Status of Ballast Water Discharge Regulations in the Great Lakes Region

Prepared by the Great Lakes Commission

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PREFACE

This document summarizes the current state of international, national and state rules in the Great Lakes-St. Lawrence River region for regulation of ballast water discharge from commercial vessels in order to prevent the introduction and spread of aquatic invasive species. It is intended is to provide information to support ongoing policy and management discussions by outlining the primary regulatory vehicles and approaches used by different jurisdictions, as well as key commonalities and differences.

Ballast water regulatory regimes are being implemented at the international, national and state levels. Until recently, regimes have required ballast water exchange and saltwater flushing for oceangoing vessels entering the Great Lakes-St. Lawrence River system. Agencies are adopting numeric standards for the concentration of living organisms in ballast water discharge and it is expected that, initially, vessel owners will comply with these requirements by installing treatment technology. These numeric standards are derived from the 2004 International Maritime Organization (IMO) adopted the *International Convention for the Control and Management of Ships' Ballast Water and Sediments*. The Convention will enter into force on September 8, 2017. Canada ratified the IMO convention in 2010 and is beginning to develop implementing regulations. Although the U.S. is not likely to ratify the IMO Convention, both U.S. Coast Guard (USCG) discharge rules and the U.S. Environmental Protection Agency (USEPA) 2013 Vessel General Permit (VGP) use the IMO discharge standards as the basis of their respective regulatory regimes. Great Lakes states have also taken action through enactment of individual laws and permit requirements that vary in some specific ways from the federal requirements.

The U.S. Coast Guard and IMO discharge standards have been determined to be a technologically achievable and practicable standard by some federal and state agencies; however, some have questioned whether they provide sufficient protection for the Great Lakes and St. Lawrence River. Some of the regulatory regimes retain ballast water exchange/saltwater flushing requirements in addition to the numeric standards, citing a potential for added protection by combining the two approaches. There is also debate over how to address "laker" vessels, i.e., vessels that remain within the Great Lakes and St. Lawrence River system. These are key points to address in policy and management discussions regarding opportunities to harmonize approaches, reduce burden on industry, and protect the water resources of the Great Lakes and St. Lawrence River.

TERMINOLOGY

Definitions

Ballast water: any water and suspended matter taken on board a vessel to control or maintain, trim, draft, stability, or stresses of the vessel, regardless of how it is carried

Ballast water capacity: the total volumetric capacity of any tanks, spaces, or compartments for carrying, loading, or discharging ballast water, including any multi-use tanks, space or compartment designed to allow carriage of ballast water

International Maritime Organization: the United Nations specialized agency with responsibility for the safety and security of shipping and the prevention of marine pollution by ships

Ballast water exchange: to replace the water in a ballast tank, using one of the following methods:

- "Empty/refill exchange" means to pump out the "ballast water" taken on in ports, estuarine, or territorial waters until the tank is empty, then refilling it with water
- "Flow through exchange" means to flush out "ballast water" by pumping in water into the bottom of the tank and continuously overflowing the tank from the top until three full volumes of water has been changed to minimize the number of original organisms remaining in the tank (USCG and USEPA)

Laker vessel or laker: vessels that operate exclusively in Lake Ontario, Lake Erie, Lake Huron (including Lake St. Clair), Lake Michigan, Lake Superior, and the connecting channels (St. Marys River, St. Clair River, Detroit River, Niagara River, and St. Lawrence River), including all other bodies of water within the drainage basin of such lakes and connecting channels (USEPA)

Existing vs. new vessel: vessels are differentiated as "existing" or "new" in ballast water regulations using their date of construction; vessels constructed before the specified date are considered "existing" and vessels built after the specified date are considered "new"

- The USCG and USEPA and the states of Indiana and Wisconsin define existing vs. new vessels using the date December 1, 2013
- The state of Minnesota defines existing vs. new vessels using the date January 1, 2012

Oceangoing vessel: a vessel that operates beyond the U.S. boundary line established by 46 CFR part 7 (USCG); the Great Lakes do not have any boundary lines per 46 CFR part 7, the western end of Anticosti Island is used as a line of demarcation for applying ballast water treatment requirements for any vessels that operate along the coast and in and out of the Great lakes and St. Lawrence Seaway.

Saltwater flushing: the addition of ocean water to empty ballast water tanks; the mixing of the added water with residual ballast water and sediment through the motion of the vessel; and the discharge of the mixed water until loss of suction, such that the resulting residual water remaining in the tank reaches a specified salinity (USEPA)

Abbreviations

BW	ballast water	NAS	National Academy of Sciences
BWE	ballast water exchange	NISA	National Invasive Species Act of 1996
BWM	ballast water management	NPDES	National Pollutant Discharge Elimination System
BWTS	ballast water treatment system		
CSA	Canadian Shipowners Association	NOBOB	No ballast on board
CWA	Clean Water Act	NANPCA	Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990
USCG	U.S. Coast Guard		
cfu	colony forming unit(s)	SAB	Science Advisory Board
USEPA	U.S. Environmental Protection Agency	SF	saltwater flushing
EEZ	Exclusive Economic Zone	TBEL	technology based effluent limit
GLSLS	Great Lakes-St. Lawrence Seaway	VGP	Vessel General Permit
GLWQA	Great Lakes Water Quality Agreement	WQBEL	water quality based effluent limit
IMO	International Maritime Organization		

I. International and Federal Ballast Water Discharge Regulations

International Maritime Organization

The International Maritime Organization (IMO) adopted the *International Convention for the Control and Management of Ships' Ballast Water and Sediments* in 2004. The IMO Convention "aims to prevent the spread of harmful aquatic organisms from one region to another, by establishing standards and procedures for the management and control of ships' ballast water and sediments." The Convention applies to oceangoing ships and requires a ship-specific ballast water management plan, record book and international ballast water management certificate. The Convention also establishes ballast water standards to be phased in over a period of time. These standards include both a ballast water exchange standard (Regulation D-1) and a ballast water performance standard (Regulation D-2). The D-1 exchange standard is required only until the D-2 performance standard goes into effect. The Convention requires a review of the D-2 performance standard considering several criteria and including a determination of whether technology is available to meet the standard. The Convention will enter into force 12 months after it has been ratified by 30 member states, representing at least 35 percent of the world's merchant shipping tonnage. On September 8, 2016, the Convention met the minimum ratification requirements and is now ratified by 53 states representing 53.28 percent of the world's merchant shipping tonnage (as of 10/31/2016). The Convention will enter into force on September 8, 2017. The U.S. has not ratified the Convention; Canada ratified the Convention in 2010.

