

Regulatory Analysis Form

(Completed by Promulgating Agency)

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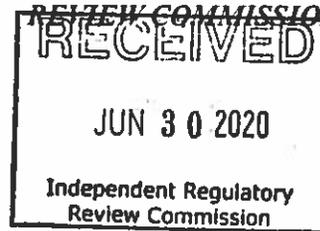
(1) Agency

Environmental Protection

(2) Agency Number: 7

Identification Number: 553

INDEPENDENT REGULATORY
REVIEW COMMISSION



IRRC Number: 3260

(3) PA Code Cite:

25 Pa Code, Chapter 93 & Chapter 96

(4) Short Title:

Water Quality Standards for Manganese and Implementation

(5) Agency Contacts (List Telephone Number and Email Address):

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(6) Type of Rulemaking (check applicable box):

- Proposed Regulation
- Final Regulation
- Final Omitted Regulation

- Emergency Certification Regulation;
- Certification by the Governor
- Certification by the Attorney General

(7) Briefly explain the regulation in clear and nontechnical language. (100 words or less)

Section 303(c)(1) of the Federal Clean Water Act (CWA) requires that states periodically, but at least once every three years, review and revise as necessary, their water quality standards to reflect current scientific knowledge and recommendations. Further, states are required to protect existing uses of their waters. This proposed regulation is undertaken as part of the Department of Environmental Protection's (Department) ongoing review of Pennsylvania's Water Quality Standards.

The Environmental Quality Board (Board) proposes to amend 25 Pa. Code Chapter 93 (relating to water quality standards) and 25 Pa. Code Chapter 96 (relating to water quality standards implementation). The amendments propose to delete the existing manganese numeric criterion from Table 3 at § 93.7 (relating to specific water quality criteria) which was established for the protection of the Potable Water Supply use and to add a manganese criterion to Table 5 at § 93.8c (relating to human health and aquatic life criteria for toxic substances) designed to protect human health from the neurotoxicological effects of manganese when exposure to levels necessary to maintain adequate health are exceeded. Additionally, the amendments propose two alternative points of compliance for the proposed manganese criterion. The first alternative point of compliance moves the point of compliance to the point of all existing or planned surface potable water supply withdrawals. The second alternative point of compliance maintains the existing point of compliance in all surface waters (i.e., at or near the point of discharge). The proposed regulations, set forth in Annex A, present both alternatives for consideration.

(8) State the statutory authority for the regulation. Include specific statutory citation.

This proposed rulemaking is being made under the authority of sections 5(b)(1) and 402 of The Clean Streams Law (35 P.S. §§ 691.5(b)(1) and 691.402), which authorize the Board to develop and adopt rules and regulations to implement The Clean Streams Law (35 P.S. §§ 691.1—691.1001). Additional authority for this proposed rulemaking includes sections 1920-A(b) and (j) of The Administrative Code of 1929 (71 P.S. § 510-20(b) and (j)), which grants to the Board the power and duty to formulate, adopt and promulgate rules and regulations for the proper performance of the work of the Department and mandates that the Board “promulgate regulations under the act of June 22, 1937 (P.L. 1987, No. 394), known as The Clean Streams Law, or other laws of this Commonwealth that require that the water quality criteria for manganese established under 25 Pa. Code Ch. 93 (relating to water quality standards) shall be met, consistent with the exception in 25 Pa. Code § 96.3(d) (relating to water quality protection requirements).” In addition, sections 101(a)(2) and 303 of the Federal Clean Water Act (CWA) (33 U.S.C.A. §§ 1251(a)(2) and 1313) set forth requirements for water quality standards, which the State must meet to implement the CWA in the Commonwealth. Section 101(a)(3) of the CWA declares the national policy that the discharge of toxic pollutants in toxic amounts be prohibited (33 U.S.C.A. § 1251(a)(3)).

(9) Is the regulation mandated by any federal or state law or court order, or federal regulation? Are there any relevant state or federal court decisions? If yes, cite the specific law, case or regulation as well as, any deadlines for action.

Subsection (j) to Section 1920-A of The Administrative Code of 1929, 71 P.S. § 510-20(j) (known as “Act 40 of 2017”), requires the following: “the board shall promulgate regulations under the act of June 22, 1937 (P.L. 1987, No. 394), known as The Clean Streams Law (CSL), or other laws of this Commonwealth that require that the water quality criteria for manganese established under 25 Pa. Code Ch. 93 (relating to water quality standards) shall be met, consistent with the exception in 25 Pa. Code § 96.3(d) (relating to water quality protection requirements). Within ninety days of the effective date of this subsection, the board shall promulgate proposed regulations.”

Under sections 4, 5 and 402 of the CSL, the Department has the duty to formulate regulations that prevent and eliminate water pollution. “Pollution” is defined by the law as “contamination of any waters of the Commonwealth such as ... to render such waters harmful, detrimental or injurious to public health... or to domestic, municipal, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses, or to livestock, wild animals, birds, fish or other aquatic life...” (35 P.S. §§ 691.4, 691.5, and 691.402) Section 1920-A of the Administrative Code of 1929 authorizes the Board to formulate, adopt and promulgate such rules and regulations as may be determined by the Board for proper performance of the work of the Department (71 P.S. § 510-20(b)). Where a pollutant found in discharges to surface waters is toxic to human health or aquatic life, the Commonwealth’s regulations require development of appropriate water quality criteria to control pollution.

In addition, it is the duty of the Department, pursuant to Section 5 of the CSL, to consider water quality management, pollution control in the watershed as a whole, as well as the present and possible future uses of waters in adopting regulations.

Section 303(c) of the federal CWA and 40 CFR Part 131 require states to develop water quality standards that consist of designated uses, water quality criteria to protect those uses, and antidegradation requirements. Such standards must “protect the public health or welfare and enhance the quality of water” (33 U.S.C.A. § 1313(c)). In addition, such standards must take into consideration water uses including

public water supplies, propagation of fish and wildlife, recreational purposes, agricultural purposes, and industrial purposes. Section 101(a)(3) of the CWA declares the national policy that the discharge of toxic pollutants in toxic amounts be prohibited (33 U.S.C.A. § 1251(a)(3)).

(10) State why the regulation is needed. Explain the compelling public interest that justifies the regulation. Describe who will benefit from the regulation. Quantify the benefits as completely as possible and approximate the number of people who will benefit.

Change in Criteria

Because the manganese water quality criterion designed to be protective of the Potable Water Supply use has been in place, without reevaluation, since June 28, 1967, the Department reviewed current scientific and current toxicological information to comprehensively evaluate the manganese standard as it relates to the water uses identified in § 93.3 (related to protected water uses) and, in particular, to determine the need to develop manganese toxics criteria related to human health and aquatic life exposure. Because Act 40 of 2017 involves proposing a regulation that moves the point of compliance for manganese, it is necessary to consider the appropriate criterion to protect human health, the Potable Water Supply use and other water uses.

The purpose of developing water quality standards is to protect the uses and users of Pennsylvania's surface waters. Pennsylvania's surface waters, through the water quality standards program, are protected for a variety of uses including: drinking water supplies for humans, livestock, and wildlife; industrial water supplies; irrigation for crops; aquatic life uses; and recreation and fish consumption. All of the residents and visitors of this Commonwealth will benefit from updating the Chapter 93 water quality standards to include a water quality criterion for manganese of 0.3 mg/L because it provides the appropriate level of water quality protection for all water uses and users of the surface waters. Current scientific data demonstrates that manganese is a neurotoxin when levels to maintain adequate health are exceeded.

Change in Point of Compliance

The need to propose a change to the point of compliance for the manganese criterion is driven by Act 40 of 2017. See response to #9.

Under the first alternative point of compliance, movement of the point of compliance away from discharges and to the point of all downstream existing or planned surface potable water supply withdrawals will be beneficial to facilities that have National Pollutant Discharge Elimination System (NPDES) permits to discharge manganese in their wastewater. It will reduce monitoring and treatment costs for these discharging facilities, which includes mining industry discharges.

Under the second alternative point of compliance, which would maintain the point of compliance in all surface waters (i.e., at or near the point of discharge), the manganese criterion would provide protection of human health and would be applicable in all surface waters. Application of the proposed criterion in all surface waters will protect all other water uses, including potable water supplies and aquatic life. It is widely known that high levels of manganese are toxic to aquatic life. By protecting the water uses, and the quality of the water necessary to maintain the uses, benefits may be gained in a variety of ways by all residents and visitors of the Commonwealth. For example, clean surface water used as source water for drinking water supplies benefits consumers by lowering drinking water treatment costs and reducing medical costs associated with drinking water-related illnesses. Additionally, by maintaining water quality standards, clean surface water is available for irrigation of crops and livestock and for use in industrial

processes. Clean surface waters also benefit the Commonwealth by providing for increased tourism and recreational use of the waters. Clean water provides for increased wildlife habitat and more productive fisheries.

(11) Are there any provisions that are more stringent than federal standards? If yes, identify the specific provisions and the compelling Pennsylvania interest that demands stronger regulations.

EPA does not currently have national recommendations concerning surface water quality criteria for manganese. However, the Federal CWA Section 303(c)(2)(A) requires that Pennsylvania develop water quality criteria that are protective of existing and designated uses, even in the absence of federal recommended criteria, if such protection is deemed necessary for Pennsylvania's waters. The proposed ambient water quality criterion for manganese for the protection of human health at 25 Pa. Code § 93.8c, Table 5 is necessary since manganese is discharged through wastewater from industrial facilities and is a pollutant found in many Pennsylvania streams. Current scientific literature identifies manganese as a neurotoxin when the level necessary to maintain adequate health is exceeded and the proposed regulation was developed to provide the appropriate protection for human health exposure associated with surface waters.

(12) How does this regulation compare with those of the other states? How will this affect Pennsylvania's ability to compete with other states?

Other states are also required to maintain water quality standards, based on the federal mandate at section 303(c) of the federal CWA and 40 CFR Part 131. While there are no federally recommended CWA Section 304(a) criteria for manganese, amendments in this proposed rulemaking are not expected to put Pennsylvania at a competitive disadvantage to other states since other states with similar geology, resource extraction activities, or industries to Pennsylvania also have similar obligations under the federal CWA and a need for such protections. Water quality standards for manganese may not be necessary for some states if manganese is not discharged to the surface waters within that state.

See Table – Manganese RAF Question #12

(13) Will the regulation affect any other regulations of the promulgating agency or other state agencies? If yes, explain and provide specific citations.

With respect to whether the proposed regulation may affect any other regulation, the first alternative point of compliance may affect the ability of drinking water suppliers to comply with existing state and federal safe drinking water regulations. Under this alternative, the point of compliance for the manganese criterion will be at the point of any planned or existing potable water supply withdrawal. Water suppliers will likely need to conduct additional source water monitoring at their facilities to determine the effects of increased source water manganese levels on their operations. As the levels of manganese change in the surface water, all water supply facilities using surface waters as their source water will need to monitor the raw water manganese levels to ensure adequate manganese removal will be achieved through their treatment processes and may require facility upgrades or additional chemical usage to continue achieving the secondary maximum contaminant level (SMCL) for manganese of 0.05 mg/L in the finished water, which is required under the Pennsylvania Safe Drinking Water Act (35 P.S. §§ 721.3 and 721.5) and regulations at 25 Pa. Code Chapter 109.202(b) (relating to state MCLs, MRDLs and treatment technique requirements). The SMCL for manganese in Pennsylvania is based on the Federal standard found at 40 CFR § 143.3.

Additional burdens to water suppliers may apply based on other drinking water requirements. EPA developed one-day, 10-day and lifetime Health Advisory Limits (HALs) for manganese, pursuant to the Federal Safe Drinking Water Act (42 U.S.C.A. §§ 300f-300j-26). The lifetime HAL of 0.3 mg/L protects against concerns of potential neurological effects. The one-day and 10-day HALs of 1 mg/L are for acute exposure and it is advised that for infants younger than 6 months, the lifetime HAL of 0.3 mg/L be used even for an acute exposure of 10 days, because of the concerns for differences in manganese content in human milk and formula and the possibility of higher absorption and lower excretion in young infants. Because EPA developed HALs for manganese, public water suppliers may be subject to additional monitoring and public notification requirements if the HALs are exceeded in the finished water. In accordance with the current regulations found at Chapter 93, the Potable Water Supply water quality criterion ensures that public water systems receive raw water at their intake structures that can achieve compliance with 25 Pa. Code Chapter 109 Safe Drinking Water (SDW) standards utilizing only conventional treatment. If a water supplier or the Department indicates a contaminant is present in the potable water supply and may cause a potential health hazard, additional monitoring may be required under 25 Pa. Code § 109.302(b) (relating to special monitoring), which may then trigger additional treatment requirements pursuant to § 109.4 (relating to general requirements). If source water for public water supply operations is received at or above 0.3 mg/L, sequestration of manganese is no longer an option and modifications to operations and/or additional treatment technologies for removal of manganese would be required. Sequestration does not remove the manganese so it is still present and still bioavailable and as such it can act as a neurotoxin. Finally, under § 109.407(a)(9) (relating to general public notification requirements) and § 109.408(a)(11) (relating to Tier 1 public notice—categories, timing and delivery of notice), Tier 1 public notice requirements may be triggered if exceedance of the HALs has the “potential to have serious adverse effects on human health as a result of short-term exposure.”

(14) Describe the communications with and solicitation of input from the public, any advisory council/group, small businesses and groups representing small businesses in the development and drafting of the regulation. List the specific persons and/or groups who were involved. (“Small business” is defined in Section 3 of the Regulatory Review Act, Act 76 of 2012.)

The Department published, within 90 days of the effective date of Act 40 of 2017, an advance notice of proposed rulemaking (ANPR) in the *Pennsylvania Bulletin* on January 27, 2018 (48 Pa. B. 605), soliciting information necessary to prepare the rulemaking documents required by Commonwealth and Federal law to support the Board’s adoption of the required proposed regulations. In response to the ANPR, the Department received comments from 15 organizations or individuals, including EPA, Pennsylvania Anthracite Council, American Rivers, PA American Water, Rosebud Mining Company, Pennsylvania Fish and Boat Commission (PFBC), Pennsylvania Coal Alliance, Counsel to the Manganese Interest Group, PennFuture, Pennsylvania Public Utility Commission (PUC), CONSOL Energy, Corsa Coal Corporation, City of Lancaster Public Works Philadelphia Water Department, and SUEZ-FCGA.

On November 29, 2018, May 23, 2019 and July 25, 2019, the Department met with the Water Resources Advisory Committee (WRAC) to discuss the scientific literature and information available to support manganese water quality criteria development and other regulatory issues relating to manganese. On July 25, 2019, WRAC voted on a motion to: acknowledge the legislative requirement in Act 40 of 2017 to propose a regulation moving the point of compliance for manganese to the point of all existing or planned surface potable water supply withdrawals; support proposing a regulation that adds manganese to Table 5 in section 93.8c as a toxic substance for human health at the level of 0.3 mg/L, recognizing that the compliance point for this standard will be met in all surface waters, as described in section 96.3(c); and recommend that the Board request public comment on this combined approach for consideration in developing a final regulation.

The Department met with the Agricultural Advisory Board on October 25, 2018, June 20, 2019 and August 29, 2019 to present information and seek additional agriculture-related information relating to manganese and this proposed rulemaking. Also, the Department met with the Small Water Systems Technical Assistance Center Advisory Board (TAC) on January 31, 2019 and August 8, 2019 to present information and seek additional water supply treatment information relating to manganese and this proposed rulemaking. TAC voted to concur with WRAC's motion.

(15) Identify the types and number of persons, businesses, small businesses (as defined in Section 3 of the Regulatory Review Act, Act 76 of 2012) and organizations which will be affected by the regulation. How are they affected?

All persons, groups, or entities with proposed or existing point source discharges of manganese into surface waters of the Commonwealth must comply with the regulation. There are approximately 925 NPDES permits that currently contain manganese monitoring and report requirements and/or manganese effluent limits. These permits are associated with mining operations, industrial and sewage treatment facilities, food processing facilities, landfills and water supply facilities. A subsampling of the 925 NPDES permits indicates that a majority of them are not associated with small businesses as defined in in Section 3 of the Regulatory Review Act, Act 76 of 2012.

Under the second alternative point of compliance, persons with an existing NPDES permitted discharge or proposing to add a new discharge to a stream could be adversely affected upon permit renewal or issuance of a new permit if they need to provide a higher level of treatment to meet any new standard established by this proposed rulemaking. For example, increased costs may take the form of higher engineering, construction or operating cost for point source discharges. Monitoring and treatment costs are site-specific and depend upon the size of the discharge in relation to the size of the stream and many other factors. It is therefore not possible to precisely predict the actual change in costs or the number of entities that will be affected by the regulation. Economic impacts would primarily involve the potential for higher monitoring and treatment costs for permitted discharges to streams to meet the new water quality standards requirements. The initial costs resulting from the installation of technologically advanced wastewater treatment processes may be offset by potential savings from and increased value of improved water quality through more cost-effective and efficient treatment over time.

Under the first alternative point of compliance, any of the approximately 287 public water supply systems with an existing or planned potable water supply surface water withdrawal may see increased costs if there is a need to provide a higher level of raw water treatment to continue meeting the existing SMCL for manganese, 0.05 mg/L, in the finished (i.e., potable) water. For example, increased costs may take the form of increased source water sampling and monitoring, facility upgrades, treatment modifications or additional operation and maintenance costs for treatment chemicals and waste disposal. Treatment modifications and associated costs are site-specific and will depend upon the specific treatment processes employed by a facility, the quality of the source water and many other factors. It is therefore not possible to precisely predict the actual change in costs or the number of entities that will be affected by the regulation. Economic impacts would primarily involve the potential for higher monitoring and treatment costs for public water supply facilities located downstream of permitted manganese discharges, which would likely result in water fee increases for the water supply rate payers. A review of statewide potable water supply withdrawals and permitted manganese discharges suggests a significant overlap exists between the two regulated communities, which means treatment may be necessary in areas with mining discharges.

A review of the U.S. Small Business Size Regulations under 13 CFR Part 121 provides a standard for determining what constitutes a small business for the NAICS category relating to public water systems. A public water system falls within NAICS category 221310, Water Supply and Irrigation Systems, which comprises establishments primarily engaged in operating water treatment plants and/or operating water supply systems. The small size standard for this NAICS category is annual receipts of not more than \$27.5 million.

For the 287 public water supply systems with an existing or planned potable water supply surface water withdrawal, the Department has no way to estimate annual receipts. Therefore, the Department used the federal definition of a small water system in 40 CFR 141.2, which states that a small water system is "a water system that serves 3,300 persons or fewer". Under this regulatory package, a public water system owned by a private individual or investor serving less than or equal to 3,300 persons was considered to be a small business. In this Commonwealth, there are less than 25 public water supply systems with existing or planned potable water supply surface water withdrawals that are considered small businesses.

