with regulation A-4 of the Convention.

2.4 Scientifically robust risk assessment underpins the process of Parties granting exemptions under regulation A-4 of the Convention. The assessment must be sufficiently robust to distinguish between unacceptable high risk scenarios and acceptable low risk scenarios where the discharge of ballast water not meeting regulations B-3 and C-1 is unlikely to impair or damage the environment, human health, property or resources of the granting Party and of adjacent or other States.

2.5 Risk assessments should be based on best available scientific information.

2.6 The Guidelines should be kept under review in order to incorporate experiences gained during their application and any new scientific and technical knowledge.

3 APPLICATION

3.1 These Guidelines apply to Parties granting exemptions to ships under regulation A-4 of the Convention.

3.2 Shipowners or operators wanting to seek an exemption under regulation A-4 should also consult these Guidelines.

4 DEFINITIONS

4.1 For the purposes of these Guidelines, the definitions in the Convention apply.

4.2 *Anadromous* – species that spawn/reproduce in freshwater environments, but spend at least part of their adult life in a marine environment.

4.3 *Biogeographic region* – a large natural region defined by physiographic and biologic characteristics within which the animal and plant species show a high degree of similarity. There are no sharp and absolute boundaries but rather more or less clearly expressed transition zones.

4.4 *Catadromous* – species that spawn/reproduce in marine environments, but spend at least part of their adult life in a freshwater environment.

4.5 *Cryptogenic* – species that are of unknown origin, i.e. species that are not demonstrably native or introduced to a region.

4.6 *Donor port* – port or location where the ballast water is taken onboard.

4.7 *Euryhaline* – species able to tolerate a wide range of salinities.

4.8 *Eurythermal* – species able to tolerate a wide range of temperatures.

4.9 *Freshwater* – water with salinity lower than 0.5 PSU (practical salinity units).

4.10 *Marine water* – water with salinity higher than 30 PSU.

4.11 *Non-indigenous species* – any species outside its native range, whether transported intentionally or accidentally by humans or transported through natural processes.

4.12 *Recipient port* – port or location where the ballast water is discharged.

4.13 *Target species* – species identified by a Party that meet specific criteria indicating that they may impair or damage the environment, human health, property or resources and are defined for a specific port, State or biogeographic region.

4.14 *Same Risk Area (SRA)* – an agreed geographical area based on a completion of a risk assessment carried out in line with these Guidelines.

5 RISK ASSESSMENT PRINCIPLES

5.1 Risk assessment is a logical process for assigning the likelihood and consequences of specific events, such as the entry, establishment, or spread of harmful aquatic organisms and pathogens. Risk assessments can be qualitative or quantitative, and can be a valuable decision aid if completed in a systematic and rigorous manner.

5.2 The following key principles define the nature and performance of risk assessment:

.1 **Effectiveness –** that risk assessments accurately measures the risks to the extent necessary to achieve an appropriate level of protection.

.2 **Transparency –** that the reasoning and evidence supporting the action recommended by risk assessments, and areas of uncertainty (and their possible consequences to those recommendations), are clearly documented and made available to decision-makers.

.3 **Consistency –** that risk assessments achieve a uniform high level of performance, using a common process and methodology.

.4 **Comprehensiveness –** that the full range of values, including economic, environmental, social and cultural, are considered when assessing risks and making recommendations.

.5 **Risk management –** that low risk scenarios may exist, but zero risk is not obtainable, and as such risk should be managed by determining the acceptable level of risk in each instance.

.6 **Precautionary –** that risk assessments incorporate a level of precaution when making assumptions, and making recommendations, to account for uncertainty, unreliability, and inadequacy of information. The absence of, or uncertainty in, any information should therefore be considered an indicator of potential risk.

.7 **Science based –** that risk assessments are based on the best available information that has been collected and analysed using scientific methods.

.8 **Continuous improvement –** any risk model should be periodically reviewed and updated to account for improved understanding.

5.3 In undertaking risk assessment when considering granting an exemption, the risk assessment principles should be carefully applied. The lack of full scientific certainty should be carefully considered in the decision making process. This is especially important under these Guidelines, as any decision to grant an exemption will allow for the discharge of ballast water that does not meet the standards of regulation D-1 or D-2.

6 RISK ASSESSMENT METHODS

6.1 General

6.1.1 There are three risk assessment methods outlined in these Guidelines for assessing the risks in relation to granting an exemption in accordance with regulation A-4 of the Convention:

.1 environmental matching risk assessment;

.2 species' biogeographical risk assessment; and

.3 species-specific risk assessment.

6.1.2 Environmental matching risk assessment relies on comparing environmental conditions between locations, species' biogeographical risk assessment compares the overlap of native and non-indigenous species to evaluate environmental similarity and to identify high risk invaders, while species-specific risk assessment evaluates the distribution and characteristics of identified target species. Dependent on the scope of the assessment being performed, the three approaches could be used either individually or in any combination, recognizing that each approach has its limitations.

6.1.3 Environment matching and species' biogeographical risk assessment may be best suited to assessments between biogeographic regions. Species-specific risk assessment may be best suited to situations where the assessment can be conducted on a limited number of harmful species within a biogeographic region.

6.2 Environmental matching risk assessment

6.2.1 Environmental matching risk assessments compare environmental conditions including temperature and salinity between donor and recipient regions. The degree of similarity between the locations provides an indication of the likelihood of survival and the establishment of any species transferred between those locations.

6.2.2 Since species are widely distributed in a region, and are rarely restricted to a single port the environmental conditions of the source region should be considered.

6.2.3 These regions are typically defined as biogeographic regions. Noting that all of the existing biogeographical schemes were derived for different purposes than proposed here, it is suggested that the Large Marine Ecosystems (LME) scheme (http://www.edc.uri.edu/lme) be used based on best available information at this time, with local and regional adaptation as necessary. It is recognized that the suggested biogeographical scheme may not be appropriate in certain circumstances and in this case other recognized biogeographical schemes may need to be considered[1].

6.2.4 Environmental matching should therefore compare environmental conditions between the donor biogeographic region and the recipient port to determine the likelihood that any species found in the donor biogeographic region are able to survive in the recipient port in another biogeographic region. The environmental conditions that may be considered for environmental matching include salinity, temperature or other environmental conditions, such as nutrients or oxygen.

6.2.5 The difficulty in using environmental matching risk assessments is identifying the environmental conditions that are predictive of the ability of the harmful species to successfully establish and cause harm in the new location, and in determining whether the risk of ballast water discharge is sufficiently low to be acceptable. Environmental matching risk assessments have limited value where the differences between a donor biogeographic region and a recipient port are small as high similarity is likely to indicate high likelihood of successful establishment.

[1] Watling and Gerkin (http://marine.rutgers.edu/OBIS/index.html) based on Briggs (1953) and Springer (1982); IUCN bioregion system; Briggs (1953) and Ekman (1974; 1995); Longhurst provinces.

6.2.6 Environmental conditions should also be compared between the donor and recipient ports. Similarity in key environmental conditions between the two ports is a stronger indication that species entrained in ballast water in the donor port could survive when released into the waters of the recipient port. The environmental conditions that may be considered for environmental matching include salinity, temperature or other environmental conditions, such as nutrients or oxygen.

6.2.7 The data necessary to enable a risk assessment using environmental matching includes, but is not limited to:

.1 origin of the ballast water to be discharged in recipient port;

.2 biogeographic region of donor and recipient port(s); and

.3 average and range of environmental conditions, in particular salinity and temperature.

This information is used to determine the degree of environmental similarity between the donor and recipient environments. In many cases, it should be possible to use existing data for part or all of these environmental profiles.

6.2.8 The following should be considered in gathering data on the environmental conditions:

.1 seasonal variations in surface and bottom salinities and temperatures at the recipient port and the larger water body the port is contained within (e.g. estuary or bay). Surface and bottom values are needed to determine the full range of environmental conditions available for a potential invader (e.g. low salinity surface waters allowing the invasion of a freshwater species). Salinity and temperature depth profiles are not required if available data indicates the waters are well mixed over the entire year;

.2 in recipient ports with strong tides or currents, the temporal variations in salinity should be determined over a tidal cycle;

.3 in areas with seasonal or depth variations, the salinity should be determined on a seasonal and/or depth basis;

.4 any anthropogenic influences on freshwater flow that could temporarily or permanently alter the salinity regime of the recipient port and surrounding waters; and

.5 seasonal temperature variation of coastal waters for the biogeographic region of the recipient port. Consideration should be given to both surface waters and to how temperature varies with depth.

6.2.9 It is recommended that the analysis of environmental conditions be followed by a consideration of the species known to be in the donor region that can tolerate extreme environmental differences. If present, a species-specific approach should be used to evaluate the risks associated with these species. Such species include:

.1 species that utilize both fresh and marine environments to complete their life-cycle (including anadromous (e.g. Sea Lamprey) and catadromous (e.g. Chinese Mitten crab) species); and

.2 species with a tolerance to a wide range of temperatures (eurythermal species) or salinities (euryhaline species).

6.3 Species' biogeographical risk assessment

6.3.1 Species' biogeographical risk assessment compares the biogeographical distributions of nonindigenous, cryptogenic, and harmful native species that presently exist in the donor and recipient ports and biogeographic regions. Overlapping species in the donor and recipient ports and regions are a direct indication that environmental conditions are sufficiently similar to allow a shared fauna and flora. The biogeographical analysis could also be used to identify high risk invaders. For example, native species in the donor biogeographic region that have successfully invaded other similar biogeographic regions but that are not found in the recipient biogeographic region could be considered high risk invaders for the recipient port or location. The larger the number of biogeographic regions that such species have invaded, the greater the potential that those species would be able to become established in the recipient port or biogeographic region if introduced by ballast water not meeting regulation B-3 or C-1. Another general indicator of risk would be if the donor biogeographic region is a major source of invaders to other areas.

6.3.2 The data necessary to enable a risk assessment using a species biogeographical approach includes but may not be limited to:

.1 records of invasion in the donor and recipient biogeographic regions and ports;

.2 records of native or non-indigenous species that could be transferred through ballast water in the donor biogeographic region that have invaded other biogeographic regions and the number and nature of biogeographic regions invaded; and

.3 records of native species in the donor region that have the potential to affect human health or result in substantial ecological or economic impacts after introduction in the recipient region through ballast water transfer.

6.3.3 The species' biogeographical risk assessment could also be used to identify potential target species in the donor regions as indicated by native species with wide biogeographical or habitat distributions or which are known invaders in other biogeographic regions similar to that of the recipient port.

6.4 Species-specific risk assessment

6.4.1 Species-specific risk assessments use information on life history and physiological tolerances to define a species' physiological limits and thereby estimate its potential to survive or complete its life cycle in the recipient environment. That is, they compare individual species characteristics with the environmental conditions in the recipient port, to determine the likelihood of transfer and survival.

6.4.2 In order to undertake a species-specific risk assessment, species of concern that may impair or damage the environment, human health, property or resources need to be identified and selected. These are known as the target species. Target species should be selected for a specific port, State, or geographical region, and should be identified and agreed on in consultation with affected States.

6.4.3 To determine the species that are potentially harmful and invasive, parties should initially identify all species (including cryptogenic species) that are present in the donor port but not in the recipient port. Target species should then be selected based on criteria that identify the species that have the ability to invade and become harmful. The factors to consider when identifying target species include, but should not be limited to:

.1 evidence of prior introduction;

.2 demonstrated impacts on environment, economy, human health, property or resources;

.3 strength and type of ecological interactions, e.g. ecological engineers;

.4 current distribution within biogeographic region and in other biogeographic regions; and

.5 relationship with ballast water as a vector.

6.4.4 Species-specific risk assessments should then be conducted on a list of target species, including actual or potentially harmful non-indigenous species (including cryptogenic species). As the number of species included in the assessment increases the number of low risk scenarios decreases. This is justified if the species assessments are accurate. The difficulty arises when the assessments are conservative due to lack of data. It should be recognized however, that the fewer the number of species analysed, the greater the uncertainty in predicting the overall risk. The uncertainty associated with limiting the analysis to a small number of species should therefore be considered in assessing the overall risk of invasion.

6.4.5 It should be noted that there are limitations involved with using a target species approach. Although some data and information can be obtained to support decision making, identifying species that may impair or damage the environment, human health, property or resources is subjective and there will be a degree of uncertainty associated with the approach. For example, it is possible that species identified as harmful in some environments may not be harmful in others and vice versa.

6.4.6 If species-specific risk assessments are undertaken when the donor and recipient ports are within different biogeographic regions, Parties should identify and consider any uncertainties resulting from lack of data on the presence of potentially harmful species in the donor location.

6.4.7 The extent and directionality of natural dispersal of the target species should be modelled for the relevant water bodies. The area defined by the extent of connected locations of populations of target species may determine the extent of an SRA.

6.4.8 The data necessary to enable a risk assessment using the species-specific approach includes, but is not limited to:

.1 biogeographic region of donor and recipient port(s);

.2 the presence of all non-indigenous species (including cryptogenic species) and native species in the donor port(s), port region and biogeographic region, not present in the recipient port, to allow identification of target species;

.3 the presence of all target species in the recipient port(s), port region, and biogeographic region;

.4 the difference between target species in the donor and recipient ports, port region, and biogeographic region;

.5 life history information on the target species and physiological tolerances, in particular salinity and temperature, of each life stage;

.6 habitat type required by the target species and availability of habitat type in the recipient port; and

.7 in the context of carrying out the risk assessment using the SRA approach, the hydrodynamic, environmental and meteorological conditions of the area in question.

6.4.9 If a target species is already present in the recipient port, it may be reasonable to exclude that species from the overall risk assessment for that port unless that species is under active control. It is important to recognize, however, that even when a non-indigenous species or cryptogenic species has been reported from the donor and recipient ports, its continual introduction into the recipient ports could increase the probability that it will become established and/or achieve invasive population densities.

6.4.10 A risk assessment can take different forms. A simple assessment can be undertaken as outlined in paragraph 6.4.8 of whether a target species is present in the donor port but not in a recipient port and can be transported through ballast water. However, if considered appropriate, the likelihood of target species surviving each of the following stages may be assessed, including:

.1 uptake – probability of viable stages entering the vessel's ballast water tanks during ballast water uptake operations;

.2 transfer – probability of survival during the voyage;

.3 discharge – probability of viable stages entering the recipient port through ballast water discharge on arrival; and

.4 population establishment – probability of the species establishing a self-maintaining population in the recipient port.

6.4.11 To determine the likelihood of transfer and survival of a harmful species, the probability of each species surviving each of the stages contained in paragraph 6.4.10 may be assessed. To the extent possible the different life stages of the target species may also be assessed considering seasonal variations of life stage occurrence in donor port with seasonal conditions in the recipient port. The overall risk assessment for the discharge of unmanaged ballast water is therefore determined based on the assessment of all target species surviving all these stages.

6.4.12 In assessing whether a species will survive in the recipient port, physiological tolerances of all life stages need to be considered.

.1 ability of the adults to survive would be indicated by the physiological limits for both temperature and salinity that fall within the environmental ranges observed in the recipient port and larger water body. As a check,

a comparison could be made with the native and/or introduced ranges of the species to determine if the predicted tolerances (based on lab or field studies) reflect actual distributions;

.2 for other life stages the physiological requirements of each stage in the life cycle should be compared against the environmental conditions during the season(s) of reproduction, noting that these stage(s) may live in different habitats to complete their life cycle (e.g. coastal pelagic larvae of estuarine benthic invertebrates). Data should be collected as appropriate; and

.3 comparisons of known physiological tolerances for other conditions should be conducted if the data are available and relevant.

6.4.13 To evaluate whether the species-specific risk assessment approach is sufficiently robust to predict invaders, the approach could be used to estimate the probabilities of invasion for a suite of existing invaders within the recipient port. Failure to accurately predict existing invaders may indicate that the model under predicts the risk.

6.5 Evaluation and decision-making

6.5.1 The port State granting exemptions shall, in both the evaluation and consultation processes, give special attention to regulation A-4.3 which states that any exemptions granted under this regulation shall not impair or damage the environment, human health, property or resources of adjacent or other States. Regulation A-4.3 also states that States that may be adversely affected shall be consulted, and Parties should refer to section 8 regarding consultation.

6.5.2 It is important for the transparency and consistency of the risk assessments to define a priori criteria to distinguish between unacceptable high risk scenarios and acceptable low risk scenarios where the risk of ballast water not meeting regulations B-3 and C-1 is unlikely to impair or damage the environment, human health, property or resources of the granting Party and of adjacent or other States. The specific criteria depend upon the risk assessment approach, as well as the uncertainty in the analysis.

6.5.3 For an environmental matching risk assessment:

.1 a high-risk scenario could be indicated if the environmental conditions of the donor ports overlap the environmental conditions of the recipient region; and

.2 a low-risk scenario could be indicated if the environmental conditions of the donor port do not overlap the environmental conditions of the recipient region;

6.5.4 For the species' biogeographical risk assessment:

.1 a high risk could be indicated if the recipient port presently contains non-indigenous species whose native range includes the donor biogeographic region;

.2 a high risk could be indicated if the donor and recipient ports share non-indigenous species whose source is from other biogeographic regions;

.3 a moderate to high risk could be indicated if the recipient biogeographic region presently contains non-indigenous species whose native range includes the donor biogeographic region; and

.4 a moderate to high risk could be indicated if the donor biogeographic region is a major source for invaders for other biogeographic regions.

6.5.5 For a species-specific risk assessment, an assessment could be deemed high-risk if it identifies at least one target species that satisfies all of the following:

.1 likely to cause harm;

.2 present in the donor port or biogeographic region;

.3 likely to be transferred to the recipient port through ballast water; and

.4 likely to survive in the recipient port.

6.5.6 A risk assessment for an SRA will typically take the form of a species-specific assessment. For an SRA species-specific risk assessment, an assessment could be deemed low-risk if target species are already present in all the selected ports or locations or have a high probability, based on validated models, of establishing throughout the SRA by the process of natural dispersal within the agreed time window.

6.5.7 The overall probability of a successful invasion also depends in part on the number of organisms and the frequency with which they are introduced over the entire period of the exemption. Therefore, it is recommended that a risk assessment should consider estimates of at least the following four factors:

.1 total volume of water discharged;

.2 volume of water discharged in any event (voyage);

.3 total number of discharge events; and

.4 temporal distribution of discharge events.

6.5.8 In all cases, the level of uncertainty needs to be considered in evaluating the extent of risk. High levels of uncertainty in the biogeographical distributions and/or physiological tolerances of a target species may be sufficient in themselves to classify the risk as high. Additionally, the potential ecological impact of the target species should be considered in deciding the level of acceptable risk. The absence of, or uncertainty in, any information should not be considered a reason to grant an exemption to regulation B-3 or C-1.

6.5.9 Once the level of risk and the extent of uncertainty have been assessed, the result can be compared to the levels a Party(s) is willing to accept in order to determine whether an exemption can be granted.

6.5.10 Ships on a voyage(s) or route(s) that satisfy the requirements of regulation A-4.1 and that pass(es) the terms of acceptance in the risk assessment may be granted an exemption.

6.5.11 It is recommended that an independent peer review of the risk assessment method, data and assumptions be undertaken in order to ensure that a scientifically rigorous analysis has been conducted. The peer review should be undertaken by an independent third party with biological and risk assessment expertise.

7 PROCEDURES FOR GRANTING EXEMPTIONS

7.1 The purpose of this section is to provide guidance for Parties, Administrations and ships engaged in the process of applying for, evaluating and/or granting exemptions in accordance with the provisions of regulation A-4. The appendix also identifies minimum information required for an exemption application.

7.2 Parties may undertake the risk assessment themselves in order to grant exemptions, or require the shipowner or operator to undertake the risk assessment. In any event the Party granting an exemption is responsible for evaluating the risk assessment, verifying the data and information used, and ensuring the risk assessment is conducted in a thorough and objective manner in accordance with the Guidelines. The recipient port State(s) should reject any application for exemption found not to be in accordance with these Guidelines, and should provide reasons as to why the application was not accepted.

7.3 Shipowners or operators wanting to seek an exemption should contact the relevant Parties to ascertain the risk assessment procedures to be undertaken and the information requirements of these procedures.

7.4 Where a Party has determined that the shipowner or operator should undertake the risk assessment, the Party should provide relevant information, including any application requirements, the risk assessment model to be used, any target species to be considered, data standards and any other required information. The shipowner or operator should follow these Guidelines and submit relevant information to the Party.

7.5 The port State shall ensure that, as required by regulation A-4.1.3, exemptions are only granted to ships that do not mix ballast water or sediments other than between the locations specified in the exemption. The port State should require evidence of the specific measures undertaken to ensure compliance with this regulation at the time the exemption is granted and over the duration of the exemption. Non-compliance during the period of exemption should result in prompt suspension or revocation of the exemption.

7.6 An exemption shall not be effective for more than five years from the date granted. The approval may contain seasonal and time-specific or other restrictions within the time of validity.

7.7 The result of the risk assessment should be stated as:

.1 the voyage(s) or route(s) represent(s) an acceptable risk. The application for an exemption is granted;

.2 the voyage(s) or route(s) may represent an unacceptable risk. Further consideration is required; and

.3 the voyage(s) or route(s) represent(s) an unacceptable risk. The exemption from the ballast water management requirements of regulation B-3 or C-1 of the Convention is not granted.

8 CONSULTATION

8.1 In accordance with regulation A-4.3, Parties shall consult any State that may be adversely affected from any exemptions that may be granted. This should include adjacent States and any other States that may be affected, including those located in the same biogeographic region as the recipient port(s). States should exchange information and endeavour to resolve any identified concerns. Sufficient time must be given for affected States to consider proposed exemptions carefully.

8.2 Affected States should be provided with information on: the risk assessment method applied; the quality of the information used in the assessment; uncertainties in the model, model inputs and/or risk assessments; the rationale for the proposed exemption; and any terms or conditions applicable to the exemption.

8.3 The risk assessment should document the following elements, as appropriate:

.1 criteria or reference for defining target species in the risk method;

.2 inventories of native, non-indigenous, and cryptogenic species used in the species' biogeographical risk assessment; and

.3 acceptance criteria applied in each step of the analysis. The risk assessment has to be put in a relevant context to enable determination of whether the risk level is acceptable or not. The only transparent verifiable way of doing this is to compare the actual risk level with clear predefined acceptance criteria in paragraphs 6.5.2 to 6.5.9.

8.4 In addition, the criteria or scientific methods used in defining and delimiting the biogeographic regions shall be presented if a scheme other than that recommended in paragraph 6.2.3 is used.

8.5 The invitation for comments should contain one of the two following options for the affected State's response:

.1 supported without comments or conditions; or

.2 supported with comments and/or conditions.

8.6 The deadline for comments from the affected State(s) should be specified in the invitation. If no response within the given time-limit is received, this may be regarded as "Accepted without comments or conditions".

8.7 If an affected State does not support the granting of the exemption(s), the appropriate reasons should be provided. Any conditions or limitations which an affected State believes to be necessary to enable them to support an exemption should be clearly identified.

9 COMMUNICATION OF INFORMATION

9.1 Each Party to the Convention that has indicated it will grant exemptions should establish a point or points of contact for receipt of applications. Relevant contact details should be submitted to the Organization. In the absence of such information from a Party, the contact point notified to the Organization should be regarded as the contact point for the purpose of these Guidelines.

9.2 The Organization should circulate the list of contacts and update it on a regular basis.

9.3 The decision of the recipient port State(s) shall be communicated to the shipowners or operators, the affected State(s) and the Organization as soon as possible before the effective date of the exemption. The decision should explain the basis for granting the exemption and how any comments from affected States were addressed and specify the voyage or voyages in which the exemption is granted, including the specified ports or location(s), or SRA delineation, the duration of the exemption and details of any conditions or limitations on the exemption.

9.4 Exemptions granted in accordance with regulation A-4 of the Convention shall be effective after communication to the Organization and circulation of relevant information to Parties.

9.5 Any exemption granted shall also be recorded in the ballast water record book in accordance with regulation A-4.4.

9.6 Where exemptions have been granted for a specific voyage, any changes in voyage plans must be communicated to the Party that has granted the exemption prior to undertaking the voyage or prior to discharge of ballast water.

10 REVIEW OF RISK ASSESSMENT AND WITHDRAWAL OF EXEMPTIONS

10.1 It is recommended that information used in the risk assessment be reviewed regularly as data and assumptions used in the assessment can become outdated.

10.2 It is recommended that an intermediate review be undertaken within 12 months but in any circumstances no later than 36 months after permission is granted. A recipient port State may require several reviews to be taken during the period the exemption is granted for, but more frequent than annual reviews generally should not be required.

10.3 Renewal of an exemption following the initial 60 months must not be granted without a thorough review of the risk assessment, consultation with affected States and notice of the decision to the Organization under regulation A-4.2.

10.4 An exemption granted under regulation A-4 of the Convention may need to be withdrawn where the actual risk associated with a voyage has increased substantially since the risk assessment was conducted. This would include emergency situations such as outbreaks, incursions, infestations, or proliferations of populations of harmful aquatic organisms and pathogens (e.g. harmful algal blooms) which are likely to be taken up in ballast water (regulation C-2 of the Convention).

10.5 When a port State notifies mariners of areas under its jurisdiction where ships should not uptake ballast water due to an emergency or other high risk situation, all exemptions should be withdrawn from ships that take up ballast water in the defined area. In such circumstances the shipowners or operators should be notified of the decision to withdraw the exemption as soon as possible.

10.6 The *Guidelines for additional measures regarding ballast water management including emergency situations (G13),* adopted by resolution MEPC.161(56), provide guidance to rapidly identify appropriate additional measures whenever emergency situations occur in relation to ballast water operations.

11 TECHNICAL ASSISTANCE, CO-OPERATION AND REGIONAL COOPERATION

11.1 Article 13 of the Convention provides that Parties undertake, directly or through the Organization and other international bodies, to provide support for those Parties which request technical assistance, that Parties undertake to cooperate and that Parties shall endeavour to enhance regional cooperation.

11.2 With regard to these Guidelines, assistance should include provision of data and information required to undertake a risk assessment, technical assistance regarding the methods for undertaking risk assessment and acceptance criteria.

APPENDIX

APPLICATION TO PORT STATE

An application for exemption to the port State should as a minimum contain information on the points listed below.

1 GENERAL INFORMATION

.1 period for which an application is sought; from month and year to month and year; and

.2 why an exemption under regulation A-4 is sought.

2 SHIP'S INFORMATION

.1 ship name;

.2 IMO number;

.3 port of registry;

.4 gross tonnage;

.5 owner;

.6 call sign;

.7 ballast water management option usually undertaken by ship, including ballast water treatment technology, if installed;

.8 a copy of the ship's Ballast Water Management Plan ; and

.9 the Administration may also require ballast water and sediment management history for a determined period.

3 ROUTE INFORMATION

.1 route of application, given as donor port(s) and recipient port for ballast water discharge;

.2 if single voyage: date and time of departure and arrival;

.3 if multiple voyages: voyage frequency, regularity and estimated amount of ballast water discharged during the exemption period, estimated time and dates for departures and arrivals;

.4 any voyages the ship plans to take to ports other than the specified ports during the duration of the exemption; and

.5 if multiple voyages, the estimated total number of voyages and the amount of ballast water discharged under the duration of the exemption.