The IMO is currently reconsidering the implementation timeline for the requirements. The original timeline was set prior to full ratification and needs to be revised. The IMO adopted Resolution A.1088(28) in December 2013 that established an agreement to defer enforcement of the D-2 standard for existing vessels until their first IOPP renewal survey[1] following entry into force. This resolution forms the basis for a draft amendment that has been agreed to by the IMO Marine Environment Protection Committee (MEPC), and which will be circulated immediately following entry into force for consideration of adoption. A subsequent proposal has been put forward to extend the period following entry into force for some ships to the second IOPP renewal survey following entry into force (alternative proposals are possible when the draft amendment comes under consideration). The MEPC is scheduled to meet again July 2017.

More Information

- IMO Ballast Water Management
- IMO Ballast Water Convention

U.S. Coast Guard

Under authority provided through the Nonindigenous Aquatic Nuisance Prevention and Control Act (NANPCA), the U.S. Coast Guard (USCG) began requiring ballast water exchange for vessels entering the Great Lakes in 1993. This requirement was expanded nationwide in 2004 pursuant to requirements in the 1996 reauthorization of NANPCA, the National Invasive Species Act (NISA). Vessels declaring 'no ballast on board' (NOBOB) were exempt from these requirements. In 2009, USCG issued a "Notice of Proposed Rulemaking" proposing standards for the allowable concentration of living organisms in ships' ballast water discharged in U.S. waters. This rulemaking was finalized in March 2012 and went into effect in June 2012. The final rule requires all ocean-going vessels, including NOBOBs, to meet ballast water management (BWM) requirements. Vessels have a range of options, including the use of water from a U.S. Public Water System (PWS), discharge to reception facilities, or installation and use of an approved treatment technology, to meet the numeric discharge standard. This standard is nearly same as the IMO performance standard, but differs by targeting "living" organisms, while the IMO standard specifies "viable" (i.e., able to reproduce) organisms.

Existing ships must meet the management requirement by their first scheduled dry-docking after January 1, 2016 (or January 1, 2014 for ships with a certain ballast water capacity). The USCG may grant an extension to the implementation schedule only in those cases where the master, owner, operator, agent, or person in

[1] International Oil Pollution Prevention Certificate (IOPP), Renewal Survey, carried out every 5 years

charge of a vessel can document that, despite all efforts, compliance with the ballast water management requirement is not possible. Currently, no ballast water ballast water treatment systems (BWTS) have been type-approved by the USCG for use. Further, exclusive use of PWS or discharge to facilities are currently impracticable. Vessels also have the option of using a system that has been accepted as an alternate management system (AMS). An AMS is a BWTS that has been approved by a foreign administration under the International Ballast Water Management Convention, and temporarily accepted by the USCG for use in lieu of BWE. Under the AMS provision, an AMS installed on a ship prior to the ship's compliance date may also be used for up to 5 years after the compliance date. It is expected that this 5-year window will provide sufficient time for the AMS manufacturer to obtain USCG type approval, or for the ship owner to make arrangements for replacing the AMS with use of an approved management method (e.g., installation of a USCG approved BWM system). Alternatively, vessels wishing to use PWS to ballast must either have previously cleaned the ballast tanks (including removing all residual sediments) and not subsequently introduced ambient water; or have never introduced ambient water to those tanks and supply lines. The USCG rules do not require confined lakers to meet the discharge standard and it do not require BWE/SF once the standard goes into effect.

The USCG press release states that the "numerical limits set by the discharge standard in this Final Rule were supported by reports from the National Academy of Science and the U.S. Environmental Protection Agency Science Advisory Board in 2011 as the most stringent that vessels can practicably implement and that the Coast Guard can enforce at this time."[2] USCG findings published in the final rule also state that existing BWE requirements are not a desirable long-term approach because "results from several studies have shown the effectiveness of BWE varies considerably and is dependent on vessel type (design), exchange method, ballasting system configuration, exchange location, and method of study" and "a significant number of vessels are constrained by design or route from conducting BWE in compliance with existing regulations prior to their arrival into waters of the United States."[3]

The USCG is required to conduct a practicability review to determine if more stringent requirements can be met and update standards by no later than January 1, 2017. This practicability review was completed and published in the Federal Register on May 11, 2016. The review concludes that "at this time, technology to achieve a significant improvement in ballast water treatment efficacy onboard vessels cannot be practicably implemented. The reason for this determination is that, as of the date of completion of the Practicability Review, there are no data demonstrating that ballast water management systems can meet a discharge standard more stringent than the existing performance standards."[4]

More Information

- USCG Ballast Water Management
- Code of Federal Regulation

U.S. Environmental Protection Agency

In 2008, the U.S. Environmental Protection Agency (USEPA) issued the Vessel General Permit (VGP). This action followed a 2006 U.S. District Court decision vacating USEPA's longstanding permit exclusion of discharges incidental to the normal operation of a vessel (including ballast water discharges) under the Clean Water Act (CWA) National Pollutant Discharge Elimination System (NPDES). The VGP provides NPDES permit coverage for 25 incidental discharges into waters of the U.S. from commercial vessels greater than 79 feet in length and for ballast water from commercial vessels of all sizes. The 2008 VGP reflected, at the time, existing USCG mandatory ballast water management and exchange standards. Consistent with CWA section 401 for state