Facilities with water supply intakes for use in food and beverage production or preparation, paper and textile manufacturing, aquaculture, and irrigation may also see increased costs if there is a need to provide a higher level of raw water treatment to continue meeting their industry specific standards and the need for a certain level of raw water quality. Economic impacts would primarily involve the potential for higher monitoring and treatment costs for facilities located downstream of permitted manganese discharges, which would likely result in the increased costs for the goods or services provided by these facilities being passed on to consumers.

In comments received on the ANPR, PFBC indicated that if source water concentrations of manganese are greater than 1.0 mg/L there would be a need to pretreat the source water used in the agency's fish hatchery facilities to reduce the level of manganese to an acceptable level for fish culture. There are 14 PFBC State hatcheries, 166 cooperative fish hatcheries, and several private hatcheries across the State.

(16) List the persons, groups or entities, including small businesses, that will be required to comply with the regulation. Approximate the number that will be required to comply.

All persons, groups, or entities with proposed or existing point source discharges of manganese into surface waters of the Commonwealth must comply with the regulation. There are approximately 925 NPDES permits that currently contain manganese monitoring and report requirements and/or manganese effluent limits. These permits are associated with mining operations, industrial and sewage treatment facilities, food processing facilities, landfills and water supply facilities. A subsampling of the 925 NPDES permits indicates that a majority of them are not associated with small businesses as defined in in Section 3 of the Regulatory Review Act, Act 76 of 2012.

Also, see response #15.

(17) Identify the financial, economic and social impact of the regulation on individuals, small businesses, businesses and labor communities and other public and private organizations. Evaluate the benefits expected as a result of the regulation.

Overall, the Commonwealth's residents and visitors and its natural resources benefit from providing the appropriate level of protection to preserve the integrity of existing and designated uses of surface waters in this Commonwealth. Protecting water quality provides: economic value to present and future generations in the form of a clean water supply for human consumption, wildlife, irrigation and industrial use; recreational

opportunities such as fishing (also for consumption), water contact sports, and boating; and aquatic life protection.

All of the Commonwealth's residents and visitors will benefit by having a manganese criterion that is protective of aquatic life. It is widely known that high levels of manganese are toxic to aquatic life. PFBC provided information indicating that manganese is one of several heavy metals associated with acid mine discharges that act on aquatic organisms as metabolic poisons. Depending on the water chemistry, manganese will often settle on stream beds as a black, sticky coating that interferes with the colonization, abundance, and diversity of stream dwelling aquatic insects which are very important in the aquatic ecosystem. Based on the proposed water quality criterion for manganese and the first alternative point of compliance, additional compliance costs may be imposed on the regulated drinking water community due to potential increases in source water levels of manganese, while reducing compliance costs for the wastewater dischargers.

All of the Commonwealth's residents and visitors, both present and future, will benefit from having clean water that is protected and maintained. Any reduction in the total toxic load in Pennsylvania waterbodies is likely to have a positive effect on the human health of Pennsylvanians. This will translate into a yet unknown economic benefit through avoided cleanup or remediation costs that would have been incurred later in time, as well as avoided costs for the treatment and caring for persons with diseases and disabilities that can be reasonably attributed to environmental contaminants in surface water.

By implementing a human health standard applicable in all surface waters of the Commonwealth, users downstream will not have to bear the costs associated with remediating discharge from upstream users before the water can be used. For example, lower levels of manganese in surface waters may reduce costs incurred by downstream surface water users who have to pre-treat water for industrial or commercial use (i.e., food processors). Also, reductions at the point of discharge reduce the costs for water suppliers who will have to treat water that is high in manganese at their intakes to meet drinking water standards. Passing on the treatment to water suppliers will increase costs to drinking water customers. Any intervening water uses such as Irrigation, Livestock Water Supply, and Fishing, between the point of discharge and the point of use, will be protected by limiting the amount of manganese that may be discharged. Under these scenarios, multiple surface water users will benefit—industrial, agricultural, commercial, and potable water users.

Reduced toxics in Pennsylvania's waterways will likely increase recreational fishing and tourism to swimming and fishing locations throughout the state. Additionally, cleaner rivers and fish may lead to increased birding and wildlife viewing opportunities, as the benefits of cleaner water and less contaminated fish work themselves up the food chain, resulting in substantial economic benefits. Persons who recreate on the waters and who fish, both for sport and consumption, will benefit from better water quality protection.

A reduction in toxics found in Pennsylvania's waterways may lead to increased property values for properties located near rivers or lakes. The study, *The Effect of Water Quality on Rural Nonfarm Residential Property Values*, (Epp and Al-Ani, *American Journal of Agricultural Economics*, Vol 61, No. 3 (Aug. 1979)), used real estate prices to determine value of improvements in water quality in small rivers and streams in Pennsylvania. Water quality, whether measured in pH or by the owner's perception, has a significant effect on the price of adjacent property. Their analysis showed a positive correlation between water quality and housing values. They concluded that buyers are aware of the environmental setting of a home and that differences in the quality of nearby waters affects the price paid for a residential property.

A 2006 study from the Great Lakes region ("*Economic Benefits of Sediment Remediation*," <http://www.nemw.org/Econ>) estimated that property values were significantly depressed in two regions associated with toxic contaminants (PAHs, PCBs, and heavy metals). The study showed that a portion of the Buffalo River region (approx. 6 miles long) had depressed property values of between \$83 million and \$118 million for single-family homes, and between \$57 million and \$80 million for multi-family homes as a result of toxic sediments. The same study estimated that a portion of the Sheboygan River (approx. 14 miles long) had depressed property values of between \$80 million and \$120 million as the result of toxics. While this study related to the economic effect of contaminated sediment in other waters in the Great Lakes region, the idea that toxic pollution depresses property values is easily transferable to Pennsylvania. A reduction in toxic pollution in Pennsylvania's waters has a substantial economic benefit to property values in close proximity to waterways.

There are economic benefits to be gained by maintaining clean water for potable and other water supply uses. Water suppliers, and their customers, may benefit from lower pretreatment costs if water is withdrawn that meets surface water quality standards. Assuring the availability of clean water will cut down on the costs to consumers for purchasing household pretreatment/water filtration systems and bottled water (see "*The Real Cost of Bottled Water*," San Francisco Chronicle, Feb. 18th, 2007, which estimates the cost of bottled water to be anywhere between 240 and 10,000 times more expensive than tap water). An additional benefit to greater reliance on tap water is the reduction of containers that need to be recycled or disposed of in landfills. Persons may incur a cost benefit by reducing their dependence on bottled waters and household water filtration systems based on their confidence in source water quality.

There are also economic benefits to be gained by having clearly defined remediation standards for surface waters. Under Pennsylvania's Land Recycling and Environmental Remediation Standards Act, liability relief is available, by operation of law, if a person demonstrates compliance with the environmental remediation standards established by the law. Surface water quality criteria are used to develop remediation standards under the law. Persons performing remediation depend upon these criteria to obtain a liability relief benefit under the law. An article in the Duquesne University Law Review discusses the importance of liability limitation as "vital to the participation in the remediation process" ("*COMMENT: Pennsylvania's Land Recycling Program: Solving the Brownfields Problem with Remediation Standards and Limited Liability*," Creenan, James W. and Lewis, John Q., Duquesne University Law Review, 34 *Duq. L. Rev.* 661 (Spring 1996)). The article recognizes that "liability protection provides the missing ingredient—financial incentive—for undertaking the cleanup of an industrial site." Industrial land redevelopers will benefit from these regulations by having financial certainty when choosing a surface water cleanup standard and by being eligible for liability relief under state law.

Also, see responses #10 and #15.

(18) Explain how the benefits of the regulation outweigh any cost and adverse effects.

Section 4 of the Pennsylvania Clean Streams Law (Declaration of Policy) clearly states "clean, unpolluted streams are absolutely essential if Pennsylvania is to attract new manufacturing industries and to develop Pennsylvania's full share of the tourist industry." 35 P.S. 691.4(1).

Under the first alternative point of compliance, adverse effects may occur at an existing or planned potable water supply. A surface water supplier may see increased costs if there is a need to provide a higher level of raw water treatment to continue meeting the existing SMCL for manganese, 0.05 mg/L, in the finished (i.e., potable) water. Facilities with water supply intakes for use in food and beverage production or preparation,

paper and textile manufacturing, aquaculture, and irrigation may also see increased costs if there is a need to provide a higher level of raw water treatment

Under the second alternative point of compliance, adverse effects associated with the adoption of new criteria may take the form of additional wastewater treatment requirements. Sometimes these requirements require costly upgrades. If new criteria apply to a facility and if treatment requirements require significant and costly changes operationally, there are regulatory mechanisms in place, through the NPDES permitting program, to manage an appropriate schedule for meeting the new standards.

Health and welfare benefits to all residents and visitors of the Commonwealth accrue from protecting the surface waters of the Commonwealth at the appropriate level. The benefits from substantial revenue and jobs associated with clean drinking water, recreational fisheries, and other industries that rely on clean water, outweigh the cost and adverse effects associated with selective effluent treatment technology for those who discharge pollutants to the surface waters.

Protection of water quality, up front, reduces the need for costly remedial measures that are often difficult to retrofit. In addition, maintenance of water quality eliminates the need for spending taxpayer dollars to meet additional regulatory obligations such as federally mandated total maximum daily loads (TMDLs). If a waterbody becomes impaired and is not meeting its protected water uses, the Commonwealth will be obligated to develop TMDLs and impose more stringent water quality standards. By maintaining the appropriate water quality to protect the uses, expensive remediation costs can be avoided.

Also, see response #15 and #17.

(19) Provide a specific estimate of the costs and/or savings to the regulated community associated with compliance, including any legal, accounting or consulting procedures which may be required. Explain how the dollar estimates were derived.

For both alternative points of compliance, specific estimates of treatment costs and savings cannot be determined at this time because each activity affected by this regulation must be reviewed based on site-specific considerations.

Under the first alternative point of compliance, regulated wastewater dischargers may experience cost savings through reduced monitoring and treatment costs associated with removing manganese from their permitted discharges. However, regulated public water suppliers with an existing or planned potable water supply surface water withdrawals may see increased costs since there will be a need to conduct additional source water monitoring, and some facilities may need to provide a higher level of raw water treatment to continue meeting the existing SMCL for manganese, 0.05 mg/L, in the finished (i.e., potable) water.

Under the second alternative point of compliance, the compliance and treatment costs for regulated wastewater dischargers may increase based on site-specific considerations. These site-specific considerations include, but are not limited to the size, flow volume, and the chemical, biological, and physical properties of both the receiving water and the effluent discharge. These unique parameters result in a site-specific analysis. Conversely, this alternative may result in cost savings to the drinking water suppliers as manganese levels in source waters will be lower and less treatment will be necessary to meet drinking water regulations.

The Department is required to establish monitoring requirements and/or water quality-based effluent limitations for the discharge of pollutants in an NPDES permit. There are factors that may be considered by

the Department that may result in the modification of effluent limitations or the deadline by which compliance with limitations must be achieved. Cost and/or savings may be affected by the remedial measures leading to compliance with the effluent limitations. Based on site-specific evaluations, effluent limitations developed based on new water quality criteria may be modified, or more time for compliance may be granted under applicable regulations.

Information on the analytical laboratory costs, based on the analytical method used, can be obtained from the National Environmental Methods Index (NEMI) website. This website can be used to access most EPA approved analytical methods (www.nemi.gov). Based upon current information in NEMI, analytical costs for manganese water samples can be expected to range between \$50-\$400 and vary based upon the analytical method used.

(20) Provide a specific estimate of the costs and/or savings to the local governments associated with compliance, including any legal, accounting or consulting procedures which may be required. Explain how the dollar estimates were derived.

No costs will be imposed directly upon local governments by this regulation. This proposed rulemaking is based on and will be implemented through existing Department programs, procedures, and policies. Certain municipally-owned water suppliers that treat surface water or municipally-owned wastewater treatment plants that discharge manganese to surface waters may be affected by this regulation as described in #15. The costs associated with permits and performance or design requirements will be site-specific and depend upon the alternative point of compliance for the proposed criterion.

Under the first alternative point of compliance, municipally-owned water suppliers may realize increased treatment costs if the level of manganese increases at their point of surface water withdrawal. Based on information provided by the Pennsylvania PUC, the Local Government Association estimates that for a small water treatment plant: "...a municipal water authority operating a 1 MGD (million gallons/day) water treatment plant, estimated an additional annual cost of \$20,000 just for chemical usage (Potassium Permanganate) to treat manganese". The Local Government Association further states that, "diligent monitoring and sampling would be required by operators to ensure removal to prevent unpleasant taste and odor, discoloration and staining, and potential health impacts from high Manganese levels."

Under the second alternative point of compliance, the compliance and treatment costs for municipally-owned wastewater treatment plants may increase if manganese is present in the discharge, but each facility will require an evaluation based on site-specific considerations. No additional costs are expected for local governments that own public water supplies under this alternative because manganese in wastewater discharges would be treated to achieve compliance with the proposed criterion at the point of discharge.

In addition to cost savings, under the second alternative point of compliance, a municipality may derive additional revenue and employment from the outdoor recreation and tourism industries when waters are protected by the proposed manganese criterion.

(21) Provide a specific estimate of the costs and/or savings to the state government associated with the implementation of the regulation, including any legal, accounting, or consulting procedures which may be required. Explain how the dollar estimates were derived.

No costs will be imposed directly upon state governments by this regulation. This proposed rulemaking is based on and will be implemented through existing Department programs, procedures, and policies. However, certain state agencies that operate regulated drinking water supplies or wastewater treatment

plants that discharge manganese to surface waters may be affected by this regulation as described in #15. The costs associated with permits and performance or design requirements will be site-specific.

Under the first alternative point of compliance, state-owned wastewater treatment plants will benefit from the proposed regulation through reduced monitoring and treatment costs associated with removing manganese from their permitted discharges. In addition, bond forfeiture sites for mining activities where the Commonwealth is responsible for mine drainage treatment would potentially have a reduction in treatment costs. However, state agencies that provide drinking water may realize increased treatment costs if the level of manganese increases at their point of surface water withdrawal.

Under the second alternative point of compliance, the compliance and treatment costs for the state-operated wastewater plants may increase. However, this alternative should also result in cost savings for the state agencies that provide drinking water since manganese levels in source waters will be lower and less treatment will be necessary to meet drinking water regulations.

In addition to cost savings, under the second alternative point of compliance, the state may derive additional revenue and employment from the outdoor recreation and tourism industries when waters are protected by the proposed manganese criterion.

Also, see response #17 and 20.

(22) For each of the groups and entities identified in items (19)-(21) above, submit a statement of legal, accounting or consulting procedures and additional reporting, recordkeeping or other paperwork, including copies of forms or reports, which will be required for implementation of the regulation and an explanation of measures which have been taken to minimize these requirements.

Each activity that will result in a discharge of pollutants to waters of this Commonwealth requires a review that is based on site-specific considerations, including the specific levels of manganese expected or known to be in the discharge to waters of this Commonwealth, as well as the physical and chemical properties of the receiving water. Existing Department procedures will be used to implement this regulation.

Persons with existing or proposing new or expanded activities or projects which result in discharge of manganese to waters of the Commonwealth will be required to implement treatment of effluent and the appropriate protections to meet the water quality standards established by this regulation. These requirements are generally implemented upon renewal or amendment of existing NPDES permits.

(22a) Are forms required for implementation of the regulation?

No additional forms are required as a result of this regulation.

(22b) If forms are required for implementation of the regulation, attach copies of the forms here. If your agency uses electronic forms, provide links to each form or a detailed description of the information required to be reported. Failure to attach forms, provide links, or provide a detailed description of the information to be reported will constitute a faulty delivery of the regulation.

N/A

(23) In the table below, provide an estimate of the fiscal savings and costs associated with implementation and compliance for the regulated community, local government, and state government for the current year and five subsequent years.

	Current FY Year (2019-20)	FY +1 Year (2020-21)	FY +2 Year (2021-22)	FY +3 Year (2022-23)	FY +4 Year (2023-24)	FY +5 Year (2024-25)
SAVINGS:	\$	\$	\$	\$	\$	\$
Regulated Community	Not Measurable	Not Measurable	Not Measurable	Not Measurable	Not Measurable	Not Measurable
Local Government	"	"	"	"	"	"
State Government	"	"	"	"	"	"
Total Savings	"	"	"	"	"	"
COSTS:						
Regulated Community	Not Measurable	Not Measurable	Not Measurable	Not Measurable	Not Measurable	Not Measurable
Local Government	"	"	"	"	"	"
State Government	"	"	"	"	"	"
Total Costs	"	"	"	"	"	"
REVENUE LOSSES:						
Regulated Community	Not Measurable	Not Measurable	Not Measurable	Not Measurable	Not Measurable	Not Measurable
Local Government	"	"	"	"	"	"
State Government	"	"	"	"	"	"
Total Revenue Losses	"	"	"	"	"	"

(23a) Provide the past three-year expenditure history for programs affected by the regulation.

Program	FY -3 (2016-17)	FY -2 (2017-18)	FY -1 (2018-19)	Current FY (2019-20)
160-10381 Enviro Protection Operations	\$86,462,000	\$89,215,000	\$93,190,000	\$84,523,000
161-10382 Enviro Program Management	\$26,885,000	\$29,413,000	\$30,932,000	\$28,420,000

(24) For any regulation that may have an adverse impact on small businesses (as defined in Section 3 of the Regulatory Review Act, Act 76 of 2012), provide an economic impact statement that includes the following:

(a) An identification and estimate of the number of small businesses subject to the regulation.

Persons with proposed or existing discharges into surface waters of the Commonwealth must comply with the regulation. Also, see response #15.

(b) The projected reporting, recordkeeping, and other administrative costs required for compliance with the proposed regulation, including the type of professional skills necessary for preparation of the report or record.

Each activity that will result in a discharge of pollutants to waters of this Commonwealth requires a review that is based on site-specific considerations. NPDES permits and other approvals will be required for discharges to surface waters, using the water quality criteria and standards identified in the regulations. Existing Department procedures will be used to implement this proposed regulation.

(c) A statement of probable effect on impacted small businesses.

Each activity that will result in a discharge of pollutants to waters of this Commonwealth requires a review that is based on site-specific considerations. NPDES permits and other approvals will be required for discharges to surface waters, using the water quality criteria and standards identified in the regulations. Existing Department procedures will be used to implement this proposed regulation.

(d) A description of any less intrusive or less costly alternative methods of achieving the purpose of the proposed regulation.

There were no non-regulatory alternatives or less intrusive methods available to consider in order to achieve the purpose of this regulation.

