MERCURY, MINING IN MINNESOTA, AND CLEAN WATER ACT PROTECTION: A REPRESENTATIVE ANALYSIS BASED ON THE PROPOSED POLYMET NORTHMET PROJECT

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I. INTRODUCTION

The PolyMet Mining Corporation's (Polymet's) proposal to locate its NorthMet copper-nickel open pit mine and processing facility in Northern Minnesota, draining to impaired waters within the Lake Superior Basin, is one of several proposals to increase mining and minerals processing within the Great Lakes System. This project and successive projects pose important legal questions about the application of the Clean Water Act and the Great Lakes Initiative for mercury point source discharge to impaired waters and increased mercury concentrations in the food chain resulting from nonpoint source loading. These processes pose significant risks, such as mercury air emissions and sulfate discharge within the watershed.[1] This article describes legal limitations applicable to mercury increases from mining and minerals processing, based on federal and state law implementations of the Clean Water Act, the Great Lakes Initiative, state mercury standards, and Minnesota's Statewide Mercury Total Maximum Daily Load (TMDL).

Point source discharge must meet wildlife-based standards for mercury concentrations in water under the Great Lakes Initiative and health-based limits on mercury in fish tissue set by Minnesota laws.[2] Neither mixing zones nor variances are permitted for point source discharge, and water quality may not be degraded.[3] Detectable mercury discharge to waters within the Great Lakes System triggers analysis of whether a new mining and processing facility causes or contributes to the violation of mercury standards or degradation of water quality.[4] Significantly, discharge with the potential to cause or contribute to water quality violations requires analysis through a TMDL study or comparable waste load allocation study.[5] New discharge is

1. This note is not intended to suggest that mercury and sulfates are the only potential contaminants of copper-nickel hardrock mining in Minnesota. The list of such substances is long and includes copper, nickel, manganese, iron, aluminum, and arsenic, as well as solvents and processing wastes.
2. *See infra* Part IV.B.
3. *See infra* Part IV.C–IV.D.
4. *See infra* Part V.
5. *See infra* Part IV.E.

only permitted if affected water bodies will attain mercury water quality standards within a reasonable time, considering watershed impacts from point source discharge, nonpoint sources, deposition of air emissions, chemical reactions within the watershed, and schedules for compliance.[6] Mercury emissions reductions must be consistent with sector-specific targets in Minnesota's Statewide TMDL.[7] In Minnesota's Great Lakes waters that are already impaired by mercury, only discharge and emissions reductions that are contemporaneous within the watershed and calculated to achieve compliance with water quality standards could offset new mercury discharge and increased mercury methylation resulting from a mining and processing facility such as the PolyMet NorthMet facility.[8]

II. POTENTIAL IMPACTS OF SULFIDE ON SULFIDE HARD ROCK MINING ON MERCURY

A. Mercury and Methylmercury

Mercury occurs naturally in the environment in various chemical forms. "Most mercury in the atmosphere (approximately 95–97 percent) is present in a neutral, elemental state" that does not biomagnify in aquatic food systems.[9] "In water, sediments and soils, most mercury is found in [an] oxidized . . . state."[10] Bacteria transform a small portion of this pool of oxidized, or divalent, mercury into methylmercury.[11]

Aquatic organisms can accumulate and retain certain chemicals in their bodies, including mercury, when exposed to these chemicals through water and diet.[12] This process is called bioaccumulation.[13] Inorganic divalent mercury and methylmercury both accumulate in aquatic vegetation, phytoplankton, and benthic invertebrates.[14] However, unlike inorganic mercury, methylmercury biomagnifies through

6. *See infra* Part III.B.
7. *See infra* Part IV.G.
8. *See infra* Part IV.G–V.A.
9. U.S. ENVTL. PROT. AGENCY, EPA-823-R-09-002, GUIDANCE FOR IMPLEMENTING THE JANUARY 2001 METHYLMERCURY WATER QUALITY CRITERION 14 (2009), *available at* http://www.epa.gov/waterscience/criteria/methylmercury/pdf/guidance-final.pdf [hereinafter METHYLMERCURY GUIDANCE].
10. *Id.*
11. *Id.*
12. *Id.* at 15.
13. *Id.*
14. *Id.*

each successive level in the food chain so that mercury in predatory, freshwater fish at the top of the food chain is found almost exclusively as methylmercury.[15]

The primary route by which the U.S. population is exposed to mercury is through the consumption of fish containing methylmercury.[16] Maternal consumption of fish can also cause negative neurological effects in children.[17] Birds and mammals that eat fish are also exposed to mercury mainly through consuming contaminated fish, and as a result they accumulate mercury to levels greater than those in their prey.[18] Methylmercury is a highly toxic substance that, even in low dosages, is inimical to human health. For example, it attacks the nervous system, the kidneys, the immune system, the reproductive system, and is especially damaging to a developing fetus.[19] Methylmercury is the most bioavailable form of mercury and is bioaccumulated in humans and animals alike.[20]