[2] U.S. Coast Guard. Coast Guard Issues Standard for Living Organisms in Ships' Discharged Ballast Water. News Release. March 16, 2012. http://www.uscgnews.com/go/doc/4007/1410847/Coast-Guard-issues-standard-for-living-organisms-in-ships-discharged-ballast-water

[3] U.S. Coast Guard. Standards for Living Organisms in Ships' Ballast Water Discharged in U.S. Waters; Final Rule. Federal Register, Vol. 77, No. 57. March 23, 2012. http://www.gpo.gov/fdsys/pkg/FR-2012-03-23/pdf/2012-6579.pdf.

[4] U.S. Coast Guard. Practicability Review: Standards for Living Organisms in Ships' Ballast Water Discharged in United States Waters. Federal Register, Vol. 81, No. 91. May 11, 2016. https://www.gpo.gov/fdsys/pkg/FR-2016-05-11/pdf/2016-11129.pdf.

certification of USEPA permits, a state may include additional permit conditions it deems necessary to further protect water quality in its state. A number of states provided such conditions in their certifications and EPA added them to the VGP pursuant to CWA section 401(d).

The 2008 VGP was issued for a five-year period, expiring in December 2013. In March 2013, the USEPA issued the 2013 VGP to replace the 2008 permit. The 2013 VGP, which will expire in December 2018, requires ocean-going vessels to meet a discharge standard equivalent to the IMO performance standard (IMO D-2) and, with a few notable exceptions, generally aligns with the USCG final rule. One difference is that the VGP contains discharge monitoring requirements to demonstrate BWTS are functioning correctly. In addition, the VGP retains the BWE/SF requirement for ships entering the Great Lakes-St. Lawrence River system. A number of Great Lakes states continued to impose state-specific 401 certification requirements on the 2013 VGP. USEPA found that this 401 certification had unusual circumstances which warranted additional time and provided over 9 months for the certification process, as opposed to the 60-day regulatory norm for NPDES permits.

The 2013 permit requires ocean-going vessels to meet a discharge standard equivalent to the IMO performance standard (IMO D-2) by their first scheduled dry-docking after January 1, 2016 (or January 1, 2014 for ships with a certain ballast water capacity) for existing vessels, defined as vessels built prior to December 1, 2013. Vessels built after December 1, 2013 are expected to have technology installed that allows vessels to meet this standard upon delivery. The USEPA "does not require the use of U.S. government approved pollution prevention systems" for purposes for the VGP; but provides the option of using either a U.S. or other foreign government approved system as necessary to meet this discharge standard.[5]

In December 2013, USEPA, in consultation with USCG, issued an Enforcement Response Policy, noting that there are no USCG approved BWTS, and therefore, vessel owner/operators who have received an extension of their compliance deadline from the USCG, and have complied with all other applicable BWM requirements under USCG rule and the VGP, would be considered a low enforcement priority for their failure to comply with the VGP's numeric ballast water effluent limits.

Lakers built prior to 2009 (existing lakers) are exempt from the meeting the discharge standard but are required to conduct best management practices. Lakers built after 2009 (new lakers) must meet the numeric discharge standard consistent with the implementation schedule for ocean-going vessels. In the permit reissuance notice, the EPA justifies this decision of "January 1, 2009 as the cutoff date because this is the date that IMO originally first required treatment for some new build vessels. Any vessel owner/operators building or contracting vessels after this date were well aware of the need to design their systems to meet ballast water discharge limits and EPA therefore assumes that such vessels were so designed."[6] New lakers must also conduct the BMPs required of all vessels, but are not required to meet the additional BMPs required of existing lakers. Vessels owned by the Canadian Shipowners Association (CSA) are not subject to EPA regulations.

The USEPA and USCG jointly commissioned two scientific studies to inform understanding of ballast water discharges. USEPA considered the results of these studies in developing the VGP. The National Research Council of the National Academies of Science (NAS) study "Assessing the Relationship Between Propagule Pressure and Invasion Risk in Ballast Water," released in June 2011, provided technical advice to inform the derivation of numeric standards. Based on this report, USEPA determined that developing a ***numeric*** water-quality based effluent limit would be "infeasible to calculate" at the time, given "available data and information."[7] A second report, "Efficacy of Ballast Water Treatment Systems: A Report by the EPA Science

[5] U.S. Environmental Protection Agency. National Pollutant Discharge Elimination System (NPDES) » Vessels-Frequent Questions. https://www.epa.gov/npdes/vessels-frequent-questions

[6] U.S. Environmental Protection Agency. 2013 Final Issuance of National Pollutant Discharge Elimination System (NPDES) Vessel General Permit (VGP) for Discharges Incidental to the Normal Operation of Vessels Fact Sheet. http://www.epa.gov/npdes/pubs/vgp_fact_sheet2013.pdf

[7] Ibid.

Advisory Board (SAB)," evaluated the status of ballast water treatment technologies. The July 2011 report found that systems exist to meet the IMO D-2 standard and that some of those systems may achieve a limit 10 times more stringent; however, due to the detection limitations of current monitoring technology and approaches, the SAB could not definitively determine whether systems could meet this more stringent limit.