In addition to the flexibility afforded by the regulatory mechanisms in the NPDES permitting program, the water quality standards regulations include a provision that allows for the development of site-specific water quality criteria, in lieu of the statewide criteria, under certain circumstances. In particular, in accordance with § 93.8d(a), if site-specific biological or chemical conditions of the receiving waters differ from the conditions upon which the statewide criteria are based, or there exists a need for a site-specific criterion for a substance not listed in § 93.8c, Table 5, the Department will consider a request for site-specific criteria. A discharger has the opportunity to weigh the costs of developing a site-specific standard against the usage of an existing statewide standard.

(25) List any special provisions which have been developed to meet the particular needs of affected groups or persons including, but not limited to, minorities, the elderly, small businesses, and farmers.

There are no such provisions in this rulemaking.

(26) Include a description of any alternative regulatory provisions which have been considered and rejected and a statement that the least burdensome acceptable alternative has been selected.

Two alternative regulatory schemes are being proposed for consideration in achieving the correct level of protection for the waters of the Commonwealth. The amendments propose two alternatives for a point of compliance with the manganese water quality standard: the point of all existing or planned surface potable water supply withdrawals (First Alternative Point of Compliance); or all surface waters, near the point of discharge (Second Alternative Point of Compliance). The first alternative complies with Act 40 of 2017 and

the second alternative is consistent with the CSL and Pennsylvania's existing water quality program as it relates to toxic pollutants, since manganese is a neurotoxin at exposure levels beyond those necessary to maintain adequate health.

(27) In conducting a regulatory flexibility analysis, explain whether regulatory methods were considered that will minimize any adverse impact on small businesses (as defined in Section 3 of the Regulatory Review Act, Act 76 of 2012), including:

(a) The establishment of less stringent compliance or reporting requirements for small businesses.

This rulemaking does not establish or revise compliance or reporting requirements for small businesses. There was no less stringent compliance or reporting requirements to consider in this case. Any water quality criteria that are less stringent than those recommended by the Department and accepted by the Board in the proposed rulemaking were not protective enough for the waters of the Commonwealth and would negate the benefits listed in #17. The rulemaking reflects the results of a scientific evaluation of regulatory criteria.

(b) The establishment of less stringent schedules or deadlines for compliance or reporting requirements for small businesses.

There were no non-regulatory alternatives available to consider in this case. Schedules of compliance and reporting requirements to meet the standards of this rulemaking may be considered when permit or approval actions are taken, in accordance with 25 Pa. Code Chapter 92a. They are not considered as part of this scientific evaluation of the correct water quality criteria needed to protect surface waters.

(c) The consolidation or simplification of compliance or reporting requirements for small businesses.

Schedules of compliance and reporting requirements to meet the standards of this rulemaking may be considered when permit or approval actions are taken. They are not part of this scientific evaluation and establishment of the correct water quality criteria needed to protect surface waters.

(d) The establishment of performance standards for small businesses to replace design or operational standards required in the regulation.

The regulations represent performance standards. They identify the instream goals for water quality protection and do not identify the design or operational standards that must be used to meet the goals.

(e) The exemption of small businesses from all or any part of the requirements contained in the regulation.

There were no such exemptions of small businesses to consider in this case.

(28) If data is the basis for this regulation, please provide a description of the data, explain in detail how the data was obtained, and how it meets the acceptability standard for empirical, replicable and testable data that is supported by documentation, statistics, reports, studies or research. Please submit data or supporting materials with the regulatory package. If the material exceeds 50 pages, please provide it in a searchable electronic format or provide a list of citations and internet links that, where possible, can be accessed in a searchable format in lieu of the actual material. If other data was considered but not used, please explain why that data was determined not to be acceptable.

Please see the attached rationale document for criteria development and specific literature reviews and citations.

The Department assessed the peer-reviewed technical documentation and scientific literature and found it was scientifically sound.

(29) Include a schedule for review of the regulation including:

- | | |
|--|---|
| A. The length of the public comment period: | <u>64 days</u> |
| B. The date or dates on which any public meetings or hearings will be held: | <u>September 8, 9, 10, 2020</u> |
| C. The expected date of delivery of the final-form regulation: | <u>Quarter 2, 2021</u> |
| D. The expected effective date of the final-form regulation: | <u>Upon publication in the Pennsylvania Bulletin as final-form rulemaking for Clean Streams Law permit and approval actions, or as approved by EPA for purposes of CWA permits.</u> |
| E. The expected date by which compliance with the final-form regulation will be required: | <u>Upon issuance or renewal of NPDES permits or other approvals of the Department only after publication in the final-form rulemaking in the Pennsylvania Bulletin</u> |
| F. The expected date by which required permits, licenses or other approvals must be obtained: | <u>When permits or approvals are issued or renewed.</u> |

(30) Describe the plan developed for evaluating the continuing effectiveness of the regulations after its implementation.

This regulation will be reviewed, as required, at least once every three years, in accordance with the federal CWA. As newer science is developed, the standards will be updated, as needed.

TABLE - MANGANESE RAF QUESTION #12
Summary: Criteria Update for Other States

State	Human Health		Aquatic life		Agriculture	Potable Water Supply
	Water + Fish	Fish Consumption	Acute	Chronic		
New York	--	--	--	--	--	0.3 mg/L
West Virginia	1.0 mg/L ¹	--	5.0 mg/L ²	--	--	--
Washington, D.C.	--	0.1 mg/L ³	--	--	--	--
Alaska	0.05 mg/L	0.1 mg/L	--	--	0.2 mg/L ⁴	--
Arizona	0.98 mg/L	--	--	--	10.0 mg/L ⁴	--
Colorado	--	--	2.986 mg/L ⁵	1.650 mg/L ⁵	0.2 mg/L	0.05 mg/L
Illinois	--	--	4.181 ug/L ⁶	1.778 mg/L ⁶	--	1.0 mg/L
Maine	--	0.1 mg/L	--	--	--	--
Nebraska	--	--	--	1.0 mg/L	--	0.05 mg/L
New Hampshire	0.05 mg/L	0.1 mg/L	--	--	--	--
Wyoming	--	--	3.110 mg/L ⁶	1.462 mg/L ⁶	--	0.05 mg/L

¹ Applies within 5-mile zone immediately upstream above a known water supply

² Site-specific acute criteria for manganese applies to Fly Ash Run of Daugherty Run.

³ Class D Human Health Criteria for Metals based on Total Recoverable Metals; Noncarcinogen; 30 day average

⁴ Standard is for irrigation and does not include livestock water supply

⁵ Hardness dependent equation. Value is based on a CaCO₃ of 100 mg/L.

⁶ Hardness dependent equation. Value is based on a CaCO₃ of 100 mg/L. Value is based on the dissolved amount.

PA DEPARTMENT OF ENVIRONMENTAL PROTECTION

BUREAU OF CLEAN WATER

Rationale

Development of the Human Health Criterion for Manganese

Executive Summary

In October 2017, a law was passed in the Commonwealth (“Act 40”) that directed the Environmental Quality Board (Board) to promulgate proposed regulations related to manganese. Act 40 has directed a modification to Pennsylvania’s water quality standards (WQSs). As the existing Potable Water Supply (PWS) criterion for manganese has not been reevaluated in many years and as states have an obligation under Section 303(c)(1) of the federal Clean Water Act (CWA) to periodically review and update, as appropriate, their WQSs to reflect current scientific knowledge and recommendations, the Department of Environmental Protection (DEP) evaluated the existing scientific data and information to ensure adequate criteria for manganese exist to protect all of PA’s water uses. On January 27, 2018, DEP published an advance notice of proposed rulemaking soliciting information necessary to prepare the rulemaking documents required by law and support the Board’s adoption of proposed regulations. The information received in response to the advance notice and recent scientific information relating to manganese were used to evaluate manganese water quality criteria with respect to the protected water uses identified in PA’s water quality standards regulation.

Following an evaluation of the available scientific data, in accordance with its regulations and policies, DEP developed a human-health based water quality criterion for manganese of 0.3 mg/L. DEP recommends that this criterion should apply in all surface waters (i.e., at the point of discharge) in accordance with DEP’s Water Quality Toxics Management Strategy (25 Pa. Code Chapter 16) and regulations found at 25 Pa. Code Chapters 93 (relating to water quality standards) and 96 (relating to water quality standards implementation).

History of Regulation

Prior to 1971, the Sanitary Water Board (SWB) in the Department of Health had primary responsibility for maintaining the rules and regulations related to water quality criteria and standards in Pennsylvania. Pennsylvania has had a water quality criterion for manganese since Article 301 Water Quality Criteria was added to the SWB Rules and Regulations on June 28, 1967. The criterion contained in Article 301 of the SWB Rules and Regulations appeared as “k –Total Manganese – Not to exceed 1.0 mg/L”. This criterion was originally applied as Specific Criteria in Section 7 of Article 301 for selected waterbodies, or segments, in the North Branch Susquehanna, Monongahela, Allegheny, and Ohio River basins. In 1971, the SWB was abolished, and the authority and responsibilities of the SWB were transferred to the Pennsylvania Department of Environmental Resources (DER). Also, in 1971, the SWB Rules and Regulations, Article 301 Water Quality Criteria were replaced by the creation of 25 Pa. Code Chapter 93 Water Quality Standards, effective September 11, 1971 (1 Pa.B. 1804). In 1979, manganese was adopted as a statewide PWS criterion, implemented at the point of discharge by being added to 25 Pa.

Code § 93.7(d), Table 4, as part of DER's first triennial review of water quality standards (adopted by the Board on August 21, 1979, published in the *Pa. Bulletin* on September 8, 1979 (9 Pa.B. 3051), effective October 8, 1979). PWS is identified in §93.7 Table 3 as the *critical use*. As stated in §93.7, the critical use is the designated or existing use the criteria are designed to protect, and more stringent site-specific criteria may be developed to protect other more sensitive, intervening uses. When the critical use is identified and the statewide criterion is developed, it should provide protection of all water uses, unless new information shows additional protection is needed. In accordance with the current regulations found at Chapter 93, the purpose of PWS water quality criteria is to ensure that public water systems receive raw water at their intake structures that can achieve compliance with 25 Pa. Code Chapter 109 Safe Drinking Water (SDW) standards utilizing only conventional treatment. The only known rationale document for the existing PWS criterion was prepared by Kenneth Schoener, a DER water supply engineer. The rationale document explains the criterion was partially based on testimony from Mr. Reginald Adams, an experienced water supply manager from the Wilkinsburg Joint Water Authority. Mr. Adams stated that an "average up-to-date water plant can probably handle soluble manganese concentrations without too much difficulty. A well-designed plant can handle 1.5 to 2 parts per million...". He further indicated that if the manganese content of the raw water is 1.0 mg/L, or less, addition of potassium permanganate (KMnO₄) to the coagulation-sedimentation area at a rate of 2 parts of KMnO₄ to 1 part of manganese will remove the manganese. Operators can simply add KMnO₄ until a "slight pink residual color appears in the sedimentation unit". This process was commonly used in western PA, but it is considered a treatment process beyond "conventional treatment"¹.

DEP provided clarification to the manganese criterion in the 2000 Regulatory Basics Initiative (RBI) triennial review (30 Pa.B. 6059 on November 18, 2000) by adding a reference that the criterion is to be measured as total recoverable and based on potable water supply (PWS²) critical use protection. Manganese characteristics do not align with those of the other PWS substances included in § 93.7 (relating to specific water quality criteria), which are: total dissolved solids (TDS), bacteria (Bac₂), color (col), phenolics (Phen), iron (Fe₂), fluoride (F), chloride (Ch), sulfate (Sul) and nitrite plus nitrate (N). Through implementation requirements, compliance points differ for these substances. Compliance with total dissolved solids, fluoride, phenolics and nitrite plus nitrate criteria was moved from the point of discharge to the point of an existing or planned surface PWS withdrawal when § 93.5(e)³ (relating to application of potable water supply use criteria) was added in the 1985 triennial review (adopted by the Board on December 18, 1984, effective on February 16, 1985 as published in the *Pa. Bulletin* (15 Pa.B. 544)). The creation of 25 Pa Code, Chapter 96 Water Quality Standards Implementation occurred during the RBI Triennial Review in 2000. Language originally found in § 93.5(e) was relocated to § 96.3(d) during this RBI Triennial. Subsequently, chloride (Ch) and sulfate (Sul) were added to the § 96.3(d) provision in 2002, as adopted by the Board on September 17, 2002, and published in the *Pa. Bulletin* on December 14, 2002 (32 Pa.B. 6101). See Figure 1 for a summary of the regulatory changes.

¹ The term "conventional treatment" is defined in § 93.1 as follows: "For the purpose of surface water protection of the Potable Water Supply (PWS) use, coagulation, followed by filtration for the removal of solids, and disinfection for the control of pathogens to produce water for drinking and other human consumption."

² PWS is described in 25 Pa. Code § 93.3 as "used by the public as defined by the Federal Safe Drinking Water Act, 42 U.S.C.A. § 300F, or by other water users that require a permit from the Department under the Pennsylvania Safe Drinking Water Act (35 P.S. §§ 721.1—721.18), or the act of June 24, 1939 (P.L. 842, No. 365) (32 P.S. §§ 631—641), after conventional treatment, for drinking, culinary and other domestic purposes, such as inclusion into foods, either directly or indirectly."

³ The language in § 96.3(d) was relocated from an earlier regulation, § 93.5(e), that is now a reserved section.

Figure 1. Summary Table for § 96.3(d) PWS exceptions.

PWS Criteria including Manganese(Mn) & those listed in 96.3(d)	Year that the point of application was moved from the point of discharge to the point of PWS withdrawal	Consistent with Primary MCL values?	Primary MCL (Value in mg/L)	Consistent with Secondary MCL values?	Secondary MCL (Value in mg/L)	Not based on either primary or secondary MCL values
Ch	2002	--	--	yes	250	
F	1985	no	4	yes	2	
Mn	--	--	--	no	0.05	yes
N - Nitrate	1985	yes	10	--	--	
N - Nitrite	1985	yes	1	--	--	
Phen	1985	--	--	--	--	yes
Sul	2002	--	--	yes	250	
TDS	1985	--	--	yes	500	

Implementation of water quality standards is discussed in 25 Pa. Code Chapter 96. Section 96.3(c) (relating to water quality protection requirements) states that the water quality criteria described in Chapter 93, including the criteria in §§ 93.7 and 93.8(b) (relating to specific water quality criteria; and toxic substances) shall be achieved *in all surface waters* at least 99% of the time, unless otherwise specified in this title. Section 96.3(d) states “as an exception to subsection (c), the water quality criteria for total dissolved solids, nitrite-nitrate nitrogen, phenolics, chloride, sulfate and fluoride established for the protection of potable water supply shall be met at least 99% of the time *at the point of all existing or planned surface potable water supply withdrawals* unless otherwise specified in this title.”⁴ PWS parameters that are currently met in all surface waters are manganese, color, coliform bacteria and dissolved iron.

Manganese Background

Natural and Anthropogenic Sources

Manganese (Mn) is a ubiquitous element that exists naturally at low levels in many types of rocks, soils, waterbodies and plants. Pure manganese is a silver-colored metal, but manganese does not exist as a free element in nature. It is typically found in a variety of salts and minerals often combined with iron (Fe).

While manganese can exist in multiple oxidation states, it is generally present in surface waters in only two oxidation states, Mn⁺² and Mn⁺⁴. The Mn⁺⁴ state is the insoluble manganese dioxide (MnO₂) and would be present in a suspended state. The Mn⁺² state is dissolved. It is very soluble in acid waters and is sparingly soluble in alkaline waters. Mn⁺² slowly oxidizes to MnO₂ under most natural water conditions.

⁴ The language in § 96.3(d) was relocated from an earlier regulation, § 93.5(e), that is now a reserved section.

Surface water levels of manganese may increase either as a result of direct discharges of manganese to the waterbody or due to an alteration of the chemical composition of the surface waters through mobilization of existing manganese sinks (Kaushal, et. al. 2018). Manganese appears to primarily enter PA waters as a result of anthropogenic activities including, but not limited to, DEP permitted discharges of sewage, various types of discharges categorized as industrial waste, stormwater, other permitted discharges and non-permitted discharges such as abandoned mine drainage. Manganese also finds its way into surface waterbodies through the natural weathering of rocks and minerals present in the earth's crust which then enter the waterbody either via stormwater runoff or through groundwater base flow containing manganese. Groundwater in certain areas of PA is known to contain high levels of iron and manganese due to the underlying geology of the region.

In addition to direct discharges to surface waters and mobilization of manganese sinks, manganese can enter the air from power plants, iron and steel manufacturing, coke ovens, automobile emissions, and dust from mining operations. It is usually found in the subsoil layers and not in any significant level at the surface. Thus, high surface soil levels may indicate contamination from vehicle exhaust associated with the fuel additive, methylcyclopentadienyl manganese tricarbonyl (MMT) (Lytle 1994).

Unless otherwise impacted by anthropogenic activities, dissolved manganese concentrations in surface waters rarely exceed 1 mg/L and are usually less than 0.20 mg/L (WHO 2004). An analysis of surface water samples collected in Pennsylvania between 2008 and 2018 revealed that 4% of 775 sample sites exceeded the current PWS manganese criterion of 1.0 mg/L, and 48% of the sites exceeded the secondary drinking water MCL of 0.05 mg/L. The natural quality of PA's surface waters can be characterized by the median and mean values of the 2008-2018 comprehensive statewide dataset, which are 0.026 mg/L and 0.037 mg/L, respectively. Sample sites were assessed for land use type and graded for land disturbance, which is a strong indicator of the presence of anthropogenic activity. The analyses showed a very strong positive correlation between land disturbance (e.g., mining regions of Pennsylvania) and average manganese concentrations in surface waters, such that sites in areas with higher land disturbance measured higher average manganese concentrations in surface waters within the same areas. In accordance with §93.1, *natural quality* is defined as "the water quality conditions that exist or that would reasonably be expected to exist in the absence of human related activity." Thus, the available statewide data suggest that where anthropogenic activity is absent or limited, natural manganese concentrations in Pennsylvania's surface waters are low.

Manganese is commonly used in the manufacture of metal alloys (aluminum and stainless steels), dry cell batteries, U.S. coins, glass, matches, fireworks, micro-nutrient fertilizer additives, organic compounds used in paint driers, textile bleaching, and leather tanning (EPA criteria 1979; Santamaria, 2008). It is also used in the manufacture of fungicides, such as Maneb and Mancozeb (Mora 2014, Bouabid, et. al 2016). Wastewater discharges resulting from these industrial manufacturing processes may be more likely to contain measurable, or significant, quantities of manganese. In addition, land application of manganese-containing pesticides could potentially result in the mobilization and discharge of manganese to waterbodies through discharges of stormwater runoff.

Discharges and Sources of Manganese in Pennsylvania

In Pennsylvania, coal mining activity has been and continues to be a significant contributor of manganese to waters of the Commonwealth. DEP's mining program has identified approximately 650 active NPDES mining permits containing numeric manganese limits. It is unknown how many abandoned mine discharges, which do not require permits, may exist across the Commonwealth.