Very young children and fetuses are more sensitive to mercury than adults.[21] Children exposed to low concentrations of methylmercury in the womb are at risk for neurodevelopment effects including lowered performance in fine motor function, language skills, visual-spatial abilities, and verbal memory.[22] Mercury in the mother's body can cross the placenta and can pass to a nursing infant through breast milk.[23] Mercury's harmful effects that may result from transfer to the fetus or to an infant include brain damage, mental retardation, lack of coordination, impairment of vision, seizures, and other nervous system problems as well as digestive system and kidney damage.[24] Some recent epidemiological studies have suggested that methylmercury may also be associated with higher risk of heart attacks, coronary heart disease, and cardiovascular disease in men.[25]

15. METHYLMERCURY GUIDANCE, *supra* note 9, at 1, 15.
16. *Id.* at 10.
17. *Id.*
18. *Id.*
19. *Id.*
20. Me. People's Alliance v. Mallinckrodt, Inc., 471 F.3d 277, 281–82 (1st Cir. 2006).
21. U.S. ENVTL. PROT. AGENCY, EPA-823-R-01-001, WATER QUALITY CRITERION FOR THE PROT. OF HUMAN HEALTH: METHYLMERCURY 2-2, 2-5 (2001), *available at* http://www.epa.gov/waterscience/criteria/methylmercury/pdf/mercury-criterion.pdf.
22. METHYLMERCURY GUIDANCE, *supra* note 9, at 9.
23. *See* U.S. ENVTL. PROT. AGENCY, *supra* note 21, at 3-1.
24. AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY (ATSDR), CAS#: 7439-97-6, TOXFAQS:MERCURY 2 (1999), http://www.atsdr.cdc.gov/tfacts46.pdf.
25. Anna Choi et al., *Methylmercury Exposure and Adverse Cardiovascular Effects in*

Methylmercury bioaccumulates and biomagnifies to a relatively high extent, so mercury concentrations in the upper trophic level of freshwater fish typically consumed by humans or piscivorous wildlife can be 500,000 to 10,000,000 times as high as concentrations of mercury in water.[26]

Wetlands play a critical part in the mercury cycle, increasing methylmercury production and methylmercury inputs to surface waters. As explained by the U.S. Environmental Protection Agency (EPA), increased presence of sulfur and organic matter increase the levels of methylmercury in the food chain:

> Changes in the bioavailability of inorganic mercury and the activity of methylating microbes as a function of sulfur, carbon, and ecosystem-specific characteristics mean that ecosystem changes and anthropogenic "stresses" that do not result in a direct increase in mercury loading to the ecosystem, but alter the rate of methylmercury formation, might also affect mercury levels in organisms.[27]

In addition to sulfates, other physical and biogeochemical factors, such as wetting and drying cycles resulting from changes to watershed hydrology, have been known to impact methylmercury concentration in rivers.[28] Rising water levels can introduce sulfate into the highly organic wetland matrix, followed by falling water levels that hydraulically deliver elevated methylmercury to a stream or river.[29] Increased methylmercury is associated with flooded wetlands, whether as a result of high precipitation events or inundation of wetlands.[30]

Although mercury concentration in waters is related to national

Faroese Whaling Men, 117 ENVTL. HEALTH PERSP. 367, 367 (2009), *available at* http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2661905/pdf/ehp-117-367.pdf.

26. U.S. ENVTL. PROT. AGENCY, *supra* note 21, at 6-1.

27. METHYLMERCURY GUIDANCE, *supra* note 9, at 15.

28. *See generally* Bruce Monson, *Total Mercury and Methylmercury Flux in a Constructed Wetland for Stormwater Treatment*, ENVTL. BULL. NO. 10, MINN. POLLUTION CONTROL AGENCY, June 2008, *available at* http://www.pca.state.mn.us/publications/environmentalbulletin/tdr-eb08-10.pdf (discussing the flux of methylmercury in the McCarrons-Villa Park stormwater treatment system in Roseville, Minnesota).

29. *See* MINN. POLLUTION CONTROL AGENCY, IMPLEMENTATION PLAN FOR MINNESOTA'S STATEWIDE MERCURY TOTAL MAXIMUM DAILY LOAD 26 (2009), *available at* http://www.pca.state.mn.us/publications/wq-iw4-01p.pdf.

30. *See generally* TRAVIS BAVIN & MICHAEL BERNDT, MINN. DEP'T OF NATURAL RES., SULFATE AND MERCURY CHEMISTRY OF THE ST. LOUIS RIVER IN NORTHEASTERN MINNESOTA: A REPORT TO THE MINERALS COORDINATING COMMITTEE (June 2009) (unpublished draft report) (on file with author) (explaining the results of a reconnaissance survey conducted in September 2007 of the St. Louis River and eight of its major tributaries).

and even international atmospheric deposition, it is believed that near-field mercury deposition is probably dominated by local emissions.[31] The response of mercury deposition rates to emissions changes close to anthropogenic sources is, thus, likely to be much more rapid than emissions changes at remote locations.[32]