USEPA cited the reason for retaining the BWE requirement for vessels entering the Great Lakes as adding "another measure of protection against invasive species to reduce the compatibility of source and recipient regions when freshwater or brackish water is transported via ballast tanks into the Great Lakes." [8] USEPA also wrote that "requiring BWE in addition to the application of effluent limits that reflect available treatment technologies… will achieve applicable water quality standards, as we expect continued BWE to further decrease the probability that non-native organisms will be introduced into and establish themselves in the Great Lakes." [9] Research cited documenting the effectiveness of BWE included

- Reid, D.F. (2012). The Role of Osmotic Stress (Salinity Shock) in Protecting the Great Lakes from Ballast-Associated Aquatic Invaders. Technical Report.
- Briski, E., Allinger, L. E., Balcer, M., Cangelosi, A., Fanberg, L., Markee, T. P., Mays, N., Polkinghorne, C. N., Prihoda, K. R., Reavie, E. D., Regan, D. H., Reid, D. M., Saillard, H. J., Schwerdt, T., Schaefer, H., TenEyck, M., Wiley, C. J., and Bailey, S. A. (2013). "Multidimensional Approach to Invasive Species Prevention." *Environmental Science & Technology*, 47(3), 1216-1221.

In addition, the USEPA VGP retains the saltwater flushing requirement because it has been shown to be an effective method of reducing AIS invasion risks from vessels with residual ballast water and/or sediment, such as NOBOB vessels, citing the following technical memorandum[10]:

- Ruiz, G.M., & Reid, D.F. (Ed.). (2007). Current state of understanding about the effectiveness of ballast water exchange (BWE) in reducing aquatic Nonindigenous species (ANS) introductions to the Great Lakes Basin and Chesapeake Bay, USA: synthesis and analysis of existing information (NOAA Technical Memorandum GLERL-142). Ann Arbor, MI: NOAA.

The USEPA's 2013 VGP was challenged in court and eventually heard in the U.S. Second Circuit Court of Appeals.[11] The court found that USEPA acted "arbitrarily and capriciously" in several of its VGP decisions and requirements.[12] Namely, the Court identified the following major issues with the permit:

- USEPA provided no evidence in the record as to why it did not impose a standard higher than the IMO D-2, but lower than 100 times as stringent as IMO;
- USEPA did not fully analyze onshore treatment and did not conduct a "cost-benefit" analysis comparing shipboard to onshore treatment;
- the justification for the exemption for lakers based on a lack of supply of updated shipboard systems is not legitimate because the best available technology (BAT) standard is meant to force technology;
- the justification for demarcating between pre- and post-2009 built lakers does not make sense; and
- the narrative water quality-based effluent limit lacked specificity and did not provide for monitoring.

The Court determined that USEPA ignored contrary evidence or failed to satisfactorily explain the choices it made, leading to the rejection of the permit aspects mentioned above. The Court upheld the VGP's technology-based monitoring provisions. The Court did not vacate the VGP, but instead allowed it to remain in place until the next issuance of the permit.

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[8] Ibid.
[9] Ibid.
[10] Ibid.
[11] United States Court of Appeals, Second Circuit. Natural Resources Defense Council v. United States Environmental Protection Agency. 2015. http://caselaw.findlaw.com/us-2nd-circuit/1714798.html
[12] Ibid.

More Information

- USEPA Vessel General Permit

Transport Canada

In 1989, Canada issued guidelines for voluntary BWE for vessels entering the Great Lakes. In 2000, these guidelines were expanded to cover all Canadian waters and were renamed the *Guidelines for the Control of Ballast Water Discharge from Ships in Waters under Canadian Jurisdiction, TP 13617*. In 2006, under the Canada Shipping Act 2001, all vessels entering Canada were required to manage their ballast water. The regulations required BWE as well as saltwater flushing for vessels entering the Great Lakes. The regulations also adopted the IMO D-2 performance standard for ballast water treatment; however, there are currently no obligations at this time for vessels to install BWTS. Vessels are expected to exchange or treat their ballast to the D-2 standard prior to discharge in waters under Canadian jurisdiction.

Canada ratified the IMO Convention in 2010 and the treatment requirement will go into effect when Canada brings the Convention into force through amendments to its Ballast Water Control and Management regulations. Although the regulatory process to implement the Convention is not formally begun, consultation has occurred. Transport Canada issued a discussion paper outlining a proposed regulatory approach to bring the Convention into force in Canada, and invited comment from Canadian and U.S. stakeholders. The proposed approach would require ships operating internationally to comply with the Convention, including Great Lakes ships that operate binationally. The proposed approach would also retain the BWE/SF requirements for vessels entering Canadian fresh waters. Canada's justification for retaining this requirement is that scientific research has shown that "residual ballast water and sediment is an important vector for introduction of ship-mediated non-native species" and "that exposure to high salinity is extremely effective in killing high-risk freshwater and estuarine organisms contained in residual ballast water and sediments."[13] The research cited for this justification is:

- Bailey, S.A., Deneau, M.G., Jean, L., Wiley, C.J., Leung, B. and MacIsaac, H.J. (2011) Evaluating efficacy of an environmental policy to prevent biological invasions. *Environmental Science and Technology 45,* 2554-2561.
- Duggan, I.C., van Overdijk, C.D.A., Bailey, S.A., Jenkins, P.T., Limén, H. and MacIsaac, H.J. (2005) Invertebrates associated with residual ballast water and sediments of cargo-carrying ships entering the Great Lakes. *Canadian Journal of Fisheries and Aquatic Science 62*, 2463-2474.