In addition to mining, a recent review of Pennsylvania's sewage and industrial waste NPDES discharge permits revealed that manganese is also a potential issue for several non-mining sectors of the regulated community. These sectors include landfills, wastewater treatment plants (sewage and drinking water filter backwash plants) and power plants. Approximately 560 non-mining individual NPDES permits contain at least "monitor & report" conditions for manganese, and roughly 90 of those permits contain actual numeric effluent limits for manganese based on the existing PWS water quality criterion for manganese of 1.0 mg/L. Permits were identified across the state in each of the six DEP regions.

Human Health and Manganese

Physiological Need - Adequate Intake and Deficiency

Manganese is an essential micronutrient for plants and animals with Mn^{+2} and Mn^{+3} as the predominant oxidation states found in biological systems (Smith 2017). The highest concentrations in the human body are found in the bone, liver, kidney, pancreas, adrenal glands and pituitary gland (O'Neal 2015). Within the body's cells, it is found primarily in mitochondrial superoxide dismutase (MnSOD). MnSOD is a vital enzyme that maintains the overall health of the body's cells through its potent antioxidant capacity. Rodent studies have demonstrated that complete knockout of this enzyme results in death shortly after birth (Holley 2011). Beyond MnSOD, manganese is found in various metalloproteins especially glutamine synthetase in astrocytes, but it is also a cofactor for various enzymes that include hydrolases, kinases, decarboxylases and transferases (EPA IRIS). These manganese-based metalloproteins and enzymes play a critical role in the regulation of development, reproductive function, metabolism, blood clotting, digestion, bone growth, cell death and brain function (ATSDR 2012, Chen 2015, Chung 2015, Erikson 2007, Smith 2017, Yoon 2011).

Manganese deficiency can lead to bone malformation, skin lesions, hypocholesterolemia and seizures, but given the ubiquitous nature of manganese in the diet, deficiency is rarely observed except in susceptible individuals such as those with severely restricted diets or receiving total parenteral nutrition (TPN) formulated without manganese. Adequate intake (AI) levels recommended by the National Academy of Medicine vary by age group, gender and reproductive state (for women). The AI levels for adult males and non-pregnant, non-lactating females are 2.3 mg and 1.8 mg, respectively (Institute of Medicine 2001). Low manganese levels have also been associated with specific disorders including Alzheimer's disease, amyotrophic lateral sclerosis (ALS), epilepsy, phenylketonuria, maple syrup urine disease and Perthes' disease (Cordova 2013, Crossgrove 2004, Finley 1999). However, more research is needed to understand whether the observed low levels of manganese are present before (i.e., causal) or after the disease manifests.

Excessive Intake of Manganese - Effects of Elevated Manganese in the Human Body

As a micronutrient, only small quantities of manganese are necessary to achieve adequate health. As with many other heavy metals (i.e., lead, mercury), chronic exposure to elevated levels of manganese may lead to adverse health effects including various irreversible neurological deficits in adults, children, infants, and the developing fetus. Manganese is preferentially deposited in mitochondria-rich tissues such as the liver, pancreas and brain and has been shown to cross the placenta and the blood-brain barrier (BBB) (Lidsky 2007). Exposures to levels of manganese beyond those necessary for maintaining adequate health can lead to excess manganese in brain tissue resulting in a parkinsonian-like condition known as manganism. In 1837, James Couper became the first to describe this condition in a group of Scottish laborers working in the chemical industry (Menezes-Filho 2009, Santamaria 2008). Manganism is a neurodegenerative condition that results in extrapyramidal motor system dysfunction. It usually begins with neuropsychological symptoms that include aggressiveness, anxiety, headache, and decreased cognitive function. Upon very acute exposure or continued chronic exposure to lower levels of manganese, the condition will progress to changes in motor function which are characterized by a signature "cock-like" walk, dystonia, upright stance, difficulty walking backward and mild tremors (Aschner 2000, Chen et al. 2015, Crossgrove 2004). Depending upon the length and severity of the exposure, these neurological effects may result in permanent, irreversible damage to the brain. While the symptoms of manganism closely resemble Parkinson's Disease, it is a distinctly different condition (Bouabid 2016).

Historically, public health policies were primarily concerned with addressing acute toxicities that resulted from occupational exposure of adults to various heavy metals and chemicals. History has also shown that identification of other toxic effects in sensitive subpopulations will slowly follow, and eventually, subclinical effects are considered and examined. Unfortunately, significant amounts of time generally pass between our understanding of the initial acutely toxic events and the subtle chronic impacts on children and development, which results in considerable delays in removing the exposure pathway. In fact, it took several decades of research and periodic reevaluation of the approved threshold level for lead to understand that there is no safe level of exposure for children (Lidsky 2007). The acute effects associated with high levels of manganese are widely known and well understood, but our understanding of the chronic, subclinical effects is lacking for manganese particularly with regards to children and brain development. Researchers have begun to examine the effects of chronic low-level exposures on children. Preliminary data suggests that the period of fetal development through early childhood represents a sensitive time period, but more research is needed to determine possible exposure-related effects and what levels are considered safe. Consequences of low-level exposure are often subtle for an individual child and thus easily dismissed, but at the population level, such shifts in intellectual ability or behaviors can have a substantial impact (Lanphear 2015). The available epidemiological data on children suggests that exposure to elevated manganese levels may result in a variety of neurological and developmental deficits including symptoms consistent with attention-deficit, hyperactivity disorder (ADHD), short-term memory impairments, visual identification impairments, impaired performance on manual dexterity and rapidity tests and a reduction in IQ scores (Bouchard 2007, Chung 2015, Henn 2011, Grandjean 2014, Haynes 2015, Khan 2011, Khan 2012, Kim 2009, Menezes-Filho 2009, Oulhote 2014, Wasserman 2006). In addition, Kim et. al. (2009) examined the possibility that co-exposure to neurotoxicants may have an additive effect on neurodevelopment. In this case, the researchers assessed the intellectual function of school-aged children in Korea exposed to environmentally relevant levels of lead and manganese (Kim 2009).

Exposure Pathways and Homeostatic Control Mechanisms

There are two primary human exposure pathways for manganese – inhalation and oral exposure. Intravenous injection of illegal narcotics and TPN represent other possible routes of exposure. We know that inhalation of manganese dusts poses greater immediate toxicity risks and often results in significant acute and chronic neurotoxic effects because inhaled manganese bypasses the body's homeostatic control mechanisms. The majority of manganese intoxication cases have been associated with occupational exposures (i.e., welders, miners, smelters, battery-manufacture workers, etc.) (Crossgrove 2009). The increased level of toxicity associated with this exposure pathway is not unexpected since inhaled manganese has a direct pathway to the brain via the olfactory nerve (O'Neal 2015). Manganese can also be absorbed through the lungs. The human body tightly regulates the amount of *ingested* manganese that enters the circulatory system via intestinal absorption and the amount that circulates through the body via biliary excretion (Chen, 2015, Crossgrove 2004, Erikson 2007, O'Neal 2015, Schroeter 2012, Yoon 2011). The intestines and liver, which regulate manganese blood levels by reducing absorption from the digestive tract and by increasing excretion through the production of bile, are effectively bypassed when manganese is inhaled. Thus, the body will typically absorb 100% of the inhaled manganese. Other possible environmental sources of inhalable manganese include power plant and automobile (MMT) emissions.

By far, the major route of exposure for most individuals is through the oral pathway (i.e., dietary sources). In addition to food, individuals may also consume manganese via surface water and groundwater sources. Dietary sources and amounts vary greatly with average intake for adults ranging between 2 and 9 mg/day. Significant sources of manganese include nuts, whole grains, legumes and rice. Moderate to high amounts can also be found in tea, green leafy vegetables, egg yolks, chocolate, seeds, and some fruits (Aschner 2000, Chen 2015, Finley 1999). Therefore, manganese levels at the higher range are more likely to be encountered with vegetarian (plant-based) diets. According to the EPA's Integrated Risk Information System (IRIS) database, studies have suggested that absorption rates may differ between drinking water and food sources due to differences in bioavailability and fasting state of the individual. For example, a vegetarian diet can provide in excess of 9 mg/day of manganese. However, it is important to note that the plant-based diet also contains many substances that bind and inhibit the absorption of manganese including tannins, oxalates, phytates and fiber which significantly reduces bioavailability (EPA IRIS). In addition, many manganese-rich foods are likely to contain a wide variety of minerals in addition to manganese, and the transport protein mechanisms of intestinal cell membranes may have a greater affinity for those other minerals, such as iron, thus limiting the absorption of manganese. Unlike for other heavy metals, the oral exposure pathway is generally not expected to result in toxic levels of manganese within the body due to the tight homeostatic control mechanisms mentioned above. Proper functioning of these homeostatic control mechanisms generally ensures that manganese levels remain within the appropriate range necessary for good health. Compared to the inhalation route which results in nearly 100% absorption, absorption of manganese from the diet averages only 3-5% (ATSDR 2012, Smith 2017).

Factors influencing Manganese levels in the body

Although diet is not generally expected to lead to elevated manganese levels, the blood and tissue manganese levels within specific individuals of the population are highly influenced by a variety of factors including manganese oxidation state, liver function, gender/mineral status, fasting state and age. Furthermore, with a narrow dose range between inadequate and excess intake and such low oral

absorption rates (typically less than 5%), a small variation in absorption of manganese could substantially change the overall body burden of manganese (Smith 2017).

Different oxidation states of manganese are absorbed by different cell membrane transport proteins and pathways. The divalent metals transporter 1 (DMT-1) shuttles primarily divalent manganese while the transferrin (Tf)/transferrin receptor (TfR) system is responsible for transporting trivalent manganese (Chen 2015). Mn^{+3} has a high affinity for the Tf system. On the other hand, Mn^{+2} may be transported into cells through a variety of transporters other than DMT-1 including the zinc transporters (ZIP8 and ZIP14), the citrate transporter, the choline transporter, the dopamine transporter (DAT), and calcium (Ca) channels (Chen 2015). The divalent oxidation state is one of two oxidation states typically found in surface waters.

As already discussed, the liver plays an important role in maintaining manganese homeostasis within the body. Liver impairment has a profound effect on manganese levels in the blood. If excess manganese has been absorbed, biliary excretion is the major pathway for elimination (Crossgrove 2004). Thus, any form of liver impairment (i.e., cirrhosis, hepatitis, fatty liver disease, etc.) may decrease manganese elimination and increase blood plasma levels leading to neurotoxicity.

Individuals with iron-deficiency anemia are at risk for increased manganese levels in the body because both minerals use common transporters for uptake, and iron-deficiency increases the expression of these transport systems (Chen 2015). Manganese is structurally and biochemically similar to iron in numerous ways (Smith 2017). Both metals are transition elements, carry similar valence charge under physiological conditions (2+ and 3+), strongly bind Tf and preferentially accumulate in mitochondria (Aschner 2008). Not surprisingly, females of childbearing age have been shown to absorb more manganese than males. Iron-deficiency anemia is prevalent among this group (Bouchard 2007, O'Neal 2015).

Fetuses, neonates and infants are known to absorb greater amounts of manganese than adults due to several unique features of these life stages (Brown 2008, O'Neal 2015, Yoon 2011). First, this age group appears to lack a fully-developed excretory pathway via the liver. Second, there is evidence that neonate and infant digestive systems may absorb more manganese than adults. The increased absorption may be related to increased expression of the DMT-1 protein at the cell surface due to the need for large amounts of iron during early development. Third, formula-fed infants consume more water per unit of body weight. This difference is at a maximum in the first month and decreases with increasing age. Infants consuming at the 95th percentile of intake ingest 8 times more water on a ml/kg basis than a 70 kg adult (Brown 2008). Fourth, there is increased permeability across the BBB and retention of manganese in infant tissues. To date, this tendency has been attributed to an immaturity of the BBB mechanisms. However, research has suggested that the uptake of manganese may be controlled by active transport mechanisms distinct from adults allowing for greater uptake of compounds required for normal development (Yoon 2011).

Guidelines for Manganese

Health-based and Aesthetic Guidelines

EPA first mentions manganese in the Water Quality Criteria 1972 book, also known as the "Blue Book". At that time, EPA established a recommendation that soluble manganese not exceed 0.05 mg/L in public water sources. In the 1976 Quality Criteria for Water book, known as the "Red Book", EPA retained the 0.05 mg/L criterion to protect domestic water supply and added a 0.1 mg/L "organism only" criterion for protection of consumers of marine mollusks. These criteria remained unchanged in EPA's Quality Criteria for Water 1986, known as the "Gold Book". According to these EPA documents, public water systems with conventional treatment should be able to partially sequester manganese with special treatment, but manganese is not removed by conventional filtration. Complaints of laundry staining and objectionable tastes are common when manganese levels exceed 0.150 mg/L and low concentrations of Fe may increase these effects. In 1963, McKee and Wolf summarized the available toxicity data on freshwater aquatic life. Tolerance values ranged from 1.5 mg/L to over 1,000 mg/L. According to the EPA Red Book, background surface water levels of manganese were not expected to exceed 1 mg/L. As background levels were not expected to exceed 1.0 mg/L, manganese was not considered to be a problem in freshwater waterbodies. It is unclear whether this data included consideration of impacts of manganese on freshwater mollusks. With respect to marine mollusks, manganese was found to bioaccumulate in the edible portions with bioaccumulation factors (BAFs) as high as 12,000. As such, EPA established the 0.1 mg/L "organism only" criterion. At concentrations of slightly less than 1.0 mg/L to a few milligrams per liter, manganese may be toxic to plants from irrigation water applied to soils with pH values lower than 6.0 (EPA Red Book). As elevated manganese levels in groundwater and surface water tend to be limited to specific regions within the country, EPA does not have a national water quality standard recommendation for manganese for the protection of human health or aquatic life.

EPA's IRIS database provides human health assessment information on chemical substances following a comprehensive review of toxicity data as outlined in the *IRIS assessment development process*. The oral reference dose (RfD) is based on the assumption that thresholds exist for certain toxic effects such as cellular necrosis. It is expressed in units of mg/kg-day. In general, the RfD is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. The RfD for manganese is for the total oral (dietary) intake of manganese and was last revised in November 1995. EPA recommended that a modifying factor of 3 be applied if this RfD is used for assessments involving nondietary exposures (soils or water). There are four primary reasons for the recommendation. First, fasting individuals have been shown to absorb more manganese from drinking water than non-fasting individuals. Second, a study by Kondakis et. al. (1989) raised concerns about possible adverse health effects associated with a lifetime consumption of drinking water containing approximately 2 mg/L of manganese. Third, formula fed infants have been found to have a much higher concentration of manganese in hair samples versus breast fed infants. Not only does infant formula contain higher amounts of manganese than breast milk, the valence form of the manganese in formula appears to increase the absorption rate. Studies have shown that the levels of manganese in learning-disabled children were significantly increased in comparison with that of non-disabled children. Although no causal relationship has been determined, further research is needed. There is evidence that the infant digestive tract absorbs more manganese than adults and that infants are less able to excrete it. Furthermore, it has been shown to readily cross the blood-brain barrier in infants. A study by Mena et.

al. (1974) found the rate of penetration in animal experiments to be 4 times higher in infants than in adults. These considerations, in addition to the likelihood that any adverse neurological effects of manganese associated with early exposure are likely to be irreversible and not manifested for many years after exposure, warrant caution when establishing safe levels of manganese in water until more definitive data are available (EPA IRIS 2017).

EPA's Drinking Water Health Advisory Program, sponsored by the Health and Ecological Criteria Division of the Office of Science and Technology (OST), Office of Water (OW), provides information on the health and organoleptic (e.g., taste, odor, color) effects of contaminants in drinking water. A health advisory (HA) is not an enforceable standard, but rather provides technical guidance to assist Federal, State and local officials when emergency spills or contamination situations occur. The current HA for manganese was issued in 2004 and was based partly on the Agency for Toxic Substances and Disease Registry's final Toxicological Profile for Manganese (ATSDR 2000) and the Institute of Medicine's Dietary Reference Intakes for Manganese (IOM 2001). HAs are generally determined for one-day, ten-day and lifetime exposure if adequate data are available that identify a sensitive noncarcinogenic end point of toxicity. There was no suitable information to develop a one-day HA for manganese. The ten-day HA of 1 mg/L for a child is recommended as a conservative estimate for a 1-day exposure for both children and adults. The ten-day HA for a 10-kg child is 1 mg/L. The lifetime HA for adults and children is 0.3 mg/L and was calculated using the RfD in IRIS. For infants younger than 6 months, the lifetime HA of 0.3 mg/L is also recommended for acute exposures (ten-day, one-day) due to similar concerns identified by EPA in establishing the oral RfD for manganese (EPA manganese HAL). Currently, the federal Safe Drinking Water regulations only regulate manganese as a secondary contaminant. Under Federal regulations, SMCLs are considered non-enforceable federal guidelines for contaminants that may cause cosmetic or aesthetic effects. However, as mentioned previously, SMCLs are enforceable standards in the Commonwealth of Pennsylvania, and they are regulated under 25 Pa. Code Chapter 109. The SMCL for manganese in potable water is 0.05 mg/L.

Technology-based Guidelines

Effluent Limitation Guidelines (ELGs) are national, technology-based wastewater discharge regulations that are developed by EPA on an industry-by-industry basis. DEP received comments from the mining industry during the public comment period of the ANPR regarding ELGs. The mining sector has pointed to the federal ELGs found at 40 CFR 434, which place limitations on the amount of manganese that can be legally discharged in mining effluent. Pennsylvania's mining regulations found at 25 Pa. Code §§ 87.102, 88.92, and 89.52 mirror these federal limitations. Both the state and federal regulations effectively limit discharges of manganese to 2.0 mg/L as a 30-day average, 4.0 mg/L as a daily maximum and 5.0 mg/L as an instantaneous maximum. The mining sector contends that moving the application of the PWS criterion to the point of PWS withdrawal would not result in harmful levels of manganese in waters of the Commonwealth at the point of discharge because the federal ELGs effectively prevent mining companies from discharging at such levels. DEP recognizes that this industry has additional regulations that would limit the amount of manganese in their discharges if the Commonwealth's PWS manganese criterion would be applied at the point of PWS withdrawal. However, the other industrial sectors identified earlier in this rationale document do not have federal ELGs in place to restrict the discharge of manganese to waters of this Commonwealth. Therefore, the mining ELGs and regulations do not adequately address control of manganese at the point of discharge for any industrial sector other than mining. Conversely, water quality criteria are applicable to, and are

necessary to prevent pollution from, all types of activities associated with and discharges to surface waters of the Commonwealth. Criteria are also used by DEP in the assessment of waterbodies and for other permit and non-permit related activities.