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ANNEX 12

RESOLUTION MEPC.290(71)
(adopted on 7 July 2017)

THE EXPERIENCE-BUILDING PHASE ASSOCIATED WITH THE BWM CONVENTION

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

RECALLING Articles 38(a) and 38(b) of the Convention on the International Maritime Organization concerning the functions of the Marine Environment Protection Committee conferred upon it by international conventions for the prevention and control of marine pollution from ships, and its functions for considering appropriate measures to facilitate the enforcement of such conventions,

RECALLING ALSO that the International Conference on Ballast Water Management for Ships held in February 2004 adopted the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (the Convention),

CONSIDERING that the entry into force of the Convention on 8 September 2017 will represent the beginning of global ballast water management, and that challenges may arise during the implementation of any new convention that were not foreseen at the time of its adoption,

RECOGNIZING the concerns of the shipping industry regarding the potential penalization of shipowners and operators during the implementation of the Convention due to non-compliance with the performance standard of the Convention for reasons beyond the control of the shipowner and ship's crew, as well as the need to protect the environment, human health, property and resources from the discharge of harmful aquatic organisms and pathogens in any non-compliant ballast water,

DETERMINED to monitor the implementation of the Convention so as to identify aspects of the implementation that are working well and to shed light on issues that require further attention,

PREFERRING to develop most improvements to the Convention as a package, following a systematic and evidence-based approach, and informed by experience gained during the implementation of the Convention,

1 AGREES to establish an experience-building phase associated with the Convention (ballast water experience-building phase), as set out in the annex to this resolution;

2 URGES port States, flag States and other stakeholders to gather, prepare and submit data to the ballast water experience-building phase, taking into account the *Guidelines for port State control under the BWM Convention* (resolution MEPC.252(67)), *Guidance on ballast water sampling and analysis for trial use in accordance with the BWM Convention and Guidelines (G2)* (BWM.2/Circ.42/Rev.1) and the survey guidelines under the Convention;

3 RESOLVES to undertake an analysis of the data gathered and a systematic and evidence-based review of the text of the Convention and develop a package of amendments to the Convention as appropriate;

4 AGREES that, during the ballast water experience-building phase, a ship should not be penalized (sanctioned, warned, detained or excluded) solely due to an exceedance of the ballast water performance standard described in regulation D-2 of the Convention following use of a ballast water management system (BWMS), provided that:

.1 the BWMS is approved in accordance with regulation D-3.1;

.2 the BWMS has been installed correctly;

.3 the BWMS has been maintained in accordance with the manufacturer's instructions;

.4 the Ballast Water Management Plan approved in accordance with regulation B-1 of the Convention has been followed, including the operational instructions and the manufacturer's specifications for the BWMS; and

.5 either the self-monitoring system of the BWMS indicates that the treatment process is working properly, or the port State has been advised that the BWMS is defective prior to the discharge of any ballast water;

5 FURTHER AGREES that the measures in paragraph 4 above do not pertain to other actions of the port State pursuant to Articles 9.3 and 10.3 of the Convention concerning protection of the environment, human health, property and resources;

6 RECOMMENDS that the port State, flag State and shipowner should take into account any guidelines developed by the Organization on contingency measures in determining the most appropriate solution to allow for the discharge of non-compliant ballast water.

ANNEX

STRUCTURE OF THE EXPERIENCE-BUILDING PHASE ASSOCIATED WITH THE BWM CONVENTION

Introduction

1 The entry into force of the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (the Convention) will represent the beginning of global ballast water management. As challenges can be expected with any new global approach, there may be a need for improvements to the Convention in light of experience gained, in accordance with article 2.5 of the Convention (concerning the continued development of ballast water management and standards).

2 The purpose of the ballast water experience-building phase (EBP) is to allow the Marine Environment Protection Committee (the Committee) to monitor the implementation of the Convention. The EBP includes data gathering and analysis to allow the Committee to identify aspects of the Convention's implementation that are working well and to shed light on issues that require further attention. The EBP also includes a systematic and evidence-based process for reviewing and improving the Convention.

3 The EBP is intended to permit port States, flag States and stakeholders (e.g. owners and operators of ships, manufacturers of BWMS, and recognized organizations) to:

.1 gather and submit data concerning the implementation of the Convention;

.2 participate in the analysis of this data in the Ballast Water Review Group (BWRG) of the Committee; and

.3 undertake a review of the text of the Convention to identify any areas where the evidence demonstrates a need for improvement of the Convention, and then develop a package of priority amendments.

4 To this end, the EBP is structured as three stages: a data gathering stage, a data analysis stage, and a Convention review stage (see figure 1). The EBP begins with the entry into force of the Convention and ends with the entry into force of the package of priority amendments. A specific timeline for the stages of the EBP will be included within a data gathering and analysis plan for the ballast water experience-building phase (DGAP) setting out the concrete approach to gathering and analysing data during the EBP.

5 The scope for the EBP is the Convention regime as a whole. The EBP includes, and is broader than, the more specific "trial period" associated with methods for sampling and analysing ballast water during port State control (PSC)[1]. The arrangements for the trial period have been updated and incorporated within the EBP, and data associated with the trial period will be gathered and analysed in parallel with data concerning other aspects of the Convention.

[1] See document BLG 17/18, annex 6, *Recommendations related to the trial period for reviewing, improving and standardizing the Guidance for ballast water sampling and analysis for trial use in accordance with the BWM Convention and Guidelines* (G2). These recommendations were agreed in principle by MEPC 65.

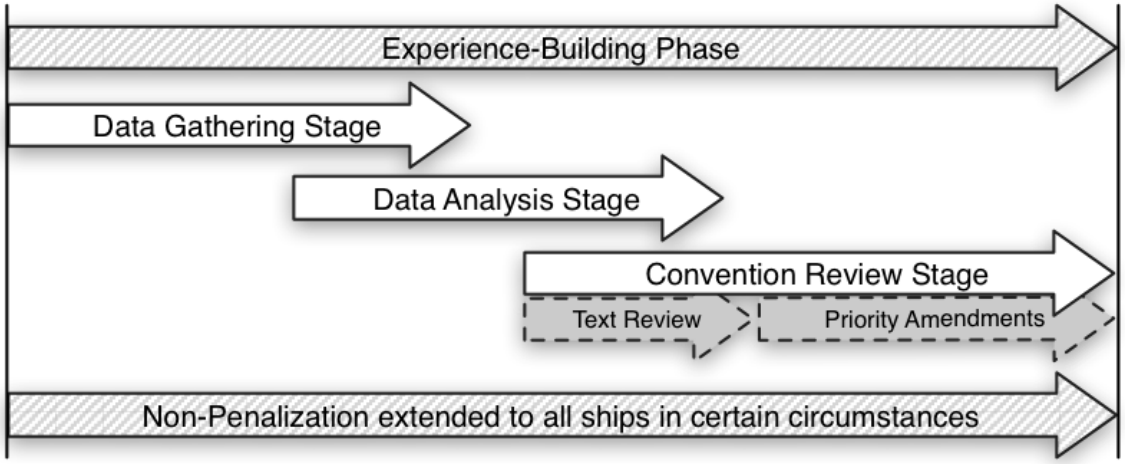

Figure 1: Stages of the ballast water experience-building phase and non-penalization

Non-penalization

6 By way of the resolution adopting the EBP, the Committee has adopted certain non-penalization measures that will be in place during the EBP. These measures are intended to recognize and address concerns expressed by the shipping industry regarding the potential penalization of shipowners and operators during the implementation of the Convention due to non-compliance with the ballast water performance standard described in regulation D-2 of the Convention despite the use of a proper ballast water management system (BWMS). The measures also recognize the need to protect the environment, human health, property and resources in port States from the discharge of non-compliant ballast water.

7 Ships should carry documents on board demonstrating that the preconditions associated with the non-penalization measures have been met (e.g. relating to approval, installation and maintenance of the BWMS). The crew should adhere to the operational instructions and manufacturer's specifications of the BWMS (which should be carried on board). The crew should also attend to the self-monitoring system of the BWMS.

8 This temporary non-penalization that is specific to the EBP has no bearing on other decisions of the Committee concerning other non-penalization arrangements.

9 Aside from this non-penalization, the EBP does not alter the basic roles, responsibilities, obligations and recommendations under the Convention, its guidelines and other guidance.

Data gathering

10 Data gathering is intended to ensure that the Committee has adequate information on the implementation of the Convention. The specific information to be collected is to be set out in the DGAP. The DGAP is intended as a living document and may be revised as appropriate by the Committee during the EBP.

11 Member States are encouraged to participate fully in the EBP in order to maximize the information available to the Committee. EBP data will be gathered from Member States voluntarily through four interfaces: basic interface reports (on data generally collected by port and flag States), supplementary interface reports (on specific topics that might be provided by a limited number of States), trial period interface reports (on methods for sampling and analysis for port State control) and stakeholder reports (e.g. from shipowners, BWMS manufacturers

and classification societies). For practical reasons, stakeholders are invited to provide their voluntary submission to a relevant Member State for aggregation and submission to the stakeholder interface.

12 In order to ensure data quality, the DGAP will include common data templates associated with each interface. These templates will request mainly numerical or categorical data that can be easily combined for global reporting. The submissions will be reports (rather than raw data) from Member States so as to manage the volume of information. In cases where different approaches to data collection by States could significantly affect the comparability of reports, States will be requested to identify the approach used to collect the data.

13 Commercial sensitivities will be protected through the use of aggregate reporting by port States and flag States. The EBP does not require ships or shipowners to be identified in data submissions.

Data analysis

14 The data analysis is intended to ensure that the globally aggregated EBP data is processed to yield useful and timely information and insight into the implementation of the Convention. This information should include matters such as the pace and progress of implementing the Convention, degree to which the standards of the Convention and its other requirements are achieved, unforeseen safety or environmental hazards, etc.

15 The analysis report will be developed once the data gathering stage has concluded. The analysis report will be based primarily on the results of the data gathering stage. The terms of reference for the report will be approved by the Committee in order to focus the analysis and identify any appropriate additional data sources and/or questions. A draft of the analysis report should be provided to the Committee for consideration and comment by its Ballast Water Review Group (BWRG) prior to its completion.

Convention review

16 As the entry into force of the Convention on 8 September 2017 will represent the beginning of global ballast water management, challenges may arise that were not envisioned when the Convention was adopted in 2004. In accordance with Article 2.5 of the Convention (concerning the continued development of ballast water management and standards) there may be a need to amend the Convention in the light of experience gained.

17 The purpose of the Convention review, therefore, is to take a systematic and evidence-based approach to the development of a package of amendments to the Convention for recommendation by the Committee to the Parties. Basing the review on the data gathering and final analysis report developed earlier in the EBP will ensure that amendments to the Convention are developed holistically through an objective, transparent and inclusive approach.

18 The Convention review stage should be undertaken by the Committee with the support of its BWRG, and should consist of two sequential steps:

.1 a textual review of the Convention as a whole to develop an evidence-based list of issues with the Convention, highlighting those priority issues that need to be addressed before the end of the EBP (and its associated non-penalization arrangements). Guidelines and guidance developed by the Committee in connection with the Convention may be included in the Convention review if warranted based on the data analysis; and

.2 the development of a package of amendments to the Convention to address the priority issues (amendments to address other issues identified during the textual review may then be developed after the end of the EBP.)

19 In reviewing the Convention, the Committee intends to give due consideration to matters such as the policy goals of the Convention, any challenges identified in its implementation and the considerations outlined in regulation D-5 of the Convention.

20 It is recommended that most amendments to the Convention be developed through the EBP as it provides a systematic and evidence-based approach to improving the Convention. That said, the EBP does not prevent any Party from proposing amendments independently at any time in accordance with article 19 of the Convention.

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ANNEX 13

RESOLUTION MEPC.291(71)
(adopted on 7 July 2017)

2017 GUIDELINES ADDRESSING ADDITIONAL ASPECTS OF THE NO_X TECHNICAL CODE 2008 WITH REGARD TO PARTICULAR REQUIREMENTS RELATED TO MARINE DIESEL ENGINES FITTED WITH SELECTIVE CATALYTIC REDUCTION (SCR) SYSTEMS

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

RECALLING Article 38(a) of the Convention on the International Maritime Organization concerning the functions of the Marine Environment Protection Committee conferred upon it by international conventions for the prevention and control of marine pollution from ships,

RECALLING ALSO that, at its fifty-eighth session, it adopted, by resolution MEPC.176(58), a revised MARPOL Annex VI (hereinafter "MARPOL Annex VI") and, by resolution MEPC.177(58), a revised Technical Code on Control of Emission of Nitrogen Oxides from Marine Diesel Engines (hereinafter "NO_X Technical Code 2008"),

NOTING regulation 13 of MARPOL Annex VI which makes the NO_X Technical Code 2008 mandatory under that Annex,

NOTING ALSO that the use of NO_X-reducing devices is envisaged in the NO_X Technical Code 2008 and that selective catalytic reduction systems (hereinafter referred to as "SCR systems") are such NO_X-reducing devices for compliance with the Tier III NO_X limit,

NOTING FURTHER that, at its sixty-second session, it adopted, by resolution MEPC.198(62), the *2011 Guidelines addressing additional aspects to the NO_X Technical Code 2008 with regard to particular requirements related to marine diesel engines fitted with Selective Catalytic Reduction (SCR) Systems* (hereinafter "the 2011 Guidelines"), and, at its sixty-eighth session, by resolution MEPC.260(68), amendments thereto,

RECOGNIZING the need to update the 2011 Guidelines in line with latest developments,

HAVING CONSIDERED, at its seventy-first session, a draft revision of the 2011 Guidelines, prepared by the Sub-Committee on Pollution Prevention and Response, at its fourth session,

1 ADOPTS the *2017 Guidelines addressing additional aspects to the NO_X Technical Code 2008 with regard to particular requirements related to marine diesel engines fitted with Selective Catalytic Reduction (SCR) Systems*, as set out at annex to the present resolution;

2 INVITES Administrations to take the annexed Guidelines into account when certifying engines fitted with SCR systems;

3 REQUESTS Parties to MARPOL Annex VI and other Member Governments to bring the annexed Guidelines to the attention of shipowners, ship operators, shipbuilders, marine diesel engine manufacturers and any other interested parties;

4 AGREES to keep these Guidelines under review in light of experience gained with their application;

5 SUPERSEDES the 2011 Guidelines, adopted by resolution MEPC.198(62) and amended by resolution MEPC.260(68).

ANNEX

2017 GUIDELINES ADDRESSING ADDITIONAL ASPECTS TO THE NO_X TECHNICAL CODE 2008 WITH REGARD TO PARTICULAR REQUIREMENTS RELATED TO MARINE DIESEL ENGINES FITTED WITH SELECTIVE CATALYTIC REDUCTION (SCR) SYSTEMS

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1 INTRODUCTION

1.1 The use of NO_X-reducing devices is envisaged in section 2.2.5 of the NO_X Technical Code 2008 (NTC 2008) and a Selective Catalytic Reduction (SCR) system is one of such devices.

1.2 The NTC 2008 contains two ways for pre-certification of engine systems fitted with NO_X-reducing devices:

.1 engine fitted with SCR: approval in accordance with paragraph 2.2.5.1 and test in accordance with chapter 5 of the NTC 2008; and

.2 a simplified measurement method in accordance with section 6.3 of the NTC 2008 as regulated in paragraph 2.2.5.2 (Primary failure case) of the Code.

1.3 According to paragraph 2.2.5.1 of the NTC 2008, where a NO_X-reducing device is to be included within the EIAPP certification, it must be recognized as a component of the engine, and its presence shall be recorded in the engine's Technical File. The engine shall be tested with the NO_X-reducing device fitted unless, due to technical and practical reasons, the combined testing is not appropriate and the procedures specified in paragraph 2.2.4.1 of the NTC 2008 cannot be applied, subject to approval by the Administration. In the latter case the provisions of Scheme B as set out in these Guidelines should be applied.

1.4 Administrations are invited to take these Guidelines into account when certifying engines fitted with SCR.

2 GENERAL

2.1 Purpose

The purpose of these Guidelines is to provide guidance in addition to the requirements of the NTC 2008 for design, testing, surveys and certification of marine diesel engines fitted with an SCR system to ensure its compliance with the requirements of regulation 13 of MARPOL Annex VI.

2.2 Application

These Guidelines apply to marine diesel engines fitted with SCR for compliance with regulation 13 of MARPOL Annex VI.

2.3 Definitions

Unless provided otherwise, the terms in these Guidelines have the same meaning as the terms defined in regulation 2 of MARPOL Annex VI and in section 1.3 of the NTC 2008.

2.3.1 "Engine system fitted with SCR" means a system consisting of a marine diesel engine, an SCR chamber and a reductant injection system. When a control device on NO_X-reducing performance is provided, it is also regarded as a part of the system.

2.3.2 "Catalyst block" means a block of certain dimension through which exhaust gas passes and which contains catalyst composition on its inside surface to reduce NO_X from exhaust gas.

2.3.3 "SCR chamber" means an integrated unit, which contains the catalyst block(s), and into which flows exhaust gas and reductant.

2.3.4 "Reductant injection system" means a system, which consists of the pump(s) to supply reductant to the nozzle(s), the nozzle(s) spraying reductant into the exhaust gas stream and control device(s) of the spray.

2.3.5 "AV (area velocity) value" means a value of the exhaust gas flow rate passing through the catalyst blocks (m^3/h) per total active surface area of the catalyst blocks in the SCR chamber (m^2). Therefore, unit of AV value is (m/h). The exhaust gas flow volume is the volume defined at 0°C and 101.3 kPa.

2.3.6 "SV (space velocity) value" means a value of the exhaust gas flow rate passing through the catalyst block(s) (m^3/h) per total volume of the catalyst block(s) in the SCR chamber (m^3). Therefore, unit of SV value is (1/h). The exhaust gas flow volume is the volume defined at 0°C and 101.3 kPa.

2.3.7 "Total volume of the catalyst block" means the volume (m^3) based on outer dimensions of the catalyst block.

2.3.9 "LV (linear velocity) value" means a value of the exhaust gas flow rate passing through the catalyst blocks (m^3/h) per catalyst block's section (m^2) in a normal direction of exhaust gas flow. Therefore, unit of LV value is (m/h). The exhaust gas flow volume is the volume defined at 0°C and 101.3 kPa.

2.3.9 "Block section" means the cross-sectional area (m^2) of the catalyst block based on the outer dimensions.

2.3.10 "NO_X reduction rate η" means a value deriving from the following formula. Unit of η is (%):

$$\eta = \frac{(c_{inlet} - c_{outlet})}{c_{inlet}} \cdot 100$$

Where: c_{inlet} is NO_X concentration (ppm) as measured at the inlet of the SCR chamber;

c_{outlet} is NO_X concentration (ppm) as measured at the outlet of the SCR chamber.

2.3.11 "Catalyst block casing or frame" means a casing or frame of an assembly (module) of several catalyst blocks.

3 PRE-CERTIFICATION PROCEDURE

3.1 General

3.1.1 Engine systems fitted with SCR should be certified in accordance with chapter 2 of the NTC 2008. In cases where combined engine/SCR systems cannot be tested on a test bed owing to technical and practical reasons nor an on board test can be performed fully complying with the requirements of chapter 5 of the NTC 2008 the procedures provided by Scheme B of these guidelines should be applied.

3.1.2 The applicant for certification should be the entity responsible for the complete engine system fitted with SCR.

3.1.3 The applicant should supply all necessary documentation, including the Technical File for the complete system, a description of the required on board NO_X verification procedure and, where applicable, the description of the confirmation test procedure.

3.2 Technical File and on board NO_X verification procedures

In addition to the information supplied in paragraph 3.1.3 of these Guidelines and items in section 2.4 of the NTC 2008, engine systems fitted with SCR should include the following information in Technical File:

.1 reductant: component/type and concentration;

.2 reductant injection system including critical dimensions and supply volume;

.3 design features of SCR specific components in the exhaust duct from the engine exhaust manifold to the SCR chamber. The design features are to be specified by the applicant and may include, but are not limited to:

.1 any restrictions specified by the applicant relating to exhaust duct configuration/design, including the position and number of bends in exhaust duct along with orientation and geometry, exhaust duct changes of diameter and arrangements fitted to manipulate exhaust flow, where applicable;

.2 minimum distance between reductant injection point(s) and SCR chamber;

.3 position of reductant injection equipment within duct and the direction of reductant injection, e.g. counter flow or parallel flow;

.4 reductant mixing arrangements;

.5 reductant lances, nozzles, atomizing arrangement;

.6 inlet plenum design, top entry or bottom entry;

.7 where an SCR by-pass arrangement is stipulated by the applicant, the control specifications, identification of the by-pass valve and its control device; and

.8 where an integrated reductant injection and SCR chamber arrangement is supplied as a packaged item to be fitted into an exhaust duct, the parameters of such a unit which may affect NO_X emissions;

.4 catalyst block specification and arrangement in the SCR chamber. The details of the catalyst block specification and the arrangement of catalyst blocks within the SCR chamber may include, but are not limited to:

.1 installation of blocks within the SCR chamber, including the number of blocks, number of layers and the SCR chamber casing and frame to prevent exhaust gas slip;

.2 catalyst block geometry;

.3 limiting characteristics such as CPSI (cells per square inch) and ranges for physical parameters such as the space velocity (SV), area velocity (AV) and linear velocity (LV), or a part number or specification number specified by the applicant on the catalyst block;

.4 catalyst material: this may be identified by means of a part number or specification number. The means to ensure a correct catalyst block installed on board against the Technical File, where a part number or specification number specified by the applicant on the catalyst block casing or frame is acceptable;

.5 arrangement of soot blowing equipment;

.6 inspection and access arrangements. The inspection of the SCR chamber should be limited to ensuring that the correct catalyst blocks are fitted during assembly of the SCR and the inspection of spare catalyst blocks can be accepted to demonstrate compliance at surveys other than at the initial assembly of the SCR; and

.7 any baffle plates or other devices installed within the SCR chamber for exhaust gas and reductant flow distribution;

.5 inlet parameters including allowable exhaust gas temperature (maximum and minimum) at the inlet of the SCR chamber;

.6 cross-unit parameters: allowable pressure loss (Δp) between inlet and outlet of SCR chamber and in the exhaust duct caused by SCR components. Where there is any element of the SCR system upstream and/or downstream of the SCR chamber which affects the allowable pressure loss, then this allowable pressure loss (Δp) is to be based on the entire SCR system;

.7 aspects related to the fuel oil quality resulting in continued compliance of the engine with the applicable NO_X emission limit to assure continued NO_X reduction may include, but not be limited to:

.1 the maximum allowable sulphur content of fuel oil which can be combusted, while maintaining compliance; and

.2 guidance on applicable fuel oil composition and fuel oil contaminants under operational conditions;

.8 factors related to the deterioration rate of SCR performance, e.g. exchange condition for SCR catalyst blocks and recommended exchange time of SCR catalyst blocks:

.1 where a feedback or a feed forward reductant control strategy is incorporated with a NO_X measurement device, this is acceptable as a means of monitoring catalyst condition/degradation. The exchange criteria of catalyst blocks against the reading of the NO_X measurement device is to be specified by the applicant as well as the maintenance, service, and calibration requirements for the NO_X measurement device;

.2 where a feed forward reductant control strategy is adopted without a NO_X measurement device, the application is to provide the details of:

.1 the expected deterioration curve under expected operating conditions or the life of catalyst under expected operating conditions;

.2 factors which can influence catalyst NO_X reduction efficiency; and

.3 guidance on how to assess catalyst NO_X reduction efficiency based on periodical spot checks or monitoring as specified by the applicant, if applicable; records are to be kept for inspection during annual, intermediate and renewal surveys. The frequency of periodical spot checks is to be defined by the applicant considering the expected deterioration of the catalyst. The frequency for spot-checks should be at least after installation and once every 12 months; and

.3 other strategies on monitoring the catalyst condition/degradation are subject to the approval of the Administration;

.9 controlling arrangements and settings of the SCR, e.g. model, specification of control device. This is to include, but not be limited to:

.1 the reductant injection control strategy which may be a feed forward reductant injection control or feedback reductant injection control strategy;

.2 instrumentation and sensors which are part of the SCR control arrangement, as applicable;

.3 crew instructions for allowable adjustment of control parameters including details of how to prevent unauthorized alteration of the system configuration parameters, programmable logic controller (PLC) data, and central processing units (CPU) as applicable;

.4 where a NO_X measurement device is used, the following details should be included:

.1 type/model (identification number);

.2 calibration, zero and span check procedures and the periodicity of such checks, if applicable;

.3 calibration gases to be carried on board if applicable; and

.4 maintenance and/or exchange requirements;

.5 where the engine system fitted with SCR has different operating modes (e.g. modes for Tier II and Tier III compliance separately), details of the control philosophy for selecting different modes of operation and recording the mode of operation together with means of changing between modes; and

.6 auxiliary control devices, as mentioned in regulation 13.9 and defined in regulation 2.4 of MARPOL Annex VI, respectively, may be used on engine systems fitted with SCR, covering starting and stopping, low load operation and reversing operation, subject to the approval of the Administration;

.10 measures to minimize reductant slip. The maximum reductant slip may be specified by the applicant. Supporting information, including reductant injection rates under certain engine loads, the catalyst temperature or exhaust gas temperature when reductant injection occurs, etc. may be included in order to prevent reductant slip from exceeding the specified maximum level. Reductant slip monitoring in the exhaust duct downstream of the SCR or an equivalent means may be accepted as a means to minimize reductant slip. Alternatively, means of alleviating reductant slip (for example through the use of an ammonia slip catalyst or active catalyst thermal management) may be accepted as a means to minimize reductant slip;

.11 parameter check method as the verification procedure: with regard to the application of the parameter check method, requirements given in paragraph 2.3.6 and guidance given in paragraph 2 of appendix VII of the NTC 2008 should be taken into account in assessing the adequacy of a proposed procedure with analysers meeting or exceeding the requirements of appendix III of the NTC 2008; and

.12 any other parameter(s) specified by the applicant.

3.3 Measures to minimize reductant slip

When SCR uses urea solution, ammonia solution or ammonia gas as reductant, measures to prevent reductant slip should be provided to avoid the supply of an excessive amount of reductant in the system. The reductant injection system should be designed to prevent emissions of any harmful substance from the system.

3.4 Pre-certification procedure

Test and pre-certification of an engine system fitted with SCR should be conducted either by Scheme A (as given in section 5 of these Guidelines), or by Scheme B (as given in sections 6 and 7 of these Guidelines), as appropriate.

3.5 EIAPP certificate

3.5.1 An Engine International Air Pollution Prevention (EIAPP) Certificate (see appendix I of the NTC 2008) should be issued by the Administration after approval of the Technical File.

3.5.2 When an applicant chooses Scheme B for pre-certification, the IAPP initial survey should not be completed until the on board initial confirmation test provides compliant results. The applicant remains the responsible entity until final acceptance of the system.

3.5.3 When the engine is to be certified to both Tier II and Tier III, the EIAPP Certificate should be completed for both Tier II and Tier III with a single Technical File covering both Tier modes.