A number of comments were submitted on the paper, some of which raised "technical issues pertaining to both the efficacy of BWTS with respect to Great Lakes conditions and the feasibility of installing BWTS on Great Lakes ships." In response to the comments, Transport Canada commissioned two independent studies on the efficacy of BWTS and the feasibility of fitting them onboard ships that operate on the Great Lakes. Transport Canada held a one-day workshop to review study results. In March 2015, Transport Canada published a complete record of the technical comments, studies, workshop and associated information resulting from release of the discussion paper.[14] The summary conclusions reached by the agency following this process is that while "existing BWTS processes could be applicable to Great Lakes conditions and could be fit and operated on Great Lakes ships…there is a need to address the confirmation testing…and/or to allow the U.S. to complete its BWTS approval processes before Great Lakes shipowners can fit BWTS with confidence," and finally, that there are "technical challenges for ships operating primarily on the Great Lakes-St. Lawrence Seaway system."[15]

[13] Transport Canada. *Discussion Paper: Canadian Implementation of the Ballast Water Convention.* Oct. 26, 2012 (Rev. Dec. 21, 2012).
[14] Transport Canada. *Transactions on Ballast Water Treatment Systems for the Great Lakes-St. Lawrence Seaway System.* https://www.tc.gc.ca/eng/marinesafety/oep-environment-bwts-4444.html
[15] Ibid.

More Information

- Transport Canada, A Guide to Canada's Ballast Water Control and Management Regulations
- Transport Canada, Transactions on Ballast Water Treatment Systems for the Great Lakes-St. Lawrence Seaway System

Great Lakes-St. Lawrence Seaway

The U.S. and Canadian St. Lawrence Seaway agencies enacted saltwater flushing requirements for NOBOB vessels in 2008. In addition, lakers must agree to comply with voluntary best management practices.

More Information

- Great Lakes-St. Lawrence Seaway System, Ballast Water
- Shipping Federation of Canada, Code of Best Practices for Ballast Water Management
- Lake Carriers' Association and Canadian Shipowners Association, Voluntary Management Practices to Reduce the Transfer of Aquatic Nuisance Species Within the Great Lakes

Great Lakes Water Quality Agreement

The newly renegotiated Great Lakes Water Quality Agreement (GLWQA), signed by the U.S. and Canada in September 2012, requires the two federal governments to work together to "establish and implement programs and measures that protect the Great Lakes Basin Ecosystem from the discharge of Aquatic Invasive Species in Ballast Water." Specifically, Annex 5 of the agreement makes the following commitments in relation to ballast water:

- Preventing the release of harmful aquatic invasive species and pathogens as a result of accumulation of microorganisms, plants, algae, or animals on ships
- Preventing the discharge of aquatic invasive species in ballast water[16]

More Information

- Binational.net, Discharges from Vessels (Annex 5)
- USEPA, Great Lakes Water Quality Agreement
- Environment Canada, Great Lakes Water Quality Agreement

[16] Binational.net. Discharges from Vessels (Annex 5). https://binational.net/annexes/a5/.

Table 1. Summary of IMO and U.S. Federal Ballast Water Regulations

	IMO Convention[17] (February 2004)	**USCG Final Rule** (March 2012)	**EPA 2013 Vessel General Permit** (March 2013)
General Applicability	Ocean-going vessels	Ocean-going vessels Confined lakers are exempt from the discharge standard	Ocean-going vessels[18] (not owned by CSA) Lakers built prior to 2009 (not owned by CSA) are exempt from the discharge standard; BMPs are required
Requirements	Requires vessels to meet the D-1 ballast water exchange standard until the D-2 ballast water performance standard is phased in	BWE/SF **<u>until</u>** a vessel is required to meet the discharge standard with an approved BWM system. An alternate management system[19] (AMS) may be used if it was installed prior to the date the discharge standard goes into effect; the AMS may be used for up to 5 years after the discharge standard goes into effect	Best management practices (including BWE) until requirements to meet the numeric discharge standard[20]. Prohibits discharges violating applicable state water quality standards and maintains the BWE/SF requirement for vessels entering the Great Lakes in addition to meeting the discharge standard (water quality-based effluent limits).
Discharge Standard	D-2 performance standard: • Organisms > or = 50 micrometers: <10 ***viable*** organisms per cubic meter • Organisms < 50 micrometers and > or = 10 micrometers: <10 ***viable*** organisms per milliliter (mL) • Indicator microorganisms: ○ *Vibrio cholerae*: < 1 colony forming unit (cfu) per 100 mL (or < 1 cfu per 1 gram (wet weight) zooplankton samples) ○ E. coli: < 250 cfu per 100 mL ○ Intestinal enterococci: < 100 cfu per 100 mL	• Organisms > or = 50 micrometers: <10 living organisms per cubic meter • Organisms < 50 micrometers and > or = 10 micrometers: <10 living organisms per milliliter (mL) • Indicator microorganisms: ○ *Vibrio cholerae*: < 1 colony forming unit (cfu) per 100 mL ○ E. coli: < 250 cfu per 100 mL ○ Intestinal enterococci: < 100 cfu per 100 mL	• Organisms > or = 50 micrometers: <10 living organism per cubic meter • Organisms < 50 micrometers and > or = 10 micrometers: <10 living organisms per milliliter (mL) • Indicator microorganisms: ○ *Vibrio cholerae*: < 1 colony forming unit (cfu) per 100 mL ○ E. coli: < 250 cfu per 100 mL ○ Intestinal enterococci: < 100 cfu per 100 mL
Practicability Review	IMO is required to review the D-2 standard, taking into account a number of criteria. The review should include a determination of whether appropriate technologies are available to achieve the standard, an assessment of the specified criteria, and an assessment of the socio-economic effect(s).	Practicability Review published in the Federal Register on May 11, 2016 with determination on (1) whether a more stringent standard can be met and (2) whether testing protocols can be implemented that can accurately measure treatment efficacy to meet a more stringent standard.	EPA does not have a practicability review process; however, upon permit expiration (not to exceed 5 years), EPA must reissue the permit in compliance with the CWA, including conducting "Best Available Technology" and water quality analyses.
Implementation Schedule	The timeline in the original convention was set prior to its ratification and is in the process of being revised.	For vessels using a USCG approved BWMS: • New vessels constructed on or after Dec. 1, 2013: On delivery • Existing vessels constructed before Dec. 1, 2013: ○ BW capacity <1500 cubic meters: first drydocking after Jan. 1, 2016 ○ BW capacity 1500-5000 cubic meters: first drydocking after Jan. 1, 2014 ○ BW capacity > 5000 cubic meters: first drydocking after Jan. 1, 2016	• New lakers constructed after Jan. 1, 2009 and before Dec. 1, 2013: Must meet the standard on delivery, but are not required to install a BWTS. • New vessels constructed after Dec. 1, 2013: On delivery • Existing vessels constructed before Dec. 1, 2013: ○ BW capacity <1500 cubic meters: first drydocking after Jan. 1, 2016 ○ BW capacity 1500-5000 cubic meters: first drydocking after Jan. 1, 2014 ○ BW capacity > 5000 cubic meters: first drydocking after Jan. 1, 2016