Water quality criteria are developed by DEP to protect all existing and designated water uses, and their application is not restricted to any one particular group or activity. DEP must follow appropriate Federal and State regulations when developing water quality criteria. Under section 303(c)(1) of the federal CWA, DEP is also required to review and update its WQSs periodically, but at least once every 3 years. Therefore, DEP must develop the necessary water quality criteria to protect Pennsylvania's water uses as defined in 25 Pa. Code §93.3 based on the best available scientific information and recommended guidelines, as appropriate.

Scientific Literature and Data Related to the Human Health Effects of Manganese

DEP has reviewed, and will continue to review, the scientific literature on the human health effects of manganese, a metal that will behave similarly to other heavy metals at levels beyond those necessary to maintain adequate health. Such a narrow dose range exists between inadequate and excess intake that small variations in the body's absorption and handling of manganese could substantially change the body burden (Smith 2017). Epidemiological studies and research have begun to examine the effects of manganese exposure on the developing fetus, infants and children. The summary that follows highlights some of the current knowledge on the human health effects of manganese.

In 2006, Grandjean et. al. reviewed the scientific literature and identified five industrial chemicals as neurodevelopmental toxicants: lead (Pb), methylmercury, PCBs, arsenic (As) and toluene. Since that time, epidemiological studies have documented six additional neurotoxicants: manganese, fluoride, chlorpyrifos, dichlorodiphenyltrichloroethane, tetrachloroethylene, and polybrominated diphenyl ethers (PBDEs) (Grandjean 2014). Lidsky (2007) and Grandjean recognized that the risks of industrial chemicals to brain development has historically required decades of research to identify and understand the subclinical neurotoxic effects since the initial discovery of toxicity often begins with poisoning and episodes of high-dose exposure. In addition, the full effects of early damage may not become apparent until school age or beyond due to the normal sequence of developmental stages (Grandjean 2014). Efforts to control and restrict developmental neurotoxicity are hampered by the lack of data required by law on developmental neurotoxicity for chemicals. While our understanding of the effects of early manganese exposure is currently limited, the recent research on well-documented neurotoxicants such as lead and methylmercury has generated new insights into the consequences of early exposure to heavy metals.

Between 2007 and 2011, Chung et. al. (2015) recruited 232 mother-infant pairs from the Mothers and Children's Environmental Health study (MOCEH) in Korea to evaluate the relationship between neurodevelopment and maternal blood manganese level without a specific source of occupational or environmental exposure (Chung 2015). The results of the study suggest an association between maternal blood manganese at delivery and neurodevelopmental scores of infants at 6 months of age.

Manganese levels in infant formula have been shown to contain as much as 75 times more manganese per liter than human breastmilk not including any additional manganese from the water used in the mixture (Brown 2008, Ljung 2007). Breastmilk manganese content can range between 1.8 and 27.5

µg/L and has been shown to vary with the stage of lactation. Higher levels of manganese occur during the initial weeks of breastfeeding and gradually decrease over the first several months. Levels at this later time generally average around 3 µg/L (Erikson 2007). Concentrations in infant formula, however, can range dramatically from 33 µg/L to well over 300 µg/L (EPA IRIS 1995). Soy-based formulas have been shown to contain the highest levels of manganese with a typical level between 200-300 µg/L. Unlike the natural decline of manganese levels observed in breastmilk over time, infant exposure to the manganese levels in formula will remain fairly constant until weaned. It is notable that human breastmilk manganese is also in a different oxidation state than infant formula. Human milk manganese is in the trivalent oxidation state whereas infant formula manganese is in the divalent oxidation state (Erikson 2007). Differences in absorption have been observed and may be attributed to the transport mechanisms that allow for manganese uptake across the gastrointestinal tract. Studies have found that formula-fed infants consume, absorb, and retain more manganese per day than breastfed infants (Brown 2008). If manganese is present in the drinking water used to prepare the infant formula, the manganese content will be further increased.

Bouchard et. al. (2007) conducted a pilot study of 46 Canadian children (boys and girls ages 6-15 years) to assess differences in children's exposure to public well water from two wells with different manganese concentration. Manganese levels in Well 1 had increased from 230 to 610 µg/L over the period from 1996-2005 with a mean value of 500 ± 129 µg/L. Well 2 was drilled in 1999 and had stable manganese levels that averaged 160 µg/L. Most families drank bottled water due to the bad taste associated with elevated manganese, but well water was used in cooking and to prepare soups and concentrated fruit juices. Manganese body burden was determined by measuring the manganese content of hair samples. Elevated levels of manganese in hair was associated with increased hyperactivity and oppositional behaviors in the classroom after adjusting for income, age and sex. Girls had significantly higher hair manganese levels than boys. The group was ethnically homogeneous, had an economic level above provincial average and most had a biparental family structure.

Following the 2007 pilot study, Bouchard et. al. (2011) conducted a cross-sectional study on 362 children (ages 6-13) living in southern Quebec. Researchers examined the effects of manganese intake from diet and drinking water on intellectual impairment. The results showed that children exposed to higher concentrations of manganese in tap water had lower IQ scores after adjustment for socioeconomic status and other metals present in the water. The study also showed that manganese intake from water ingestion, but not from the diet, was significantly associated with elevated hair manganese. This finding suggests that the body's normal homeostatic control mechanisms may not respond to drinking water manganese in the same manner as dietary manganese and may not prevent increased body burden (Bouchard 2011).

Oulhote et. al. (2014) conducted an additional assessment of the Bouchard cohort to determine possible associations between manganese in water and behavioral impairments (i.e., issues with memory, attention, motor function and hyperactive behaviors.) The results suggest that higher levels of manganese exposure are associated with poorer performance of memory, attention and motor functions, but not hyperactivity, in children.

Haynes et. al. (2015) assessed the impact of manganese on neurocognition in a cohort of school-age children (age 7-9) residing in communities near Marietta, Ohio, which is home to the longest operating ferromanganese refinery in North America. Mothers of selected children must have resided in the area

during their pregnancies. Results showed that both high and low levels of manganese may affect neurodevelopment.

Kern et. al. (2010) conducted experiments on neonate Sprague-Dawley rats to better understand the relationship between early, pre-weaning manganese exposure and neurobehavioral deficits. The pre- and early post-weaning period coincides with the development of dopaminergic pathways in specific brain regions that are instrumental in the regulation of executive function behaviors involving learning, memory and attention (Kern 2010). Experimental exposure doses approximated the relative increases in manganese exposure experienced by infants and young children exposed to manganese contaminated water or soy-based infant formulas (or both) compared to manganese ingestion from human breastmilk. Pre-weaning oral manganese exposure led to significant learning deficits in the 8-arm radial maze. Since the rats were measured at a time (postnatal day 33-46) when brain manganese levels had declined to near-control levels, the deficits may reflect lasting effects of early exposure (Kern 2010).

Beaudin et. al. (2013) evaluated fine sensorimotor dysfunction in 55 adult Long-Evans rats following either pre-weaning or lifelong manganese exposure using objective measurements that are directly relevant to the types of motor outcomes studied in pediatric manganese research. The pre-weaning exposure group showed selective long-lasting impairment in reaching skills 3 months after the last oral dose of manganese, when blood and brain manganese levels had long since returned to background levels. These deficits suggest permanent or irreversible damage to the basal ganglia systems of the adult rat brain. Lifelong manganese exposure produced wider-spread deficits that included both reaching and grasping skills (Beaudin 2013).

Khan et. al. (2011) assessed the effects of manganese on a community in Bangladesh. Children (ages 8-11) were designated into one of four groups: a) high arsenic, high manganese; b) high arsenic, low manganese; c) low arsenic, high manganese; d) low arsenic, low manganese. Each group contained approximately 75 children. Significant associations were found between manganese (water) and test scores for both externalizing and internalizing behaviors. Manganese was significantly more strongly related to externalizing behavior problems. Interestingly, arsenic was not associated with either externalizing or internalizing behavior problems (Khan 2011).

Moreno et. al (2009) investigated whether exposure to manganese in early life alters susceptibility to manganese during aging. C57B1/6 mice were exposed to manganese by gavage as juveniles, adults or juveniles and again as adults. Moreno et. al. examined metal accumulation in multiple brain regions and serum as well as catecholamine and monoamine neurotransmitter levels and neurobehavioral parameters. Results indicated that developing mice are highly susceptible to changes in behavior and striatal neurochemistry and effects of exposure persist during aging that render specific brain regions more vulnerable to neurotoxic insults later in life (Moreno 2009).

Wasserman, et. al. (2006) examined associations between drinking water manganese (WMn) and intellectual function in 124 children (ages 9.5-10.5) from Araihasar, Bangladesh. The mean WMn concentration in the studied drinking water was 795 µg/L. After adjusting for sociodemographic factors, WMn was associated with significantly reduced Full-Scale, Performance, and Verbal raw scores in a dose-dependent fashion.

Evaluation of Available Recommendations and Scientific Data

DEP has reviewed and considered the available scientific data and recommendations in accordance with 25 Pa. Code Chapter 16. Water Quality Toxics Management Strategy – Statement of Policy and 25 Pa. Code Chapter 93. Water Quality Standards. Human health criteria are based on one of two approaches – threshold level or non-threshold level toxic effects (carcinogens). DEP guidelines for the development of threshold level toxic effect human health-based criteria are found specifically at 25 Pa. Code §16.32. When no criteria have been developed by EPA for a substance identified or expected in a discharge, DEP will develop criteria following EPA’s standard toxicological procedures outlined in the Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (EPA-822-B-00-004, October 2000) as amended and updated (25 Pa. Code §16.32(c)(2)). As further stated in §16.32(d), the sources DEP uses to obtain relevant risk assessment values for protection for threshold level toxic effects to human health as are follows:

- (1) Verified reference doses, listed in the EPA agency-wide supported data system known as IRIS (Integrated Risk Information System) and other EPA approved data sources referred through IRIS
- (2) Maximum contaminant Level Goals (MCLGs)
- (3) The EPA’s CWA § 304(a) health criteria listed under the National Toxics Rule in 40 CFR 131.36 (57 FR 80848, December 22, 1992) (relating to toxics criteria for those States not complying with Clean Water Act section 303(c)(2)(B)), as amended and updated and other final criteria published by the EPA and the Great Lakes Initiative Clearinghouse.
- (4) Teratology and other data that have been peer-reviewed may provide information for criteria development.

In accordance with policy, DEP would use the verified reference dose for manganese listed in EPA’s IRIS database unless more recently published, peer-reviewed studies are available which provide sufficient information for DEP to develop an updated reference dose. At this time, DEP has reviewed the available scientific data and literature and is not proposing to develop an updated reference dose. However, the data broadly supports the need for an IRIS reference dose for manganese.

Development of Manganese Criteria

Criteria for the protection of Human Health (Toxics)

As described above, DEP develops human health-based criteria in accordance with the Water Quality Toxics Management Strategy. Human health criteria development considers various exposure pathways including exposures from drinking water and fish consumption and may include exposures from inhalation or dermal absorption. Inclusion of multiple exposure pathways and the toxicity risk of the substance make development of human-health based criteria different than PWS criteria. Many of PA’s existing PWS criteria are based on SDW primary MCLs or SMCLs and are related to aesthetic qualities of the water (i.e., taste and odor). MCLs are not developed using the same risk assessment factors required by DEP’s regulations for the development of WQS. SMCLs are not based on concerns related to toxicity.

Development of a Human Health Criterion based on IRIS

The EPA developed an oral reference dose (RfD) for manganese and published it in the IRIS database in 1995. Central nervous system effects were identified as the non-threshold critical health effect. As discussed throughout this rationale, the research on manganese is currently advancing and it continues to support the need for an RfD for manganese. At this time, DEP is not proposing to develop a new approach, or RfD, to develop human health-based manganese criteria. DEP is proposing to use EPA's existing IRIS RfD for manganese. This information represents the best available science and data for the purposes of criteria development and is in accordance with the DEP's Water Quality Toxics Management Strategy. As the science and knowledge on manganese toxicity progresses, DEP will review and evaluate new manganese exposure recommendations and will revise the manganese criterion, as appropriate, through DEP's required and ongoing WQSs review process.

To date, manganese has not been shown to be carcinogenic. Thus, the criterion has been developed following the threshold level approach. The applicable RfD in IRIS is for the total daily oral intake of manganese, which includes drinking water and dietary sources. However, the No Observed Adverse Effect Level (NOAEL) study data which informed the RfD value were obtained solely from dietary studies; therefore, EPA recommends that an assessment of drinking water exposure should include a modifying factor of 3. DEP agrees with this recommendation and has applied a modifying factor 3 to the current RfD in its calculation of a criterion. The published RfD assumes an uncertainty factor (UF) of 1 and a modifying factor (MF) of 1.

Calculation of the RfD in IRIS

$$\text{RfD} = (\text{NOAEL}) / (\text{UF}) \text{ or } (\text{MF})$$

$$= 0.14 \text{ mg/kg-day} \div 1$$

$$= 0.14 \text{ mg/kg-day}$$

Calculation of the modified RfD

In order to assess manganese exposure from water consumption, DEP followed the EPA recommendation to apply an MF of 3 to the RfD.

$$\text{RfD}_{\text{Dw}} = (0.14 \text{ mg/kg-day} \div 3)$$

$$= 0.05 \text{ mg/kg-day}$$

In accordance with the 2000 EPA Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health using the 2015 updated exposure input values (body weight, drinking water intake, and fish consumption) and PA Chapter 93 guidelines, DEP derived the following human health criterion for manganese. Manganese is currently not known to significantly bioaccumulate in fish; therefore, a bioaccumulation factor of 1 has been assumed. While it has been observed in marine mollusks (EPA Red Book), it is not known if significant bioaccumulation occurs in freshwater mussels.

Bioaccumulation factors (BAFs) for manganese may be adjusted in the future if peer-reviewed, published research shows that bioaccumulation is occurring in freshwater fish or mussels.

$$AWQC_{Mn} = RfD \times RSC \times (BW \div [DWI + (FI \times BAF)])$$

Where:

$$RfD = 0.05 \text{ mg/kg-day}$$

$$\text{Relative Source Contribution (RSC)} = 0.2$$

$$\text{Body Weight (BW)} = 80 \text{ kg}$$

$$\text{Drinking Water Intake (DWI)} = 2.4 \text{ L}$$

$$\text{Fish Intake (FI)} = 0.022 \text{ kg/day}$$

$$\text{Bioaccumulation factor (BAF)} = 1$$

$$AWQC_{Mn} = 0.05 \text{ mg/kg-day} \times 0.2 \times (80 \div [2.4 + (0.022 \text{ kg/day} \times 1)])$$

$$AWQC_{Mn} = 0.3 \text{ mg/L}$$

Conclusion

DEP has calculated a threshold level toxic effect human health-based criterion for manganese of 0.3 mg/L. Since this criterion is not limited to the protection of the PWS use or to addressing aesthetic concerns, DEP recommends that it will apply in all surface water (i.e., at the point of discharge). Water quality based effluent limits (WQBELs) for manganese will be developed using the design flow conditions for threshold human health criteria contained in 25 Pa. Code §96.4, Table 1. In addition, DEP recommends that the human health water quality criterion for manganese shall be achieved in all surface waters at least 99% of the time as specified in 25 Pa. Code §96.3(c).

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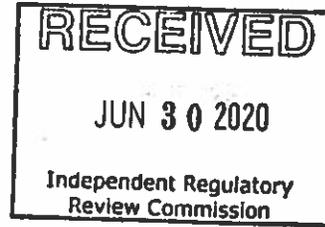
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Attorney General

By: *Alyssa Elliott*
(Deputy Attorney General)

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(AGENCY)

DOCUMENT/FISCAL NOTE NO. 7-553

DATE OF ADOPTION DECEMBER 17, 2019

BY: *Patrick McDonnell*

TITLE PATRICK MCDONNELL
CHAIRPERSON

EXECUTIVE OFFICER CHAIRPERSON OR SECRETARY

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NOTICE OF PROPOSED RULEMAKING

DEPARTMENT OF ENVIRONMENTAL PROTECTION
ENVIRONMENTAL QUALITY BOARD

Water Quality Standards for Manganese and Implementation

25 Pa. Code Chapters 93 and 96

PROPOSED RULEMAKING

ENVIRONMENTAL QUALITY BOARD [25 PA. CODE CHS. 93 AND 96]

Water Quality Standard for Manganese and Implementation

The Environmental Quality Board (Board) proposes to amend 25 Pa. Code Chapter 93 (relating to water quality standards) and 25 Pa. Code Chapter 96 (relating to water quality standards implementation). The amendments propose to delete manganese from Table 3 at § 93.7 (relating to specific water quality criteria) and add manganese to Table 5 at § 93.8c (relating to human health and aquatic life criteria for toxic substances). Additionally, the amendments propose two alternatives for a point of compliance with the manganese water quality standard: the point of all existing or planned surface potable water supply withdrawals; or all surface waters (i.e., near the point of discharge). The proposed regulations, set forth in Annex A, support both alternatives.

This proposed rulemaking was adopted by the Board at its meeting on December 17, 2019.

A. Effective Date

This proposed rulemaking will go into effect upon final-form publication in the *Pennsylvania Bulletin*. Subsequent approval by the United States Environmental Protection Agency (EPA) of water quality standards is required to implement the Federal Clean Water Act (33 U.S.C.A §§ 1251-1388).

B. Contact Persons

For further information, contact Thomas Barron, Bureau of Clean Water, 11th Floor, Rachel Carson State Office Building, P.O. Box 8774, 400 Market Street, Harrisburg, PA 17105-8774, (717) 787-9637; or Michelle Moses, Assistant Counsel, Bureau of Regulatory Counsel, 9th Floor, Rachel Carson State Office Building, P.O. Box 8464, Harrisburg, PA 17105-8464, (717) 787-7060. Persons with a disability may use the AT&T Relay Service at (800) 654-5984 (TDD users) or (800) 654-5988 (voice users). This proposed rulemaking is available on the Department of Environmental Protection (Department) web site at www.dep.pa.gov (select "Public Participation," then "Environmental Quality Board (EQB)").

C. Statutory and Regulatory Authority

This proposed rulemaking is being made under the authority of sections 5(b)(1) and 402 of The Clean Streams Law (CSL) (35 P.S. §§ 691.5(b)(1) and 691.402), which authorize the Board to develop and adopt rules and regulations to implement the CSL (35 P.S. §§ 691.1—691.1001). Additional authority for this proposed rulemaking includes sections 1920-A(b) and (j) of The Administrative Code of 1929 (71 P.S. § 510-20(b) and (j)), which grants to the Board the power and duty to formulate, adopt and promulgate rules and regulations for the proper performance of the work of the Department and mandates that the Board “promulgate regulations under the act of June 22, 1937 (P.L. 1987, No. 394), known as The Clean Streams Law, or other laws of this

Commonwealth that require that the water quality criteria for manganese established under 25 Pa. Code Ch. 93 (relating to water quality standards) shall be met, consistent with the exception in 25 Pa. Code § 96.3(d) (relating to water quality protection requirements).” Sections 101(a)(2) and 303 of the Federal Clean Water Act (CWA) (33 U.S.C.A. §§ 1251(a)(2) and 1313) set forth requirements for water quality standards, which states must meet to implement the CWA in the Commonwealth. Section 101(a)(3) of the CWA declares the national policy that the discharge of toxic pollutants in toxic amounts be prohibited (33 U.S.C.A. § 1251(a)(3)).