4 FAMILY AND GROUP CONCEPTS FOR ENGINE SYSTEMS FITTED WITH SCR

4.1 The requirements in chapter 4 of the NTC 2008 apply equally to engine systems fitted with SCR.

4.2 The parent engine is to be the engine system fitted with SCR with the highest NO_X emission value of the group/family as specified in paragraphs 4.3.9.1 and 4.4.8.1 of the NTC 2008. In cases where there is more than one combined engine/SCR system with the same highest NO_X emission value given to two decimal places (cycle value in g/kWh) within an engine family or an engine group, the parent engine is the system with the highest raw NO_X value emitted from the engine.

4.3 The parent engine for Tier II compliance is not necessarily the same parent of the combined engine/SCR system for Tier III compliance.

5 TEST PROCEDURES FOR SCHEME A

5.1 General

5.1.1 A test for a combined system of an engine fitted with an SCR in Scheme A is to ensure compliance with the applicable NO_X emission limits of MARPOL Annex VI, as required. The test bed measurement procedures of chapter 5 of the NTC 2008 should apply.

5.1.2 Notwithstanding paragraph 5.1.1, the applicant may choose to test the combined system of an engine fitted with an SCR with a by-pass arrangement without that by-pass installed for the purpose of test bed measurement. Any effect to the fluid dynamics or reductant distribution caused by the absence of the by-pass arrangement is to be presented by the applicant.

5.2 Calculation of gaseous emissions

5.2.1 The calculation method in section 5.12 of the NTC 2008 is also applied to engine systems fitted with SCR. No allowance is made for the reductant solution injected into the exhaust gas stream in respect of its effect on exhaust gas mass flow rate calculation (appendix VI) or dry/wet correction factor (equation (11), paragraph 5.12.3.2.2 of the NTC 2008). The NO_X correction factor for humidity and temperature (equations (16) or (17), paragraphs 5.12.4.5 and 5.12.4.6, respectively, of the NTC 2008) should not be applied.

5.2.2 For an engine system fitted with SCR, the following parameters should be measured and recorded in the engine test report in accordance with section 5.10 of the NTC 2008:

.1 injection rate of reductant at each load point (kg/h);

.2 exhaust gas temperature at the inlet and outlet of the SCR chamber (°C);

.3 pressure loss (kPa): it is necessary to measure the pressure at inlet and at outlet of the SCR chamber and to calculate pressure loss Δp. It would also be permissible to measure the pressure loss Δp of the SCR chamber with a differential pressure sensor. The allowable Δp limit should be confirmed; and

.4 other parameter(s) as specified by the Administration.

6 TEST PROCEDURES FOR SCHEME B

6.1 General

6.1.1 A test for an engine system fitted with SCR in Scheme B is to ensure that the system complies with the applicable NO_X emission limits in MARPOL Annex VI, as required. The test procedures in Scheme B are as follows:

.1 an engine is tested to obtain the NO_X emission value (g/kWh) in accordance with paragraph 6.2.1 of these Guidelines;

.2 the SCR NO_X reduction rate may be calculated by modelling tools, taking into account geometrical reference conditions, chemical NO_X conversion models as well as other parameters to be considered;

.3 for every type of catalytic element, an SCR chamber, not necessarily to full scale, is to be tested in accordance with section 6.3 of these Guidelines in order to generate data for the calculation model as that used in paragraph 6.1.1.2 of these Guidelines;

.4 the NO_X emission from the engine system fitted with SCR, which is calculated in accordance with section 6.4 of these Guidelines using the NO_X emission value from the engine and the NO_X reduction rate of SCR chamber. At this point the Technical File will be completed and this NO_X emission value will be entered into the supplement of the EIAPP certificate; and

.5 the NO_X emission performance of the engine combined with the SCR is verified by a confirmation test in accordance with the procedure in paragraph 7.5 of these Guidelines.

6.1.2 The calculation of gaseous emissions in paragraph 6.1.1.1 of these Guidelines should be undertaken in accordance with paragraph 5.2.1 of these Guidelines.

6.2 Verification test procedures for an engine

6.2.1 The purpose of the test of an engine is to establish the emission values for use in section 6.4 of these Guidelines. These measurements should be in accordance with chapter 5 of the NTC 2008.

6.2.2 Paragraph 5.9.8.1 of the NTC 2008 requires engine conditions to be measured at each mode point, for an engine system. This equally applies in the case of an engine fitted with SCR. Additionally, exhaust gas temperature at the intended inlet of the SCR chamber should be determined and recorded in the test report as required by section 5.10 of the NTC 2008.

6.3 Test procedures for SCR chambers

6.3.1 General

6.3.1.1 The SCR chamber for validation testing may be either a full scale SCR chamber or a scaled version. A SCR chamber should demonstrate the reduction in NO_X concentrations (ppm) expected in exhaust gas measured in section 6.2 of these Guidelines. Therefore, NO_X reduction rate of the SCR chamber should be determined for each individual mode point. Where undertaken on a scaled version of the SCR chamber the scaling process should be validated to the satisfaction of the Administration.

6.3.1.2 The scaling process is to correspond with the modelling tool of paragraph 6.1.1.2 of these Guidelines, and take into account geometrical reference conditions, and chemical NO_X conversion models, and other parameters which have influence on NO_X conversion rate in the modelling tool. If the scaling process could not be validated satisfactorily by theoretical analysis or calculations taking into consideration the complex conditions in the SCR chamber, such as uniformity of gas speed, reductant, a combined engine and SCR system validation test in accordance with Scheme A should be undertaken.

6.3.1.3 The modelling tool of paragraph 6.1.1.2 of these Guidelines is acceptable for use in other engine groups which operate within the same defined boundary conditions.

6.3.2 Test conditions at each mode point

Exhaust gas, catalyst, reductant and an injection system should satisfy the following conditions at each mode point:

.1 Exhaust gas flow
Exhaust gas flow rate for the test should be scaled accordingly to account for the dimension of the catalyst model.

.2 Exhaust gas component
Exhaust gas for the test should either be diesel engine exhaust gas or simulated gas.

Where diesel exhaust gas is used it should correspond, in terms of concentrations, to the exhaust gas in section 6.2 of these Guidelines, in terms of NO_X, O_2, CO_2, H_2O and SO_2 (±5% of the required concentration for each emission species).

Where simulated gas is used it should correspond, in terms of concentrations, to the exhaust gas in section 6.2 of these Guidelines, in terms of NO, NO_2, O_2, CO_2, H_2O and SO_2 (±5% of the required concentration for each emission species) balance N_2.

An exemption for one or more of the above-mentioned gas species' concentration requirements may be allowed subject to a demonstration test showing that the gas or gases do not affect the NO_X reduction rate by more than 2%.

.3 Exhaust gas temperature
The temperature of exhaust gas used for the test should correspond to the temperatures obtained from testing in section 6.2 of these Guidelines, ensuring that the SCR chamber is activated at every load point, other than as provided for by 3.1.4 of the NTC 2008, and that no ammonia bisulphate formation, or reductant destruction, takes place.

.4 Catalyst blocks and AV, SV value
The catalyst blocks used in the test should be representative of the catalyst blocks to be used in the SCR chamber in service. AV, SV or LV value should, in the case of full scale tests, be within -5% or above of the required value as obtained in testing from section 6.2 of these Guidelines. In the case of scaled tests it should correspond to the above.

.5 Reductant
The reductant concentration on the surface of the tested catalyst should be representative of the reductant concentration on the surface of the catalyst during actual engine operation. Ammonia gas may be used as a reductant for the SCR chamber test, provided that it results in an equivalent concentration on the catalyst surface.

6.3.3 Stability for measurement

All measurements should be recorded after they have stabilized.

6.3.4 List of data to be derived from the model

6.3.4.1 Operating data which is to be given in the Technical File should be derived from the modelling process or otherwise justified.

6.3.4.2 Exhaust gas analysers should be in accordance with appendix III and appendix IV of the NTC 2008 or otherwise to the satisfaction of the Administration.

6.3.5 Test report for SCR chamber

Data recorded under paragraph 6.3.1.1 of these Guidelines should be recorded in the test report as required by section 5.10 of the NTC 2008.

6.4 Calculation of the specific emission

6.4.1 The NO_X emission value of the engine system fitted with SCR should be calculated as follows:

$$\text{gas}_x = \frac{\sum_{i=1}^{i=n} \left((100 - \eta_i)/100 \right) \cdot q_{mgas_i} \cdot W_{F_i}}{\sum_{i=1}^{i=n} \left(P_i \cdot W_{F_i} \right)}$$

Where: η_i NO_X reduction rate (%) derived in accordance with section 6.3 of these Guidelines;

q_{mgas_i} = Mass flow of NO_X gas measured in accordance with section 6.2 of these Guidelines;

W_{F_i} = Weighting factor;

P_i = Measured power at individual mode points in accordance with section 6.2 of these Guidelines.

The weighting factors and number of modes (n) used in above calculation shall be according to the provisions of section 3.2 of the NTC 2008.

6.4.2 The NO_X emission value (g/kWh) calculated in accordance with paragraph 6.4.1 of these Guidelines should be compared to the applicable emission limit. This emission value is entered into 1.9.6 of the Supplement to the EIAPP certificate (appendix I of the NTC 2008).

6.5 Test report to be submitted to the Administration

The test report referenced under paragraphs 6.2.2 and 6.3.5 of these Guidelines, together with the data from section 6.4 of these Guidelines should be consolidated into the overall documentation to be submitted to the Administration.

7 ON BOARD CONFIRMATION TEST FOR SCHEME B

7.1 After installation on board of an engine system fitted with SCR and before entry into service an initial confirmation test should be performed on board.

7.2 The engine system fitted with the SCR should be verified as corresponding to the description given in the Technical File.

7.3 The confirmation test should be undertaken as close as possible to 25%, 50% and 75% of rated power, independent of test cycle.

7.4 At each mode point of the confirmation test the operating values as given in the Technical File should be verified.

7.5 NO_X emission concentrations should be measured at the inlet and outlet of the SCR chamber. The NO_X reduction rate should be calculated. Both values should either be dry or wet. The value obtained for NO_X reduction rate should be compared to the initial confirmation test required value at each mode point as given in the Technical File. Reduction efficiency values obtained at each of the test points should not be less than the corresponding values as given in the Technical File by more than 5%.

7.6 The NO_X analyser should meet the requirements of chapter 5 of the NTC 2008.

7.7 When an engine system fitted with SCR is in a group defined in chapter 4 of these Guidelines, the confirmation test should be conducted only for the parent engine system of the group. Where the parent engine system of the group is not the first one to complete the onboard confirmation test as required by chapter 7 of these Guidelines, the onboard confirmation test is to be done for all installed engine systems within the engine group unless it is an identical NO_X specification member engine or the parent engine system has been installed and tested successfully. Where the parent engine system is not available to be installed on board, the first installed member engine system of the engine group can be chosen and adjusted to the worst case NO_X emission for confirmation test on board instead. The test results should be verified as described in the Technical File.

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ANNEX 16

RESOLUTION MEPC.292(71)
(adopted on 7 July 2017)

2017 GUIDELINES FOR ADMINISTRATION VERIFICATION OF SHIP FUEL OIL CONSUMPTION DATA

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

RECALLING Article 38(a) of the Convention on the International Maritime Organization concerning the functions of the Marine Environment Protection Committee conferred upon it by international conventions for the prevention and control of marine pollution from ships,

RECALLING ALSO that it adopted, by resolution MEPC.203(62), amendments to the annex of the Protocol of 1997 to amend the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (inclusion of regulations on energy efficiency for ships in MARPOL Annex VI),

NOTING that the aforementioned amendments to MARPOL Annex VI, which included a new chapter 4 on regulations on energy efficiency for ships in the Annex, entered into force on 1 January 2013,

NOTING ALSO that it adopted, by resolution MEPC.278(70), amendments to MARPOL Annex VI related to the data collection system for ship fuel oil consumption which are expected to enter into force on 1 March 2018 upon their deemed acceptance on 1 September 2017,

NOTING FURTHER that regulation 22A.7 of MARPOL Annex VI requires that ship fuel oil consumption data shall be verified according to procedures established by the Administration, taking into account guidelines developed by the Organization,

RECOGNIZING that the aforementioned amendments to MARPOL Annex VI require relevant guidelines for uniform and effective implementation of the regulations and to provide sufficient lead time for industry to prepare,

HAVING CONSIDERED, at its seventy-first session, draft 2017 Guidelines for Administration verification of ship fuel oil consumption data,

1 ADOPTS the *2017 Guidelines for Administration verification of ship fuel oil consumption data* (the 2017 Guidelines), as set out in the annex to the present resolution;

2 INVITES Administrations to take the annexed 2017 Guidelines into account when developing and enacting national laws which give force to and implement requirements set forth in regulation 22A of MARPOL Annex VI, as amended;

3 REQUESTS the Parties to MARPOL Annex VI and other Member Governments to bring the annexed 2017 Guidelines to the attention of masters, seafarers, shipowners, ship operators and any other interested parties;

4 AGREES to keep the 2017 Guidelines under review in light of experience gained with their implementation.

ANNEX

2017 GUIDELINES FOR ADMINISTRATION VERIFICATION OF SHIP FUEL OIL CONSUMPTION DATA

1 INTRODUCTION

1.1 Regulation 22A of MARPOL Annex VI establishes the IMO Ship Fuel Oil Consumption Database, to be administered by the Organization, to which each Administration will submit relevant data for their registered ships of 5,000 gross tonnage (GT) and above. Regulation 22A.7 specifies that "the data shall be verified according to procedures established by the Administration, taking into account guidelines to be developed by the Organization". This document contains the Guidelines referred to in that regulation and is intended to assist Administrations in developing their own verification programme.

1.2 A data verification procedure should ensure the reliability of the collected data while minimizing the costs and associated burdens to the ship and the Administration.

2 DEFINITIONS

For the purpose of these Guidelines, the definitions in MARPOL Annex VI apply.

3 RESPONSIBILITIES

3.1 The responsibilities of Administrations and ships are set out in MARPOL Annex VI. These Guidelines do not change those or create any new obligations.

3.2 Under the data collection system for fuel oil consumption of ships, as specified in MARPOL Annex VI, an Administration may authorize an organization[1] to receive the data from a ship, verify the data for compliance with the requirements, issue the Statement of Compliance, submit the data to the Organization and perform other actions authorized by the Administration with respect to the IMO Ship Fuel Oil Consumption Database. In every case, the Administration assumes full responsibility for all tasks conducted by the Administration or any organization duly authorized by it (hereinafter referred to as "the Administration").

4 VERIFICATION OF THE REPORTED DATA

4.1 To facilitate data verification, the Administration should indicate what additional documentation a ship should submit along with its annual data report. Specification of this documentation can be done on a ship basis, as part of the assessment of the Data Collection Plan[2], or it may be done as a general policy statement or through such other policy instruments as the Administration deems appropriate. Additional documentation to facilitate data verification may include the following, as well as other documentation that the Administration deems relevant:

.1 a copy of the ship's Data Collection Plan;

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[1] Refer to the *Guidelines for the Authorization of organizations acting on behalf of the Administration*, adopted by the Organization by resolution A.739(18), as amended by resolution MSC.208(81), and the *Specifications on the Survey and Certification Functions of Recognized Organizations Acting on Behalf of the Administration*, adopted by the Organization by resolution A.789(19), as may be amended by the Organization.

[2] Refer to the 2016 Guidelines for the development of a Ship Energy Efficiency Management Plan (SEEMP), adopted by resolution MEPC.282(70).

.2 summaries of bunker delivery notes (BDNs), in sufficient detail to show that all fuel oil consumed by the ship is accounted for (see sample form of BDN summary set out in appendix 1);

.3 summaries of disaggregated data of fuel oil consumption, distance travelled and hours underway, in a format specified by the Administration (see sample form of data summary set out in appendix 2);

.4 information to demonstrate that the ship followed the Data Collection Plan set out in its SEEMP, including information on data gaps and how they were filled as well as how the event that caused the data gap was resolved; and

.5 copies of documents containing information on the amount of fuel oil consumption, distance travelled and hours underway for the ship's voyages during the reporting period (e.g. the ship's official logbook, oil record book, BDNs, arrival/noon/departure reports, etc.).

4.2 In addition to the documentation described in paragraph 4.1, the Administration may request a ship to submit such documentation needed to perform a comprehensive review of a ship's annual fuel oil consumption, distance travelled, and hours underway. The Administration may request this documentation be submitted by all ships or a subset of the ships subject to its jurisdiction. This documentation may be used by the Administration to verify whether the ship followed the methodology specified in its Data Collection Plan, with a view to confirming:

.1 consistency of reported data and calculated values, including with previous reporting periods (if applicable), through recalculating the annual reported values using the underlying data, etc.;

.2 completeness of data (e.g. perform substantive testing based on reconciliation, recalculations, and document cross-check, for example with official logbook and/or arrival/noon/departure reports, recalculate hours underway and total quantities of fuel oil used and distance travelled); and

.3 reliability and accuracy of the data (e.g. test that the data quality procedures as described in the Data Collection Plan (see section 9 of sample form of Data Collection Plan, as set out in appendix 2 of the *2016 Guidelines for the development of a ship energy efficiency management plan (SEEMP)*) have been properly implemented, carry out site visits (typically to the Company's offices rather to the ship) to test the systems, processes and the control activities) through corroborating fuel oil consumption data with distance travelled and hours underway, comparing reported fuel oil consumption with that which is expected for the ship size, operational profile, and technical characteristics, and/or comparing reported fuel oil consumption total fuel bunkered, etc.

4.3 Should any discrepancy be identified by the Administration in the reported data, it should be communicated to the Company on a timely basis for correction. On receipt of corrected data from the Company and satisfactory completion of the verification, the Statement of Compliance will be issued by the Administration.

APPENDIX 1

SAMPLE OF THE BDN SUMMARIES

Date of Operations (dd/mm/yyyy)	Fuel Oil Type/Mass(MT)							Descriptions
	DO/GO	LFO	HFO	LPG(P)	LPG(B)	LNG	Others(C_F)	
① BDN								
09/01/2019								
02/05/2019			150					
08/07/2019								
09/10/2019								
10/12/2019			300					
①Annual Supply Amount	0	0	450	0	0	0	0	
② Correction for the tank oil remainings								
01/01/2019			400					
31/12/2019			200					
②Correction for the tank oil remainings	0	0	200	0	0	0	0	The difference in the amount of the remaining tank oil at the beginning/end of the data collection period.
③ Other corrections								
30/03/2019								
15/09/2019								
31/12/2019								
③Annual other corrections	0	0	0	0	0	0	0	
Annual Fuel Consumption								
Annual Fuel Consumption (①+②+③)	0	0	650	0	0	0	0	

Explanatory remarks;
If bunker supply/correction data have been recorded in a Company's electronic reporting system, the data is acceptable to be submitted in the existing format instead of submitting the data by this format.

APPENDIX 2

SAMPLE OF THE COLLECTED DATA SUMMARIES

Date from (dd/mm/yyyy)	Date to* (dd/mm/yyyy)	Distance Travelled (n.m)	Hours Underway (hh:mm)	Fuel Consumption (Metric tons)						
				DO/GO	LFO	HFO	LPG(P)	LPG(B)	LNG	Others(C_F)
01/01/2019		210	24:00	2	3	19	0	0	0	0
02/01/2019		283	24:00	2	0	20	0	0	0	0
03/01/2019		321	24:00	2	0	18	0	0	0	0
04/01/2019		221	24:00	1	0	19	0	0	0	0
05/01/2019		320	18:00	2	0	13	0	0	0	0
06/01/2019		302	24:00	2	0	17	0	0	0	0
07/01/2019		210	24:00	1	0	19	0	0	0	0
08/01/2019		302	24:00	1	0	20	0	0	0	0
09/01/2019		280	24:00	2	0	21	0	0	0	0
10/01/2019		50	01:00	3	0	2	0	0	0	0
11/01/2019		198	24:00	3	0	21	0	0	0	0
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30/12/2019		320	24:00	0	0	20	0	0	0	0
31/12/2019		213	24:00	1	0	17	0	0	0	0
Annual Total										

*In the case of daily underlying data, this column would be left in blank.
Explanatory remarks;
If the listed data in the format have been recorded in a Company's electronic reporting system, the data is acceptable to be submitted in the existing format instead of submitting the data by this format.

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ANNEX 17

RESOLUTION MEPC.293(71)
(adopted on 7 July 2017)

2017 GUIDELINES FOR THE DEVELOPMENT AND MANAGEMENT OF THE IMO SHIP FUEL OIL CONSUMPTION DATABASE

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

RECALLING Article 38(a) of the Convention on the International Maritime Organization concerning the functions of the Marine Environment Protection Committee conferred upon it by international conventions for the prevention and control of marine pollution from ships,

RECALLING ALSO that it adopted, by resolution MEPC.203(62), amendments to the annex of the Protocol of 1997 to amend the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (inclusion of regulations on energy efficiency for ships in MARPOL Annex VI),

NOTING that the aforementioned amendments to MARPOL Annex VI, which included a new chapter 4 on regulations on energy efficiency for ships in Annex VI, entered into force on 1 January 2013,

NOTING ALSO that it adopted, by resolution MEPC.278(70), amendments to MARPOL Annex VI related to the data collection system for fuel oil consumption which are expected to enter into force on 1 March 2018 upon their deemed acceptance on 1 September 2017,

NOTING FURTHER that regulation 22A.12 of MARPOL Annex VI requires that the IMO Ship Fuel Oil Consumption Database shall be undertaken and managed by the Secretary-General of the Organization, pursuant to guidelines developed by the Organization,

RECOGNIZING that the aforementioned amendments to MARPOL Annex VI require relevant guidelines for uniform and effective implementation of the regulations and to provide sufficient lead time for industry to prepare,

HAVING CONSIDERED, at its seventy-first session, draft 2017 Guidelines for the development and management of the IMO Ship Fuel Oil Consumption Database,

1 ADOPTS the *2017 Guidelines for the development and management of the IMO Ship Fuel Oil Consumption Database* (the 2017 Guidelines), as set out in the annex to the present resolution;

2 INVITES the Secretariat to take the annexed 2017 Guidelines into account when developing the IMO Ship Fuel Oil Consumption Database, in accordance with regulation 22A.12 of MARPOL Annex VI;

3 REQUESTS the Parties to MARPOL Annex VI and other Member Governments to bring the annexed 2017 Guidelines to the attention of masters, seafarers, shipowners, ship operators and any other interested parties;

4 AGREES to keep the 2017 Guidelines under review in light of experience gained with their implementation.

ANNEX

2017 GUIDELINES FOR THE DEVELOPMENT AND MANAGEMENT OF THE IMO SHIP FUEL OIL CONSUMPTION DATABASE

1 INTRODUCTION

1.1 These Guidelines provide guidance on the development and management of the IMO Ship Fuel Oil Consumption Database (hereafter "the database"), and describe methods that will be used to anonymize ship data for use by Parties, in accordance with regulation 22A of MARPOL Annex VI, and to ensure the completeness of the database.

1.2 In general, the purpose of the database is to support consideration of further measures for enhancing energy efficiency of international shipping by enabling robust data analysis.

1.3 With regard to data confidentiality, regulation 22A.11 stipulates that "The Secretary-General of the Organization shall maintain an anonymized database such that identification of a specific ship will not be possible. Parties shall have access to the anonymized data strictly for their analysis and consideration." These Guidelines balance data anonymization with the usability of data for analysis by the Parties and Organization.

1.4 Regulation 22A.12 states that "The IMO Ship Fuel Oil Consumption Database shall be undertaken and managed by the Secretary-General of the Organization, pursuant to guidelines to be developed by the Organization." With regard to the establishment of the database, it will be developed as a module within the Global Integrated Shipping Information System (GISIS) platform, with the integrated IMO Web Accounts framework utilized to manage secure access to the module.

2 DEFINITIONS

For the purpose of these Guidelines, the definitions in MARPOL Annex VI apply.

3 DATA ANONYMIZATION

Pursuant to regulation 22A.11 of MARPOL Annex VI, the data are to be anonymized such that identification of a specific ship will not be possible. For the purpose of the anonymization of the fuel oil consumption data, the following should apply for the database:

.1 the IMO number and ship flag should not be shown;

.2 technical characteristics of ships in the database (gross tonnage (GT), net tonnage (NT), deadweight tonnage (DWT), power output (rated power), EEDI (if applicable)) should be rounded to two significant digits, for example, a ship tonnage of 167,430 GT should be shown as 170,000 GT;

.3 the annual data of fuel oil consumption, distance travelled and hours underway should be provided in full without modification;

.4 ship types other than those defined in regulation 2 should be shown as "others"; and

.5 ice class should be shown as "Yes" or "No".

4 DATA SUBMISSION AND ACCESS

4.1 An Administration should be able to log in to the online database to submit its data via an online form. The data input into the database should be checked by the database system to ensure that the data are being submitted in the standardized format and be cross-referenced with the data from the Ship Particulars module of GISIS.

4.2 The Administration should designate a contact person for the purposes of the database who is responsible for communication with the Secretariat if any matter arises with regard to the submission of data by the respective Administration.

4.3 To encourage the consistent submission of data and improve the usability of the database, automatic notifications and reminders concerning data submission, modification and database update could be incorporated as features in the database.

4.4 An Administration will have access to non-anonymized data of ships flying its flag.

4.5 An Administration should be able to log in to the online database to download the anonymized dataset.

5 MEASURES TO ENSURE THE COMPLETENESS OF THE DATABASE

In accordance with the requirements of regulation 22A.10 of MARPOL Annex VI concerning reporting of the status of missing data, the Secretary-General should:

.1 at the beginning of each calendar year, produce a list of ships falling under the scope of regulation 22A by cross-referencing with the data from the Ship Particulars module of GISIS;

.2 send the aforementioned list of ships to the Administration for reference, in order to receive feedback in case of any discrepancies;

.3 check the completeness of the database by comparing the list produced under .1 with the reported data;

.4 remind Administrations which have failed to submit the data in the required form;

.5 report the status of missing data to the Committee on an annual basis; and

.6 request non-reporting Administrations to submit the data of all their registered ships falling under the scope of regulation 22A.

6 ANNUAL REPORT TO THE MARINE ENVIRONMENT PROTECTION COMMITTEE

Regulation 22A.10 states that "the Secretary-General of the Organization shall produce an annual report to the Marine Environment Protection Committee summarizing the data collected, the status of missing data, and such other relevant information as may be requested by the Committee." At a minimum, each annual report should include the following and also any other information as requested by the Committee:

.1 an aggregated annual amount of each type of fuel oil consumed by all ships of 5,000 GT and above engaged on international voyages;

.2 the aggregated annual amount of each type of fuel oil consumed, distance travelled and hours underway for ships of 5,000 GT and above engaged on international voyages, by EEDI ship type and EEDI size category, including the "other" category for ships not subject to EEDI;

.3 the number of ships of 5,000 GT and above engaged on international voyages reported to the database, by EEDI ship type and EEDI size category, including the "other" category for ships not subject to EEDI; and

.4 the number of ships of 5,000 GT and above engaged on international voyages registered with the Party of Annex VI for which data was not received, by EEDI ship type and EEDI size category including the "other" category for ships not subject to EEDI.