[17] The Convention will enter into force on September 8, 2017

[18] Vessels operating in a capacity as a means of transportation; geographic jurisdiction out to 3 nautical miles and navigable waters (including inland waters)

[19] Alternate management system: a BWM system approved by a foreign administration that meets IMO standards and all applicable U.S. law requirements

[20] Inland and certain seagoing vessels less than 1600 gross registered tons; vessels operating exclusively within a limited area on short voyages; unmanned, unpowered barges; and vessels built before January 1, 2009 that operate exclusively in the Laurentian Great Lakes are exempt from the numeric discharge standard

II. Current U.S. Great Lakes State Ballast Water Discharge Regulations[21]

Illinois
The Illinois Environmental Protection Agency found that the 2013 USEPA VGP would comply with state water quality standards and issued a series of conditions on the permit. These conditions do not change the numeric ballast water discharge standard or implementation scheduled required by the VGP.

Indiana
The Indiana Department of Environmental Management certified the 2013 USEPA VGP with state conditions including a requirement that oceangoing vessels entering the GLSLS from beyond the EEZ to perform BWE/SF before entering the GLSLS. In addition, the state conditions reiterate the timeline for meeting VGP discharge standards for existing vessels (those constructed prior to Dec. 1, 2013) as the first scheduled drydocking after Jan. 1, 2016 and new vessels (those constructed after Dec. 1, 2013) prior to operation in Indiana state waters.

Michigan
Michigan passed legislation in 2005 requiring all oceangoing vessels engaging in port operations in the state to obtain a permit from the Michigan Department of Environmental Quality (MDEQ) beginning Jan. 1, 2007. This legislation also prohibits the discharge of any ballast water from oceangoing vessels in Michigan waters without a permit. The permit applies to oceangoing vessels that: a) engage in port operations in Michigan and do not discharge ballast water into state waters; b) discharge ballast water treated by one or more of the ballast water treatment methods specified in the permit; or c) have not otherwise been determined to need an individual permit. The permit allows for four types of ballast water treatment: (1) hypochlorite treatment; (2) chlorine dioxide treatment; (3) ultra violet light radiation treatment preceded by suspended solids removal; and (4) deoxygenation treatment. Any oceangoing vessel that discharges ballast water must use one of the approved treatment types. Permit applicants may propose and receive approval under an individual permit to use an alternate treatment method upon demonstration of effectiveness and environmental soundness. The general permit was first issued in 2006 and, following its expiration, was reissued in 2012 with minimal modifications. The current permit will expire in 2017 and MDEQ is working on updates to the permit.

The MDEQ has also issued conditions on the 2013 USEPA VGP. These conditions require oceangoing vessels engaging in port operations or discharging ballast water to obtain the aforementioned state permit. In addition, oceangoing vessels entering Michigan waters with ballast on board must perform BWE/SF in waters outside the EEZ and at least 200 nautical miles from shore.

Minnesota
The Minnesota State Legislature passed legislation in 2008 establishing ballast water management requirements. In response, the Minnesota Pollution Control Agency (MPCA) developed a ballast water discharge general permit which was issued in September 2008 and reissued in October 2013. The permit covers all commercial vessels, ocean-going and lakers, that transit the Minnesota waters of Lake Superior. The current state permit concurs with the VGP numeric discharge standards and implementation schedule. For lakers built prior to 2009, vessels must meet the numeric discharge requirements in the VGP by their first scheduled dry-docking after March 30, 2018, unless the permittee can demonstrate that the USCG has not type approved any ballast water treatment system commercially available and compatible for the permittee's vessel as of that date. The permit expires in September 2018.

The MPCA also issued state conditions on the 2013 USEPA VGP. These conditions require vessels to obtain a state permit ***and*** perform BWE/SF before entering Minnesota waters Further, the MPCA may prohibit a discharge, require a discharge to occur in a particular area, or require emergency treatment of any ballast water it designates as “high risk” ballast water. The state conditions also specify best management practices for lakers and impose monitoring requirements for all vessels. For vessels required to meet the EPA VGP

[21] This summary reflects the most recent state regulations and state 401 certification conditions on the 2013 USEPA VGP.

numeric discharge limits (i.e. ocean-going vessels and vessels built after 2009), once-per-year monitoring of ballast water is required. As of December 2015, lakers built before 2009 are required to have installed equipment allowing the collection of samples from ballast water discharges and to collect and analyze total organisms in ballast water discharges annually. These analyses may be completed by ship-owners on their own or in cooperation with others.