B. Sulfide Mining and the Mercury Cycle

Mercury loading in water bodies from metals mining activity may reflect "both historical and recent mining activity within a watershed."[33] Sulfide deposits from which ores are mined "are often associated with mercury."[34] The EPA has found that "[l]ocations at mining sites that might serve as sources of mercury include direct seeps, as well as leachate from tailings or spoil piles."[35] In addition, acid mine drainage containing high sulfate concentrations may enhance methylation of mercury from sediments and wetlands potentiated by sulfate-reducing bacteria.[36] Sources of mercury to water bodies impacted by mining and mineral processing may include the following:

> (1) direct discharges of mercury from water point sources, including industrial dischargers and wastewater treatment plants; (2) atmospheric deposition, including direct deposition to the waterbody surface and deposition to the watershed, which subsequently is transported to the waterbody via runoff and erosion, including via stormwater; (3) runoff, ground water flow, acid mine drainage, and erosion from mining sites or mining wastes, and other waste disposal sites such as landfills and land application units; (4) sediments, which might have mercury contamination or hot spots resulting from past discharges; and (5) "naturally occurring" mercury in soils and geologic materials.[37]

It has been recognized for decades that extraction and beneficiation of ores from rock formations containing sulfides poses an envi-

31. *See* METHYLMERCURY GUIDANCE, *supra* note 9, at 160.
32. Lindberg et al., *Panel on Source Attribution of Atmospheric Mercury: A Synthesis of Progress and Uncertainties in Attributing the Sources of Mercury in Deposition*, AMBIO, Feb. 2007, at 21.
33. *See* METHYLMERCURY GUIDANCE, *supra* note 9, at 79.
34. *Id.*
35. *Id.*
36. *Id.*
37. *Id.* at 74.

ronmental risk of acid formation and acid mine drainage.[38] "Acid is generated at mine sites when metal sulfide minerals [present in the host rock] are oxidized."[39] The natural weathering processes cause oxidation of minerals and create sulfuric acid, even before mining begins.[40] "Extraction and beneficiation operations associated with mining increase the rate of [oxidation] . . . by exposing large volumes of sulfide rock material with increased surface area to air and water."[41] The rate of sulfuric acid production is a function of sulfide minerals, water, oxygen, bacteria to catalyze the oxidation process, ferric iron, generated heat, and the physical exposure of minerals in the rock formation.[42]

Surface mining of copper and nickel creates large, open pits, tailings ponds, and waste-rock piles.[43] The quantity of waste rock and tailings from modern hardrock mines "has increased markedly" as companies have learned to mine profitably from lean or low-grade ore bodies.[44] The scale of large, open pit mining in sulfide rock "increases oxidation of metal sulfide minerals in rocks and the rate of acid mine drainage."[45] In particular, the NorthMet Mine and Ore Processing Facilities Project proposed by PolyMet proposes open pit mining and processing of approximately 228 million tons of copper, nickel, and other metallic ore over an approximately twenty-year mine life.[46] The project would mine an average of approximately 91,200 tons per day of rock from three surface mine pits and would generate approximately 394 million tons of waste rock and lean ore over the duration of the mine.[47]

The PolyMet mine site and processing plant is proposed to be located on the south portion of the Mesabi Iron Range in St. Louis County, Minnesota, approximately fifty miles north of the city of Du-

38. *See* U.S. ENVTL. PROT. AGENCY, TECHNICAL DOCUMENT: ACID MINE DRAINAGE PREDICTION 4 (1994), *available at* http://www.epa.gov/waste/nonhaz/industrial/special/mining/techdocs/amd.pdf.

39. *Id.*

40. *Id.*

41. *Id.*

42. *Id.* at 6.

43. John F. Seymour, *Hardrock Mining and the Environment: Issues of Federal Enforcement and Liability*, 31 ECOLOGY L.Q. 795, 821 (2004).

44. *Id.*

45. *Id.*

46. POLYMET MINING, INC., NORTHMET PROJECT, DRAFT ENVIRONMENTAL IMPACT STATEMENT S-5, 1-1 (2009), *available at* http://files.dnr.state.mn.us/input/environmentalreview/polymet/draft_eis/volume_i_text_and_tables_deis.pdf [hereinafter POLYMET DEIS].

47. *Id.*

luth.[48] For the processing plant, PolyMet has purchased or leased approximately 15,000 acres of a brownfield site from a prior taconite processing facility near Hoyt Lakes, one-third of which is expected to have ground-level disturbance resulting from the NorthMet minerals processing facility.[49] NorthMet's mine is proposed to be located in a previously unmined area of the Superior National Forest approximately six miles south of Babbitt, after a land exchange substituting new public lands for approximately 6700 acres at and adjacent to the mine site.[50]

PolyMet mining operations would have ground-level impacts on about 3016 acres and would result in forest clearing and soil and wetlands disruption of an area of approximately 1536 acres.[51] The project would directly or indirectly impact at least 1522 acres of wetlands at the mine site and tailings basin as a result of chemical and hydrological changes and excavation and removal.[52]