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ANNEX 18

RESOLUTION MEPC.294(71)
(adopted on 7 July 2017)

DESIGNATION OF THE TUBBATAHA REEFS NATURAL PARK AS A PARTICULARLY SENSITIVE SEA AREA

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

RECALLING Article 38(a) of the Convention on the International Maritime Organization concerning the functions of the Marine Environment Protection Committee conferred upon it by international conventions for the prevention and control of marine pollution from ships,

BEING AWARE of the ecological criteria, in particular the criteria relating to uniqueness or rarity, naturalness, diversity and fragility criteria, and the socio-economic and scientific criteria of the Tubbataha Reefs Natural Park as well as its vulnerability to damage by international shipping activities and the steps taken by the Philippines to address that vulnerability,

NOTING the *Revised Guidelines for the Identification and Designation of Particularly Sensitive Sea Areas* adopted by resolution A.982(24), as amended by resolution MEPC.267(68), (*Revised PSSA Guidelines*), and the *Revised Guidance Document for Submission of PSSA Proposals to IMO* set forth in MEPC.1/Circ.510,

HAVING AGREED that the criteria for the identification and designation of a Particularly Sensitive Sea Area (PSSA) provided in the Revised PSSA Guidelines are fulfilled for the Tubbataha Reefs Natural Park,

HAVING NOTED that the Maritime Safety Committee, at its ninety-eighth session, adopted, pursuant to SOLAS Chapter V, the establishment of an area to be avoided as an Associated Protective Measure for the "Tubbataha Reefs Natural Park Particularly Sensitive Sea Area (PSSA) in the Sulu Sea" (SN.1/Circ.335), aimed at improving the safety of navigation and the protection of the marine environment, and that this routeing measure will be implemented on 1 January 2018 at 0000 hours UTC,

1 DESIGNATES the region surrounding Tubbataha Reefs Natural Park, as described in annex 1 to the present resolution, as a Particularly Sensitive Sea Area;

2 INVITES Member Governments to recognize the ecological, socio-economic and scientific criteria of the Tubbataha Reefs Natural Park area, set forth in annex 2 to the present resolution, as well as its vulnerability to damage by international shipping activities, as described in annex 3 to the present resolution;

3 FURTHER INVITES Member Governments to note the Associated Protective Measure established to address the area's vulnerability, the details of which are contained in annex 4 to the present resolution.

ANNEX 1

DESCRIPTION OF THE TUBBATAHA REEFS NATURAL PARK PARTICULARLY SENSITIVE SEA AREA*

To minimize the risk of damage from ship groundings and pollution damage by international shipping activities and to protect the area's unique and threatened species as well as to preserve as far as practicable its critical habitat and diversity, mariners should exercise extreme care when navigating in the area bounded by the geographical coordinates of the Particularly Sensitive Sea Area, provided below, and adhere to the Associated Protective Measure set out in annex 4.

(1) 09º 17'.75 N, 119º 47'.79 E
(2) 09º 04'.73 N, 120º 12'.76 E
(3) 08º 49'.63 N, 120º 13'.99 E
(4) 08º 29'.63 N, 119º 53'.16 E
(5) 08º 36'.15 N, 119º 35'.46 E
(6) 09º 11'.06 N, 119º 36'.67 E
hence back to point (1).

(Reference charts: Philippine charts No. 4707 (INT 5052), 2nd edition, November 2010; No. 4357, 1st edition, May 2009.

Note: These charts are issued by the National Mapping and Resource Information Authority, Philippines and based on World Geodetic System 1984 datum (WGS 84).)

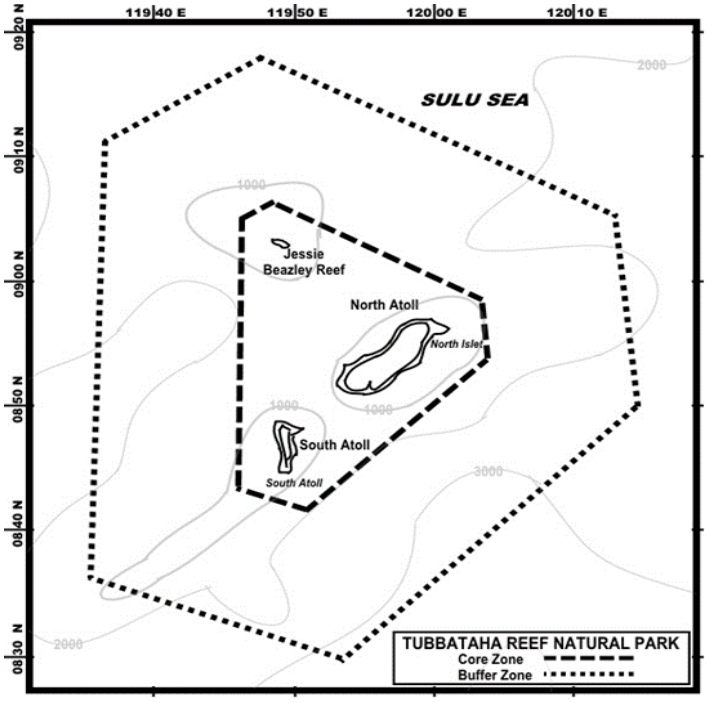

Figure 1 – Chartlet showing the PSSA

ANNEX 2

* The text in this annex is drawn from the Philippines' submission contained in document MEPC 69/10/1. All references used in this resolution are set out in the annex to document MEPC 69/10/1.

ECOLOGICAL AND SOCIO-ECONOMIC CRITERIA OF THE TUBBATAHA NATURAL REEFS PARK PARTICULARLY SENSITIVE SEA AREA*

1 Introduction

1.1 The Tubbataha Reefs Natural Park (TRNP) is comprised of the Tubbataha Reef complex, the Jessie Beazley Reef, and their surrounding waters, enclosed within a Core Zone established under Republic Act No.10067. Established and maintained by the Philippine Government since 1988, the TRNP presently encompasses an area comprised of a 97,030 hectare "Core Zone" and a 350,000 hectare "Buffer Zone" surrounding it. It is approximately 80 NM southeast of Puerto Princesa City, the capital of the Philippine island province of Palawan. In 1993, it was inscribed as a World Heritage Site. The TRNP was also inscribed in the Ramsar List of Wetlands of International Importance in 1999. Since 2009 the Park has been designated as a national MPA through Republic Act 10067, which establishes a 10 NM Buffer Zone around the perimeter of the Core Zone of the TRNP, see figure 1 below.

1.2 The Tubbataha Reef complex is comprised of the North and South Atolls. The North Atoll is a large oblong-shaped reef platform 2 km wide and enclosing a sandy lagoon some 24 m deep. The seaward face of the reef is comprised of steep and often perpendicular walls extending to a depth of 40 to 50 m. The South Atoll is a small triangular reef up to approximately 1 NM wide. It also consists of a shallow platform enclosing a sandy lagoon. The North and South Atolls are separated by a 5 NM channel. Each atoll has an islet associated with it: the Bird Islet in the North Atoll and the South Islet in the South Atoll. Bird Islet serves as an internationally significant nesting site for birds and marine turtles. South Islet is a coralline-sand cay of approximately 800 square metres, and is also used as a nesting site. Jessie Beazley Reef is 13 NM north of the two atolls. It extends some 640 m in a north-westerly direction, and is approximately 137 m wide. A small hill of broken coral stands at the centre of the reef about 1.8 m high devoid of vegetation. At low water, the reef bares over a considerable area. A small number of birds will sometimes land on the bare parts of the reef. A white sand cay is readily visible by day from a distance of 3 to 5 NM.

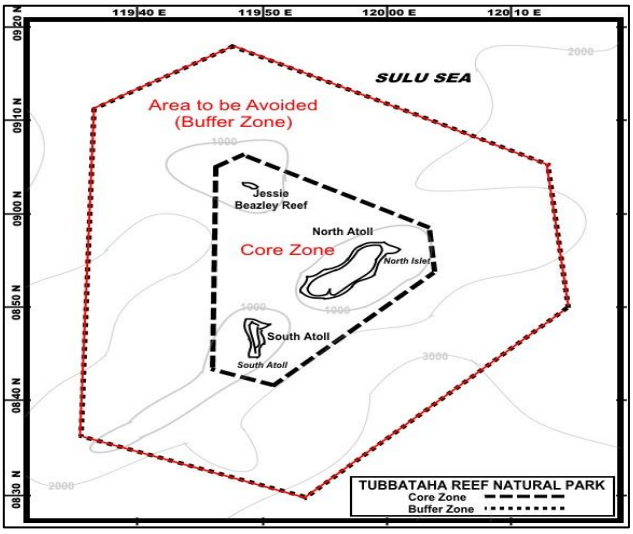

Figure 1 – Map highlighting the 10 NM Buffer Zone around the TRNP
The Reef Ecosystem in the TRNP

* The text in this annex is drawn from the Philippines' submission contained in document MEPC 69/10/1. All references used in this resolution are set out in the annex to document MEPC 69/10/1.

1.3 Atolls like those in the Tubbataha Reef complex are formed when living corals colonize the edges of seamounts or volcanoes. As the volcano gradually sinks underwater, corals reaching for sunlight grow upward toward the sea surface, building on top of thick layers of coral reefs. The Park thus includes extensive reef flats and perpendicular walls reaching over 100 m depth, as well as large areas of deep sea.

1.4 The TRNP's North and South Atolls each have two principal but very different habitats: (1) the outer reef slopes, and (2) the lagoon. The outer reef slopes have very clear water, strong wave action and currents, high oxygen and low nutrient contents, and a very wide depth range from about 1 m to over 40 m. The lagoons have turbid water, little wave action or currents, lower oxygen and higher nutrient content, higher temperatures than surrounding waters, and a much more restricted depth range of from less than 1 to 25 m. The outer reef slopes have much greater coral diversity than the lagoon, and consequently much higher values in terms of biodiversity, biological productivity, and tourism potential.

1.5 The TRNP is universally important because it is one of the world's few remaining examples of a highly diverse near-pristine coral reef. It is located within the Coral Triangle (figure 2), the centre of global coral biological diversity that is also a region of high fishing pressure. The TRNP is an important source of fish, coral, and decapod larvae that enrich fisheries in the greater Sulu Sea area, including the surrounding Philippine islands and their coastal waters. Its huge assemblages of fish and corals attract scuba divers from around the world and provide opportunity for tourism. It is also a living laboratory with an enormous potential to contribute to educational and scientific advancement. These factors make the protection of the TRNP more critical to science and the regional economy.

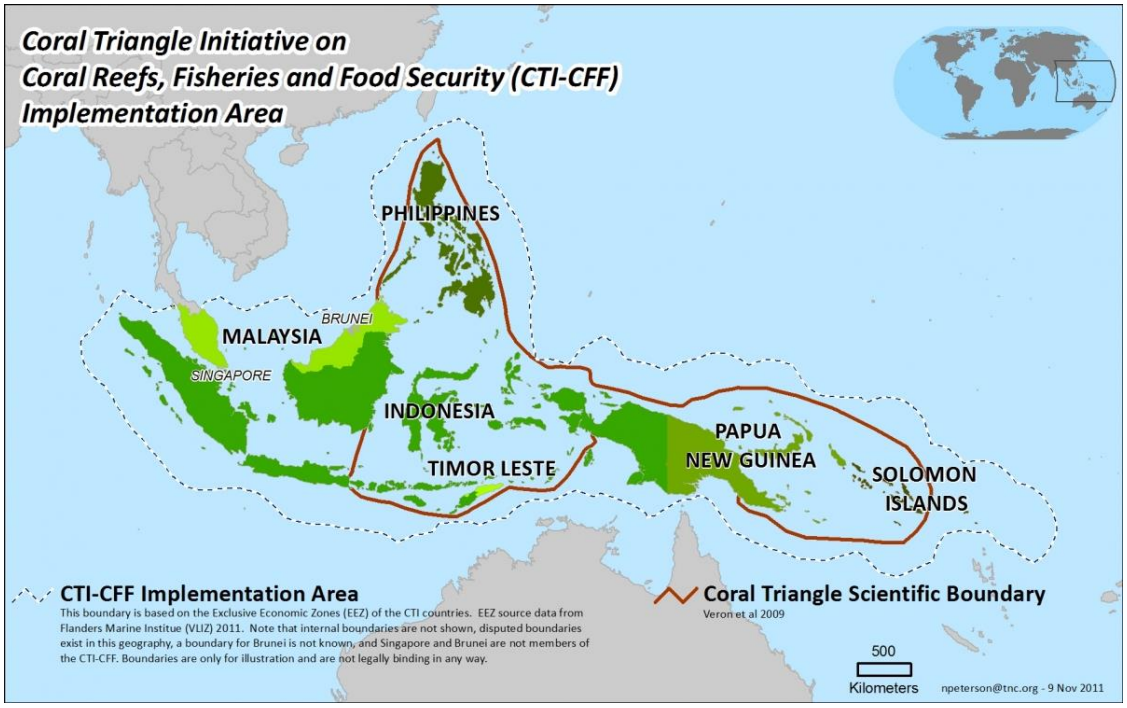

Figure 2: Map of the Coral Triangle

General

1.6 As a marine protected area with coral reefs, small islets, and large sea spaces, the TRNP simultaneously evinces multiple criteria for PSSA designation. This part indicates the presence of all these criteria within the Park's boundaries. As a general rule, the ecological, socio-economic, and scientific values apply across the entire TRNP, especially with respect to marine life, habitat, and human uses. Certain values related to its terrestrial components are naturally localized and concentrated, but overall, the pristine conditions of their surrounding waters and the entire Park also ensure sustainability of the environmental conditions that make such localized areas viable. The various criteria for PSSA designation are as acutely intertwined as are the various components of the TRNP ecosystem.

2 Ecological criteria

Uniqueness or rarity

2.1 TRNP is one of the last few remaining examples in the world of a highly diverse, near-pristine coral reef complex in an offshore area located far from human settlements. The great distance from population centres and separation by deep waters from inhabited landmasses have protected TRNP's reefs from degradation and destruction due to over-exploitation associated with many other near-shore reef systems in the Philippines (UNESCO 2008; UNESCO 1992). TRNP is the largest and only atoll reef complex enclosed within the Philippine archipelago. Its high levels of biodiversity and abundant biological productivity are unmatched by any other coral reef in the country (Alino et al. 2002). It stands out as the most intact and diverse of all of the marine reserves in the Philippines (IUCN 2009; UNESCO 1992; Arquiza 1990). It has been referred to as the "crown jewel" of Philippine marine protected areas and biodiversity conservation priorities (UNESCO 2013). It is also the only purely offshore or marine World Heritage Site in Southeast Asia today (Aquino et al. 2011).

Critical habitat

2.2 The entire TRNP is home to significant populations of critical endangered species of marine flora and fauna. It hosts considerable assemblages of marine life equal to, if not surpassing, coral reef sites of the same size around the world. It contains 401 out of 461 species of hard corals (zooxanthellatescieractinians) found in the Philippine waters (TMO 2003). More than 600 species of fish have been compiled from various fish surveys in the TRNP, which include protected species of fish such as the Humphead Wrasse (Cheilinus undulates) (TMO 2015). Endangered species of mollusks like the Topshells (Trachusniloticus), Clams (Tridacna sp.), Tridacnid clams such as crocus clam (Tridacnacrosea), giant clam (T. gigas), scaly clam (T. squamosal), and horse's hoof clam (Hipopushippopus) are found in some parts of the lagoons (Dolorosa 2010; Ledesma et al. 2008; UNESCO 1992). Significant numbers of critically endangered marine turtles are found and have their nesting/breeding grounds in the TRNP. Two species of the highly endangered marine turtles, the Green Sea Turtle (Cheloniamydas) and the Hawksbill Turtle (Eretmachelysimbricata), nest in the islets and use the Park as a developmental stage habitat (Cruz and Torres 2005). Thirteen species of cetaceans (dolphins and whales) and twelve species of sharks have been identified as Park inhabitants. Marine scientists have established that the Sulu Sea is part of the migratory range of the endangered whaleshark (Rhincodontypus) (Eckert et al. 2002). TRNP also supports the highest population densities known to date for white-tip reef sharks (Triaenodonobesus) (Walker & Palomar-Abesamis, 2005). Sightings of white-tip sharks, black-tip sharks (Carcharinusmelanopterus), and eagle rays are common (IUCN 2009).

2.3 TRNP is one of the few diverse strongholds or rookeries of seabirds in the Philippines and Southeast Asia. (Jensen 2009) Its remoteness and protected status make it critical to the continued existence of seabirds in the Philippines. A total of 109 species of birds, both resident and migrant, have been recorded on the islets and cay of the Park. These include species like the brown boobies (Sula leucogaster), red-footed boobies (Sula sula), sooty tern (Onychoprionfuscatus) and crested tern (Thalasseusbergii), as well as the Philippine sub-species of Black Noddy (Anousminutusworcestri), found nowhere else in the world (Aquino et al. 2011). TRNP is the last known major breeding place of the Black Noddy (Anousminutusworcestri). It is also one of only four remaining breeding areas for the Sooty Tern (Fuscatanubilosa), the other three being North Borneo, the Paracel Islands, and Layang-layang Island in Malaysia. It is also the last known breeding area for the Masked Booby (Sula dactylatrapersonata) (Jensen 2009; Heegard and Jensen 1992; Wells 1991). Eight species of seabirds have been observed to have resided and bred in the Tubbataha Reef islets. Most of these seabirds have disappeared from their natural roosts in the Sulu Sea and other parts of the Philippines; they can be found only in the Park (Jensen 2009).

Dependency

2.4 Coral reefs comprise less than 1% of the Earth's surface and less than 2% of the ocean bottom. Despite this scarcity, they support a quarter of all species found in the ocean (SMNH 2013). Hence, as a general rule, many forms of marine life are directly dependent on the existence of coral reef systems. It may be surmised that such systems would be very important for life in semi-enclosed sea areas like the Sulu Sea. The TRNP plays a fundamental role in the process of reproduction, dispersal and colonization of marine life in the Sulu Sea (Campos et al. 2008). The northeast monsoon encourages the transport of larvae towards the Balabac Strait and the opposite monsoon winds transport larvae towards the southwest, to the Cagayancillo Islands and beyond. Internal wave patterns have been observed moving in a westerly direction, towards the eastern coast of Puerto Princesa City, Palawan, and vice versa to the Cagayan de Sulu area, bringing with it marine larvae that enhances fisheries productivity in these localities (Villanoy et al. 2003). One of the very few coral formations in the middle of the Sulu Sea, TRNP functions as a natural fish aggregating area that attracts, sustains, and disperses various marine organisms that depend on the reef's general overall health for their survival. (Campos et al. 2008) As such it performs a major natural role in support of marine biological productivity and sustainability of fisheries in and around the Sulu Sea. TRNP plays a vital role in the stocking of fisheries in the Sulu Sea and adjacent Philippine waters, thus producing much of the region's wealth of fisheries. Oceanographic studies (Villanoy et al. 2003) and larval dispersal investigations (Campos et al. 2008) demonstrate that ocean currents in the Sulu Sea support the distribution of fish, corals, and decapod larvae to the surrounding islands. The Sulu Sea, of which TRNP is part, is also critical to the emigration of commercially important fish species from reserves like Tubbataha Reef to adjacent areas (DeVantier et al. 2004).

2.5 Aside from the six resident species of seabirds on the islets, TRNP is regularly visited by the Christmas Island Frigate (Fregata Andrewsi), a critically-endangered species of which less than 3000 individuals are believed to exist in the world. This foreign species likewise benefits from the protection of TRNP since the Park forms part of its range (Jensen 2009).

2.6 TRNP is one of the elements of the Tri-national Sea Turtle Network of Protected Areas in the Sulu-Sulawesi Marine Ecoregion (MRF 2008). This MPA contributes the largest no-take area in the Philippines' total marine no-take areas (Weeks et al. 2009).

Representativeness

2.7 TRNP contains excellent examples of pristine and near-pristine reefs with a high density of marine life, a spectacular 100 m perpendicular wall, an almost undisturbed reef crest and reef edge, extensive lagoons with seagrass beds and coral beds, and two coral islands (UNESCO 2015a; UNESCO 1992). The Tubbataha Reefs complex is among the best-documented examples of diverse and concentrated coral atoll systems in Southeast Asia (UNESCO 1994; White 1991). This is among the reasons why TRNP is part of the Palawan Biosphere Reserve, one of two biosphere reserves designated in 1990 under the UNESCO Man and Biosphere Programme (UNESCO 2015b). It is also the largest MPA in the Philippines, and its Core Zone represents 65% of the most highly protected waters of the country (Ong et al. 2002).

Diversity

2.8 The reef complex contains a diverse coral assemblage, with species representing 80 of the 111 coral genera found worldwide. There are endemic coral species found only in the lagoons, most notable of which are 30 species previously unreported in the Philippines (Fenner 2001). TRNP contains 374 species of corals representing almost 90% of all species in the Philippines and about 80% of all coral species in the Sulu-Sulawesi Seas (UNESCO 2015a; TPAMB 2014). Several distinct physiographic zones are discerned on the reefs. The deep stretches of the steep drop-off show foliose or plate-like forms of Pachyseries, Leptoseris, and Montipora at 20-30 m depth. At 12-20 m depth, massive Diploastrea, Platygyra and Porites are found. The reef edge is an Acropora zone with branching Montipora, Pocillopora, Porites, and some faviids, and extends to a reef slope of similar composition. The reef flats consist mainly of A. hyacinthus, Pocillopora, Millepora, and some faviids. Porites "micro-atolls" and branched Porites characterize the back-reef areas (UNESCO 1992).

2.9 A very high diversity of fish species has been recorded with 600 species in at least 40 families. Among the reasons cited by UNESCO for inscription of TRNP as a World Heritage Site was the exceptional diversity of corals and fish, particularly pelagic fish species such as jacks, tuna, barracuda, and sharks (UNESCO 1992). Forty-five species of benthic macroalgae and four species of microalgae are found, and extensive seagrass beds grow in the shallower parts of the lagoon. The four dominant species are Thalassiahemprichii, Halophiliaovalis, Haloduleuninervis, and H. Pinifolia (UNESCO 1992).

Productivity

2.10 Fish biomass in TRNP is estimated to be as much as 200 metric tons per square kilometre in the last decade, the highest in the country. It is far higher than the average biomass of healthy reefs elsewhere in the Philippines, which is estimated to be from 35-40 metric tons per square kilometre (TMO 2014). The very high fish biomass estimates in TRNP translates to more larvae that serve to seed degraded fishing grounds surrounding the Sulu Sea. The productivity of TRNP therefore is linked to the productivity of the Sulu Sea and surrounding waters.

Spawning or breeding grounds

2.11 TRNP is a major source and sink of larvae in the Sulu Sea. Larval dispersal simulations show that within a 12-month period, TRNP broadcasts larvae into most of the fishing areas in the Sulu Sea (Campos et al. 2008). As stated above, various threatened or critically endangered species such as marine turtles, seabirds, sharks, and molluscs also spawn or breed within the TRNP.

Naturalness

2.12 Marine life in TRNP thrives on account of its being relatively undisturbed for hundreds of years, due to its remote location and inaccessibility. Weather conditions limit access to the Park, so that tourism activities can be controlled and conducted only three months every year, from mid-March to mid-June. The Park is otherwise left in its natural condition for the rest of the year, and is free from human habitation except for the 8-12 Park Rangers in residence in a centrally located ranger station that stands watch over the MPA. The remote and undisturbed character of the TRNP and the continued presence of large marine fauna such as tiger sharks, cetaceans and marine turtles, large schools of pelagic fish such as barracuda and trevallies add to the ecological and aesthetic qualities of the TRNP (UNESCO 1992). For this reason, The UNESCO designated the TRNP as a World Heritage Site in 1993. It is the first such site in the Philippines, having been approved for inscription for satisfying three of the four criteria for World Heritage Sites. The criteria included the fact that TRNP contained "superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance," "outstanding examples representing significant ongoing ecological and biological processes in the evolution and development of terrestrial, freshwater, coastal and marine ecosystems and communities of plants and animals," and "most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation" (UNESCO 2008; UNESCO 1992).

Integrity

2.13 The TRNP comprises the North and South Atolls and the Jessie Beazley Reef. It includes open sea areas with an average depth of 750 m and contains a well-preserved marine ecosystem with top predators, a large number and diversity of coral, as well as pelagic and demersal fish species. It is of sufficient size to maintain associated biological and ecological processes; this also ensures the complete representation of the key features and processes of the reef ecosystems within it. The low level of fishing pressure, due to the no-take policy in place throughout the park, is key to maintaining its integrity. However, maintenance of ecosystem values within the TRNP requires measures to be taken outside the TRNP boundaries, in relation to some migratory species and to create a buffer from threats to the marine environment that could occur in the wider area.

2.14 Compared with other Philippine reefs, the corals of TRNP have recovered well from the bleaching events, the most serious of which took place in 1998 resulting in 21% loss of coral cover. The reefs recovered faster than in locations where human activity was intense. Scientists suspect the protected status of the reefs allows it to better recover from one stress because they do not have to deal with other stresses such as pollution and fishing (Francisco et al. 2008). The corals' resilience is a sign that TRNP has been able to maintain its integrity despite the onset of environmental stressors. Well-connected reef systems usually take 10 to 20 years to fully re-establish after a massive disturbance (Fabricius et al. 2007).

Fragility

2.15 Coral reefs like those in the TRNP are fragile ecosystems to begin with; they require a delicate balance of environmental conditions to survive and thrive. The existence of a coral ecosystem may be threatened by changes to even one of those environmental conditions. Corals grow very slowly, with the fastest growing species expanding by more than 6 inches (15 cm) per year. Most corals grow less than an inch per year (SMNH 2013). This slow growth contributes to the vulnerability of the reefs to natural and man-made damage or disaster. Thus, even brief changes in water quality (e.g. turbidity, salinity, acidity) could threaten the very survival of coral reefs. For this reason, corals are considered a threatened species.

The health of most reefs across the region is in decline as a result of human exploitation (CRA 2014). It has been suggested that one third of reef-building coral species are under elevated threat of extinction due to human impacts and climate change (Carpenter et al. 2008). Shipping activities may generate low-level but constant impacts that accumulate over time, such as operational pollution, as well as introduce risks of occasional or accidental impacts such as large oil or chemical spills that may be relatively brief but potentially catastrophic.

2.16 Climate change impacts increase the vulnerability of coral reefs to degradation. It negatively affects sea surface temperatures, which are suspected to be the cause of "coral bleaching" where live coral in the sea die prematurely, leaving white coral reef skeletons. Extreme environmental conditions such as warmer-than-usual waters, combined with man-made accidental pollution events, could push coral reefs beyond the limits of their biological resilience and result in their destruction in a short period of time. As demonstrated by the coral bleaching event in 1998 resulting in 21% loss of coral cover, TRNP is already close to the limits of its ability to recover from natural stresses. Coincidence with human-induced stresses arising from shipping activities is thus a major risk at present.