D. Background and Purpose

General background information

Water quality standards are in-stream water quality targets that are implemented by imposing specific regulatory requirements and permit conditions (such as treatment requirements, effluent limitations and best management practices (BMPs)) on individual sources of water pollution. The water quality standards include the existing and designated uses of the surface waters of the Commonwealth, along with the specific numeric and narrative criteria necessary to achieve and maintain those uses, and antidegradation requirements. The purpose and goals of this proposed rulemaking are: to comply with Act 40 of 2017 (71 P.S. § 510-20(j)); to delete the existing manganese numeric water quality criterion from Table 3 at § 93.7 (relating to specific water quality criteria) which was established for the protection of the Potable Water Supply use; to add a manganese criterion to Table 5 at § 93.8c (relating to human health and aquatic life criteria for toxic substances) designed to protect human health from the neurotoxicological effects of manganese which will also ensure adequate protection of all water uses; and to identify the point of compliance for the criterion.

On October 30, 2017, subsection (j) (known as “Act 40”) was added to section 1920-A of The Administrative Code of 1929. This subsection states:

(j) The board shall promulgate regulations under the act of June 22, 1937 (P.L. 1987, No. 394), known as "The Clean Streams Law," or other laws of this Commonwealth that require that the water quality criteria for manganese established under 25 Pa. Code Ch. 93 (relating to water quality standards) shall be met, consistent with the exception in 25 Pa. Code § 96.3(d) (relating to water quality protection requirements). Within ninety days of the effective date of this subsection, the board shall promulgate proposed regulations.

Act 40 directed the Board to propose a regulation that moves the point of compliance for manganese from the point of discharge to any downstream public water supply intake.

In addition to Act 40, the Department needs to consider other environmental statutes like the CSL and the Pennsylvania Safe Drinking Water Act (35 P.S. §§ 721.1 – 721.17). For instance, section 4(1) of the CSL declares that clean, unpolluted streams are absolutely essential if Pennsylvania is to attract new manufacturing industries and to develop Pennsylvania’s full share of the tourist industry. 35 P.S. § 691.4(1). Similarly, section 4(3) declares that an objective of the CSL is to prevent pollution and restore streams that are presently polluted. 35 P.S. §

691.4(1). Sections 4(4) and 5(b)(1) of the CSL provide that the Department has the duty to formulate regulations that prevent and eliminate water pollution. (35 P.S. §§ 691.4(4) and 691.5(b)(1)) "Pollution" is defined as "contamination of any waters of the Commonwealth such as ... to render such waters harmful, detrimental or injurious to public health..., or to domestic, municipal, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses, or to livestock, wild animals, birds, fish or other aquatic life...." 35 P.S. § 691.1.

In adopting rules and regulations under the CSL, to carry out the purposes of the act, the Department needs to consider, where applicable, the following: (1) water quality management and pollution control in the watershed as a whole; (2) the present and possible future uses of particular waters; (3) the feasibility of combined or joint treatment facilities; (4) the state of scientific and technological knowledge; and (5) the immediate and long-range economic impact upon the Commonwealth and its citizens. 35 P.S. § 691.5(a).

Where a pollutant found in discharges to surface waters is toxic to human health or aquatic life, the Commonwealth's regulations require development of appropriate water quality criteria to control pollution. 25 Pa. Code § 93.8a specifically provides that "[t]he waters of this Commonwealth may not contain toxic substances attributable to point or nonpoint source waste discharges in concentrations or amounts that are inimical to the water uses to be protected."

Section 303(c) of the federal CWA and 40 CFR Part 131 require states to develop water quality standards that consist of designated uses, water quality criteria to protect those uses, and antidegradation requirements. Such standards must "protect the public health or welfare and enhance the quality of water" (33 U.S.C.A. § 1313(c)). In addition, such standards must take into consideration water uses including public water supplies, propagation of fish and wildlife, recreational purposes, agricultural purposes, and industrial purposes. Section 101(a)(3) of the CWA declares the national policy that the discharge of toxic pollutants in toxic amounts be prohibited (33 U.S.C.A. § 1251(a)(3)).

Furthermore, the Pennsylvania Safe Drinking Water Act (SDWA) provides that an adequate supply of safe, pure drinking water is essential to the public health, safety and welfare and that such a supply is an important natural resource in the economic development of the Commonwealth. (35 P.S. §§ 721.2). Moreover, among other things, the Department is required to develop a safe drinking water program necessary to assume enforcement responsibility of the Federal Safe Drinking Water Act, 42 U.S.C. §§ 300f to 300j-27. 35 P.S. § 721.5. On November 30, 1984, the Department assumed responsibility under the Federal act. 50 FR 342 (January. 3, 1985). Public water suppliers must achieve the Secondary Maximum Contaminant Level (SMCL) for manganese of 0.05 mg/L in finished water based on the Federal standard found at 40 CFR § 143.3.

Section 1920-A of the Administrative Code of 1929 authorizes the Board to formulate, adopt and promulgate such rules and regulations as may be determined by the Board for proper performance of the work of the Department.

This proposed regulation takes the statutory directives of the CWA, CSL, SDWA, and the Administrative Code into consideration.

Manganese is found in discharges in the Pennsylvania waters and was last evaluated by the Commonwealth in 1967. The Department is required to protect surface waters based on the most current toxicological data and science. Current data and science demonstrate manganese is a neurotoxin to humans when levels necessary to maintain adequate health are exceeded. The Department took the provisions of Act 40, the CWA, the CSL, and the Pennsylvania SDWA into account in this evaluation.

Following the passage of Act 40, the Department solicited information for the development of the proposed regulations through an Advance Notice of Proposed Rulemaking (ANPR) published on January 18, 2018 at 48 Pa.B. 605. The Department sought scientific and current toxicological information to comprehensively review the manganese standard as it relates to the water uses identified in § 93.3 (relating to protected water uses) and, in particular, to determine the need to develop manganese toxics criteria related to human health and aquatic life exposure. Additionally, because Act 40 directed the Board to propose a regulation that moves the point of compliance for manganese from the point of discharge to the point of all existing or planned surface potable water supply withdrawals, the Department requested information on the financial and economic impact of compliance with the manganese water quality standard, including costs associated with adding manganese treatment to public water supply facilities, and manganese treatment process information.

The Department received comments on the ANPR from 15 organizations, including EPA, American Rivers, PA American Water, PennFuture, Pennsylvania Public Utility Commission (PUC), Pennsylvania Fish and Boat Commission (FBC), City of Lancaster Public Works, Philadelphia Water Department, the Manganese Interest Group, SUEZ-FCGA, CONSOL Energy, Pennsylvania Anthracite Council, Pennsylvania Coal Alliance, Corsa Coal Corporation, and Rosebud Mining Company.

The Department's evaluation resulted in the proposed criterion in Table 5 of § 93.8c. Chapters 93 and 96 implement the CSL and the CWA. Pursuant to these chapters, a pollutant identified as a toxic substance requires control of the substance in all surface waters to protect all water uses. No toxic substances are currently identified in section 96.3(d), which identifies exceptions to the control of substances in all surface waters. By adding a toxic substance to the list of pollutants in section 96.3(d), intervening water uses between the point of discharge and the point of potable water supply withdrawal may not be protected. Also, changing the point of compliance to the point of withdrawal will shift the burden of treatment and control to downstream users, such as public water suppliers and customers.

On November 29, 2018, May 23, 2019 and July 25, 2019, the Department met with the Water Resources Advisory Committee (WRAC) to discuss the scientific literature and information available to support manganese water quality criteria development and other regulatory issues relating to manganese. On July 25, 2019, WRAC voted on a motion to: acknowledge the legislative requirement in Act 40 to propose a regulation moving the point of compliance for manganese to the point of all existing or planned surface potable water supply withdrawals; support proposing a regulation that adds manganese to Table 5 in section 93.8c as a toxic substance for human health at the level of 0.3 mg/L, recognizing that the compliance point for

this standard will be met in all surface waters, as described in section 96.3(c); and recommend that the Board request public comment on this combined approach for consideration in developing a final regulation.

The Department met with the Agricultural Advisory Board on October 25, 2018, June 20, 2019 and August 29, 2019 to present information and seek additional agriculture-related information relating to manganese and this proposed rulemaking. Also, the Department met with the Small Water Systems Technical Assistance Center Advisory Board (TAC) on January 31, 2019 and August 8, 2019 to present information and seek additional water supply treatment information relating to manganese and this proposed rulemaking. TAC voted to concur with WRAC's motion.

E. Summary of Regulatory Requirements

Proposed Amendments to Manganese Criteria in Chapter 93

The Department periodically reviews its existing criteria to ensure that they are appropriate. If the peer-reviewed scientific information demonstrates that a change is warranted, the criteria will be revised to ensure protection of the most sensitive water use, or population to be protected. For this rulemaking, the Department completed a comprehensive review of the available scientific data for manganese to determine the appropriate water quality criteria to protect all existing and designated water uses and to evaluate the impact of the proposed regulations required by Act 40.

The Department conducted a review of the information received through the ANPR as well as an independent search of the scientific literature available on the toxic effects of manganese to aquatic life, livestock and humans. With respect to aquatic life, the Department reviewed manganese studies on aquatic macroinvertebrates, fish and algae. Current science indicates that elevated manganese is toxic to aquatic organisms. Limited information was available to evaluate the impacts of elevated source water manganese on livestock, but some data suggests elevated levels of manganese in the drinking water for livestock may significantly reduce palatability resulting in lower water consumption. With respect to impacts on humans, the Department reviewed over 60 human health studies relevant to the toxic effects of manganese and included areas of epidemiology, epigenetics, and animal toxicity studies. The Department also reviewed information available through EPA's Integrated Risk Information System (IRIS) database. At levels beyond those necessary to maintain adequate health, manganese has been identified as a nervous system toxin and has been specifically linked to negative impacts on fetal and childhood neurodevelopment.

Based on the science reviewed, the Board is proposing adoption of a numeric water quality criterion for manganese designed to be protective of human health. This criterion would be added to §93.8c Table 5 - Water Quality Criteria for Toxic Substances, and the existing Potable Water Supply criterion of 1 mg/L, found in § 93.7 Table 3 would be deleted. Table 3 generally identifies a specific water use, or uses, to be protected by each criterion. Conversely, Table 5 does not identify specific water uses to be protected by each criterion, but rather the table identifies the organisms to be protected by the criterion (i.e., aquatic life or human health). While Table 3 criteria are specific to the protection of those uses identified, the Table 5 criteria may be

relevant to multiple protected water uses particularly with respect to human health (e.g., water supply, water contact sports, irrigation and fishing may all be relevant). The proposed numeric human health criterion for manganese is more stringent than the existing Potable Water Supply criterion of 1.0 mg/L and includes protection of the Potable Water Supply use; therefore, the Potable Water Supply use would be afforded appropriate protection from elevated levels of manganese when the human health standard is applied in accordance with Department policy and regulations. Since this numeric criterion will be included in Table 5, it should apply in all surface waters of the Commonwealth, consistent with § 93.8a(a) (relating to toxic substances), § 96.3(c) (relating to water quality protection requirements) and the Department's Water Quality Toxics Management Strategy – Statement of Policy (25 Pa. Code Chapter 16). Based upon the Department's scientific review, the adoption and implementation of a human health criterion in all surface waters in accordance with these proposed regulations should also provide adequate protection to aquatic life and livestock from the toxic effects of manganese.

When a chemical or compound, in sufficient quantity or concentration, is harmful to humans the Department must limit the concentrations in waste discharges, as required in § 93.8a(a). In accordance with Chapter 16 and EPA-approved methodologies, human health criteria are developed based on one of two approaches – threshold level or non-threshold level toxic effects (carcinogens). The terms “threshold effect” and “nonthreshold effects” are defined in 25 Pa. Code § 93.1 (relating to definitions). For threshold level toxic effects, there exists a dose below which no adverse response will occur. Toxic effects include most systemic effects and developmental toxicity, including teratogenicity. Developmental toxicity includes all adverse effects in developing offspring resulting from prenatal exposure to a causative agent. A non-threshold effect is an adverse impact, including carcinogenic effects, for which no exposure greater than zero assures protection to the exposed individual. Manganese has not been shown to be carcinogenic. Therefore, a criterion was developed following the Department's threshold level toxic effects policy found at §16.32 (relating to threshold levels of toxic effects).

Under §16.32 (relating to threshold levels of toxic effects), the Department will establish criteria for threshold toxics in accordance with the following guidelines: (1) if EPA has developed criteria, the Department will evaluate and accept the criteria when it is determined that they are adequate to protect the designated water uses; (2) if the EPA criteria have been evaluated, and have been determined to be inadequate to protect designated uses, or when no criteria have been developed for a substance identified or expected in a discharge, the Department will develop criteria following EPA's standard toxicological procedures outlined in the Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (EPA-822-B-00-004, October 2000) and the National Recommended Water Quality Criteria (EPA-822-H-04-001, 2004), as amended and updated or Exhibit 3-1 of the Water Quality Standards Handbook, Second Edition, EPA-823-0-94-005A, August 1994, as amended and updated; and (3) if no data are available to characterize the human health hazard of a chemical, no criterion will be developed. A criterion to protect the next most sensitive use will be used. In accordance with this policy, the Department reviewed the available information to determine whether or not a criterion could be developed for manganese. EPA has not published a human health criterion recommendation for manganese; however, toxicological data relating to the human health effects of manganese does exist. Therefore, the Department followed the procedures outlined in §16.32(c)(2) to develop a human health criterion for manganese.

In addition to these guidelines for criteria development, Section 16.32(d) identifies the sources the Department uses to obtain relevant risk assessment values for protection from threshold level toxic effects, which includes the following sources: (1) verified reference doses listed in EPA's IRIS database and other EPA approved data sources referred through IRIS; (2) maximum contaminant level goals; (3) the EPA's CWA § 304(a) health criteria as amended and updated and other final criteria published by the EPA and the Great Lakes Initiative Clearinghouse; and (4) Teratology and other data that have been peer-reviewed may provide information for criteria development. In accordance with §16.32(d), the Department will typically use verified reference doses in the IRIS database when available. When appropriate reference dose information is not available in IRIS, the Department must develop a reference dose using one of the other sources of information listed above. A reference dose is an essential component of the EPA equation used to derive ambient water quality criteria for the protection of human health. In other words, a human health criterion cannot be calculated without an appropriate reference dose.

EPA developed an oral reference dose (RfD) for manganese (CASRN 7439-96-5) and published the complete summary in the IRIS database <https://www.epa.gov/iris> in 1995. EPA defines a reference dose as "an estimate (with an uncertainty spanning approximately an order of magnitude) of a daily exposure to the human population (including sensitive subgroups) that is likely to be without appreciable risk of deleterious effects over a lifetime." When EPA's 2000 Human Health Methodology was published, the most common approach for deriving a reference dose was to identify the no-observed-adverse-effect level (NOAEL) for the most sensitive known toxicity endpoint, that is, the toxic effect that occurs at the lowest dose. This effect is called the critical effect (EPA-822-B-00-004, October 2000). Many different factors are evaluated when selecting the most appropriate NOAEL from among all available studies. For manganese, EPA identified central nervous system effects as the critical effect.

The 1995 IRIS reference dose is for the total daily oral intake of manganese, which includes drinking water and dietary sources. However, the NOAEL was based solely on dietary studies; therefore, EPA recommends that an assessment of drinking water exposure should include a modifying factor (MF) of 3. EPA provided four reasons for this recommendation. First, fasting individuals have been shown to absorb more manganese from drinking water than non-fasting individuals. Second, there were concerns about possible adverse health effects associated with a lifetime consumption of drinking water containing approximately 2 mg/L of manganese. Third, formula-fed infants have been found to have a much higher concentration of manganese in hair samples versus breast fed infants. Not only does infant formula contain higher amounts of manganese than breast milk, but the valence form of the manganese in formula appears to increase the absorption rate. Studies have shown that the levels of manganese in learning-disabled children were significantly increased in comparison with that of non-disabled children. Although no causal relationship has been determined, further research is needed. Fourth, there is evidence that the neonate (infant less than 28 days old) digestive tract absorbs more manganese than an adult's and that neonates are less able to excrete it. Furthermore, it has been shown that manganese will more readily cross the blood-brain barrier in neonates, suggested by studies to be at a rate 4-times higher in infants than in adults. Caution is warranted when establishing safe levels of manganese in water since any adverse neurological effects acquired during this critical

period of development are likely to be irreversible and may not manifest for years after the exposure.

The Board's proposed criterion relies upon EPA's existing IRIS RfD for manganese with the recommended MF of 3. EPA recommends applying an MF of 3 in order to assess manganese exposure from water consumption.

$$\text{RfD} = (0.14 \text{ mg/kg-day} \div 3) = 0.05 \text{ mg/kg-day}$$

In accordance with the guidelines in § 16.32(c) (relating to threshold level toxic effects), the Department follows the EPA Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (2000) <https://www.epa.gov/wqc/methodology-deriving-ambient-water-quality-criteria-protection-human-health-2000-documents> in establishing criteria for threshold toxics. The Department used the updated exposure input values as given in the 2015 EPA Updated Ambient Water Quality Criteria for the Protection of Human Health <https://www.epa.gov/wqc/2015-epa-updated-ambient-water-quality-criteria-protection-human-health>. In accordance with § 93.8a (relating to toxic substances), the Department derived the following human health criterion for manganese. Manganese is not known to significantly bioaccumulate in freshwater fish; therefore, a bioaccumulation factor of 1 has been assumed.

AWQC_{Mn} = Ambient Water Quality Criterion for Manganese

$$\text{AWQC}_{\text{Mn}} = \text{RfD} \times \text{RSC} \times (\text{BW} \div [\text{DWI} + (\text{FI} \times \text{BAF})])$$

Where:

$$\text{RfD} = 0.05 \text{ mg/kg-day}$$

$$\text{Relative Source Contribution (RSC)} = 0.2$$

$$\text{Body Weight (BW)} = 80 \text{ kg}$$

$$\text{Drinking Water Intake (DWI)} = 2.4 \text{ L}$$

$$\text{Fish Intake (FI)} = 0.022 \text{ kg/day}$$

$$\text{Bioaccumulation factor (BAF)} = 1$$

$$\text{AWQC}_{\text{Mn}} = 0.05 \text{ mg/kg-day} \times 0.2 \times (80 \div [2.4 + (0.022 \text{ kg/day} \times 1)])$$

$$\text{AWQC}_{\text{Mn}} = 0.3 \text{ mg/L}$$

This proposed criterion of 0.3 mg/L is expected to protect human health from the threshold level toxic effects of manganese (i.e., developmental neurotoxicological effects) consistent with Chapters 16 and 93.