In addition to three open pits that would be mined at various times, the project would include a processing plant where ore would be ground into a slurry and chemically separated from non-metallic waste (tailings).[53] The ore is further extracted after concentrate regrinding and a hydrometallurgical process using high pressure and high temperature to dissolve minerals in a solution containing sulfates and sulfuric acid.[54] Metals would be precipitated and extracted with chemical extractors and electrowinning of copper.[55] Dried copper and nickel concentrate would then be stored, loaded into rail cars, and shipped off-site.[56]

In the St. Louis River basin, where the PolyMet NorthMet mine and processing facility would be located, studies recently conducted by the Minnesota Department of Natural Resources (DNR) have recognized that the following situations have the potential to increase mercury methylation: "[sulfate] discharge to wetlands that drain to a river, discharge to streams where flooding may result in inundation of high organic wetlands, or [sulfate loading] to lakes or impound-

48. *Id.* at 1-1.
49. *Id.* at 3-18 to 3-19, fig. S-1.
50. *Id.* at 1-2 to 1-3, 3-1.
51. *Id.* at 3-2, 4.1-123.
52. *Id.* at 4.2-9, 4.2-17 to 4.2-18, 4.2-24.
53. *Id.* at S-7.
54. *Id.*
55. *Id.* at S-7, 3-21 to 3-27.
56. *Id.* at 3-22.

ments" in which low oxygen conditions are present.[57] Until additional studies are conducted, the study suggested that "virtually all [sulfate] releases within the St. Louis River basin can be considered high-risk since wetlands, flood plains, and lakes are common in the region."[58]

Existing mine pits and waste rock piles are a significant feature of the St. Louis River basin, and it is believed that these features contribute the majority of the sulfate currently found in the St. Louis River.[59] Sulfide minerals found in relatively low concentrations in waste rock and overburden from open pit mines "can generate high [sulfate] concentrations in water that penetrates a waste rock pile. This water can soak into local groundwater systems" and eventually make its way into surface waters.[60] Seeps from tailings basins are also an important source of sulfate to the St. Louis River because sulfate tends to concentrate in tailings water which increases sulfate loadings from tailings seepage over time.[61] In addition, a significant and quantifiable source of sulfate loads to the St. Louis River comes from the pumping of water from mine pits that are being dewatered.[62]

Currently, mining operations and sulfate sources on the St. Louis River are not located near the tributaries that have extensive wetland areas with the potential for methylmercury production.[63] The PolyMet mine and processing plant, in contrast, would be located at sites containing wetlands draining into the Embarrass and Partridge River tributaries to the St. Louis River.[64]

The Partridge River tributary has 20.3 square miles of wetlands (approximately 12.5% of its area is wetlands) and the Embarrass River has 19.3 square miles of wetlands (approximately 10.7% wetlands).[65] DNR studies suggest that the Partridge River may have a greater sensi-

57. BAVIN & BERNDT, *supra* note 30, at 3.

58. *Id.* Other Minnesota studies in St. Louis County have suggested that during warmer months, methylation will increase proportionally to increases in sulfate concentrations. USS MINNTAC, MINNTAC WATER INVENTORY REDUCTION EIS, MERCURY AND METHYLMERCURY IMPACT ASSESSMENT TECHNICAL MEMORANDUM 4-2, 4-9 to 4-10 (2004), *available at* http://www.pca.state.mn.us/news/eaw/mntac-mercury.pdf.

59. BAVIN & BERNDT, *supra* note 30, at 18.

60. *Id.* at 20.

61. *Id.* at 19 (citing K. LAPAKKO & A. JAGUNICH, MINNESOTA DEPARTMENT OF NATURAL RESOURCES DIVISION OF MINERALS, SULFATE RELEASE FROM THE USX TAILINGS BASIN AND QUANTIFICATION OF SULFATE SOURCES 14 (1991)).

62. *Id.* at 19.

63. *Id.* at 28.

64. POLYMET DEIS, *supra* note 46, at vol. II, ch. 4.2, figs. 4.2-1, 4.2-4. All volumes can be accessed at http://www.dnr.state.mn.us/input/environmentalreview/polymet/eis_toc.html.

65. BAVIN & BERNDT, *supra* note 30, at 30.

tivity to wetland influence on mercury methylation than other streams draining mining areas.[66] Environmental review documents indicate that the Embarrass River wetlands and stream, into which a portion of the PolyMet project would discharge, is a particularly high-risk situation for mercury methylation.[67]

The PolyMet NorthMet project will stockpile waste rock, overburden, and lean ore at the mine site situated on wetlands draining into the Partridge River, resulting in oxidation and the formation of sulfates (sulfuric acid compounds) that may be released along with metals.[68] Liners would be used to collect some of the water passing through stockpiles, although liner leakage is predicted.[69] Waste rock and ore contain trace amounts of mercury, which may leach from the rock, and local rainfall also contains mercury.[70]

Water collected from waste rock, overburden, and lean ore stockpiles, and process water from mine dewatering, will be pumped from a central pumping station to a wastewater treatment facility at the mine site and include ponds to equalize water flow.[71] Effluent from the wastewater treatment facility would be pumped to the tailings basin or used to supplement flooding of the east pit after extraction is completed and the dewatering system is removed.[72]

The east pit would also be backfilled with waste rock, creating a chemical effect similar to rock from the mine pit walls that oxidize and leach solutes above the water surface—an effect sought to be mitigated with a geomembrane and several inches of lime over the most reactive rock.[73] After backfilling with waste rock and overburden, it is proposed that a vegetative soil layer would be used to construct wetlands on the east pit area.[74] Stockpile drainage and wastewater treatment effluent would be pumped into the east pit wetland, as would ponded water and drainage from the lined hydrometallurgical waste

66. *Id.* at 15–16.