Bio-geographic importance

2.17 TRNP is located at the apex of the Coral Triangle, the richest biogeographic region in the world, home to the highest concentration of marine species on the planet. The Coral Triangle, often called "the Amazon of the Seas", is home to 600 corals or 76% of the world's known coral species. It contains the highest reef fish diversity with 2,500 or 37% of the world's reef fish (CTI 2015). As a result, TRNP is considered to be "extremely high" on the list of marine conservation priority areas of the final report of the Philippine Biodiversity Conservation Priorities Project implemented by the government with foreign development assistance to support the long-term planning and rationalization of Philippine environmental conservation efforts. It is also ranked as "very high" on the list of conservation priority areas for birds, reef fishes, corals, molluscs, seagrass, elasmobranches, and turtles (Ong et al. 2002). The convergence of the ranges of multiple terrestrial, marine, and aerial species (as noted above) within the Park make it an ideal and strategic location for environmental conservation and protection, with expected associated impacts extending not only to other areas of the Philippine archipelago but to the rest of the Southeast Asian region as well.

3 Social, cultural and economic criteria

Social or economic dependency

3.1 The TRNP makes direct contributions to the national and local economy through tourism revenues generated from scuba divers, and has been ranked as the eighth best diving destination worldwide (CNN 2012). Indirect contributions are derived to the fisheries by functioning as a habitat and source of larvae. The total economic value of TRNP based on tourism revenues and larvae contributions for fisheries is estimated at over $6 million annually, while values derived from non-use or simply serving as a protected habitat has been estimated at $2.5 to 4.8 million (Subade 2007).

Human dependency

3.2 The TRNP is a key source of coral and fish larvae, seeding the greater Sulu Sea. It has a decisive role in sustaining the fisheries in surrounding areas, directly providing food and livelihood for hundreds of thousands of Filipinos (Campos et al. 2008). The Philippines has nearly 2 million people who are dependent on fisheries for their livelihood (BFAR 2012). This relatively small ecological contribution translates into more substantial benefits for the human population. The TRNP is a source of fish larvae whose benefits extend beyond its

borders, and is the source of municipal/artisanal fishers and commercial fishers in areas outside the Park (Campos et al. 2008). Larvae dispersal to the surrounding area is estimated to be worth almost $3 million (Subade 2007). The inhabitants of the isolated island Municipality of Cagayancillo are directly dependent on fishing in their municipal waters, which are in turn dependent on the productivity of the TRNP. Cagayanon fishermen once reported that fish catch in their waters doubled in the three years since the establishment of the no-take policy of the TRNP, indicating that management of the fisheries in the Park area benefits neighbouring areas as well (UNESCO 2008; Cola 2008).

3.3 On a larger scale, strong wind variations from the Mindoro Strait, Balabac Strait, and Sulu archipelago create upwelling and downwelling events that affect primary productivity and the concentration or distribution of fish and other marine life. The predominantly westward movement of ocean currents in the Sulu Sea transport fish eggs and larvae to the eastern coast of Palawan; this ensures the sustainability of fisheries in mainland Palawan (Villanoy et al. 2003).

Cultural heritage

3.4 On account of its remoteness and extremely limited land area, the Park does not contain significant historical and/or archaeological sites. The few shipwreck sites located within the Park boundaries to date serve only as dive sites, and have not been the subject of marine historical or archaeological studies.

4 Scientific and education criteria

Research

4.1 Scientists, especially biologists, oceanographers and geologists have been fascinated by the manner of reef formation in the Sulu Sea and by its high biodiversity in terms of species numbers and habitat types. They consider these reefs to be prime research and experimental sites because they are associated either with emergent islands or islets, or with submerged structures. The TRNP's unique position in the middle of the sea and interactions between the atolls and surrounding marine ecosystem make it an ideal laboratory for the study of ecological and biological processes, in particular larval dissemination and fish recruitment. The TRNP offers marine researchers an opportunity to discover and study the biology and ecology of marine ecosystems at various spatial scales. Subjects for study could vary from minute plankton to the large marine mammals and apex species (TMO 2015). Scientific interest in the Tubbataha Reef complex has been increasing. During the 1980s, only five commissioned studies were conducted in the area, starting in 1982. In the following decade there were ten. Between 2000 and 2006, the number of studies had increased to 25 (Conservation International, 2006). At present, 31 studies are available online directly from the Tubbataha Management Office (TMO 2015b); these do not include many others published in scientific journals and in print.

Baseline for monitoring studies

4.2 Corals support numerous reef inhabitants and are thereby considered to be a key measure of reef habitat quality and quantity (Bruno and Selig 2007). Being separated from land by deep water, TRNP is relatively free from land-based sources of pollution and as such forms a unique area for scientific study and comparison with other areas in the Coral Triangle.

Education

4.3 TRNP is a living laboratory for the study of marine ecological processes and climate change adaptation. As part of the Palawan Biosphere Reserve of the UNESCO Man and Biosphere Programme, TRNP is considered a "Science for Sustainability support site," or a special place for testing interdisciplinary approaches to understanding and managing changes and interactions between social and ecological systems. Each reserve promotes solutions to reconcile biodiversity conservation with sustainable use (UNESCO 2015b).

ANNEX 3

VULNERABILITY TO DAMAGE BY INTERNATIONAL SHIPPING ACTIVITIES*

1 Vessel traffic characteristics

Operational factors

1.1 The vicinity of TRNP is regularly visited by passenger boats carrying scuba divers into the Park and fishing vessels conducting fishing operations outside the Core Zone. Passenger boats voyaging into the TRNP are strictly regulated by the Tubbataha Management Office and must call on the ranger station before proceeding to the designated dive sites (TMO 2008). Such boats are usually smaller kinds of boats and yachts. On the other hand, fishing vessels are often wooden vessels domestically registered, operating from other parts of the country. Management of the TRNP for the most part has effectively kept domestic fishing activity out of the Core Zone, which is designated as a "no-take" area. Fishing operations take place mainly in the Buffer Zone (TPAMB 2014). Both commercial fishers and small-scale Filipino fishers use fish aggregating devices called payao to attract valuable pelagic fish (TPAMB 2014). These types of fish aggregating devices normally involve buoys or floats with clusters of material, floating just beneath the sea surface, and anchored to the seabed with rope or chain. They may pose navigational hazards due to the possibility of entanglement with propellers of passing ships if they are run over. In addition, foreign poachers engaged in illegal fishing have often been found, and boats of local fishers collecting valuable topshells have been seen entering the Park at night (TPAMB 2014). Given the illegality of their activity, poachers surreptitiously entering, operating in, or exiting the Park area may pose collision hazards.

1.2 There has been only one instance to date where the Philippine Government issued a petroleum exploration contract with an area that included parts of the TRNP. This contract has not been implemented as of the time of this application, and the TPAMB has requested the Department of Energy to exclude the area of the TRNP from the said contract (TPAMB 2014).

Vessel types

1.3 Satellite AIS-based data, procured via NORAD and analysed and processed by the Australian Maritime Safety Authority, for the 12-month period from October 2012 to September 2013 show numerous and varied ships passing the TRNP at varied distances. Cargo ships constitute the absolute majority (approx. 70%) of such vessels, followed by tankers (approx. 10%) and other types of ships (approx. 18%). These do not include ships not equipped by AIS, particularly numerous smaller domestic vessels. Available data indicate that at minimum, total vessel traffic passing in proximity of the TRNP Core Zone may be categorized in table 1.

* The text in this annex is drawn from the Philippines' submission contained in document MEPC 69/10/1. All references used in this resolution are set out in the annex to document MEPC 69/10/1.

	Distance from TRNP Core Zone			
Type	**20 NM**	**30 NM**	**40 NM**	**50 NM**
Cargo	2,225	2,645	2,922	3,152
Fishing	1	1	1	1
Passenger	6	6	10	11
Tanker	288	349	397	442
Other	591	709	778	845
TOTAL	3,111	3,710	4,108	4,451

Table 1: Total number and types of ships that passed within certain distances from the TRNP Core Zone between October 2012 and September 2013

Traffic characteristics

1.4 TRNP lies at the intersection of north-south and east-west shipping routes that traverse the Sulu Sea, connecting the South China Sea to the Celebes Sea and to the Pacific Ocean respectively. At least 4,451 AIS-equipped vessels passed within 50 NM around the TRNP, the majority (some 75%) along the north-south route that connects Northeast Asia with Oceania. Traffic passing along the North-South route is described below likewise in terms of distance from the TRNP Core Zone, set out in table 2, below.

	Distance from TRNP Core Zone			
Type	**20 NM**	**30 NM**	**40 NM**	**50 NM**
Cargo	2,100	2,470	2,715	2,882
Fishing	1	1	1	1
Passenger	4	4	7	8
Tanker	198	237	270	291
Other	524	625	689	735
TOTAL	2,827	3,337	3,682	3,917

Table 2: Number and types of ships that passed within certain distances from the TRNP Core Zone, along the North-South routes, between October 2012 and September 2013

1.5 North of the Sulu Sea, ships passing along the North-South route pass into/out of the area through the Mindoro and Tablas Passages astride the Philippine island Province of Mindoro, converging/diverging east of the TRNP (refer to figure 1, below). A significant proportion pass within 10 NM of the Core Zone, i.e. through the TRNP Buffer Zone. This is consistent with actual observations using partial radar coverage from the TRNP ranger station, which has recorded multiple transits of vessels within the Buffer Zone between 2010-2013. These ships then pass out/into the area via the Sibutu Passage.

1.6 International maritime traffic through the Sulu Sea on this route likely connect major ports in the Philippine island of Luzon (e.g. Manila, Batangas) and Northeast Asia with ports in Indonesia, Papua New Guinea and Australia.

1.7 Traffic passing along the East-West route is distributed as follows, likewise in terms of distance from the TRNP Core Zone – refer to table 3, below.

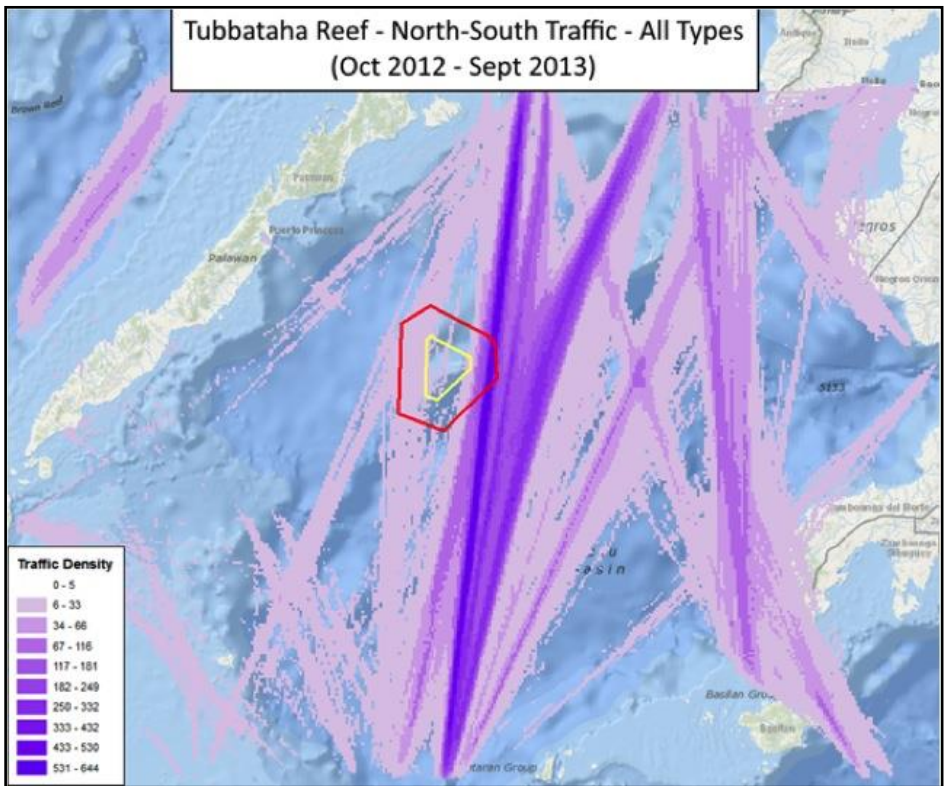

Figure 1: Traffic density plot of ships travelling along North-South routes near the TRNP

	Distance from TRNP Core Zone			
Type	**20 NM**	**30 NM**	**40 NM**	**50 NM**
Cargo	178	265	350	490
Fishing	0	0	0	0
Passenger	4	4	7	7
Tanker	105	138	167	208
Other	97	130	150	192
TOTAL	384	537	674	897

Table 3: Number and types of ships passing within certain distances from the TRNP Core Zone, along the East-West routes, between October 2012 and September 2013

1.8 Ships passing along the East-West route enter/exit the Sulu Sea through the Balabac Strait; those that traverse through the Bohol Sea are brought in proximity of the southern portion of the TRNP (see figure 2). Compared with ships on the North-South route, less numbers of vessels cross into the Buffer Zone around the TRNP.

1.9 International maritime traffic through the Sulu Sea on this East-West route likely call on major Philippine ports of Cebu and Iloilo from other ports in the Far East. The proportion of vessels that continue on through the archipelago and out by the Surigao Strait from this area is significantly less.

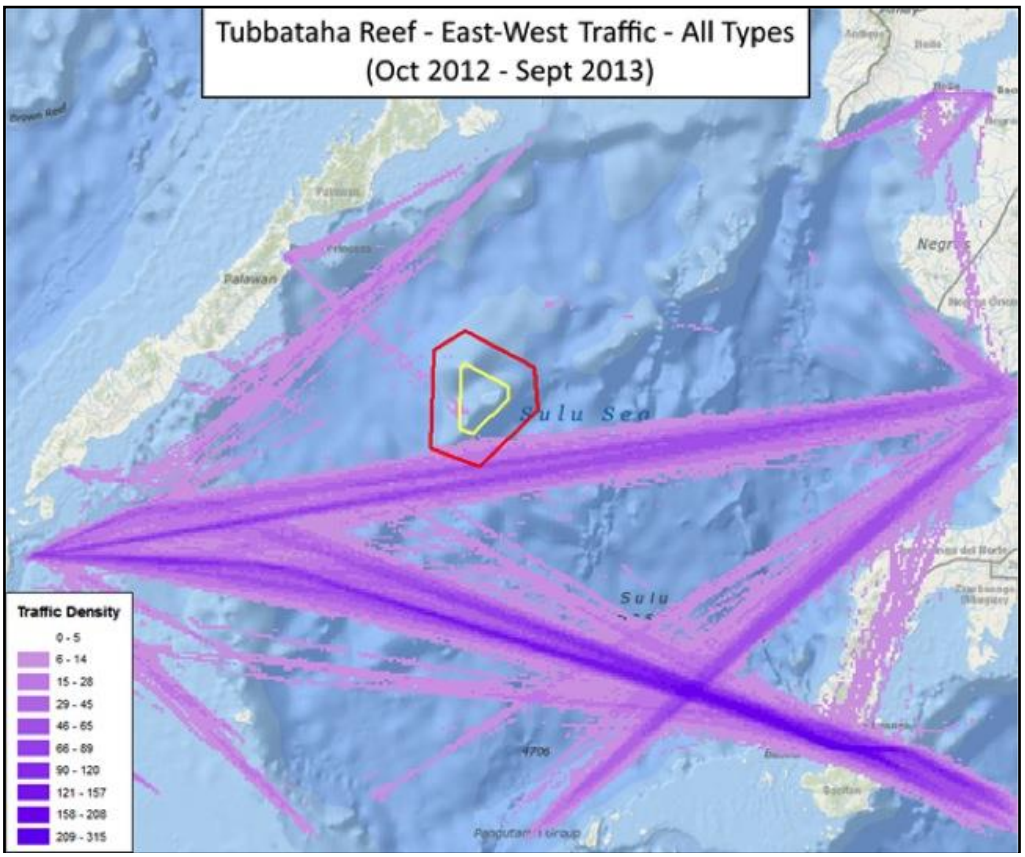

Figure 2: Traffic density plot of ships travelling along the East-West route near the TRNP

Harmful substances carried

1.10 The significant proportion of chemical and oil tankers passing within 10 NM of the TRNP Core Zone is a cause for concern. A closer examination of the AIS data show that shipping routes running through the east and west of the Park bring vessels in closest proximity to the TRNP Core Zone. Data indicates that the major route is to the east, with more than 774 vessels passing along a north-south route within 7.5 NM of the Park. This included 89 chemical tankers (11.49%) and 185 oil tankers (23.9%). Several thousand vessels pass annually along this north-south route further offshore. To the west of the Park, some 165 vessels including 31 chemical tankers (18.7%) and 46 oil tankers (27.9%) travelled within 9 NM of the Park along another north-south route.

1.11 The threat of oil and chemical pollution and potential catastrophic impact on coral reefs is well known. With oil and chemical tankers passing so close to the TRNP, there is a significant risk of accidental spills and even grounding on the reefs. Notably, the two successive ship-grounding incidents that took place in 2013 (the **USS Guardian** in January and the **Min Ying Pu** in March) were both travelling along north-south routes.

2 Natural factors

Hydrographical

2.1 The TRNP is located in a region of the Sulu Sea of varied depth ranging from 1,490 to 2,769 m. Charts indicate that the Tubbataha Reefs rise above these deep waters abruptly,

forming separate underwater pinnacles topped off by coral reef structures. Depths can change radically, from 1,000 m to less than one metre within a distance of only one nautical mile around the reefs. This steeply rising slope contributes significantly to the risk of grounding for vessels in the area. The reefs provide little protection from strong winds and surface currents.

2.2 Hydrographic information from the Philippine Coast Pilot Guide (NAMRIA 1995) describes all reefs within the TRNP in very clear terms as inherent dangers to navigation:

> "The North and South Atoll of Tubbataha Reefs are considered to be dangerous reefs separated by a deep channel about 5 miles wide.
>
> The North Atoll is oblong in shape and encloses a lagoon 2 miles wide and 5 miles long, with depths of 7.3 to 32.9 m at mud bottom. There are no passages through the barrier reef into the lagoon; only small launches can cross the barrier reef at high tide. Deep water is close to the outer edge of the reefs, and no anchorages are available. North Islet, Central Islet, and a number of small black rocks are the only objects that appear above high water. At low water, a large number of detached sand cays or ridges, each about 91 m long and 9 to 18 m, can be seen along the entire length of the reef. North Islet is covered with gravel and some guano.
>
> The South Atoll is about 4.5 miles long North and South with several black rocks and sand cays visible at high water.
>
> South Islet is made up of loose, white sand about 1.5 m above high water, and is protected by riprap. The 39.6 m cylindrical, steel-framed tower which used to be a lighthouse on this islet is very prominent.
>
> Jessie Beazley Reef, about 18 miles north of Tubbataha Reef Light, extends about 640 m in a north-westerly direction and is about 137 m wide. At the centre of the reef is a small hill of broken coral about 1.8 m high, devoid of vegetation. At low water, the reef bares over a considerable area. Birds can sometimes land on the bare parts of this reef. White sand cay is readily visible by day at a distance of 3 to 5 miles."

Meteorological

2.3 The Sulu Sea within which the TRNP is situated is a deep sea in the Southeast Asian region located along the south western quadrant of the Philippines. It is bounded by Palawan Island on the west, Mindoro Island to the north, Panay Island and Mindanao Island to the east, the Sulu Archipelago to the southeast, and Borneo to the southwest. Weather and climate is strongly influenced by the East Asian Monsoons and the seasonal migrations of the Inter-tropical Convergence Zone (ITCZ) and the El Nino Southern Oscillation (ENSO). A north-easterly wind prevails in winter and a south-westerly wind prevails in summer, but otherwise it is very variable during the transitional periods (Oppo et al. 2003; Latiff et al. 2014). Sudden heavy rainfalls are known to occur appear within the Sulu Sea region, posing hazards to shipping (Butt and Johnson, 2013).

2.4 Rough seas are present from July to October and November to March. Rainfall is highest in the Sulu Sea from May through November. From June through September, the ITCZ rainfall merges with the East Asian Monsoon. By October and November, the East Asian summer monsoon rains are over, and the dry season starts in the northern SCS but reaches its seasonal maximum in the southern SCS due to the southward position of the ITCZ (Oppo et al. 2003). The Philippines, including the Sulu Sea, is also located within the tropical "typhoon belt" regularly traversed by typhoons. On average, about 20 tropical cyclones develop within the Philippine Area of Responsibility each year, of which around half make

landfall (PAGASA 2009). These disturbances periodically aggravate weather and sea conditions in the Sulu Sea, thus sudden violent storms, heavy rainfall, and strong winds increase the risk of navigational incidents.

Oceanographic

2.5 The Sulu Sea is a semi-enclosed basin connected to surrounding seas over shallow sills. It is surrounded by major landmasses such as Palawan, Borneo, Mindanao, Panay, Antique, and Mindoro, as well as connecting several bodies of Philippine waters such as the Linapacan and Balabac Straits, the Sibuti Passage, Moro Gulf, Dipolog Strait, Bohol Sea, Panay Gulf, and Mindoro Passage. The Mindoro Passage to the north/northwest is the deepest passage at 420 m, connecting the Sulu Sea to the South China Sea, and with the Java Sea across the shallow Sunda Shelf. The Sibutu Passage to the south is the next deepest passage, connecting the Sulu Sea to the Sulawesi Sea (Oppo et al. 2003). The TRNP lies between these two passages, which also form the entry/exit points for North-South routes traversing the Sulu Sea. Water circulation patterns in the Sulu Sea show that there is an inflow from the South China Sea at the Mindoro and Balabac Straits, and an outflow into the Sulawesi Sea at the Sibutu Passage. There is a cyclonic circulation in the southern basin (Han et al. 2009). A strong current forms in the northeast Sulu Sea where currents from the Mindoro and Tablas straits converge. These converging currents are also entry/exit points for North-South shipping routes. Surface current speeds have been measured to be as much as 100 cm/sec (Han et al. 2009).

2.6 Strong westward currents in the Bohol Sea carry the surface water of the western Pacific from the Surigao Strait into the Sulu Sea via the Dipolog straits. In the Sibuyan Sea, currents flow west which carry the surface water from the Western Pacific near the San Bernardino Strait into the Sulu Sea via the Tablas Strait (Han et al., 2009). Surface currents exhibit strong variations or reversals from winter to summer, with the TRNP forming a centre around which the currents circulate. Generally, during the South West Monsoon, waters flow in a clockwise motion around the TRNP, driven by currents from the Dipolog and Linapacan Straits (Han et al., 2009). The fact that TRNP is located at the centre of this circulation pattern increases the possibility that any discharges or vessels adrift near TRNP will likewise be carried around and into its boundaries.

3 Other Information

3.1 Since 2010, TRNP Park Rangers have been collecting and compiling information on impacts of international shipping traffic around the TRNP, albeit with limited capabilities due to the isolation and inherent limitations of surveillance capabilities of the Park Ranger Station. Annual records have been based on personal observations of Park Rangers and extremely limited radar coverage of the immediate vicinity of the TRNP. A review of the records of limited radar coverage during the period from 2010-2013 echoes the upward trend of ship transit, notably passing through the TRNP Buffer Zone. Refer table 4, below.

Year	No. of Ships Tracked	Monthly Average	Rate of Increase
2010	3,358	280	-
2011	4,253	363	23%
2012	3,616	302	-20%
2013	5,546	462	35%

Table 4: Number of ships tracked by the TRNP Park Ranger Station with extremely limited radar coverage

3.2 The upward trend in ship transits around the TRNP translates into an expected increasing risk in shipping-related impacts, both operational and accidental. Ship groundings have been demonstrated as the most prominent risk, followed by pollution from discharges. A recent study of maritime trade and traffic trends in the Sulu-Sulawesi Region concluded that all global trade forecasts indicate "higher volumes of international shipping will transit through or close to Philippine national waters and as a consequence increase the vulnerability of the Tubbataha Reefs Natural Park". It pointed out that the potential increase in very large vessels transiting through the area to service the ore, coal and LNG trades, and growing populations around the Sulu-Sulawesi Region that would likely also increase import activities and the corresponding number of vessels operating in the area, also posed significant threats. (Butt and Johnson 2013).

3.3 A separate study that mathematically modelled ship incident risks around TRNP corroborated the above report by concluding that "incident probabilities and monetary value at risk (MVR) have increased in recent years; the probability of pollution in 1999-2007 increased by about 60% for South-East Asia compared to 1979-1998, and the associated MVR for tankers has doubled." It further noted that the increase of pollution risk close to the TRNP is even larger (Heij et al. 2013).

3.4 Park rangers have documented a notable increase in the amount of foreign, non-Philippine marine debris (product packaging, plastic containers) collected at the TRNP ranger station, indicating a clear correlation between the amount of shipping traffic and the amount of marine debris washed ashore at the park ranger station (refer to table 5, below).

Year	Kg of debris collected
2010	198
2011	627
2012	635
2013	1,460

Table 5: Weight of marine debris collected annually by TRNP Park Rangers

3.5 Ship groundings have occurred on Tubbataha Reefs. Available records indicate that as early as 1925, the British steamship **Egremont Castle** ran aground near the lighthouse on South Atoll, and in June 1949, the US steamer **Flying Cloud** ran aground near the South Island. Despite modern navigational technologies and accurate charting, such groundings have continued to take place. In January 2013, the US Navy minesweeper **USS Guardian** ran aground on the South Atoll and had to be completely dismantled for removal. Shortly after, in March 2013 the Chinese fishing vessel **Min Ying Pu** ran aground on the North Atoll and had to be salvaged (TPAMB 2014). These successive incidents in the TRNP have demonstrated its continued exposure to high risks posed by international shipping activity. The increase in shipping activity around the TRNP denotes a corresponding increase in risks of similar ship groundings.

3.6 Chemical and oil spill simulations conducted for the Tubbataha Management Office by the Physical Oceanography Laboratory of the Marine Science Institute show that at any given month, due to the proximity of several shipping routes around the TRNP, there is a very high probability that pollutants from chemical or oil spills will cross into the boundaries of the TRNP. Depending on the distance, time of year, monsoon and sea conditions, in the worst case scenario (outside of a vessel grounding) pollutants can take as little as four hours for chemical spills and five hours for oil spills. In the best case scenario, a chemical/oil spill threat can take as much as 8½ days before reaching the TRNP. Again, the increasing trend in shipping activities around the TRNP will result in a corresponding increase in risks of accidental chemical and oil spills (Villanoy et al. 2015).

3.7 In case of a marine incident at or in the vicinity of the TRNP, there are only two government vessels available in the nearest Coast Guard District operating base at Puerto Princesa City, a 35 m Search and Rescue Vessel and a 30 m Fisheries Monitoring, Control, and Surveillance patrol vessel. It will take such vessels approximately 10 hours to respond to an incident at the TRNP, assuming that the said vessels are not being used elsewhere and are capable of taking the stricken vessel in tow. Private salvage companies based in Manila with dedicated salvage capability will take at least 24 hours to respond to a marine casualty or incident in the vicinity of the TRNP. Moving the concentration of shipping away from the Park significantly reduces the risks of incidents and may provide just enough additional time for Park Rangers and other government agencies to prepare adequate incident response measures.