In its 401 certification letter to USEPA, MPCA states in regards to the discharge standard "MPCA is unable to conclusively determine a numeric standard which would definitely protect water quality and an unaltered species composition of the ecosystem."[22] Further, in regards to maintaining the BWE/SF requirement in addition to meeting the treatment standard, MPCA says "This requirement… effectively serves as an interim WQBEL prior to a numeric WQBEL calculation that will be protective of state water quality until the numeric WQBEL is fully implemented."[23] MPCA cites S.A. Bailey et al. (2011) as part of its justification for this requirement, as well as recent but unpublished land-based testing at the Great Ships Initiative facility. Further, in MPCA's comments to USEPA on the draft VGP, it is noted that exempting lakers from the numeric discharge standard will allow dispersion of invasive species "between water bodies within the Great Lakes System" to go "unchecked for the duration of the permit," citing the report *Non-Native Species of Concern and Dispersal Risk for the Great Lakes and Mississippi River Interbasin Study.*[24]

New York

The New York Department of Environmental Conservation (NYDEC) issued state conditions on the 2013 USEPA VGP. NYDEC conditions state that the numeric discharge standard in the VGP cannot be made less stringent without violating state water quality standards. In addition, state conditions require oceangoing vessels to perform BWE/SF before entering New York state waters in addition to meeting the ballast water treatment requirements. The conditions also require a set of best management practices for laker vessels and a set of recommended BMPs to reduce the risk that VHS will be spread. NYDEC states the state conditions "combine water quality protection with operational flexibility. They provide flexibility to the industry by allowing further development of a treatment technology and test protocols."[25] The NYDEC fact sheet on the VGP provides additional clarification and justification for the NYDEC 401 certification conditions and states "the IMO D-2 standard may not adequately treat all AIS" and "numeric WQBELs more stringent than IMO D-2 are justified, and can be developed in the future based on additional data collection, analysis, and modeling."[26] However, because USEPA did not include a more stringent standard in the VGP, NYDEC included in its certification the requirement that vessels conduct BWE/SF in addition to meeting the IMO D-2 standard as a "an interim WQBEL that will be protective of state water quality until a numeric WQBEL is developed and implemented."[27] NYDEC includes the following citations to support its findings:

- M.S. Minton et al., "Reducing propagule supply and coastal invasions via ships: Effects of emerging strategies," Front. Ecol. Environ. 3(6), 304-308 (2005).
- S.A. Bailey et al., "Evaluating Efficacy of an Environmental Policy to Prevent Biological Invasions," Environ. Sci. Technol. 45, 2554–61 (2011)
- E. Briski et al., Efficacy of 'saltwater flushing' in protecting the Great Lakes from biological invasions by invertebrate eggs in ships' ballast sediment, Freshwater Biology 55, 2414-2424 (2010)
- S. Ellis and H. MacIsaac, Salinity tolerance of Great Lakes invaders, Freshwater Biology 54, 77-89 (2009)
- S. Santagata et al., Effects of osmotic shock as a management strategy to reduce transfers of non-indigenous species among low-salinity ports by ships, Aquatic Invasions 3, 61-76 (2008)

[22] Minnesota Pollution Control Agency. February 19, 2013. Letter to U.S. Environmental Protection Agency.
[23] Ibid.
[24] Minnesota Pollution Control Agency. February 21, 2012. Comments regarding Draft 2013 NPDES Vessel General Permit (VGP2).
[25] New York State Department of Environmental Conservation. September 26, 2012. Clean Water Act Section 401 Certification for 2013 Commercial and Large Recreational VGP and sVGP.
[26] New York State Department of Environmental Conservation. September 26, 2012. Fact Sheet supporting the Vessel General Permit (VGP) Certification Letter.
[27] Ibid.

- D.F. Reid et al., Identifying, Verifying, and Establishing Options for Best Management Practices for NOBOB Vessels, Final Report, NOAA (June 2007).

In comments submitted to USEPA on the draft VGP, the NYDEC states "a WQBEL of at least 100 x the IMO D2 standard is needed to protect water quality, and this WQBEL should be included as a goal in the VGP." NYDEC cited the California State Lands Commission report *2011 Update: Ballast Water Treatment Systems for use in California Waters* (September 2011) and its own (NYDEC) evaluation of BWTS which found that treatment systems are available that meet standards greater than IMO.[28]

Ohio

The Ohio Environmental Protection Agency (OEPA) found that the 2013 USEPA VGP would comply with state water quality standards and issued a series of conditions on the permit. These conditions do not change the numeric ballast water discharge standard or implementation scheduled required by the VGP. The state conditions reiterate the VGP requirement that vessels entering the GLSLS from beyond the EEZ to perform BWE/SF before entering the GLSLS, in addition to the VGP treatment requirements.

In its certification letter, the OEPA states "Ohio EPA is certifying IMO standards because they are the most widely accepted and tested standards in the world" and that "IMO certification combined with ballast water flushing and exchange is sufficient demonstration that these treatment standards are "practical and possible" methods for meeting ballast water treatment standards for ocean-going ships."[29] In addition, "Ohio EPA also believes that there are reasons to treat existing vessels that operate exclusively within the Great Lakes differently than those that operate outside the Lakes" and "IMO treatment standards are not "practical and possible" at this time for existing vessels operating exclusively within the Great Lakes, as defined in the VGP."[30]

Pennsylvania

The Pennsylvania Department of Environmental Protection found the 2013 USEPA VGP to be consistent with state water quality standards and did not issue any state conditions.