67. POLYMET DEIS, *supra* note 46 at vol. I, S-9.

68. *Id.* at 3-14 to 3-15; *see also id.* at vol. II, ch. 3.1, fig. 3.1.1 (mine site layout); *id.* at vol. II, ch. 4.2, fig. 4.2.1 (delineated wetlands mine site).

69. *Id.* at vol. I, 3-16 to 3-17, 4.1-74 to 4.1-75, 4.1-84.

70. *Id.* at 4.1-122.

71. *Id.* at 3-9 to 3-11; *see also id.* at vol. II, ch. 3.1, figs. 3.1-10 and 3.1 -11 (maps entitled "Process Water Management - Year 1 (Proposed Action)" and "Process Water Management - Year 10 (Proposed Action)").

72. *Id.* at vol. I, 3-10, 3-38. Stormwater runoff would also be directed to the east pit. *Id.* at 3-43.

73. *Id.* at 3-12, 4.1-40, 4.1-72.

74. *Id.* at 3-40.

facility at the processing plant.[75] East pit waters would drain into the Partridge River.[76]

After ores have been extracted from the west pit area, it is proposed that the west pit would be allowed to fill with groundwater, precipitation and surface runoff, creating a pit lake.[77] Post-closure flooding is expected to result in overflow of the west pit lake.[78] This overflow would be directed to an existing wetland and eventually into the Partridge River.[79]

At the PolyMet mine site, it is acknowledged that stormwater runoff and unrecoverable groundwater seepage from a variety of sources represent potential pathways for the project to affect water quality in the Partridge River.[80] These sources include the temporary and permanent waste rock and lean ore stockpiles, mine pits, overburden storage areas, sumps, process water ponds, and equalization ponds for the wastewater treatment facility as well as the ultimate overflow of the west pit.[81] At the mine site, the depth to groundwater is generally less than five feet below the ground surface and flows toward the Partridge River.[82] Due to the shallow water table and thin surface aquifer, flow paths within the surficial deposits are likely to be short, with recharge near discharge areas.[83]

During mining operations, collection of precipitation and groundwater from the mine site for use at the plant site would represent a reduction in flow to the Partridge River.[84] Processing water would also be withdrawn from Colby Lake, a lake downstream from the mine site on the Partridge River.[85] The project will alter water levels in the Partridge River and other downstream water bodies, including Colby Lake and the Whitewater Reservoir, although the magnitude of this change is disputed.[86] Alteration of groundwater le-

75. *Id.* at 3-41 to 3-42, 3-46.

76. *Id.* at 3-43. Outlet structures may be used to affect drainage flows to the Partridge River. *Id.* at vol. II, ch. 3.1, fig.3.1-40.

77. *Id.* at vol. I, 3-39, 3-43. Effluent from the wastewater treatment facility could also be used to maintain water levels.

78. *Id.* at 3-39, 4.1-111 to 4.1-112. Overflow is projected in year sixty-five (i.e., post-closure).

79. *Id.* at 3-39.

80. *Id.* at 4.1-109.

81. *Id.*

82. *Id.* at 4.1-5.

83. *Id.* at 4.1-5.

84. *Id.* at 4.1-55.

85. *Id.* at 3-35, 4.1-55, 4.1-104.

86. *Id.* at 4.1-98 to 4.1-107. *See also id.* at vol. III, app. D, 4.1-38, 4.1-92 to 4.1-93 (describing "[e]ffects on Partridge River Morphology" and "[e]ffects on 100-Year

vels at the mine is anticipated during mine operations and post-closure until approximately sixty-five years after mining is completed.[87]

Effluent from the mine site and the wastewater treatment facility would be pumped to the tailings basin for use as plant make-up water.[88] Along with this effluent, process water and floatation tailings from the plant would also be disposed of within an unlined area of the tailings basin.[89] The tailings basin would contain ponded waters and a vegetated area as well as stored water in its void spaces and drain pipes to collect some of the seepage. The pond and wetland would continue to lose water via seepage after closure.[90]

The tailings basin into which effluent from the wastewater treatment facility and flotation tailings from the processing plant would be transferred is located on a brownfield site, where taconite tailings from LTV Steel Mining Company (LTVSMC) were previously disposed.[91] The LTVSMC site is currently being evaluated under Minnesota's Voluntary Investigation and Cleanup program for contaminated sites.[92] The LTVSMC contains sixty-two Areas of Concern (AOC) with the potential for past contamination, including twenty-two unresolved AOCs in areas acquired by PolyMet.[93] The tailings basin site generally covers an area from a mile to two miles in diameter.[94]

Hydrometallurgical wastes from the ore extraction process, including autoclave residues, metallic hydroxides, crud, and plant spillage, are proposed to be transferred to lined cells within the tailings basin.[95] Both the mine-site wastewater treatment facility and the processing plant will use hazardous and corrosive chemicals.[96]

Floodplain").