ANNEX 4

ASSOCIATED PROTECTIVE MEASURE FOR THE TUBBATAHA REEFS NATURAL PARK PSSA

Associated Protective Measure (APM)

The newly established area to be avoided "Tubbataha Reefs Natural Park PSSA" as the APM, is as follows:

Reference charts: Philippine charts No. 4707 (INT 5052), 2nd edition, November 2010; No. 4357, 1st edition, May 2009

Note: These charts are issued by the National Mapping and Resource Information Authority, Philippines and based on World Geodetic System 1984 datum (WGS 84).

Description of the area to be avoided

An area to be avoided by all types of ships of 150 gross tonnage and upwards, in the area designated as a Particularly Sensitive Sea Area, is bounded by a line connecting the following geographical positions:

(1) 09º 17'.75 N, 119º 47'.79 E
(2) 09º 04'.73 N, 120º 12'.76 E
(3) 08º 49'.63 N, 120º 13'.99 E
(4) 08º 29'.63 N, 119º 53'.16 E
(5) 08º 36'.15 N, 119º 35'.46 E
(6) 09º 11'.06 N, 119º 36'.67 E
hence back to point (1).

Note: The ATBA was approved at the fourth session of the Sub-Committee on Navigation, Communications and Search and Rescue (NCSR 4/3/4) and subsequently adopted by MSC 98. It will enter into force on 1 January 2018 at 0000 hours UTC.

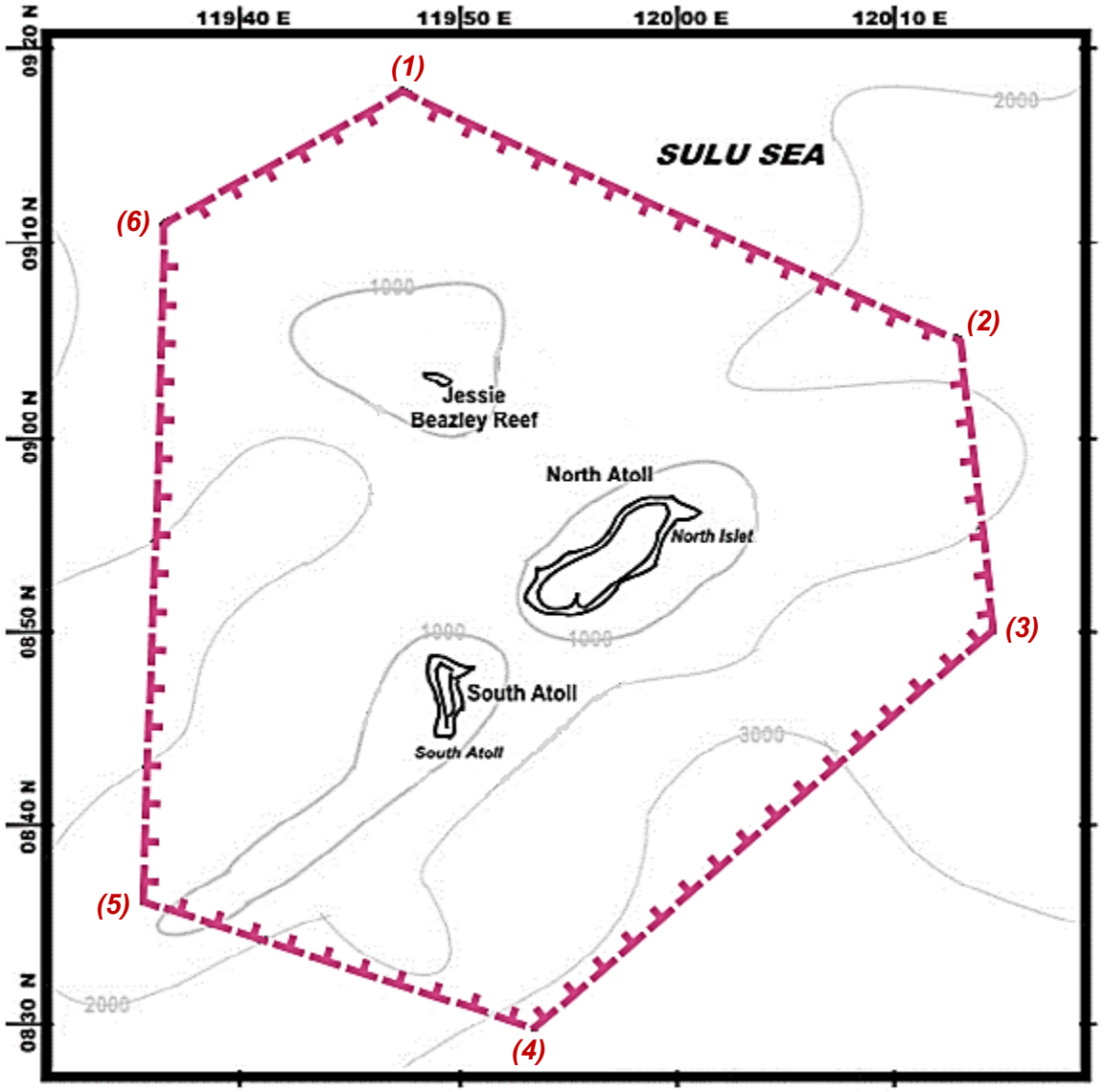

Figure: Chartlet of the Tubbataha Reefs Natural Park (TRNP) indicating the proposed ATBA with magenta lines with T-shaped dashes

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ANNEX 21

RESOLUTION MEPC.295(71)
(adopted on 7 July 2017)

2017 GUIDELINES FOR THE IMPLEMENTATION OF MARPOL ANNEX V

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

RECALLING Article 38(a) of the Convention on the International Maritime Organization concerning the functions of the Marine Environment Protection Committee conferred upon it by international conventions for the prevention and control of marine pollution from ships,

RECALLING ALSO that Annex V of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto, provides regulations for the prevention of pollution by garbage from ships,

RECALLING FURTHER that, at its sixty-second session, it adopted, by resolution MEPC.201(62), the revised MARPOL Annex V, which was further amended by resolutions MEPC.216(63), MEPC.246(66), MEPC.265(68) and MEPC.277(70),

NOTING that, at its sixty-third session, it adopted, by resolution MEPC.219(63), the *2012 Guidelines for the implementation of Annex V of MARPOL 73/78* (2012 Guidelines) which were further amended by resolution MEPC.239(65),

RECOGNIZING the need to align the relevant provisions of the 2012 Guidelines with the above-mentioned amendments to MARPOL Annex V, and relevant requirements of the International Code for ships operating in polar waters (Polar Code), adopted by resolution MEPC.264(68),

HAVING CONSIDERED, at its seventy-first session, draft 2017 Guidelines for the implementation of MARPOL Annex V,

1 ADOPTS the *2017 Guidelines for the implementation of MARPOL Annex V*, the text of which is set out in the annex to this resolution;

2 INVITES Governments to take the 2017 Guidelines into account when implementing the provisions of MARPOL Annex V;

3 REVOKES the *2012 Guidelines for the implementation of MARPOL Annex V* (resolution MEPC.219(63), as amended by resolution MEPC.239(65)).

ANNEX

2017 GUIDELINES FOR THE IMPLEMENTATION OF MARPOL ANNEX V

PREFACE

The main objectives of these Guidelines are to assist:

.1 Governments in developing and enacting domestic laws which implement MARPOL Annex V;

.2 shipowners, ship operators, ships' crews, cargo owners and equipment manufacturers in complying with requirements set forth in MARPOL Annex V and relevant domestic laws; and

.3 port and terminal operators in assessing the need for, and providing, adequate reception facilities for garbage generated on all types of ships. In the interest of uniformity, Governments are requested to refer to these Guidelines and related guidance[1] developed by the Organization when developing and enforcing appropriate national regulations.

1 INTRODUCTION

1.1 The revised MARPOL Annex V, which entered into force on 1 January 2013, prohibits the discharge of all types of garbage into the sea unless explicitly permitted under the Annex. These Guidelines have been developed taking into account the regulations set forth in MARPOL Annex V, as amended and are divided into the following six sections, providing a general framework based on which Governments can formulate programmes:

.1 Introduction;

.2 Garbage management;

.3 Management of cargo residues of solid bulk cargoes;

.4 Training, education and information;

.5 Port reception facilities for garbage; and

.6 Enhancement of compliance with MARPOL Annex V.

1.2 Under the revised MARPOL Annex V, discharge of all garbage into the sea is prohibited, except as specifically permitted in regulations 3, 4, 5 and 6 of the Annex. Annex V reverses the historical presumption that garbage may be discharged into the sea based on the nature of the garbage and defined distances from shore. Regulation 7 provides limited exceptions to these regulations in emergency and non-routine situations. Generally, discharge is restricted to food wastes, identified cargo residues, animal carcasses, identified cleaning agents and additives, and cargo residues entrained in washwater which are not harmful to the marine environment. It is recommended that ships use port reception facilities as the primary means of discharge for all garbage.

[1] Port Reception Facilities – How to do it, 2016 Edition; *Guidelines for ensuring the adequacy of port waste reception facilities* (resolution MEPC.83(44)); *Consolidated guidance for port reception facility providers and users* (MEPC.1/Circ.834).

1.3 Recognizing that MARPOL Annex V regulations continue to restrict the discharge of garbage into the sea and require garbage management for ships, and that garbage management technology continues to evolve, it is recommended that Governments and the Organization continue to gather information and review these Guidelines periodically.

1.4 Regulation 8 of MARPOL Annex V provides that Governments must ensure the provision of adequate port reception facilities for garbage from ships and should facilitate and promote their use. Section 5 provides guidelines for these facilities.

1.5 MARPOL Annex V provides definitions for terms used throughout these Guidelines. Section 1.6 includes relevant aspects of these definitions, followed by other definitions which are useful for these Guidelines.

1.6 Definitions

1.6.1 *Dishwater* means the residue from the manual or automatic washing of dishes and cooking utensils which have been pre-cleaned to the extent that any food particles adhering to them would not normally interfere with the operation of automatic dishwashers.

1.6.2 *E-waste* means electrical and electronic equipment used for the normal operation of the ship or in the accommodation spaces, including all components, subassemblies and consumables, which are part of the equipment at the time of discarding, with the presence of material potentially hazardous to human health and/or the environment.

1.6.3 *Grey water* means drainage from dishwater, shower, laundry, bath and washbasin drains. It does not include drainage from toilets, urinals, hospitals and animal spaces, as defined in regulation 1.3 of MARPOL Annex IV (sewage) and drainage from cargo spaces. Grey water is not considered garbage in the context of MARPOL Annex V.

1.6.4 *Recycling* means the activity of segregating and recovering components and materials for reprocessing.

1.6.5 *Reuse* means the activity of recovering components and materials for further use without reprocessing.

1.7 Application

1.7.1 This section provides clarification as to what should and should not be considered as garbage under MARPOL Annex V.

1.7.2 Ash and clinkers from shipboard incinerators and coal-burning boilers should be considered as operational wastes within the meaning of regulation 1.12 of MARPOL Annex V, and therefore are included in the term "garbage", within the meaning of regulation 1.9 of MARPOL Annex V.

1.7.3 The definition of "operational wastes" (regulation 1.12 of MARPOL Annex V) excludes grey water, bilge water and other similar discharges essential to the operation of a ship. "Other similar discharges" essential to the operation of a ship include, but are not limited to, the following:

.1 boiler/economizer blowdown;

.2 boat engine wet exhaust;

.3 chain locker effluent;

.4 controllable pitch propeller and thruster hydraulic fluid and other oil to sea interfaces (e.g. thruster bearings, stabilizers, rudder bearings, etc.);

.5 distillation/reverse osmosis brine;

.6 elevator pit effluent;

.7 firemain systems water;

.8 freshwater lay-up;

.9 gas turbine washwater;

.10 motor gasoline and compensating discharge;

.11 machinery wastewater;

.12 pool, spa water and recreational waters;

.13 sonar dome discharge; and

.14 welldeck discharges.

1.7.4 While cleaning agents and additives contained in hold washwater and deck and external surface washwater are considered "operational wastes" and thus "garbage" under MARPOL Annex V, these cleaning agents and additives may be discharged into the sea so long as they are not harmful to the marine environment.

1.7.5 A cleaning agent or additive is considered not harmful to the marine environment if it:

.1 is not a "harmful substance" in accordance with the criteria in MARPOL Annex III; and

.2 does not contain any components which are known to be carcinogenic, mutagenic or reprotoxic (CMR).

1.7.6 The ship's record should contain evidence provided by the producer of the cleaning agent or additive that the product meets the criteria for not being harmful to the marine environment. To provide an assurance of compliance, a dated and signed statement to this effect from the product supplier would be adequate for the purposes of a ship's record. This might form part of a Safety Data Sheet or be a stand-alone document, but this should be left to the discretion of the producer concerned.

1.7.7 Releasing small quantities of food into the sea for the specific purpose of fish feeding in connection with fishing or tourist operations should not be considered as discharge of garbage in the context of MARPOL Annex V.

1.7.8 Fishing gear that is released into the water with the intention of later retrieval, such as fish aggregating devices (FADs), traps and static nets, should not be considered garbage or accidental loss in the context of MARPOL Annex V.

2 GARBAGE MANAGEMENT

2.1 Waste minimization

2.1.1 All shipowners and operators should minimize taking onboard material that could become garbage. Ship-specific garbage minimization procedures should be included in the Garbage Management Plan. It is recommended that manufacturers, cargo owners, ports and terminals, shipowners and operators and Governments consider the management of garbage associated with ships' supplies, provisions, and cargoes as needed to minimize the generation of garbage in all forms.

2.1.2 When making supply and provisioning arrangements, shipowners and operators, where possible with the ships' suppliers, should consider the products being procured in terms of the garbage they will generate. Options that should be considered to decrease the amount of such garbage include the following:

.1 using supplies that come in bulk packaging, taking into account factors such as adequate shelf-life (once a container is open) to avoid increasing garbage associated with such products;

.2 using supplies that come in reusable or recyclable packaging and containers; avoiding the use of disposable cups, utensils, dishes, towels and rags and other convenience items whenever possible; and

.3 avoiding supplies that are packaged in plastic, unless a reusable or recyclable plastic is used.

2.1.3 When considering selection of materials for stowage and securing of cargo or protection of cargo from the weather, shipowners and operators should consider how much garbage such materials will generate. Options that should be considered to decrease the amount of such garbage include the following:

.1 using permanent reusable coverings for cargo protection instead of disposable or recyclable plastic sheeting;

.2 using stowage systems and methods that reuse dunnage, shoring, lining and packing materials; and

.3 discharging to port reception facilities the dunnage, lining and packaging materials generated in port during cargo activities as their discharge into the sea is not permitted.

2.1.4 Governments are encouraged to undertake research and technology development to minimize potential garbage and its impacts on the marine environment. Suggested areas for such study are listed below:

.1 development of recycling technology and systems for all types of materials that may be returned to shore as garbage; and

.2 development of technology for use of biodegradable materials to replace current plastic products as appropriate. In connection with this, governments should also study the impacts on the environment of the products from degradation of such new materials.

2.2 Fishing gear

2.2.1 Lost fishing gear may harm the marine environment or create a navigation hazard. Fishing vessel operators are required to record the discharge or loss of fishing gear in the Garbage Record Book or the ship's official log-book as specified in regulations 7.1 and 10.3.6 of MARPOL Annex V.

2.2.2 Fishing vessel operators are further required to report the accidental loss or discharge of fishing gear which poses a significant threat to the marine environment and navigation. Reports should be made to the flag State, and where appropriate, the coastal State in whose jurisdiction the loss of the fishing gear occurred, as specified in regulation 10.6 of MARPOL Annex V:

.1 the accidental loss or discharge of fishing gear which is required to be reported by regulation 10.6 of MARPOL Annex V should be determined specifically by the government. For such determination, the government is encouraged to consider various factors including: (1) the amount of the gear lost or discharged and (2) the conditions of the marine environment where it was lost or discharged. Comprehensive consideration is needed on the characteristics of the gear that was lost, including types, size (weight and/or length), quantity, material (especially, synthetic/plastic or not), buoyancy. In addition, governments should consider the impact of the fishing gear in different locations in order to assess whether the lost gear represents a significant threat to the marine environment or navigation, taking into account the vulnerability of habitat and protected species to gear interactions. Governments are encouraged to report to the Organization measures taken to address this issue, with a view to promoting information sharing and opinion exchange among Governments and relevant international organizations. Further, Governments are encouraged to report to the Organization progress made in implementing these measures, including summaries of where gear was lost and, if applicable, actions taken to address the gear loss;

.2 examples of lost or abandoned fishing gear which could be considered to pose a significant threat to the marine environment include whole or nearly whole large fishing gear or other large portions of gear. In determining the threat to the marine environment, Governments should give careful consideration to the impact of gear in sensitive areas, such as coral reefs, and in areas where interactions would have higher risks of detrimental impacts, such as foraging or breeding areas for protected species;

.3 Governments are encouraged to develop communication frameworks to enable the recording and sharing of information on fishing gear loss where necessary in order to reduce loss and facilitate recovery of fishing gear. Governments are further encouraged to develop frameworks to assist fishing vessels in reporting the loss of gear to the flag State and to a coastal State. Such frameworks should take into consideration implementation challenges in small scale and artisanal fisheries and recreational operations;

.4 fishing industry, relevant international organizations and Governments are encouraged to undertake such research, technology development, information sharing and management measures as may be needed to minimize the probability of loss, and maximize the probability of retrieval of fishing gear from the sea; and

.5 Governments should encourage vessel operators to implement appropriate onboard storage and handling of fishing gear, and should also consider relevant guidance issued by FAO and IMO.

2.3 Shipboard garbage handling (collection, processing, storage, discharge)

2.3.1 Regulation 3 of MARPOL Annex V provides that the discharge of garbage into the sea is prohibited, with limited exceptions, as summarized in table 1. Under certain conditions discharge into the sea of food wastes, animal carcasses, cleaning agents and additives contained in hold washwater, deck and external surface washwater and cargo residues which are not considered to be harmful to the marine environment is permitted.

Table 1: Summary of restrictions to the discharge of garbage into the sea under regulations 4, 5, 6 and 14 of MARPOL Annex V and chapter 5 of part II-A of the Polar Code

(Note: Table 1 is intended as a summary reference. The provisions in MARPOL Annex V and the Polar Code, not table 1, prevail.)

<table>
<tr><th rowspan="2">Garbage type[1]</th><th colspan="2">All ships except platforms[4]</th><th rowspan="2">Offshore platforms located more than 12 nm from nearest land and ships when alongside or within 500 metres of such platforms[4] Regulation 5</th></tr>
<tr><th>Outside special areas and Arctic waters Regulation 4 (Distances are from the nearest land</th><th>Within special areas and Arctic waters Regulation 6 (Distances are from nearest land, nearest ice-shelf or nearest fast ice)</th></tr>
<tr><td>Food waste comminuted or ground[2]</td><td>≥3 nm, en route and as far as practicable</td><td>≥12 nm, en route and as far as practicable[3]</td><td>Discharge permitted</td></tr>
<tr><td>Food waste not comminuted or ground</td><td>≥12 nm, en route and as far as practicable</td><td>Discharge prohibited</td><td>Discharge prohibited</td></tr>
<tr><td>Cargo residues[5, 6] not contained in washwater</td><td rowspan="2">≥ 12 nm, en route and as far as practicable</td><td>Discharge prohibited</td><td rowspan="2">Discharge prohibited</td></tr>
<tr><td>Cargo residues[5, 6] contained in washwater</td><td>≥ 12 nm, en route and as far as practicable (subject to conditions in regulation 6.1.2 and paragraph 5.2.1.5 of part II-A of the Polar Code)</td></tr>
<tr><td>Cleaning agents and additives[6] contained in cargo hold washwater</td><td rowspan="2">Discharge permitted</td><td>≥ 12 nm, en route and as far as practicable (subject to conditions in regulation 6.1.2 and paragraph 5.2.1.5 of part II-A of the Polar Code)</td><td rowspan="2">Discharge prohibited</td></tr>
<tr><td>Cleaning agents and additives[6] in deck and external surfaces washwater</td><td>Discharge permitted</td></tr>
<tr><td>Animal Carcasses (should be split or otherwise treated to ensure the</td><td>Must be en route and as far from the nearest land as possible. Should be >100 nm</td><td>Discharge prohibited</td><td>Discharge prohibited</td></tr>
</table>

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 metres of such platforms[4] Regulation 5
	Outside special areas and Arctic waters Regulation 4 (Distances are from the nearest land	Within special areas and Arctic waters Regulation 6 (Distances are from nearest land, nearest ice-shelf or nearest fast ice)	
carcasses will sink immediately)	and maximum water depth		
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 discharge 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 mm.

3 The discharge of introduced avian products in the Antarctic area is not permitted unless incinerated, autoclaved or otherwise treated to be made sterile. In polar waters, discharge shall be made as far as practicable from areas of ice concentration exceeding 1/10; in any case food wastes shall not be discharged onto the ice.

4 Offshore platforms located 12 nm from nearest land and associated ships include all fixed or floating platforms engaged in exploration or exploitation or associated processing of seabed mineral resources, and all ships alongside or within 500 m 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.

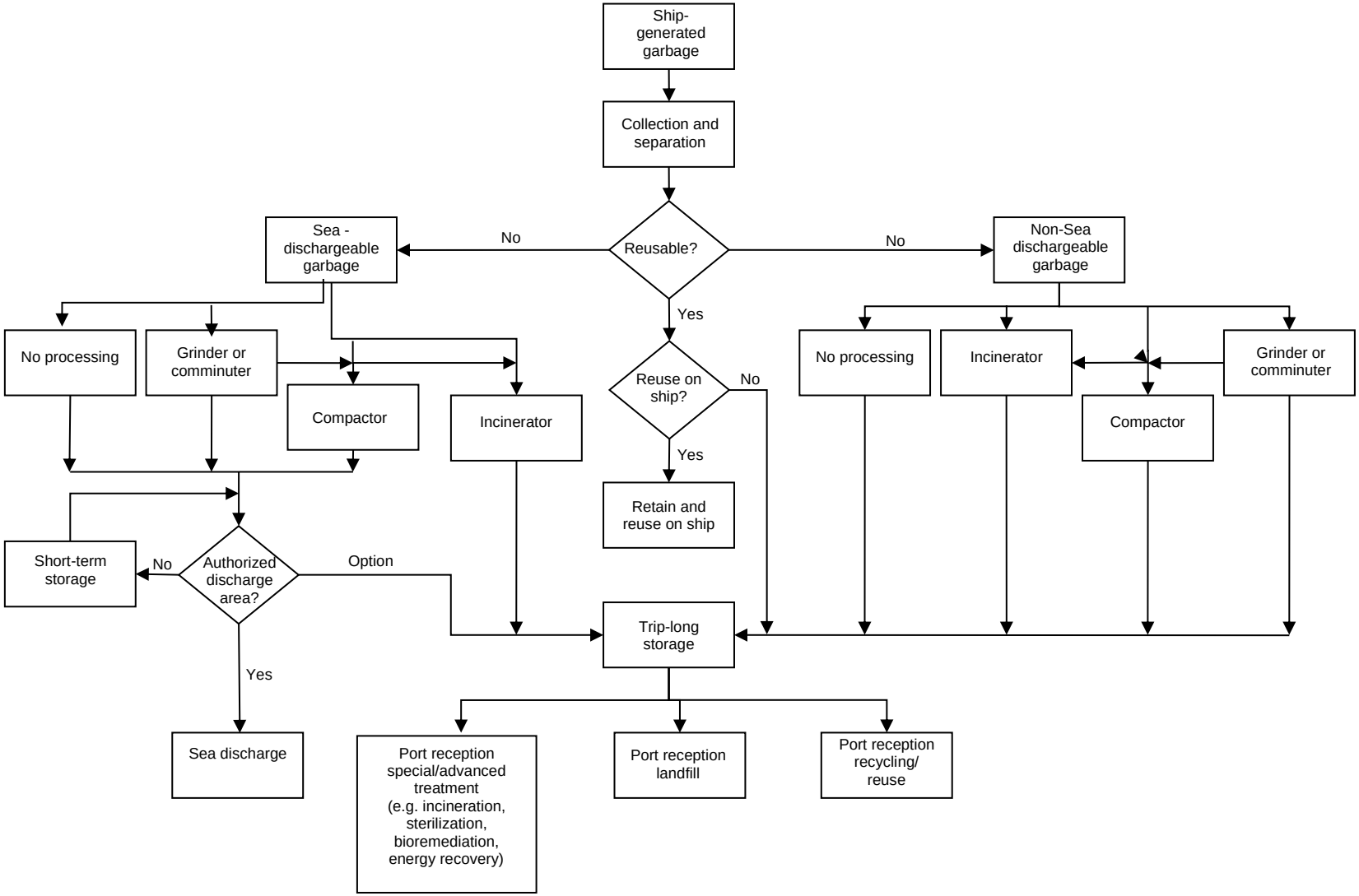
2.3.2 Compliance with MARPOL Annex V involves personnel, equipment and procedures for collecting, sorting, processing, storing, recycling, reusing and discharging garbage. Economic and procedural considerations associated with these activities include storage space requirements, sanitation, equipment and personnel costs and in port garbage service charges.

2.3.3 Compliance with the provisions of MARPOL Annex V involves careful planning by the ship's owner and operator and proper execution by crew members as well as other seafarers. The most appropriate procedures for handling and storing garbage on board ships may vary depending on factors such as the type and size of the ship, the area of operation (e.g. special area, distance from nearest land, ice-shelf or fast ice), shipboard garbage processing equipment and storage space, number of crew or passengers, duration of voyage, and regulations and reception facilities at ports of call. However, in view of the cost involved with the different garbage handling options, it is economically advantageous to first, limit the amount of material that may become garbage from being brought on board the ship and second, separate garbage eligible for discharge into the sea from other garbage that may not be discharged into the sea. Proper management of containers and packaging coming on board and proper handling and storage can minimize shipboard storage space requirements and enable efficient transfer of retained garbage to port reception facilities for proper handling (i.e. recycling, reuse) or land-based disposal.

2.3.4 Every ship of 100 gross tonnage and above every ship certified to carry 15 or more persons and fixed and floating platforms are required to carry and implement a garbage management plan that specifies procedures to be followed to ensure proper and efficient handling and storage of garbage. A garbage management plan[2] should be developed that can be incorporated in crew and ship operating manuals. Such manuals should identify crew responsibilities (including an Environmental Control Officer) and procedures for all aspects of handling and storing garbage on board the ship. Procedures for handling ship-generated garbage are divided into four phases: collection, processing, storage and discharge. A generalized garbage management plan for handling and storing ship-generated garbage is presented in table 2. Specific procedures for each phase are discussed below.

[2] Garbage management plans are mandatory on certain ships in accordance with regulation 10 of MARPOL Annex V.

Table 2: Options for shipboard handling and discharge of garbage



2.4 Collection

2.4.1 Procedures for collecting garbage generated on board should be based on the consideration of what is permitted and what is not permitted to be discharged into the sea while en route, and whether a particular garbage type can be discharged to port facilities for recycling or reuse. The details of these procedures should be written in the garbage management plan.