In response to the ANPR, the Department received comments noting that both the State and Federal regulations include technology-based limits for mining wastewater effluent discharges of manganese to 2.0 mg/L as a 30-day average, 4.0 mg/L as a daily maximum and 5.0 mg/L as an instantaneous maximum. It has been suggested that these limitations would prevent the discharge of toxic levels of manganese to Pennsylvania surface waters. However, these effluent limits are

based on the performance of wastewater treatment and control technologies, not water quality protection. The National Pollutant Discharge Elimination System (NPDES) regulations require permit limits to be based on “any requirements *in addition to or more stringent than* promulgated effluent limitations guidelines or standards under sections 301 (relating to effluent limitations), 304 (relating to information and guidelines), 306 (relating to national standards of performance), 307 (relating to toxic and pretreatment effluent limits), 318 (relating to aquaculture) and 405 (relating to disposal of sewage sludge) of the CWA *necessary to (1) achieve water quality standards established under section 303 of the CWA....*” (emphasis added) 40 CFR § 122.44(d)(1) incorporated by reference into 25 Pa. Code § 92a.44 (relating to establishing limitations, standards, and other permit conditions); and 33 U.S.C.A. § 302(a) (relating to water quality related effluent limitations).

It must be noted that the technology-based effluent limitations mentioned above are specific to the mining industry and do not apply to other dischargers of manganese. The Department conducted a review of NPDES permits and identified several non-mining, NPDES-permitted sectors (e.g., landfills, wastewater treatment plants and power plants) that currently have water quality-based effluent limits for manganese, based on the existing manganese water quality criterion, but which do not have State or Federal technology-based limits similar to the mining program which would limit their discharge of manganese at the point of discharge. In contrast to the applicability of technology-based limitations, water quality criteria are not narrowly focused or developed for specific permitted discharge activities or categories of discharge. They are developed to protect designated uses and specific populations (i.e., aquatic life or human health), and they apply to all permitted discharges regardless of the type of discharge activity. All NPDES discharge permits must be written to comply with all applicable water quality standards as set forth by the Board for the protection of water uses and users. Therefore, the Department cannot limit its review to industry specific standards when determining the water quality criteria necessary to ensure adequate aquatic life, plant, animal and human health protection.

With respect to the mining industry, EPA evaluated the Federal effluent limitation guidelines (ELGs) for manganese in 2008 at the request of mining industries and state agencies. EPA determined that the ELGs were valid and should remain in place. EPA noted that the toxic effects of manganese on aquatic species are typically chronic rather than acute in nature, and headwater streams are especially sensitive to manganese. Additionally, EPA determined that for active surface and underground mining areas and postmining areas with underground acid mine drainage discharges, manganese treatment is available, economically achievable, and compliance rates with permit limits derived from the management effluent guidelines are high (73 FR 53218; Notice of Final 2008 Effluent Guideline Program Plan).

Adoption of a new human health toxics criterion for manganese may require new and existing NPDES discharges to be evaluated when permit applications undergo Department review. This evaluation could potentially result in increased treatment and operational costs for permitted dischargers with manganese effluent limits, depending on the point of compliance for the criterion.

Proposed Amendments to Chapter 96 – Point of Compliance Alternatives

Annex A includes language which supports two alternative points of compliance for the proposed manganese criterion. The first alternative, consistent with Act 40, is to move the point of compliance to the point of all existing or planned surface potable water supply withdrawals. The second alternative is to maintain the existing point of compliance in all surface waters (i.e., at the point of discharge). The Board is seeking public comment on both alternatives.

First Alternative Point of Compliance

In accordance with Act 40, the first alternative is a proposed regulation that changes the point of compliance for manganese in Chapter 96 from “be[ing] achieved in all surface waters” (§ 96.3(c)) to being met “at the point of all existing or planned surface potable water supply withdrawals” (§ 96.3(d)). Language in the Annex A that reflects this alternative is as follows:

- (d) As an exception to subsection (c), the water quality criteria for total dissolved solids, nitrite-nitrate nitrogen, phenolics, chloride, sulfate and fluoride established for the protection of potable water supply **and the water quality criterion for manganese** shall be met at least 99% of the time at the point of all existing or planned surface potable water supply withdrawals unless otherwise specified in this title.

Under this alternative, if no potable water supply exists or is planned then no water quality-based effluent limits will apply; however, Federal ELGs would apply to the mining discharges. For all other point source discharges of manganese there would be no water quality criteria or Federal ELGs to limit the amount of manganese discharged into the surface water. Under this scenario, dischargers would have no water quality-based effluent limit applied to their discharge of wastewater containing manganese. If a potable water supply withdrawal does exist downstream of a manganese discharge, the proposed water quality criterion for manganese will only apply at the potable water supply intake, leaving the surface water users between the discharge and the potable water supply intake devoid of any kind of protection from the effects of manganese.

This scenario, which would establish the point of compliance for the proposed manganese criterion at the point of potable water supply intake, would grant some financial relief to any permitted discharger of manganese due to reduced wastewater treatment costs. Under this alternative the proposed human health criterion for manganese will not apply unless a potable water supply withdrawal is located on the surface water. If a potable water supply is located on the stream, a discharger’s point of compliance with the proposed manganese criterion will be modelled from the upstream point of discharge to the point of potable water supply withdrawal, allowing for attenuation of the effluent as it travels downstream. The discharger’s effluent limitation would be determined based on achieving the proposed manganese criterion of 0.3 mg/L at the point of potable water supply intake.

Although moving the point of compliance may be beneficial to some facilities that have permitted discharges of manganese in their wastewater, it could be an added burden to some

potable water supply facilities. It could also burden facilities with surface water intakes that require a certain level of water quality for use in food and beverage production or preparation, paper and textile manufacturing, aquaculture, and irrigation. Moving the point of compliance for the manganese water quality criterion from the point of discharge to the point of withdrawal will likely require additional monitoring by all of these facilities to determine the effects of increased source water manganese levels on their operations. As the levels of manganese change in the surface water, all potable water supply facilities using surface waters as their source water will need to monitor and may require facility upgrades or additional chemical usage to continue achieving the secondary maximum contaminant level (SMCL) for manganese of 0.05 mg/L in the finished water, which is required under the Pennsylvania Safe Drinking Water Act (35 P.S. §§ 721.3 and 721.5) and regulations at 25 Pa. Code § 109.202(b) (relating to state MCLs, MRDLs and treatment technique requirements). The SMCL for manganese in Pennsylvania is based on the Federal standard found at 40 CFR § 143.3.

Additional burdens to water suppliers may apply based on other drinking water requirements. EPA developed one-day, 10-day and lifetime Health Advisory Limits (HALs) for manganese, pursuant to the Federal Safe Drinking Water Act (42 U.S.C.A. §§ 300f-300j-26). The lifetime HAL of 0.3 mg/L protects against concerns of potential neurological effects. The one-day and 10-day HALs of 1 mg/L are for acute exposure and it is advised that for infants younger than 6 months, the lifetime HAL of 0.3 mg/L be used even for an acute exposure of 10 days, because of the concerns for differences in manganese content in human milk and formula and the possibility of higher absorption and lower excretion in young infants. Because EPA developed HALs for manganese, public water suppliers may be subject to additional monitoring and public notification requirements if the HALs are exceeded in the finished water. In accordance with the current regulations found at Chapter 93, the Potable Water Supply water quality criterion ensures that public water systems receive raw water at their intake structures that can achieve compliance with 25 Pa. Code Chapter 109 Safe Drinking Water (SDW) standards utilizing only conventional treatment. If a water supplier or the Department indicates a contaminant is present in the potable water supply and may cause a potential health hazard, additional monitoring may be required under 25 Pa. Code § 109.302(b) (relating to special monitoring), which may then trigger additional treatment requirements pursuant to § 109.4 (relating to general requirements). If source water for public water supply operations is received at or above 0.3 mg/L, sequestration of manganese is no longer an option and modifications to operations and/or additional treatment technologies for removal of manganese would be required. Sequestration does not remove the manganese so it is still present and still bioavailable and as such it can act as a neurotoxin. Finally, under § 109.407(a)(9) (relating to general public notification requirements) and § 109.408(a)(11) (relating to Tier 1 public notice—categories, timing and delivery of notice), Tier 1 public notice requirements may be triggered if exceedance of the HALs has the “potential to have serious adverse effects on human health as a result of short-term exposure.”

Industries that rely on surface waters for industrial water supplies may be faced with similar modifications and costs to achieve compliance with their respective industry standards and regulations. If a facility’s monitoring reveals an increase of manganese in the surface water source, modifications to their existing operations and/or additional technologies may be required to remove the additional manganese load. An example of a potential facility modification would be the addition of an oxidation process or increased chemical usage, but the type and degree of

modifications will be based on both the manganese concentration and the effect of manganese on other water quality parameters of the source water.

The Department reviewed information submitted by several drinking water facilities in response to the ANPR. Comments received on the ANPR from Pennsylvania American Water, PUC, Philadelphia Water Department, SUEZ FCGA, and the City of Lancaster's Department of Public Works indicated that moving the compliance point for the manganese criterion to the location of an existing or planned surface water potable water supply withdrawal will shift the burden of treatment from the resource extraction industry to the public water suppliers. The City of Lancaster's Department of Public Works and Pennsylvania American Water both indicated that the costs associated with this proposed change will be in the tens of millions of dollars.

The ANPR requested information be submitted describing the costs that would be incurred if the numeric limit of the manganese criterion remained at 1.0 mg/L and the point of compliance was moved to the surface water potable water supply intake. The evaluation of the manganese criterion, resulting in a proposal of a 0.3 mg/L limit, was not completed prior to the ANPR. If the recommended limit of 0.3 mg/L is applied only at the point of potable water supply withdrawal, the treatment cost concerns raised by the drinking water facilities still apply and such costs will likely be passed on to their customers.

Second Alternative Point of Compliance

Manganese is a human health concern through its action as a neurotoxin when levels necessary to maintain adequate health are exceeded. To be consistent with all other toxics criteria in Table 5, the second alternative is a proposed regulation that maintains the current point of compliance for manganese, in all surface waters (i.e., at the point of discharge), as stated in § 96.3(c). Language in the Annex A that reflects this alternative is as follows:

(c) To protect existing and designated surface water uses, the water quality criteria described in Chapter 93 (relating to water quality standards), including the criteria in § § 93.7 and 93.8a(b) (relating to specific water quality criteria; and toxic substances) shall be achieved in all surface waters at least 99% of the time, unless otherwise specified in this title. The general water quality criteria in § 93.6 (relating to general water quality criteria) shall be achieved in surface waters at all times at design conditions.

Under this alternative, the manganese criterion for the protection of human health would be applicable in all surface waters to protect all relevant water uses in accordance with § 96.3(c). As stated in EPA's 2000 Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (EPA-822-B-00-004), "water quality criteria are derived to establish ambient concentrations of pollutants which if not exceeded, will protect the general population from adverse health impacts from those pollutants due to consumption of aquatic organisms and water, including incidental water consumption related to recreational activities ... EPA considers that its target protection goal is satisfied if the population as a whole will be adequately protected by the human health criteria when criteria are met in ambient water." EPA further states that "in consideration of the Agency's goals of pollution prevention, ambient waters should not be contaminated to a level where the burden of achieving health objectives is shifted away from

those responsible for pollutant discharges and placed on downstream users to bear the costs of upgraded or supplemental water treatment.”

In accordance with Chapters 16, 93 and 96, the criteria for all human health toxic pollutants contained in § 93.8c Table 5 are met in all surface waters, consistent with § 96.3(c) (i.e., met at the point of discharge). In comparison, the exceptions contained in § 96.3(d) list parameters which are only required to be met at the point of any existing or planned potable water supply withdrawal. To date, exceptions to subsection (c) have only been made for limited, specific Potable Water Supply criteria that have not been identified as toxic pollutants. For example, the existing Potable Water Supply criterion for Phenolics in Table 3 is listed as an exception to subsection (c) in § 96.3. However, it should be noted that § 93.7 Table 3 specifically excludes those phenolic compounds that have been identified as Priority Pollutants (toxics) by EPA. Criteria for those specific toxic pollutants are presently located in § 93.8c Table 5 and must be met in all surface waters for the protection of human health.

The second alternative would afford aquatic life an appropriate level of protection from the deleterious effects of manganese. It is widely known that high levels of manganese are toxic to aquatic life. Comments were received in response to the ANPR which provided discussion regarding how movement of the point of compliance will affect other uses including aquatic life. FBC commented that manganese is one of several heavy metals associated with acid mine discharges that act on aquatic organisms as metabolic poisons. Depending on the water chemistry, manganese will often settle on stream beds as a black, sticky coating that interferes with the colonization, abundance, and diversity of stream dwelling aquatic insects which are very important in the aquatic ecosystem. FBC also provided information on the impacts of this proposed regulatory change on FBC and cooperative fish hatcheries that rely on withdrawals from streams for their raw source water. If manganese concentrations in the source water are greater than 1.0 mg/L there would be a new need for pre-treatment to reduce the level of manganese to an acceptable level for fish culture. FBC also noted that, although it was developed for Potable Water Supply use protection, the current manganese standard which is applicable in all surface waters provides protection for other protected uses including Boating, Fishing, Water Contact Sports, and Esthetics.

In addition to FBC’s comments, the Department reviewed EPA’s ECOTOX database for information on the toxicity of manganese to aquatic life. This database contains over 150 studies relevant to the toxicity of manganese to aquatic organisms. ECOTOX (<https://cfpub.epa.gov/ecotox/index.cfm>) is a comprehensive, publicly available knowledgebase which provides single chemical environmental toxicity data derived predominantly from peer-reviewed literature on aquatic life, terrestrial plants and wildlife.

The threshold at which manganese needs to be maintained in the surface water to avoid toxicity to humans is lower than the level necessary to afford appropriate protection for aquatic life. The current science indicates that the human health criteria proposed in this rulemaking will afford adequate protection for aquatic life if it is applied in all surface waters. Aquatic life would not be granted adequate protection under the first alternative, where the standard would only be met in at the point of potable water supply withdrawal.

Under this alternative, additional protections will be provided to the Potable Water Supply use and other protected water supply uses (e.g., Irrigation, Livestock Water Supply and Wildlife Water Supply). Furthermore, cost savings may be realized by public water systems, as manganese levels in source waters will be lower, and less treatment will be necessary to meet drinking water regulations.

F. Benefits, Costs and Compliance

Benefits

Overall, the Commonwealth's residents and visitors and its natural resources benefit from providing the appropriate level of protection to preserve the integrity of existing and designated uses of surface waters in this Commonwealth. Protecting water quality provides: economic value to present and future generations in the form of a clean water supply for human consumption, wildlife, irrigation and industrial use; recreational opportunities such as fishing (also for consumption), water contact sports, and boating; and aquatic life protection. It is important to realize these benefits and to ensure opportunities and activities continue in a manner that is environmentally, socially and economically sound. Maintenance of water quality ensures its future availability for all uses. All users of surface water will benefit from the development of a human health criterion for manganese.

If the proposed criterion is adopted and the first point of compliance alternative is adopted, those entities holding or seeking permits to discharge manganese into the surface waters of Pennsylvania will benefit. If the proposed criterion is adopted and the second point of compliance alternative is adopted, all users of surface waters will benefit.

Compliance costs

Based on the proposed water quality criterion for manganese and the first alternative point of compliance, additional compliance costs may be imposed on the regulated drinking water community due to potential increases in source water levels of manganese, while reducing compliance costs for the mining industry.

Under the first alternative point of compliance, persons with an existing or planned potable water supply surface water withdrawal could be adversely affected financially if there is a need to provide a higher level of raw water treatment to continue meeting the existing SMCL for manganese, 0.05 mg/L, in the finished (i.e., potable) water. For example, increased costs may take the form of increased source water sampling and monitoring, facility upgrades, treatment modifications or additional operation and maintenance costs for treatment chemicals and waste disposal. Treatment modifications and associated costs are site-specific and will depend upon the specific treatment processes employed by a facility, the quality of the source water and many other factors. It is therefore not possible to precisely predict the actual change in costs. Economic impacts would primarily involve the potential for higher treatment costs for public water supply facilities located downstream of permitted manganese discharges, which would likely result in water fee increases for the water supply rate payers. A review of statewide potable water supply withdrawals and permitted manganese discharges suggests a significant overlap exists between

the two regulated communities, which means treatment may be necessary in areas with mining discharges.

Based on the second alternative point of compliance and the proposed criterion for manganese, compliance and treatment costs for the regulated wastewater community, including the mining industry, may increase. The expenditures necessary to meet new effluent limitations may exceed that which is required under existing regulations.

The proposed amendments will be implemented through the Department's permit and approval actions. Persons with an existing discharge or proposing to add a new discharge point to a stream could be adversely affected upon permit renewal or permit issuance if they need to provide a higher level of treatment to meet any new standard established by this proposed rulemaking. For example, increased costs may take the form of higher engineering, construction or operating cost for point source discharges. Monitoring and treatment costs are site-specific and depend upon the size of the discharge in relation to the size of the stream and many other factors. It is therefore not possible to precisely predict the actual change in costs. Economic impacts would primarily involve the potential for higher treatment costs for permitted discharges to streams to meet the new water quality standards requirements. The initial costs resulting from the installation of technologically advanced wastewater treatment processes may be offset by potential savings from and increased value of improved water quality through more cost-effective and efficient treatment over time.

Compliance assistance plan

This proposed rulemaking has been developed as part of an established program that has been implemented by the Department since the early 1980s. All surface waters in this Commonwealth are afforded a minimum level of protection through compliance with the water quality standards, which prevent pollution and protect existing water uses.

The proposed amendments will be implemented through the Department's permit and approval actions. For example, the NPDES permitting program bases effluent limitations on the water uses of the stream, and the water quality criteria developed to maintain those uses. These effluent limits are established to assure water quality is protected and maintained.

Paperwork requirements

This proposed rulemaking should not have new direct paperwork impact on the Commonwealth, local governments, political subdivisions, or the private sector. This proposed rulemaking will be implemented in accordance with existing Department regulations.

G. Pollution Prevention

The Federal Pollution Prevention Act of 1990 (42 U.S.C.A. §§ 13101—13109) established a National policy that promotes pollution prevention as the preferred means for achieving state environmental protection goals. The Department encourages pollution prevention, which is the reduction or elimination of pollution at its source, through the substitution of environmentally-

friendly materials, more efficient use of raw materials and the incorporation of energy efficiency strategies. Pollution prevention practices can provide greater environmental protection with greater efficiency because they can result in significant cost savings to facilities that permanently achieve or move beyond compliance.