87. *Id.* at S-8.

88. *Id.* at 3-10, 3-12, 4.1-67. The wastewater treatment facility would have a maximum design flow of 3000 gallons per minute, and would generate an annual average maximum of 1600 gallons per minute during operations. *Id.* at 4.1-67.

89. *Id.* at 3-31, 3-32, 4.1-87.

90. *Id.* at 3-45.

91. *Id.* at S-1, 1-2, 4.1-124.

92. MINN. STAT. § 115B.175 (2008); Voluntary Investigation and Cleanup (VIC) Program—Minnesota Pollution Control Agency, http://www.pca.state.mn.us/cleanup/vic.html (last visited Mar. 1, 2010).

93. POLYMET DEIS, *supra* note 46, at 4.1-6, 4.1-17.

94. *Id.* at vol. II, ch. 3.1, fig.3.1-17 (plant site layout).

95. *Id.* at vol. I, 3-27, 3-33, 3-34; vol. II, ch. 3.1, fig.3.1-27 (existing tailings basin).

96. *Id.* at vol. I. 3-25, 3-30, 4.12-1, 4.12-5, 4.12-6. Wastewater treatment facility chemicals include sodium hydrosulfide, a classified corrosive, and lime. Processing facility chemicals include sodium hydrosulfide; sulfur dioxide, a classified poison gas and corrosive; sulfuric acid; hydrochloric acid; and other corrosive, toxic and com-

Seepage from the tailings basin will have high sulfate concentrations.[97] Due to the shallow aquifer at the tailings basin, groundwater seepage would exceed the capacity of the aquifer resulting in significant seepage upwelling and wetland impacts, particularly downgradient from the tailings basin.[98] This upwelling would inundate portions of the wetlands north of the tailings basin with high sulfate concentrations, creating high-risk situations for mercury methylation for the wetlands and downstream lakes on the Embarrass River.[99] Options for the tailings basin include installing wells at the toe of the basin and pumping captured seepage back into the basin, and pumping seepage and conveying it for discharge into the Partridge River.[100]

III. CLEAN WATER ACT

A. Discharge to Waters of the United States

Section 301(a) of the Clean Water Act (CWA) prohibits the discharge of any pollutant, including mercury, unless that discharge complies with certain enumerated provisions of the Clean Water Act, including the National Pollution Discharge Elimination System (NPDES) program in section 402.[101] Discharge of a pollutant is defined as "any addition of any pollutant to waters of the United States from any point source."[102]

Rules promulgated under the CWA specifically include in the definition of discharge of pollutants into waters from "surface runoff which is collected or channeled."[103] Courts have held that an overflowing or leaking mine sump is a point source[104] and that gravity flow resulting in discharge to waters of the United States may be part of a point source discharge if the discharger initially collected or channeled the water and other materials.[105]

bustible chemicals. *Id.*

97. *Id.* at S-9.

98. *Id.* at 4.1-7, 4.1-65.

99. *Id.* at 4.1-129.

100. *Id.* at 3-35, 3-52 to 3-53.

101. 33 U.S.C. § 1311(a) (2006) ("Illegality of pollutant discharges except in compliance with law. Except as in compliance with this section and sections 302, 306, 307, 318, 402, and 404 of this Act [33 USCS § 1312, 1316, 1317, 1328, 1342, 1344], the discharge of any pollutant by any person shall be unlawful.").

102. 33 U.S.C. §§ 1311, 1314 (2006).

103. Protection of the Environment, 40 C.F.R. § 122.2 (2009).

104. United States v. Earth Sci., Inc., 599 F.2d 368, 374 (10th Cir. 1979).

105. Sierra Club v. Abston Constr. Co., 620 F.2d 41, 45 (5th Cir. 1980) ("Conveyances of pollution formed either as a result of natural erosion or by material

Navigable waters under the CWA are defined in regulations to include all waters which are currently used, were or may be susceptible to use in interstate or foreign commerce, and all interstate waters:

> (c) All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, "wetlands," sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds the use, degradation, or destruction of which would affect or could affect interstate or foreign commerce including any such waters:
>
> (1) Which are or could be used by interstate or foreign travelers for recreational or other purposes;
>
> (2) From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or
>
> (3) Which are used or could be used for industrial purposes by industries in interstate commerce;
>
> (d) All impoundments of waters otherwise defined as waters of the United States under this definition.[106]

In order to regulate discharges of pollutants, Congress authorized the EPA to establish restrictions on pollutants and impose conditions on effluents under the NPDES permit program.[107] Discharge to wetlands draining into a navigable waterway is governed by the CWA.[108] Some cases have found that the CWA does not apply to groundwater,[109] but the weight of recent precedent finds that CWA protections apply to discharge that reaches surface water through groundwater that is hydrologically connected to surface waters that constitute navigable waters.[110] The EPA has interpreted the CWA to

means, and which constitute a component of a mine drainage system, may . . . subject the operators to liability under the Act.").