2.4.2 To reduce or avoid the need for sorting after collection and to facilitate recycling, it is recommended that distinctively marked garbage receptacles be provided on board the ship to receive garbage as it is generated. Receptacles on board can be in the form of drums, metal bins, cans, container bags or wheelie bins. Any receptacles on deck areas, poop decks or areas exposed to the weather should be secured on the ship and have lids that are tight and securely fixed. All garbage receptacles should be secured to prevent loss, spillage, or loss of any garbage that is deposited in the receptacles. Receptacles should be clearly marked and distinguishable by graphics shape, size or location. Receptacles should be placed in appropriate spaces throughout the ship (e.g. the engine-room, mess deck, wardroom, galley and other living or working spaces) and all crew members and passengers should be advised of what garbage should and should not be placed in them.

2.4.3 The recommended garbage types that should be separated are:

.1 non-recyclable plastics and plastics mixed with non-plastic garbage;

.2 rags;

.3 recyclable material:

.1 cooking oil;

.2 glass;

.3 aluminium cans;

.4 paper, cardboard, corrugated board;

.5 wood;

.6 metal; and

.7 plastics; (including styrofoam or other similar plastic material);

.4 E-waste generated on board (e.g. electronic cards, gadgets, instruments, equipment, computers, printer cartridges, etc.); and

.5 garbage that might present a hazard to the ship or crew (e.g. oily rags, light bulbs, acids, chemicals, batteries, etc.).

2.4.4 Crew responsibilities should be assigned for collecting or emptying these receptacles and taking the garbage to the appropriate processing or storage location. Use of such a system facilitates subsequent shipboard processing and minimizes the amount of garbage which must be stored on board ship for return to port.

Plastics and plastics mixed with non-plastic garbage

2.4.5 Plastics are used for a variety of marine purposes including, but not limited to, packaging (vapour-proof barriers, bottles, containers, liners, bags, cargo wrapping material,

foam cushioning material, etc.); ship construction (fibreglass and laminated structures, siding, piping, insulation, flooring, carpets, fabrics, paints and finishes, adhesives, electrical and electronic components, etc.); disposable eating utensils (styrofoam plates, bowls, food containers, cups, etc.); bags; sheeting; floats; fishing nets; fishing lines; strapping bands; wire rope with synthetic fibre sheaths; combination wire rope; rope; line; sails; and many other manufactured plastic items.

2.4.6 Regulation 3.2 of MARPOL Annex V prohibits the discharge of all plastics into the sea. When plastic is mixed with other garbage, the mixture must be treated as if it were all plastic. The most stringent procedures for the handling and discharge should be followed taking into account the applicable provisions of the garbage management plan.

Food wastes

2.4.7 Some Governments have regulations for controlling human, plant and animal diseases that may be carried by foreign food wastes and materials that have been associated with them (e.g. food packing and disposable eating utensils, etc.). These regulations may require incinerating, sterilizing, double bagging or other special treatment of garbage to destroy possible pest and disease organisms. This type of garbage should be kept separate from other garbage and preferably retained for discharge at port reception facilities in accordance with the laws of the receiving country. Governments are reminded of their obligation to ensure the provision of adequate reception facilities. Precautions should be taken to ensure that plastics contaminated by food wastes (e.g. plastic food wrappers) are not discharged into the sea with other food wastes.

Synthetic fishing net and line scraps

2.4.8 As regulation 3.2 of MARPOL Annex V prohibits the discharge into the sea of synthetic fishing nets and line scraps generated by the repair or operation of fishing gears, these items should be collected in a manner that avoids their loss overboard. Such material may be incinerated, compacted or stored along with other plastics or it may be preferable to keep it separate from other types of garbage if it has strong odour or is present in great volume. Unless such garbage is appropriately incinerated, the atmospheric incineration products could be toxic. Onboard incineration should follow regulation 16 of MARPOL Annex VI.

Recovery of garbage at sea

2.4.9 Seafarers are encouraged to recover persistent garbage from the sea during routine operations as opportunities arise and prudent practice permits and to retain the material for discharge to port reception facilities.

2.5 Processing

2.5.1 Depending on factors such as the type of ship, area of operation, number of crew or passengers, etc., ships may be equipped with incinerators[3], compactors, comminuters or other devices for shipboard garbage processing (see sections 2.8 to 2.11). Appropriate members of the crew should be trained and assigned responsibility for operating this equipment on a schedule commensurate with ship needs. In selecting appropriate processing procedures, the following should be considered.

2.5.2 Use of compactors, incinerators, comminuters and other such devices has a number of advantages, such as reducing shipboard space requirements for storing garbage and making it easier to discharge garbage at port reception facilities.

[3] Refer to the *2014 Standard specification for shipboard incinerators* (resolution MEPC.244(66)).

2.5.3 It should be noted that special rules on incineration under domestic law may apply in some ports and may exist in some special areas. Incineration of hazardous materials (e.g. scraped paint, impregnated wood) and certain types of plastics (e.g. PVC-based plastics or other plastics containing hazardous chemicals) calls for special precaution due to the potential environmental and health effects from combustion of by-products. The problems of combustion of by-products are discussed in 2.11.3.

2.5.4 Ships operating primarily in special areas, Arctic waters or within 3 nm from the nearest land, ice-shelf or fast ice are greatly restricted in what they can discharge. These ships should choose between storage of either compacted or uncompacted material for discharging at port reception facilities or incineration with retention of ash and clinkers. The type of ship and the expected volume and type of garbage generated determine the suitability of compaction, incineration or storage options.

2.6 Storage

Garbage collected throughout the ship should be delivered to designated processing or storage locations. Garbage that must be returned to port for discharge at port reception facilities may require storage until arrangements can be made to discharge it ashore for appropriate processing. In all cases, garbage should be stored in a manner which avoids health and safety hazards. The following points should be considered when selecting procedures for storing garbage:

.1 sufficient storage space and equipment (e.g. cans, drums, bags or other containers) should be provided. Where storage space is limited, ship operators are encouraged to consider the installation of compactors or incinerators. To the extent possible, all processed and unprocessed garbage stored for any length of time should be in tight, securely covered containers in order to prevent the unintentional discharge of stored garbage;

.2 food wastes and other garbage to be returned to port and which may carry diseases or pests should be stored in tightly covered containers and be kept separate from garbage which does not contain such food wastes. Quarantine arrangements in some countries may require double bagging of this type of waste. Both types of garbage should be stored in separate clearly marked containers to avoid incorrect discharge and facilitate proper handling and treatment on land; and

.3 cleaning and disinfecting are both preventative and remedial pest control methods that should be applied regularly in garbage storage areas.

2.7 Discharge

Although discharge into the sea of limited types of garbage is permitted under MARPOL Annex V, discharge of garbage to port reception facilities should be given primary consideration. When discharging garbage, the following points should be considered:

.1 regulations 4, 5, and 6 of MARPOL Annex V and chapter 5 of part II-A of the Polar Code, summarized in table 1, set forth the requirements for garbage permitted to be discharged into the sea. In general the discharge shall take place when the ship is en route and as far as practicable from the nearest land, ice shelf or fast ice. Attempts should be made to spread the discharge over as wide an area as possible and in deep water (50 m or more). Prevailing currents and tidal movements should be taken into consideration when discharging into the sea is permitted; and

.2 to ensure timely transfer of large quantities of ship-generated garbage to port reception facilities, it is essential for shipowners, operators or their agents to make arrangements well in advance for garbage reception. At the same time, discharge needs should be identified in order to make arrangements for garbage requiring special handling or other necessary arrangements. Advice should be provided to the port of the type of garbage to be discharged and whether it is separated and the estimated amounts. The port may have special discharge requirements for food wastes and related garbage which may carry certain disease or pest organisms, dunnage, batteries, medicines, outdated pyrotechnics or unusually large, heavy or odorous derelict fishing gear, etc.

2.8 Shipboard equipment for processing garbage

The choice of options[4] for garbage processing depends largely upon personnel limitations, generation rate, capacity, ship configuration, voyage route and availability of port reception facilities. The type of equipment available for shipboard garbage handling includes incinerators, compactors, comminuters and their associated hardware.

2.9 Grinding or comminution

2.9.1 The discharge of comminuted food wastes may be permitted under regulations 4.1.1 and 6.1.1 of MARPOL Annex V or paragraph 5.2.1 of part II-A of the Polar Code whilst the ship is en route. Such comminuted or ground food wastes must be capable of passing through a screen with openings no greater than 25 mm.

2.9.2 A wide variety of food waste grinders is available on the market and most modern ships' galleys have the equipment needed to produce a slurry of food particles and water that washes easily through the required 25 mm screen. Output ranges from 10 to 250 litres per minute. The discharge from shipboard comminuters should be directed into an appropriately constructed holding tank when the ship is operating within an area where discharge is prohibited.

2.9.3 Size reduction of certain other garbage items can be achieved by shredding or crushing and machines for carrying out this process are available for use on board ships.

2.9.4 Information on the development, advantages and use of comminuters for processing food waste aboard ships should be forwarded to the Organization for sharing between interested parties.

2.9.5 Outside special areas and Arctic waters, ships operating primarily beyond 3 nm from the nearest land are encouraged to install and use comminuters to grind food wastes to a particle size capable of passing through a screen with openings no larger than 25 mm. Regulation 4 of MARPOL Annex V requires comminuting or grinding food wastes if the food wastes are to be discharged between three and 12 nm from the nearest land. Although unprocessed food wastes may be discharged beyond 12 nm, it is recommended that comminuters be used as they hasten assimilation into the marine environment. Because food wastes comminuted with plastics cannot be discharged into the sea, all plastic materials need to be removed before food wastes are placed into a comminuter or grinder.

[4] Reference may also be made to other technical guidance such as, ISO/CD21070: *Ships and marine technology – Marine environment protection – Management and handling of shipboard garbage.*

2.9.6 When operating inside a special area or Arctic waters, regulation 6 of MARPOL Annex V and chapter 5 of part II-A of the Polar Code require all food wastes to be comminuted or ground prior to discharge into the sea. All discharges are to be as far as practicable and not less than 12 nm from the nearest land, ice-shelf or fast ice. Food wastes shall not be discharged onto the ice.

2.10 Compaction

Table 3 shows compaction options for various types of garbage.

Table 3: Compaction options for shipboard-generated garbage

Examples of garbage	Special handling by ship's personnel before compaction	Compaction characteristics			Onboard storage space
		Rate of alteration	Retainment of compacted form	Density of compacted form	
Metal, food and beverage containers, glass, small wood pieces	None	Very rapid	Almost 100%	High	Minimum
Comminuted plastics, fibre and paper board	Minor – reduce material to size for feed, minimal manual labour	Rapid	Approximately 80%	Medium	Minimum
Small metal drums[5], uncomminuted cargo packing, large pieces of wood	Moderate – longer manual labour time required to size material for feed	Slow	Approximately 50%	Relatively low	Moderate
Uncomminuted plastics	Major – very long manual labour time to size material for feed; usually impractical	Very slow	Less than 10%	Very low	Maximum
Bulky metal cargo containers, thick metal items	Impractical for shipboard compaction; not feasible	Not applicable	Not applicable	Not applicable	Maximum

2.10.1 Most garbage can be compacted to some degree; the exceptions include unground plastics, fibre and paperboard, bulky cargo containers and thick metal items. Pressurized containers should not be compacted or shredded without the use of specialized equipment designed for this purpose because they present an explosion hazard in standard compactors.

[5] Small and large drums can be compacted very easily with the proper device – a large number of these devices have been designed for remote locations, and therefore they are small and easy to operate with excellent results. It should be noted, that the compaction of drums is probably restricted to larger vessels, due to lack of space on smaller (fishing) vessels.

2.10.2 Compaction reduces the volume of garbage. In most cases, the output from a compactor is a block of material which facilitates the shipboard storage of garbage and its discharging in a port facility. It should be taken into account that the output from a compactor might be subject to quarantine, sanitary or health requirements or other requirements from the port reception facilities and advice from local authorities should be sought on any standards or requirements which are additional to those set by the Organization.

2.10.3 Compactors have options including sanitizing, deodorizing, adjustable compaction ratios, bagging in plastic or paper, boxing in cardboard (with or without plastic or wax paper lining), baling, etc. Compacted materials should be stored appropriately. While metal and plastic bales can get wet, paper and cardboard bales should be kept dry.

2.10.4 If grinding machines are used prior to compaction, the compaction ratio can be increased and the storage space decreased. Careful investigation of the appropriate compaction machine should be undertaken, based on the type and volume of material that will be compacted, as not all compactors require grinding. Compaction is just one step in the solid waste management scheme and the shipowner/operator should ensure all phases of garbage management are described in their Garbage Management Plan. Proper care should be taken when handling and storing binder wrap to prevent it from accidentally entering the marine environment.

2.10.5 A compactor should be installed in a compartment with adequate room for operating and maintaining the unit and storing garbage to be processed. The compartment should be located adjacent to the areas of food processing and commissary store-rooms. If not already required by regulation, it is recommended that the space should have freshwater wash down service, coamings, deck drains, adequate ventilation and hand or automatic fixed fire-fighting equipment.

2.10.6 Information on the development and use of shipboard compactors should be forwarded to the Organization for sharing between interested parties.

2.11 Incineration

2.11.1 Ash and clinkers from shipboard incinerators should be considered as operational waste and, therefore, as garbage that is not eligible for discharge into the sea.

2.11.2 Incineration conducted in a shipboard incinerator can significantly reduce the need to store garbage on board the ship. Shipboard incinerators should be designed, constructed, operated and maintained in accordance with the *2014 Standard specification for shipboard incinerators* (resolution MEPC.244(66), as amended). MARPOL Annex VI requires shipboard incinerators installed after 1 January 2000 to be type-approved and meeting specific air pollution criteria. Incinerators should only be used to incinerate materials that are specified by the incinerator manufacturer.

2.11.3 In general, shipboard incineration should not be undertaken when the ship is in port or at an offshore terminal. Some ports may have domestic laws that specify additional air emission restrictions, particularly those near high population areas. The use of a shipboard incinerator may require permission from the port authority concerned.

2.11.4 Table 4 presents options for incineration of garbage and includes considerations for special handling by ship's personnel, combustibility, reduction in volume, residual materials, exhaust, and onboard storage space. Most garbage is amenable to incineration, with the exception of metal and glass.

Table 4: Incineration options for shipboard-generated garbage

Examples of garbage	Special handling by ship's personnel[6] before incineration	Incineration characteristics				Onboard storage space
		Combustibility	Reduction of volume	Residual	Exhaust	
Paper packing, food and beverage containers	Minor – easy to feed into hopper	High	Over 95%	Powder ash	Possibly smoky and not hazardous	Minimum
Fibre and paperboard	Minor – reduce material to size for feed, minimum manual labour	High	Over 95%	Powder ash	Possibly smoky and not hazardous	Minimum
Plastics packaging, food and beverage containers, etc.	Minor – easy to feed into hopper	High	Over 95%	Powder ash	Possibly smoky and not hazardous based on incinerator design	Minimum
Plastics sheeting, netting, rope and bulk material.	Moderate –manual labour time to size reduction	High	Over 95%	Powder ash	Possibly smoky and not hazardous based on incinerator design	Minimum
Rubber hoses and bulk pieces	Major – manual labour time to size reduction	High	Over 95%	Powder ash	Possibly smoky and not hazardous based on incinerator design	Minimum
Metal food and beverage containers, etc.	Minor – easy to feed into hopper	Low	Less 10%	Slag	Possibly smoky and not hazardous	Moderate
Metal cargo, bulky containers, thick metal items	Major – manual labour time to size reduction(not easily incinerated)	Very low	Less 5%	Large metal Fragments and slag	Possibly smoky and not hazardous	Maximum
Glass food and beverage containers, etc.	Minor – easy to feed into hopper	Low	Less 10%	Slag	Possibly smoky and not hazardous	Moderate
Wood, cargo containers and large wood scrapes	Moderate – manual labour time to size reduction	High	Over 95%	Powder ash	Possibly smoky and not hazardous	Minimum

[6] Each operator of the onboard garbage incinerator should be trained and familiar in the use of the equipment and the types of garbage that can be destroyed in the incinerator.

2.11.5 Some of the disadvantages of incinerators may include the possible hazardous nature of the ash or vapour, dirty operation, excessive labour required for charging, stoking and ash removal. Some incinerators may not be able to meet air pollution regulations imposed in some ports and harbours or by flag and coastal States when such matters are subject to their jurisdiction. Some of these disadvantages can be remedied by automatic equipment for charging and stoking, however, the additional equipment to perform automatic functions will require more installation space.

2.11.6 The incineration of garbage that contains a large amount of plastic involves very specific incinerator settings such as higher oxygen injection and higher temperatures (850 to 1,200°C). If these special conditions are not met, depending on the type of plastic and conditions of combustion, some toxic gases can be generated in the exhaust stream, including vaporized hydrochloric (HCl) and hydrocyanic (HCN) acids. These and other intermediary products of combustion of waste containing plastics are toxic to humans and marine life.

2.11.7 Onboard incineration of garbage may reduce the volume of garbage subject to quarantine requirements in some countries. However, incinerator ash may still be subject to local quarantine, sanitary or health requirements. Advice should be sought from local authorities regarding requirements additionally to MARPOL. For example, higher temperatures and more complete combustion may be required to effectively destroy organisms that present a risk.

2.11.8 Information on the development and advantages on the use of shipboard incinerator systems should be forwarded to the Organization for sharing between interested parties.

2.12 Treatment of animal carcasses

2.12.1 Only fit and healthy animals should be presented for loading as cargo and managed in accordance with international standards for the transport of animals at sea[7]. The master of the ship is expected to have responsibility for shipboard livestock operational issues, animal health and welfare, and conditions for the control and reporting of animal mortality on board.

2.12.2 Ships carrying live animal cargo consignments are expected to have animals dying during a voyage. These mortalities accrue gradually over the voyage and are dependent on various factors including age and type of animal species, facilities on board the ship and local climatic conditions. The most common mortality causes stem from enteritis, refusal to feed, injury, exhaustion or illness not evident prior to loading. The mortality numbers are generally low and are operational issues to be controlled as part of cargo management practice. These mortalities are considered to be generated during the normal operation of the ship and liable to be discharged continually or periodically and therefore subject to MARPOL Annex V regulations.

2.12.3 As part of normal livestock ship management procedures, regular inspections (day and night) are recommended to ensure the health and welfare of the animals. It is recommended that these inspections include shipboard recording, on a daily basis, of the number of animals that have died or have been euthanized.

2.12.4 When mortalities occur on board, the carcasses should be removed from the pen areas and assessed for appropriate disposition. The options for appropriate discharge of the carcasses under MARPOL Annex V will typically be discharge into the sea or discharge to a reception facility. Where the ship has an appropriate storage area on board, limited quantities

[7] The World Organisation for Animal Health (OIE) formulated "Guidelines for the Transport of Animals by Sea" as part of the Terrestrial Animal Health Code (2010).

of treated carcasses may be stored for short periods for subsequent discharge into the sea or to reception facilities. Any storage on board should take into account occupational health and safety requirements.

2.12.5 Regulation 4.1.4 of MARPOL Annex V permits the discharge into the sea of animal carcasses generated during the normal operation of a ship, but only if the ship is en route, outside a special area and Arctic waters, as far as possible from the nearest land and taking into account the guidelines developed by the Organization. To comply with regulation 4.1.4 of MARPOL Annex V, it is recommended that the discharge into the sea should take place more than 100 nm from the nearest land and in the maximum water depth possible.

2.12.6 When a ship is on a voyage that is not often more than 100 nm from nearest land, the retention of carcasses on board during conditions of high temperatures and high humidity may constitute a threat to human health and safety or to the remaining live animals. In these circumstances it may not be possible to discharge animal carcasses in accordance with these Guidelines. In such circumstances, where the master of the ship determines that such health and safety threats exist, it is recommended the discharge into the sea should take place more than 12 nm from the nearest land. Where the discharge of animal carcasses at sea occurs under these circumstances, the entry in the Garbage Record Book of the position of the ship should also include a remark about these circumstances.

2.12.7 Animal carcasses should be split or otherwise treated prior to their discharge into the sea. Procedures for the treatment of carcasses should take into account the health and safety of the crew and other livestock cargo. Treatment should facilitate the sinking or dispersal of the carcass when it is discharged into the sea.

2.12.8 Treatment of a carcass involves:

.1 manually slitting or cutting the carcass to the extent that the thoracic and abdominal cavities are opened; or

.2 passing the carcass through equipment such as a comminuter, grinder, hogger or mincer.

2.12.9 For each animal carcass incinerated, discharged into the sea or discharged to a reception facility, an entry in the Garbage Record Book shall be made. The entry should include the date/time, position of the ship and remarks to specify the animal species (e.g. sheep, cattle, goats), the category "G" and the number of carcasses discharged. Where the discharge is to a reception facility, the receipt obtained from the facility should be attached to the Garbage Record Book.

2.12.10 Following the completion of a voyage, the master of the ship is encouraged to provide a copy of the pages of the Garbage Record Book that contain the entries for the discharges of animal carcasses into the sea to the flag State and the State from whose port the voyage originated, and other information requested.

2.12.11 Governments are encouraged to analyse the garbage records of discharges of animal carcasses and other relevant information to inform and assist future reviews of MARPOL Annex V regulations and associated guidelines.

Mortalities in excess of those generated during the normal operation of a ship

2.12.12 Carcasses of animals resulting from mortalities in excess of those generated during the normal operation of a ship are not "garbage" under MARPOL Annex V and are not covered

under these Guidelines. To assist in managing these situations, masters should contact the flag State of the ship and, where appropriate, port and/or coastal State(s), to seek guidance on the appropriate legal regimes and requirements, as well as consult relevant IMO guidelines and circulars. In particular, masters should refer to the *Revised Guidance on the management of spoilt cargoes* (MEPC.1/Circ.809), developed by a Joint London Convention and Protocol/MEPC Correspondence Group.

2.12.13 "Mortalities in excess of those generated during the normal operation of a ship" refers to animal mortalities in excess of those described in paragraph 2.12.2. While this could be a number of animals dying at the same time or within a short period of time, the number of mortalities that exceed those generated during the normal operation of a ship will depend upon the animal species and the total number and/or species carried in the consignment.

2.12.14 Circumstances that may result in mortalities that exceed those generated during the normal operation of the ship, include:

.1 malfunctioning of ventilation or watering systems;
.2 weather events such as heat waves or storm systems;
.3 infectious disease outbreaks; and
.4 refusal of cargo offloading by authorities at destination, leading to the need to euthanize some or all of the live animal cargo.

2.12.15 The guidance provided above and the *Revised Guidance on the management of spoilt cargoes* are not substitutes for any stricter requirements imposed upon a ship by a port State, a flag State or the exporting country, for the management of livestock cargoes.

2.13 Discharge of fish carried as a cargo

Fish, including shellfish, carried on board as cargo that have died or been euthanized on board during the voyage are considered to be animal carcasses and should, to the extent practicable, be treated in the manner set out in section 2.12 of these Guidelines. Governments may want to consider additional actions to reduce the risk of spreading parasitic or pathogenic organisms.

3 MANAGEMENT OF CARGO RESIDUES OF SOLID BULK CARGOES

3.1 Cargo residues are included in the definition of garbage within the meaning of regulation 1.9 of MARPOL Annex V and may be discharged in accordance with regulations 4.1.3 and 6.1.2 and paragraph 5.2.1.5 of part II-A of the Polar Code. However, cargo material contained in the cargo hold bilge water should not be treated as cargo residues if the cargo material is not harmful to the marine environment and the bilge water is discharged from a loaded hold through the ship's fixed piping bilge drainage system.

3.2 Cargo residues are considered harmful to the marine environment and subject to regulations 4.1.3 and 6.1.2.1 of MARPOL Annex V if they are residues of solid bulk cargoes (other than grain) which are classified according to the criteria set out in appendix I of the Annex.

3.3 Cargo residues that are harmful to the marine environment may require special handling not normally provided by reception facilities. Ports and terminals receiving such cargoes should have adequate reception facilities for all relevant residues, including when contained in washwater.

3.4 Solid bulk cargoes, as defined in regulation VI/1-1.2 of the International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended, other than grain, shall be classified in accordance with appendix I of MARPOL Annex V, and declared by the shipper as to whether or not they are harmful to the marine environment. For ships engaged on international voyages, such a declaration should be included in the information required in section 4.2.3 of the IMSBC Code. For ships not engaged on international voyages, other means of declaration may be used, as determined by the Administration.

3.5 Ports, terminals and ship operators should consider cargo loading, unloading and onboard handling practices[8] in order to minimize production of cargo residues. Cargo residues are created through inefficiencies in loading, unloading, onboard handling. Options that should be considered to decrease the amount of such garbage include the following:

.1 ensuring ships are suitable to carry the intended cargo and also suitable for unloading the same cargo using conventional unloading methods;

.2 unloading cargo as efficiently as possible, utilizing all appropriate safety precautions to prevent injury or ship and equipment damage and to avoid or minimize cargo residues; and

.3 minimizing spillage of the cargo during transfer operations by carefully controlling cargo transfer operations, both on board and from dockside. This should include effective measures to enable immediate communications between relevant ship and shore-based personnel during the transfer operations and when feasible, enclosure of conveyance devices such as conveyor belts. Since this spillage typically occurs in port, it should be completely cleaned up immediately following the loading and unloading event and handled as cargo; delivering it into the intended cargo space or into the appropriate unloading holding area.

3.6 When the master, based on the information received from the relevant port authorities, determines that there are no adequate reception facilities[9] at either the port of departure or the port of destination in the case where both ports are situated within the same special area or Arctic waters, the condition under regulation 6.1.2.5 of MARPOL Annex V or paragraph 5.2.1.5 of part II-A of the Polar Code should be considered satisfied.

3.7 MARPOL Annex V, regulation 6.1.2, also applies when the "port of departure" and the "next port of destination" are the same port. To discharge cargo hold washwater in this situation, the ship must be en route and the discharge must take place not less than 12 nm from the nearest land.

4 TRAINING, EDUCATION AND INFORMATION

4.1 These Guidelines are intended to address Governments, shipowners, ship operators, ships' crews, cargo owners, port reception facility operators and equipment manufacturers as sources of pollution of the sea by garbage. Accordingly, Governments should develop and undertake training, education and public information programmes suited for all seafaring communities under their jurisdiction, prepared and presented in such a way that they communicate with that segment of the community.

8 Refer to the International Maritime Solid Bulk Cargoes Code (IMSBC Code).

9 Refer to the *Consolidated Guidance for port reception facility providers and users* (MEPC.1/Circ.834).

4.2 Governments may exchange and maintain information relevant to compliance, non-compliance and information on legal proceedings for violations with Annex V regulations through the Organization. Governments are encouraged to provide the Organization with the following:

.1 technical information on shipboard garbage management methods such as minimization, recovery, recycling, reuse, incineration, compaction, separation, sorting and sanitation system, packaging and provisioning methods;

.2 educational materials developed to raise the level of compliance with Annex V. This includes printed materials (e.g. placards, posters, brochures, etc.), photographs, DVDs, audio and video tapes, and films as well as synopses of training programmes, seminars and formal curricula; and

.3 information and reports on the nature and extent of garbage from shipping found along beaches and in coastal waters under their respective jurisdictions. In order to assess the effectiveness of Annex V, these studies should provide details on amounts, distribution, sources and impacts of garbage from shipping.