Water quality standards are a major pollution prevention tool because they protect water quality and designated and existing uses. The proposed amendments will be implemented through the Department's permit and approval actions. For example, the NPDES program will establish effluent limitations in permits based on the more stringent of technology-based or water quality-based limits. Water quality-based limits are determined by the designated use of the receiving stream and the water quality criteria necessary to achieve the designated and existing uses.

H. Sunset Review

The Board is not proposing to establish a sunset date for these regulations because they are needed for the Department to carry out its statutory authority. The Department will continue to closely monitor these regulations for their effectiveness and recommend updates to the Board as necessary.

I. Regulatory Review

Under section 5(a) of the Regulatory Review Act (71 P.S. § 745.5(a)), on June 30, 2020, the Department submitted a copy of this proposed rulemaking and a copy of a Regulatory Analysis Form to the Independent Regulatory Review Commission (IRRC) and to the Chairpersons of the House and Senate Environmental Resources and Energy Committees. A copy of this material is available to the public upon request.

Under section 5(g) of the Regulatory Review Act, IRRC may convey comments, recommendations or objections to the proposed rulemaking within 30 days of the close of the public comment period. The comments, recommendations or objections must specify the regulatory review criteria in section 5.2 of the Regulatory Review Act (71 P.S. § 745.5b) which have not been met. The Regulatory Review Act specifies detailed procedures for review prior to final publication of the rulemaking by the Department, the General Assembly and the Governor.

J. Public Comments

Interested persons are invited to submit to the Board written comments, suggestions, support or objections regarding this proposed rulemaking. Comments, suggestions, support or objections must be received by the Board by September 25, 2020.

Comments may be submitted to the Board online, by e-mail, by mail or express mail as follows below.

Comments may be submitted to the Board by accessing eComment at <http://www.ahs.dep.pa.gov/eComment>.

Comments may be submitted to the Board by e-mail at RegComments@pa.gov. A subject heading of the proposed rulemaking and a return name and address must be included in each transmission.

If an acknowledgment of comments submitted online or by e-mail is not received by the sender within 2 working days, the comments should be retransmitted to the Board to ensure receipt. Comments submitted by facsimile will not be accepted.

Written comments should be mailed to the Environmental Quality Board, P.O. Box 8477, Harrisburg, PA 17105-8477. Express mail should be sent to the Environmental Quality Board, Rachel Carson State Office Building, 16th Floor, 400 Market Street, Harrisburg, PA 17101-2301.

K. Public Hearings

In accordance with Governor Tom Wolf's emergency disaster declaration and based on advice from the Department of Health regarding the mitigation of the spread of the novel coronavirus (COVID-19), the Board will hold three virtual public hearings for the purpose of accepting comments on this proposed rulemaking. The hearings will be held as follows:

September 8, 2020, at 6 p.m.
September 9, 2020, at 2 p.m.
September 10, 2020, at 6 p.m.

Persons wishing to present testimony at a hearing must contact Jennifer Swan for the Department and the Board, (717) 783-8727 or RA-EPEQB@pa.gov at least 24 hours in advance of the hearing to reserve a time to present testimony.

Witnesses must be a resident of this Commonwealth to provide testimony. Organizations are limited to designating one witness to present testimony on their behalf at only one hearing. Verbal testimony is limited to 5 minutes for each witness. Video demonstrations and screen sharing by witnesses will not be permitted.

Witnesses are requested to submit written copy of their verbal testimony by e-mail to RegComments@pa.gov after providing testimony at the hearing.

Information on how to access the hearings will be available on the Board's webpage found through the Public Participation tab on the Department of Environmental Protection's (Department) web site at www.dep.pa.gov (select "Public Participation," then "Environmental Quality Board"). Prior to each hearing, individuals are encouraged to visit the Board's webpage for the most current information for accessing each hearing.

Any members of the public wishing to observe the public hearing without providing testimony are also directed to access the Board's webpage. Those who have not registered with Ms. Swan in advance as described previously will remain muted for the duration of the public hearing.

Persons in need of accommodations as provided for in the Americans with Disabilities Act of 1990 should contact the Board at (717) 783-8727 or through the Pennsylvania AT&T Relay Service at (800) 654-5984 (TDD) or (800) 654-5988 (voice users) to discuss how the Board may accommodate their needs.

PATRICK McDONNELL,
Chairperson

ANNEX A

TITLE 25. ENVIRONMENTAL PROTECTION
 PART I. DEPARTMENT OF ENVIRONMENTAL PROTECTION
 Subpart C. PROTECTION OF NATURAL RESOURCES
 ARTICLE II. WATER RESOURCES

CHAPTER 93. WATER QUALITY STANDARDS

* * * * *

§ 93.7. Specific water quality criteria.

(a) Table 3 displays specific water quality criteria and associated critical uses. The criteria associated with the Statewide water uses listed in § 93.4, Table 2 apply to all surface waters, unless a specific exception is indicated in § § 93.9a—93.9z. These exceptions will be indicated on a stream-by-stream or segment-by-segment basis by the words “Add” or “Delete” followed by the appropriate symbols described elsewhere in this chapter. Other specific water quality criteria apply to surface waters as specified in § § 93.9a—93.9z. All applicable criteria shall be applied in accordance with this chapter, Chapter 96 (relating to water quality standards implementation) and other applicable State and Federal laws and regulations.

TABLE 3

<i>Parameter</i>	<i>Symbol</i>	<i>Criteria</i>	<i>Critical Use*</i>
* * * * *			
Iron	Fe ₁	30-day average 1.5 mg/l as total recoverable.	CWF, WWF, TSF, MF
	Fe ₂	Maximum 0.3 mg/l as dissolved.	PWS
[Manganese Nitrite plus Nitrate	Mn	Maximum 1.0 mg/l, as total recoverable.	PWS]
	N	Maximum 10 mg/l as nitrogen.	PWS

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§ 93.8c. Human health and aquatic life criteria for toxic substances.

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TABLE 5

WATER QUALITY CRITERIA FOR TOXIC SUBSTANCES

<i>PP</i>	<i>Chemical Name</i>	<i>CAS Number</i>	<i>Fish and Aquatic Life Criteria</i>		<i>Human Health Criteria (ug/L)</i>
			<i>Criteria Continuous Concentrations (ug/L)</i>	<i>Criteria Maximum Concentration (ug/L)</i>	
-	LITHIUM	07439932	N/A	N/A	N/A
<u>D</u>	<u>MANGANESE</u>	<u>07439965</u>	<u>N/A</u>	<u>N/A</u>	<u>300</u>
-	METHYLETHYL KETONE	00078933	32000	230000	21000
			* * * * *		- <u>H</u> H

**CHAPTER 96. WATER QUALITY STANDARDS
IMPLEMENTATION**

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§ 96.3. Water quality protection requirements.

* * * * *

(c) To protect existing and designated surface water uses, the water quality criteria described in Chapter 93 (relating to water quality standards), including the criteria in § § 93.7 and 93.8a(b) (relating to specific water quality criteria; and toxic substances) shall be achieved in all surface waters at least 99% of the time, unless otherwise specified in this title. The general water quality criteria in § 93.6 (relating to general water quality criteria) shall be achieved in surface waters at all times at design conditions.

(d) As an exception to subsection (c), the water quality criteria for total dissolved solids, nitrite-nitrate nitrogen, phenolics, chloride, sulfate and fluoride established for the protection of potable water supply and the water quality criterion for manganese shall be met at least 99% of the time at the point of all existing or planned surface potable water supply withdrawals unless otherwise specified in this title.

* * * * *



June 30, 2020

David Sumner
Executive Director
Independent Regulatory Review Commission
333 Market Street, 14th Floor
Harrisburg, PA 17120

Re: Proposed Rulemaking: Water Quality Standards for Manganese and Implementation (#7-553)

Dear Mr. Sumner:

Pursuant to Section 5(a) of the Regulatory Review Act, please find enclosed a copy of a proposed rulemaking for review by the Independent Regulatory Review Commission (Commission). This proposal is scheduled for publication in the *Pennsylvania Bulletin* on July 25, 2020, with a 64-day public comment period. The Environmental Quality Board adopted this proposal on December 17, 2019.

Where a pollutant found in discharges to surface waters is toxic to human health or aquatic life, Commonwealth regulations require development of appropriate water quality criteria to control pollution. 25 Pa. Code § 93.8a provides “[t]he waters of this Commonwealth may not contain toxic substances attributable to point or nonpoint source waste discharges in concentrations or amounts that are inimical to the water uses to be protected.” The Department took provisions of Act 40 of 2017, the Federal Clean Water Act, Pennsylvania Clean Streams Law, and Pennsylvania Safe Drinking Water Act into account in developing this proposed rulemaking.

This rulemaking proposes to amend 25 Pa. Code Chapter 93 (relating to water quality standards) and 25 Pa. Code Chapter 96 (relating to water quality standards implementation). The amendments propose to delete manganese from Table 3 at § 93.7 (relating to specific water quality criteria) and add manganese to Table 5 at § 93.8c (relating to human health and aquatic life criteria for toxic substances). Additionally, the amendments propose two alternatives for a point of compliance with the manganese water quality standard: the point of all existing or planned surface potable water supply withdrawals; or all surface waters (i.e., near the point of discharge). The proposed regulations, set forth in Annex A, support both alternatives.

The purpose and goals of this proposed rulemaking are: to comply with Act 40 (71 P.S. § 510-20(j)); to delete the existing 1.0 mg/L manganese numeric water quality criterion from Table 3 at § 93.7 (relating to specific water quality criteria) which was established for the protection of the Potable Water Supply use; to add a criterion of 0.3 mg/L to Table 5 at § 93.8c (relating to human health and aquatic life criteria for toxic substances) designed to protect human health from the neurotoxicological effects of manganese, which is expected to also ensure adequate protection of all water uses; and to identify the appropriate point of compliance for the criterion.

Proposed amendments to Chapter 93: Proposed regulatory amendments include a numeric water quality criterion of 0.3 mg/L for manganese designed to be protective of human health. This

standard would be added to § 93.8c Table 5 - Water Quality Criteria for Toxic Substances, and the existing Potable Water Supply criterion of 1.0 mg/L, found in § 93.7 Table 3 would be deleted. The proposed numeric human health criterion for manganese is more stringent than the existing Potable Water Supply criterion of 1.0 mg/L and includes protection of the Potable Water Supply use; therefore, the Potable Water Supply use would be afforded appropriate protection from elevated levels of manganese when the human health standard is applied in accordance with Department policy and regulations. Since this numeric criterion will be included in Table 5, it should apply in all surface waters of the Commonwealth, consistent with § 93.8a(a) (relating to toxic substances) and with the Department's Water Quality Toxics Management Strategy – Statement of Policy (25 Pa. Code Chapter 16). Based upon the Department's scientific review, the adoption and implementation of a human health criterion in all surface waters should also provide adequate protection to aquatic life and livestock from the toxic effects of manganese.

Proposed amendments to Chapter 96: Proposed regulatory amendments include language which supports two different alternatives for implementing the proposed human health criterion of 0.3 mg/L. The first alternative (consistent with Act 40) is to move the point of compliance to the point of all existing or planned surface potable water supply withdrawals. The second alternative is to maintain the existing point of compliance in all surface waters (i.e., at point of discharge).

Specific impacts depend upon the alternative selected at final rulemaking. This proposed rulemaking has potential to impact permitted dischargers of manganese if the second alternative is selected (i.e., keeping the point of compliance at the point of discharge) because dischargers will have to meet a more stringent manganese limit at the point of discharge. Conversely, public water systems and other users located downstream of manganese dischargers will be impacted if the first alternative is selected (i.e., moving the point of compliance to the point of potable water supply withdrawal as mandated by Act 40). Regardless of the alternative selected, the impacted community will likely need to employ additional treatment technologies or operational measures to remove manganese; costs associated with this increased treatment could be significant.

As set forth in the Regulatory Review Act, the Department will consider any comments and recommendations made by the Commission, as well as the House and Senate Environmental Resources and Energy Committees and the public, prior to final adoption of the enclosed rulemaking.

Please contact me by e-mail at ledinger@pa.gov or by telephone at 717.783.8727 if you have any questions or need additional information.

Sincerely,



Laura Edinger
Regulatory Coordinator

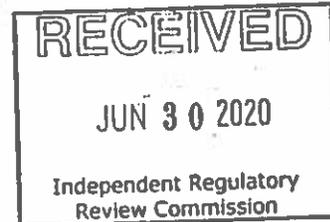
Enclosures

**TRANSMITTAL SHEET FOR REGULATIONS SUBJECT TO
 THE REGULATORY REVIEW ACT**

I.D. NUMBER: 7-553
 SUBJECT: *Water Quality Standards for Manganese & Implementation*
 AGENCY: DEPARTMENT OF ENVIRONMENTAL PROTECTION

TYPE OF REGULATION

- Proposed Regulation
- Final Regulation
- Final Regulation with Notice of Proposed Rulemaking Omitted
- 120-day Emergency Certification of the Attorney General
- 120-day Emergency Certification of the Governor
- Delivery of Tolled Regulation
 - a. With Revisions
 - b. Without Revisions



FILING OF REGULATION

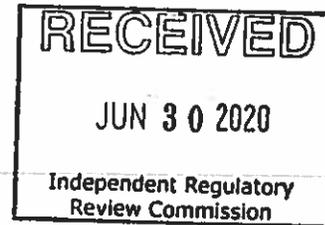
DATE	SIGNATURE	DESIGNATION
<u>6/30/2020</u>	<u><i>Janele J Menard</i></u>	Majority Chair, HOUSE COMMITTEE ON ENVIRONMENTAL RESOURCES & ENERGY <i>Representative Daryl Metcalfe</i>
<u>6/30/2020</u>	<u><i>Richard Stief</i></u>	Minority Chair, HOUSE COMMITTEE ON ENVIRONMENTAL RESOURCES & ENERGY <i>Representative Cory Vitali</i>
<u>6/30/2020</u>	<u><i>electronic Submittal</i></u>	Majority Chair, SENATE COMMITTEE ON ENVIRONMENTAL RESOURCES & ENERGY <i>Senator Gene Yaw</i>
<u>6/30/2020</u>	<u><i>electronic submittal</i></u>	Minority Chair, SENATE COMMITTEE ON ENVIRONMENTAL RESOURCES & ENERGY <i>Senator Steve Santarstero</i>
<u>6/30/2020</u>	<u><i>electronic Submittal</i></u>	INDEPENDENT REGULATORY REVIEW COMMISSION <i>David Sumner</i>
_____	_____	ATTORNEY GENERAL (for Final Omitted only)
<u>6/30/2020</u>	<u><i>electronic Submittal</i></u>	LEGISLATIVE REFERENCE BUREAU (for Proposed only) <i>Leah Brown</i>

Stephen Hoffman

From: Leah Brown <lbrown@palrb.us>
Sent: Tuesday, June 30, 2020 3:40 PM
To: Edinger, Laura; Bulletin
Cc: Adeline E. Gaydosh
Subject: [External] RE: Proposed Rulemaking #7-553 Preamble and Annex A

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Hello Laura!
I have received your documents!
Thank you!
Leah



From: Edinger, Laura <ledinger@pa.gov>
Sent: Tuesday, June 30, 2020 3:38 PM
To: Bulletin <bulletin@palrb.us>
Cc: Leah Brown <lbrown@palrb.us>; Adeline E. Gaydosh <agaydosh@palrb.us>
Subject: Proposed Rulemaking #7-553 Preamble and Annex A
Importance: High

Good Afternoon,

Please see the attached Face Sheet, Preamble, and Annex A for Proposed Rulemaking – Water Quality Standards for Manganese and Implementation, for publication on July 25, 2020.

Notifications of receipt of the rulemaking from the Senate Environmental Resources and Energy (ERE) Committees are attached as well as the transmittal sheet confirming receipt of the rulemaking by the House ERE Committees.

Please confirm that you received the rulemaking documents for publication.

Thank you!
Laura

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Department of Environmental Protection | Policy Office
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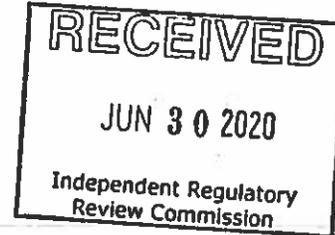
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Stephen Hoffman

From: Troutman, Nick <ntroutman@pasen.gov>
Sent: Tuesday, June 30, 2020 3:52 PM
To: Bulletin; Collins, Tim
Cc: Martin, Megan; Edinger, Laura; A.J. Mendelsohn; Duane Searle; DeLiberato, Vincent C. (LRB)
Subject: RE: Delivery of Proposed Rulemaking--Water Quality Standards for Manganese and Implementation (7-553)

Confirmed. Thank you!

-Nick
Sen. Gene Yaw's Office



From: Bulletin <bulletin@palrb.us>
Sent: Tuesday, June 30, 2020 3:40 PM
To: Collins, Tim <timothy.collins@pasenate.com>; Troutman, Nick <ntroutman@pasen.gov>
Cc: Martin, Megan (OS) <mtmartin@os.pasen.gov>; Edinger, Laura <ledinger@pa.gov>; A.J. Mendelsohn <amendelsohn@palrb.us>; Duane Searle <dsearle@palrb.us>; DeLiberato, Vincent C. (LRB) <vdeliberato@palrb.us>
Subject: Delivery of Proposed Rulemaking--Water Quality Standards for Manganese and Implementation (7-553)

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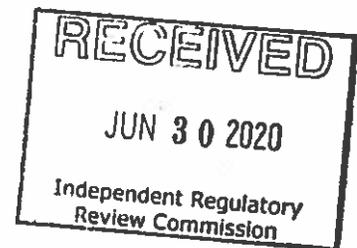
The Pennsylvania Code & Bulletin Office.

Stephen Hoffman

From: Collins, Timothy <Timothy.Collins@pasenate.com>
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To: Bulletin; Edinger, Laura
Cc: Martin, Megan; A.J. Mendelsohn; Duane Searle; Vincent Deliberato; Troutman, Nick
Subject: Re: Delivery of Proposed Rulemaking--Water Quality Standards for Manganese and Implementation (7-553)

Confirmed

Timothy Collins
Executive Director
Senate Environmental Resources & Energy Committee
Senator Steve Santarsiero, Democratic Chairman
184 Main Capitol Building
717-783-8235



From: Bulletin <bulletin@palrb.us>
Sent: Tuesday, June 30, 2020 3:40 PM
To: Collins, Timothy <Timothy.Collins@pasenate.com>; Troutman, Nick <ntroutman@pasen.gov>
Cc: Martin, Megan <mtmartin@os.pasen.gov>; Edinger, Laura <ledinger@pa.gov>; A.J. Mendelsohn <amendelsohn@palrb.us>; Duane Searle <dsearle@palrb.us>; Vincent Deliberato <vdeliberato@palrb.us>
Subject: Delivery of Proposed Rulemaking--Water Quality Standards for Manganese and Implementation (7-553)

■ EXTERNAL EMAIL ■

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Thank you.

The Pennsylvania Code & Bulletin Office.

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