106. Protection of the Environment, 40 C.F.R. § 122.2 (2009).

107. 33 U.S.C. § 1342(a)(2) (2006).

108. United States v. Riverside Bayview Homes, Inc., 474 U.S. 121, 135–39 (1985) (finding CWA jurisdiction even over wetlands with no hydrological connection to navigable waters). In *Rapanos v. United States*, 547 U.S. 715, 725–26, 741, 759, 779–80 (2006), the court reviewed the plurality and concurrence from *Riverside*, outlining the rule that a wetland would be subject to CWA jurisdiction if it is adjacent to or has a significant nexus to navigable waters.

109. *See, e.g.*, Town of Norfolk v. U. S. Army Corps of Eng'rs, 968 F.2d 1438, 1451 (1st Cir. 1992).

110. *See* Wash. Wilderness Coal. v. Hecla Mining Co., 870 F. Supp. 983, 989–90 (E.D. Wash. 1994) (holding that, although "Congress did not intend to include *isolated* groundwater as part of the 'navigable waters'" that the CWA regulates, the CWA does apply to discharges of pollutants that reach surface waters through groundwater) (emphasis added). *See also* Idaho Rural Council v. Bosma, 143 F. Supp. 2d 1169, 1180 (D. Idaho 2001) ("The CWA extends federal jurisdiction over groundwater that is hydrologically connected to surface waters that are themselves waters of the United

regulate discharges to surface water via ground water that is hydrologically connected to surface waters, taking the position that NPDES permits are intended to protect surface waters which are contaminated via a groundwater subsurface connection.[111]

Applying the holding of *Rapanos v. United States* to pit lakes suggests that pit lakes can be regulated under the CWA if there is a "significant nexus" to waters that are navigable.[112] In *Northern California River Watch v. Healdburg*, an on-site quarry pit was held to be subject to CWA regulation because the pit waters seeped into a navigable river

States."); Friends of Santa Fe County v. LAC Minerals, 892 F. Supp. 1333, 1357–58 (D. N.M. 1995) ("This decision [Quivira Mining Co.v. U.S. Envtl. Prot. Agency, 765 F.2d 125, 129 (10th Cir. 1985)] and other decisions demonstrating Tenth Circuit's expansive construction of the [CWA's] jurisdictional reach, foreclose any argument that the CWA does not protect groundwater with some connection to surface waters."); Sierra Club v. Colo. Refining Co., 838 F. Supp. 2d 1428, 1434 (D. Colo. 1993) ("Discharge of any pollutant into 'navigable waters' includes such discharge which reaches 'navigable waters' through groundwater."); McClellan Ecological Seepage Situation v. Weinberger, 707 F. Supp. 1182, 1194–96 (E.D. Cal. 1988) ("Subsequently, EPA eliminated even this narrow authority [notion that 'EPA's statutory authority to regulate discharges into the ground was limited to discharges into deep wells'] to regulate discharges into groundwater."), *vacated on other grounds*, 47 F.3d 325 (9th Cir.).

111. EPA responses to Comments on National Pollutant Discharge Elimination System Permit Regulation and Effluent Limitations Guidelines and Standards for Concentrated Animal Feeding Operations, 66 Fed. Reg. 3,016 (Jan. 12, 2001), *available at* http://www.sba.gov/advo/laws/is_cafopr2.txt.

> EPA does not argue that the CWA directly regulates ground water quality. In the Agency's view, however, the CWA does regulate discharges to surface water which occur via ground water because of a direct hydrologic connection between the contaminated ground water and nearby surface water. EPA repeatedly has taken the position that the CWA can regulate discharges to surface water via ground water that is hydrologically connected to surface waters . . . . EPA has made consistent statements on at least five other occasions. In the Preamble to the final NPDES Permit Application Regulations for Storm Water Discharges, the Agency stated: ''this rulemaking only addresses discharges to waters of the United States, consequently discharges to ground waters are not covered by this rulemaking (unless there is a hydrological connection between the ground water and a nearby surface water body.'') 55 Fed. Reg. 47,990, 47,997 (Nov. 16, 1990) (emphasis added). *See also* 60 Fed. Reg. 44,489, 44,493 (Aug. 28, 1995) (in promulgating proposed draft CAFO permit, EPA stated, ''discharges that enter surface waters indirectly through groundwater are prohibited''); EPA, ''Guide Manual On NPDES Regulations For Concentrated Animal Feeding Operations'' at 3 (Dec. 1995), *available at* http://www.epa.gov/guide/cafo/ (''Many discharges of pollutants from a point source to surface water through groundwater (that constitutes a direct hydrologic connection) also may be a point source discharge to waters of the United States.'').

Id.