Wisconsin

The Wisconsin Department of Natural Resources (WDNR) issued a general permit for ballast water discharge under Wis. Stat. §283.31 which provides the state the authority to regulate discharges of pollutants of the waters of the state. The Wisconsin permit went into effect on February 1, 2010. Starting on that date all vessels, oceangoing and lakers, were required to adopt best management practices and adhere to seawater and or biocide discharge limits, if utilized. The permit was reissued on April 1, 2015 and continues to require oceangoing ships to conduct BWE/SF, and to meet a discharge standard equivalent to the IMO D-2 standard following the 2013 USEPA VGP schedule: the effective date for new oceangoing vessels is December 1, 2013 and existing oceangoing vessels (those constructed prior to December 1, 2013) is the first dry-docking after January 1, 2016. The reissued permit also requires that lakers install ballast water treatment systems during their first dry docking starting March 30, 2018. The permit states that a BWTS "must work in freshwater" and be type approved by the USCG. Delay of BWTS installation is allowed if there are no USCG type approved systems available for use in fresh water. The permit will expire in March 2020; however, it is currently being contested in regards to the Laker requirement to meet IMO standards. It should also be noted that the original permit set a more stringent standard at 100 times the IMO D-2 standard which was subsequently changed to the IMO D-2 standard following a feasibility review and determination that treatment technologies are not available and not yet feasible to install that would meet the more stringent standard.[31]

[28] New York State Department of Environmental Conservation. February 21, 2012. New York's Comments on EPA's Proposed 2013 Vessel General Permit.
[29] Ohio Environmental Protection Agency. September 20, 2012. Statewide Grant of Section 401 Water Quality Certification.
[30] Ibid.
[31] Wisconsin Department of Natural Resources. 2010. Wisconsin Ballast Water Treatment Feasibility Determination.

The WDNR also issued state conditions on the 2013 USEPA VGP. These conditions require vessels to obtain a state permit and perform BWE/SF before entering the GLSLS. The state conditions also allow for emergency treatment of "high risk" ballast water and indicate that lakers will be addressed in the next Wisconsin permit expected in 2015.

A fact sheet on the WDNR permit states "It is the Department's belief that exchange or flushing, in addition to treatment, is a necessary practice for better protection of the waters of the Great Lakes from AIS."[32] Further, in comments submitted to USEPA on the draft VGP, WDNR recommended that "national numeric water quality based effluent limits (WQBELs) for live organisms in ballast water discharges that are protective of water quality in the entire Great Lakes basin be adopted and imposed."[33]

[32] Wisconsin Department of Natural Resources. March 6, 2013. Permit Modification Fact Sheet.
[33] Wisconsin Department of Natural Resources. February 17, 2012. Letter to U.S. Environmental Protection Agency.

Table 2. Summary of Great Lakes State Ballast Water Regulations

State (Agency)	**Regulatory Vehicle**	**Existing oceangoing**	**New oceangoing**	**Existing lakers**	**New lakers**	**Comments**
Illinois (IL Environmental Protection Agency)	401 Certification	- *(VGP requirements)*	- *(VGP requirements)*	- *(VGP requirements)*	- *(VGP requirements)*	State conditions on the VGP do not impact standards or implementation schedules
Indiana (IN Dept. of Environmental Management)	401 Certification	State conditions repeat VGP requirements	State conditions repeat VGP requirements	- *(VGP requirements)*	- *(VGP requirements)*	State conditions on the VGP require oceangoing vessels to perform BWE/SF before entering the GLSLS
Michigan (MI Dept. of Environmental Quality)	State Permit 401 Certification	*State permit* -Approved treatment technology or no discharge effective 1/1/2007	*State permit* -Approved treatment technology or no discharge effective 1/1/2007	- *(VGP requirements)*	- *(VGP requirements)*	State conditions on the VGP require oceangoing vessels engaging in port operations or discharging ballast to obtain the state permit; oceangoing vessels must perform BWE/SF before entering Michigan waters
Minnesota (MN Pollution Control Agency)	State Permit 401 Certification	*State permit* - Vessels constructed prior to 1/1/2012 *State permit* – IMO standards by 1/1/2016	*State permit* - Vessels constructed after 1/1/2012 *State permit* – IMO standards prior to operation in Minnesota waters of Lake Superior	*State permit* - Vessels constructed prior to 1/1/2009 *State permit* – IMO standards by first dry-docking after 3/30/2018 *401 Certification* – best management practices	*State permit* - Vessels constructed after 1/1/2009 *State permit* – IMO standards prior to operation in Minnesota waters of Lake Superior *401 Certification* – best management practices	State conditions on the VGP require vessels to obtain a state permit and perform BWE/SF before entering Minnesota waters, and allow for emergency treatment
New York (NY Dept. of Environmental Conservation)	401 Certification	- *(VGP requirements)*	- *(VGP requirements)*	Best management practices	Best management practices	State conditions on the VGP require oceangoing vessels to perform BWE/SF before entering New York waters
Ohio (OH Environmental Protection Agency)	401 Certification	- *(VGP requirements)*	- *(VGP requirements)*	- *(VGP requirements)*	- *(VGP requirements)*	State conditions on the VGP require oceangoing vessels to perform BWE/SF before entering the GLSLS
Pennsylvania (PA Dept. of Environmental Protection)	401 Certification	- *(VGP requirements)*	- *(VGP requirements)*	- *(VGP requirements)*	- *(VGP requirements)*	No state conditions were added to the VGP
Wisconsin (WI Dept. of Natural Resources)	State Permit [34] 401 Certification	*State permit and 401 certification* - Vessels constructed prior to 12/1/2013 IMO standards by first dry-docking after 1/1/2016 *(state permit)* and VGP deadline *(401 certification)*	*State permit and 401 certification* - Vessels constructed after 12/1/2013 IMO standards prior to operation in Wisconsin waters by VGP deadline	*State permit** –Best management practices; IMO standards by first dry-docking after 3/30/2018	*State permit** –Best management practices; IMO standards by first dry-docking after 3/30/2018	State conditions on the VGP require vessels to obtain a state permit and perform BWE/SF before entering the GLSLS, and allow for emergency treatment; state permit also requires BWE/SF

Prepared by the Great Lakes Commission

[34] The Wisconsin state permit is currently being contested over laker requirements to meet IMO standards