4.3 Governments are encouraged to amend their maritime certification examinations and requirements, as appropriate, to include a knowledge of duties imposed by national and international law regarding the control of pollution of the sea by garbage.

4.4 Placards required by regulation 10.1 of MARPOL Annex V should contain a summary declaration stating the prohibition and restrictions for discharging garbage from ships under the Annex and the possible penalties for failure to comply. Governments are encouraged to develop appropriate placards for use by every ship on their registry of more than 12 m in length overall and fixed and floating platforms (sample placards targeting crew and shipboard operations; fixed or floating platforms and ships operating within 500 m of such platforms; and passengers are shown in figures 1, 2 and 3.).

4.4.1 The declaration should be placed on a placard at least 12.5 cm by 20 cm, made of durable material and fixed in conspicuous and prominent places on board the ship. Placards should be replaced when damage or wear compromises the readability of the declaration.

4.4.2 The placards should be placed in prominent places where crew will be working and living and in areas where bins are placed for collection of garbage. These places include galley spaces, mess room(s), wardroom, bridge, main deck and other areas of the ship, as appropriate. The placards should be displayed at line of sight height and be printed in the working language of the crew. Ships which operate internationally will also have placards printed in English, French or Spanish, in accordance with regulation 10.1.2 of MARPOL Annex V.

4.4.3 Where the ship carries passengers, placards also should be placed in prominent places where passengers are accommodated and congregate. These include cabins and all deck areas for recreational purposes open to passengers.

4.5 Governments should ensure that appropriate education and training in respect of MARPOL is included in the training programmes leading to STCW and STCW-F certification.

4.6 Governments are encouraged to have maritime colleges and technical institutes under their jurisdiction develop or augment curricula to include both the legal duties as well as the technical options available to professional seafarers for handling ship-generated garbage. These

curricula should also include information on environmental and ecological impacts of garbage. A list of suggested topics to be included in the curriculum is provided below:

.1 garbage in the marine environment, sources, methods for prevention of release of garbage to the environment and impacts on the environment;

.2 national and international laws relating to, or impinging upon shipboard waste management;

.3 health and sanitation considerations related to the storage, handling and transfer of ship-generated garbage;

.4 current technology for onboard and shoreside[10] processing of ship generated garbage; and

.5 provisioning options, materials and procedures to minimize the generation of garbage aboard ships.

4.7 Professional associations and societies of ship officers, engineers, naval architects, shipowners, managers and seafarers are encouraged to ensure their members' competency regarding the handling of ship-generated garbage.

4.8 Ship and reception facility operators should establish detailed training programmes for personnel operating and maintaining ships' garbage reception or processing equipment. It is suggested that the programme include instruction on what constitutes garbage and the applicable regulations for handling and disposing of it. Such training should be reviewed annually and updated as appropriate.

4.9 Generalized public information programmes are needed to provide information to non-professional seafarers and others concerned with the health and stability of the marine environment, regarding the impacts of garbage at sea. Governments and involved commercial organizations are encouraged to utilize the Organization's library and to exchange resources and materials, as appropriate, to initiate internal and external public awareness programmes.

4.9.1 Methods for delivering this information include radio and television, articles in periodicals and trade journals, voluntary public projects such as beach clean-up days and adopt-a-beach programmes, public statements by high government officials, posters, brochures, social media, conferences and symposia, cooperative research and development, voluntary product labelling and teaching materials for public schools.

4.9.2 Audiences include recreational sailors and fishermen, port and terminal operators, coastal communities, ship supply industries, shipbuilders, garbage management industries, plastic manufacturers and fabricators, trade associations, educators and Governments.

4.9.3 The subjects addressed in these programmes are recommended to include the relevant domestic and international law; options for handling garbage at sea and upon return to shore; known sources and types of garbage; impacts of plastics on marine life and ship operations; the accumulation of garbage in the world's oceans and seas, impacts on coastal tourist trade; current actions by Governments, intergovernmental organizations, non-governmental organizations and sources of further information.

[10] Reference may also be made to other technical guidance such as, ISO/CD16304 Ships and marine technology – Marine environment protection – Arrangement and management of port waste reception facilities.

5 PORT RECEPTION FACILITIES FOR GARBAGE

5.1 The methodology for determining the adequacy of a reception facility should be based on the number and type of ships that will call at the port, the waste management requirements of each type of ship as well as the size and location of a port. Emphasis should also be placed on calculating the quantities of garbage, including recyclable material, which is not discharged into the sea, in accordance with the provisions of MARPOL Annex V.

5.2 It should be noted that, due to differences in port reception procedures and additional treatment among ports, port reception facilities may require the separation on board of:

.1 food wastes (e.g. animal derived products and by-products because of risk of animal diseases);

.2 cooking oil (animal derived products and by-products because of risk of animal diseases);

.3 plastics;

.4 domestic waste, operational waste and recyclable or reusable material;

.5 special items like medical waste, outdated pyrotechnics and fumigation remnants;

.6 animal wastes, including used bedding from the transport of live animals (due to risk of disease) but excluding drainage from spaces containing living animals;

.7 cargo residues; and

.8 E-waste such as electronic cards, gadgets, equipment, computers, printer cartridges, etc.

5.3 Ship, port and terminal operators should consider the following when determining quantities and types of garbage on a per ship basis:

.1 types of garbage normally generated;

.2 ship type and design;

.3 ship operating route;

.4 number of persons on board;

.5 duration of voyage;

.6 time spent in areas where discharge into the sea is prohibited or restricted; and

.7 time spent in port.

5.4 Governments, in assessing the adequacy of reception facilities, should also consider the technological challenges associated with the recycling, treatment and discharge of garbage received from ships and should take responsible actions within their national programmes to consider garbage management standards. In doing so, relevant international standards should be taken into account.

5.4.1 The type and capacity of equipment for treatment and final disposal of garbage is a significant factor in determining the adequacy of a reception facility. It not only provides a measure of the time required to complete the process, but it also is the primary means for ensuring that ultimate disposal of the garbage is environmentally sound.

5.4.2 Governments should continue to carry out studies into the provision of reception facilities at ports in their respective countries in close cooperation with port authorities and other local authorities responsible for garbage handling. Such studies should include information such as a port-by-port listing of available garbage reception facilities, the types of garbage they are equipped to handle, their capacities and any special procedures required to use them. Governments should submit data on the availability of port reception facilities to GISIS.

5.4.3 While selecting the most appropriate type of reception facility for a particular port, consideration should be given to several alternative methods available. In this regard, floating plants for collection of garbage, such as barges or self-propelled ships, might be considered more effective in a particular location than land-based facilities.

5.5 These Guidelines aim to stimulate Governments to develop modern waste reception facilities and continue to improve their garbage management processes. Information on developments in this area should be forwarded to the Organization.

5.6 Governments are encouraged to develop policies and practices that facilitate the reduction, use and recycling of ship-generated garbage. The development of port reception facilities and associated guidance that aids the handling of separated garbage from ships should encourage ships to separate garbage on board.

5.7 Small Island Developing States may satisfy the requirements for reception facilities through regional arrangements when, because of those States' unique circumstances, such arrangements are the only practical means to satisfy these requirements.[11]

6 ENHANCEMENT OF COMPLIANCE WITH MARPOL ANNEX V

6.1 Recognizing that direct enforcement of MARPOL Annex V regulations, particularly at sea, is difficult to accomplish, Governments are encouraged to consider not only restrictive and punitive measures consistent with international law, but also the removal of any disincentives, the creation of positive incentives and initiatives to facilitate more effective compliance, and the development of voluntary measures within the regulated community when developing programmes and domestic legislation to ensure compliance with the Annex.

6.2 Compliance facilitation and enforcement

6.2.1 Ships should inform their flag State of ports in foreign countries Party to MARPOL Annex V which do not have adequate port reception facilities for garbage. This can provide a basis for advising responsible Governments of possible problems and calling the Organization's attention to possible issues of compliance. An acceptable reporting format is reproduced in the *Consolidated Guidance for port reception facility providers and users* (MEPC.1/Circ.834), along with the procedure for submitting and handling such reports.

6.2.2 Governments should develop a strategy to assess or audit port reception facilities under their jurisdiction. Detailed guidance in this regard is provided by the Organization. At a

[11] Refer to the *2012 Guidelines for the development of a regional reception facilities plan* (resolution MEPC.221(63).

minimum, periodic inspection of the reception facilities is recommended and consideration should be given to establishing a documentation system (e.g. letters or certificates) stating that adequate facilities are available for receiving ship-generated garbage.

6.2.2.1 Governments are encouraged to improve the adequacy and efficiency of existing port reception facilities for fishing gear.

6.2.3 Governments should identify appropriate agencies for enforcement and facilitating compliance and provide legal authority, adequate training, funding and equipment to incorporate the goals and objectives under MARPOL Annex V regulations into their responsibilities. In those cases where customs or agricultural officials are responsible for receiving and inspecting garbage, Governments should ensure that the inspections are facilitated.

6.2.4 Governments should consider the use of garbage management reporting systems. Such reporting systems may provide valuable data for measuring and monitoring the impacts of garbage regulations and management and identifying trends over time. A reporting system could be based on the information in garbage record books (where applicable) or ship's official log-book. In addition, advance notification forms and garbage reception receipts could provide input into the garbage reporting system.

6.2.5 A garbage management reporting system may also include reporting of discharges of garbage. Particular attention should be given to the reporting of any discharge in special areas or Arctic waters; discharge at port reception facilities; and discharge of garbage into the sea. Reports should include the date, time, location by latitude and longitude or name of port, type of garbage and estimated amount of garbage discharged. Particular attention should be given to the reporting of:

.1 the loss of fishing gear;

.2 the discharge of cargo residues;

.3 any discharge in special areas or Arctic waters ;

.4 discharge at port reception facilities; and

.5 discharge of garbage into the sea, in those limited situations where permitted.

6.2.6 The issuance of documents or receipts (i.e. IMO standard forms) by port reception facilities might also be used in maintaining a garbage management reporting system.

6.3 Compliance incentive systems

6.3.1 The augmentation of port reception facilities to serve ship traffic without undue delay or inconvenience may call for capital investment from port and terminal operators as well as the garbage management companies serving those ports. Governments are encouraged to evaluate means within their authority to lessen this impact, thereby helping to ensure that garbage delivered to port is actually received and disposed of properly at reasonable cost or without charging special fees to individual ships. Such means could include, but are not limited to:

.1 tax incentives;

.2 loan guarantees;

.3 public ship business preference;

.4 special funds to assist in problem situations such as remote ports with no land-based garbage management system in which to deliver ships' garbage;

.5 Government subsidies; and

.6 special funds to help defray the cost of a bounty programme for lost, abandoned or discarded fishing gear or other persistent garbage. The programme would make appropriate payments to persons who retrieve such fishing gear, or other persistent garbage other than their own, from marine waters under the jurisdiction of Government.

6.3.2 The minimization of taking packaging on board and the installation of shipboard garbage management handling and processing equipment would facilitate compliance with MARPOL Annex V and lessen the burden on port reception facilities to process garbage for discharge. Therefore, Governments might consider actions to encourage the reduction of packaging and the installation of certain types of garbage processing equipment on ships operating under their flag. For example, programmes to lessen costs to shipowners for purchasing and installing such equipment, or requirements for installing compactors, incinerators and comminuters during construction of new ships could be very helpful.

6.3.3 Governments are encouraged to consider the economic impacts of domestic regulations intended to ensure compliance with MARPOL Annex V. Due to the highly variable nature of ship operations and configurations, consideration should be given in domestic regulations to permitting ships the greatest range of options for complying with the Annex. However, any range of options needs to be consistent with the Annex and should facilitate implementation and compliance.

6.3.4 Governments are encouraged to support research and development of technology that facilitates compliance of ships and ports with MARPOL Annex V regulations. This research should concentrate on:

.1 minimization of packaging;

.2 shipboard garbage handling systems;

.3 ship provision innovations to minimize garbage generation;

.4 loading, unloading and cleaning technologies to minimize dunnage, spillage and cargo residues;

.5 new ship construction design to facilitate garbage management and transfer and to minimize retention of cargo in ship holds; and

.6 wharf and berth design to facilitate garbage management and transfer.

6.3.5 Governments are encouraged to work within the Organization to develop port reception systems that simplify the transfer of garbage for ships engaged on international voyages.

6.4 Voluntary measures

6.4.1 Governments are encouraged to assist ship operators and seafarers' organizations in developing resolutions, by-laws and other internal mechanisms that encourage compliance with MARPOL Annex V regulations. Such groups include:

.1 seamen and officer unions;

.2 associations of shipowners, insurers and classification societies;

.3 pilot associations; and

.4 fishermen's organizations.

6.4.2 Governments are encouraged to assist and support, where possible, the development of mechanisms to promote compliance with MARPOL Annex V among port authorities, terminal operators, stevedores, longshoremen and land-based garbage management authorities.

APPENDIX

SAMPLE PLACARDS

Sample placard targeting crew and shipboard operations

Discharge of all garbage into the sea is prohibited except provided otherwise

The MARPOL Convention and domestic law prohibit the discharge of most garbage from ships. Only the following garbage types are allowed to be discharged and under the specified conditions.

Outside special areas designated under MARPOL Annex V and Arctic waters:

- Comminuted or ground food wastes (capable of passing through a screen with openings no larger than 25 mm) may be discharged not less than 3 nm from the nearest land.

- Other food wastes may be discharged not less than 12 nm from the nearest land.

- Cargo residues classified as not harmful to the marine environment may be discharged not less than 12 nm from the nearest land.

- Cleaning agents or additives in cargo hold, deck and external surfaces washing water may be discharged only if they are not harmful to the marine environment.

- With the exception of discharging cleaning agents or additives that are not harmful to the marine environment and are contained in washing water, the ship must be en route and as far as practicable from the nearest land.

Within special areas designated under MARPOL Annex V and Arctic waters

- More stringent discharge requirements apply for the discharges of food wastes and cargo residues; AND

- Consult MARPOL Annex V, chapter 5 of part II-A of the Polar Code and the shipboard garbage management plan for details.

For all areas of the sea, ships carrying specialized cargoes such as live animals or solid bulk cargoes should consult Annex V and the associated Guidelines for the implementation of Annex V.

Discharge of any type of garbage must be entered in the Garbage Record Book
Violation of these requirements may result in penalties.

Sample placard targeting fixed or floating platforms and ships operating within 500 m of such platforms

Discharge of all garbage into the sea is prohibited except provided otherwise

The MARPOL Convention and domestic law prohibit the discharge of all garbage into the sea from fixed or floating platforms and from all other ships when alongside or within 500 metres of such platforms.

Exception: Comminuted or ground food wastes may be discharge from fixed or floating platforms located more than 12 miles from the nearest land and from all other ships when alongside or within 500 metres of such platforms. Comminuted or ground food wastes must be capable of passing through a screen no larger than 25 millimetres.

Discharge of any type of garbage must be entered in the Garbage Record Book
Violation of these requirements may result in penalties.

Sample placard targeting passengers

Discharge of all garbage into the sea is prohibited except provided otherwise

The MARPOL Convention and domestic law generally prohibit the discharge of most forms of garbage from ships into the sea.

Violation of these requirements may result in penalties.

All garbage is to be retained on board and placed in the bins provided.

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9 December 2016

UNIFIED INTERPRETATIONS OF REGULATIONS 1.24, 12, 27 AND 28.3.3 OF MARPOL ANNEX I

1 The Marine Environment Protection Committee, at its seventieth session (24 to 28 October 2016), approved unified interpretations of regulations 1.24, 12, 27 and 28.3.3 of MARPOL Annex I (MEPC 70/18, paragraphs 10.6, 17.13 and 17.27, and annex 13), as attached at annex hereto.

2 Member Governments are invited to apply the annexed unified interpretations to MARPOL Annex I and bring them to the attention of all parties concerned.

ANNEX

UNIFIED INTERPRETATIONS OF REGULATIONS 1.24, 12, 27 AND 28.3.3 OF MARPOL ANNEX I

Regulation 1- Definitions

Lightweight

Regulation 1.24

The weight of mediums on board for the fixed fire-fighting systems (e.g. freshwater, CO_2, dry chemical powder, foam concentrate, etc.) should be included in the lightweight and lightship condition.

Regulation 12 – Tanks for oil residues (sludge)

Capacity of oil residue (sludge) tanks

Regulation 12.3.1

1 To assist Administrations in determining the adequate capacity of oil residue (sludge) tanks, the following criteria may be used as guidance. These criteria should not be construed as determining the amount of oily residues which will be produced by the machinery installation in a given period of time. The capacity of oil residue (sludge) tanks may, however, be calculated upon any other reasonable assumptions. For a ship the keel of which is laid or which is at a similar stage of construction on or after 31 December 1990, the guidance given in items .4 and .5 below should be used in lieu of the guidance contained in items .1 and .2.

.1 For ships which do not carry ballast water in oil fuel tanks, the minimum oil residue (sludge) tank capacity (V_1) should be calculated by the following formula:

V_1 = $K_1CD(m^3)$ where:

K_1 = 0.01 for ships where heavy fuel oil is purified for main engine use, or 0.005 for ships using diesel oil or heavy fuel oil which does not require purification before use;

C = daily fuel oil consumption (metric tons); and

D = maximum period of voyage between ports where oil residue (sludge) can be discharged ashore (days). In the absence of precise data a figure of 30 days should be used.

.2 When such ships are fitted with homogenizers, oil residue (sludge) incinerators or other recognized means on board for the control of oil residue (sludge), the minimum oil residue (sludge) tank capacity (V_1) should, in lieu of the above, be:

V_1 = 1 m^3 for ships of 400 gross tonnage and above but less than 4,000 gross tonnage, or 2 m^3 for ships of 4,000 gross tonnage and above.

.3 For ships which carry ballast water in fuel oil tanks, the minimum oil residue (sludge) tank capacity (V_2) should be calculated by the following formula:

$V_2 = V_1 + K_2B(\ m^3)$ where:

V_1 = oil residue (sludge) tank capacity specified in .1 or .2 above in m^3;

K_2 = 0.01 for heavy fuel oil bunker tanks, or 0.005 for diesel oil bunker tanks; and

B = capacity of water ballast tanks which can also be used to carry oil fuel (tonnes).

.4 For ships which do not carry ballast water in fuel oil tanks, the minimum oil residue (sludge) tank capacity (V_1) should be calculated by the following formula:

$V_1 = K_1CD(m^3)$ where:

K_1 = 0.015 for ships where heavy fuel oil is purified for main engine use or 0.005 for ships using diesel oil or heavy fuel oil which does not require purification before use;

C = daily fuel oil consumption (m^3); and

D = maximum period of voyage between ports where oil residue (sludge) can be discharged ashore (days). In the absence of precise data a figure of 30 days should be used.

.5 For ships where the building contract is placed, or in the absence of a building contract, the keel of which is laid before 1 July 2010, and which are fitted with homogenizers, oil residue (sludge) incinerators or other recognized means on board for the control of oil residue (sludge), the minimum oil residue (sludge) tank capacity should be:

.5.1 50% of the value calculated according to item .4 above; or

.5.2 1 m^3 for ships of 400 gross tonnage and above but less than 4,000 gross tonnage or 2 m^3 for ships of 4,000 gross tonnage and above; whichever is the greater.

2 Administrations should establish that in a ship the keel of which is laid or which is at a similar stage of construction on or after 31 December 1990, adequate tank capacity, which may include the oil residue (sludge) tank(s) referred to under 1.1 above, is available also for leakage, drain and waste oils from the machinery installations. In existing installations this should be taken into consideration as far as reasonable and practicable.

Designated pump disposal

Regulation 12.3.2

A designated pump should be interpreted as any pump used for the disposal of oil residue (sludge) through the standard discharge connection referred to in regulation 13, or any pump used to transfer oil residue (sludge) to any other approved means of disposal such as an incinerator, auxiliary boiler suitable for burning oil residues (sludge) or other acceptable means which are prescribed in paragraph 3.2 of the Supplement to IOPP Certificate Form A or B.

No discharge connection

Regulation 12.3.3

A screw-down non-return valve, arranged in lines connecting to common piping leading to the standard discharge connection required by regulation 13, provides an acceptable means to prevent oil residue (sludge) from being transferred or discharged to the bilge system, oily bilge water holding tank(s), tank top or oily water separators.

Overboard connection of oil residue (sludge) tanks

Regulation 12.3.4

Ships having piping to and from oil residue (sludge) tanks to overboard discharge outlets, other than the standard discharge connection referred to in regulation 13 installed prior to 4 April 1993 may comply with regulation 12.3.4 by the installation of blanks in this piping.

Cleaning of oil residue (sludge) tanks and discharge of residues

Regulation 12.3.5

To assist Administrations in determining the adequacy of the design and construction of oil residue (sludge) tanks to facilitate their cleaning and the discharge of residues to reception facilities, the following guidance is provided, having effect on ships the keel of which is laid or which is at a similar stage of construction on or after 31 December 1990:

.1 sufficient man-holes should be provided such that, taking into consideration the internal structure of the oil residue (sludge) tanks, all parts of the tank can be reached to facilitate cleaning;

.2 oil residue (sludge) tanks in ships operating with heavy oil, that needs to be purified for use, should be fitted with adequate heating arrangements or other suitable means to facilitate the pump ability and discharge of the tank content;

.3 the oil residue (sludge) tank should be provided with a designated pump for the discharge of the tank content to reception facilities. The pump should be of a suitable type, capacity and discharge head, having regard to the characteristics of the liquid being pumped and the size and position of tank(s) and the overall discharge time; and

.4 where any oil residue (sludge) tank (i.e. oil residue (sludge) service tank[1]) that directly supplies oil residue (sludge) to the means of the disposal of oil residues (sludge) prescribed in paragraph 3.2 of the Supplement to IOPP Certificate Form A or B is equipped with suitable means for drainage, the requirements in sub-paragraph .3 above may not be applied to the oil residue (sludge) tank.

Regulation 27 – Intact stability

1 For proving compliance with regulation 27, either sub-paragraph .1 or .2, below, should be applied:

.1 The ship should be loaded with all cargo tanks filled to a level corresponding to the maximum combined total of vertical moment of volume plus free surface inertia moment at 0° heel, for each individual tank. Cargo density should correspond to the available cargo deadweight at the displacement at which transverse KM reaches a minimum value, assuming full departure consumables and 1% of the total water ballast capacity. The maximum free surface moment should be assumed in all ballast conditions. For the purpose of calculating GMo, liquid free surface corrections should be based on the appropriate upright free surface inertia moment. The righting lever curve may be corrected on the basis of liquid transfer moments.

.2 An extensive analysis covering all possible combinations of cargo and ballast tank loading should be carried out. For such extensive analysis conditions, it is considered that:

.1 weight, centre of gravity coordinates and free surface moment for all tanks should be according to the actual content considered in the calculations; and

.2 the extensive calculations should be carried out in accordance with the following:

.1 the draughts should be varied between light ballast and scantling draught;

.2 consumables including, but not restricted to, fuel oil, diesel oil and fresh water corresponding to 97%, 50% and 10% content should be considered;

.3 for each draught and variation of consumables, the available deadweight should comprise ballast water and cargo, such that combinations between maximum ballast and minimum cargo and vice versa, are covered. In all cases the number of ballast and cargo tanks loaded is to be chosen to reflect the worst combination of VCG and free surface effects. Operational limits on the number of tanks considered to be simultaneously slack and exclusion of specific tanks should not be permitted. All ballast tanks should have at least 1% content;

[1] "Oil residue (Sludge) Service tank" means a tank for preparation of oil residue (sludge) for incineration as defined in paragraph 5.3.3 of the appendix to the annex to the 2008 Revised *Guidelines for systems for handling oily wastes in machinery spaces of ships incorporating guidance notes for an integrated bilge water treatment system (IBTS)* (MEPC.1/Circ.642), as amended by MEPC.1/Circ.676 and MEPC.1/Circ.760.

.4 cargo densities between the lowest and highest intended to be carried should be considered; and

.5 sufficient steps between all limits should be examined to ensure that the worst conditions are identified. A minimum of 20 steps for the range of cargo and ballast content, between 1% and 99% of total capacity, should be examined. More closely spaced steps near critical parts of the range may be necessary.

At every stage, the criteria described in regulations 27.1.1 and 27.1.2 of MARPOL Annex I are to be met.

2 In applying θ_f, openings which "cannot be closed weathertight" include ventilators (complying with regulation 19(4) of the International Convention on Load Lines, 1966) that for operational reasons have to remain open to supply air to the engine room or emergency generator room (if the same is considered buoyant in the stability calculation or protecting openings leading below) for the effective operation of the ship.

Regulation 28 – Subdivision and damage stability

Regulation 28.3.3

Other openings capable of being closed weathertight do not include ventilators (complying with regulation 19(4) of the International Convention on Load Lines, 1966) that for operational reasons have to remain open to supply air to the engine room or emergency generator room (if the same is considered buoyant in the stability calculation or protecting openings leading below) for the effective operation of the ship.

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UNIFIED INTERPRETATIONS OF REGULATIONS 1.23 AND 36.2.10 OF MARPOL ANNEX I

1 The Marine Environment Protection Committee, at its seventy-first session (3 to 7 July 2017), approved unified interpretations of regulations 1.23, concerning the deadweight to be stated on certificates, and 36.2.10, concerning terminal hose flush water, of MARPOL Annex I (MEPC 71/17, paragraphs 9.10 and 10.7 and annex 20), as attached at the annex hereto.

2 Member Governments are invited to apply the annexed unified interpretations to MARPOL Annex I and bring them to the attention of all parties concerned.

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ANNEX

UNIFIED INTERPRETATIONS OF REGULATIONS 1.23 AND 36.2.10 OF MARPOL ANNEX I

Regulation 1 – Definitions

Deadweight to be stated on certificates

Interpretation of regulation 1.23

Even-keel hydrostatics should be used to determine the regulatory deadweight to be entered on relevant statutory certificates.

Regulation 36 – Oil Record Book Part II – Cargo/Ballast operations

Terminal hose flush water

Interpretation of regulation 36.2.10

When the master of an oil tanker agrees to accept terminal hose flush water from a Single Point Mooring (SPM) or a Conventional Buoy Mooring (CBM), that flush water should be categorized as the disposal of residues under regulation 36.2.10. Appropriate entries should be made under Item J of Part II of the Oil Record Book. The following are examples of how these entries should be made:

.1 At the load port where the flush water is received by the tanker, use the suggested wording for remarks:

(J) 55 At the request of (terminal xxxx), terminal line flush water (seawater) has been loaded into the ship's xxx tank
56 xxx m^3 flush water
57.4 Transferred from terminal xxxx line/hoses. Total quantity in xxx tank ….. m^3;

and

.2 At the discharge port where the flush water is disposed of by the tanker:

(J) 55 xxx tank
56 xxx m^3, quantity retained in tank: xxx m^3
57.1 a quantity of xxx m^3 terminal line flush water received at the loading port terminal (xxx) was disposed/transferred to terminal xxx facility.