112. *Rapanos*, 547 U.S. at 779–80.

and affected the physical and biological integrity of the river.[113] Although the Supreme Court recently held that U.S. Army Corps of Engineers jurisdiction does not extend to an isolated pit solely due to the impact on migratory birds, the Court distinguished the potential application of state permitting requirements under the CWA, which also extend to certain non-navigable waters.[114]

Minnesota enacted a state NPDES program in conformity with federal requirements in Chapter 115 of its statutes.[115] NPDES permits in Minnesota apply to "waters of the state."[116] In connection with Minnesota's chapter of statutes under which the NPDES program is established, waters of the state are defined as "all streams, lakes, ponds, marshes, watercourses, waterways, wells, springs, reservoirs, aquifers, irrigation systems, drainage systems and all other bodies or accumulations of water, surface or underground, natural or artificial, public or private, which are contained within, flow through, or border upon the state or any portion thereof."[117] No more limited scope for NPDES permits is defined, except that rules provide exemptions for dredge and fill materials regulated under section 404 of the CWA and for discharge into treatment works.[118]

In addition to the broad definition of waters of the state, Minnesota rules suggest that mine pit lakes would be required to comply with applicable standards pertaining to mercury. Under Minnesota Rules, several mine pit lakes have been classified among the waters of

113. N. Cal. River Watch v. Healdsburg, 496 F.3d 993, 995, 1002 (9th Cir. 2007).

114. Solid Waste Agency of N. Cook County v. U.S. Army Corps of Eng'rs, 531 U.S. 159, 167, 171 (2001). *See* 33 U.S.C. § 1344(g) (2006) (authorizing states to administer permitting programs over certain non-navigable waters).

115. MINN. STAT. § 115.03, subdiv. 5 (2008); MINN. R. 7001.1000 to 7001.1100 (2009).

116. MINN. R. 7001.1020, subdiv. 12 (2009).

117. MINN. STAT. § 115.01, subdiv. 22 (2008).

118. MINN. R. 7001.1030, subp. 2 (2009). In *Bailey v. Minn. Pollution Control Agency*, No. A07-2255, 2008 WL 4777917, at *9 (Minn. Ct. App. Nov. 4, 2008), the Minnesota Court of Appeals upheld revocation of a section 401 CWA certification by the MPCA for a project that could discharge sewage to groundwater and surface waters after the U.S. Army Corps of Engineers had denied an after-the-fact section 404 permit for fill of wetlands. *See* Coeur Alaska, Inc. v. Se. Alaska Conservation Council, 129 S. Ct. 2458, 2467 (2009) (holding that the U.S. Corps of Engineers had authority to issue permits for discharge of fill material). The Court noted that the EPA had the statutory authority to veto the Corps of Engineers section 404 permit, but had declined to do so and had issued a section 402 permit setting limits on the level of pollution in the discharge and requiring treatment. *Id.* at 2465–66. The Court also stated that its holding did not affect the exceptions in 40 C.F.R. § 230.10 (b), which prevent discharge of fill material if it violates state water quality standards or toxic effluent limits. *Id.* at 2474.

the state.[119] Minnesota's Lake Superior Basin mercury standards apply to waters within the classifications that have been applied to other mine pit lakes in the state.[120]

B. NPDES Permit Standards

Under the NPDES program, the EPA or states and tribes authorized to administer the program may issue permits that allow the discharge of pollutants into waters of the United States, notwithstanding the general prohibition of section 301(a).[121] These permits must contain (1) technology-based effluent limitations, which represent the degree of control that can be achieved using various levels of pollution control technology[122] and (2) more stringent limitations, known as water quality-based effluent limitations when necessary to ensure that the receiving waters achieve applicable water quality standards.[123] State and tribal permitting programs must conform to federal standards and procedure or impose more stringent requirements.[124]

Any permit for discharge issued by the EPA or by a state NPDES program to a new source or a new discharger must comply with federal regulations promulgated under the CWA. Those federal regulations prohibit issuance of permits to a new source or new discharger if its construction or operation will cause or contribute to the violation of water quality standards.[125] Minnesota NPDES permits must contain conditions necessary for the permittee to achieve compliance with applicable Minnesota or federal statutes or rules and any conditions that the agency determines to be necessary to protect human health and the environment.[126]

As provided in 40 C.F.R. § 122.4(i), where receiving waters do not

119. MINN. R. 7050.0470, subp. 1(B) (2009) (classifying approximately twenty pit lakes, for example: Canton Mine Pit Lake and Corsica Mine Pit Lake as 1B, 2Bd and 3C waters; Embarrass Mine Pit (Sabin Lake or Lake Mine) as 1B, 2A, 3B waters; Fraser Mine Pit Lake, Mesabi (Missabe) Mountain Mine Pit Lake and Morton Mine Pit Lake, and St. James Mine Pit as 1C, 2Bd and 3C waters; Judson Mine Pit as 1B, 2A, 3B waters).

120. MINN. R. 7050.0200, subp. 3a; MINN. R. 7050.0222, subp. 3; MINN. R. 7052.0100, subp. 2; MINN R. 7052.0100, subp. 4 (2009). Great Lakes Initiative mercury water concentration standards and Minnesota's health-based fish tissue standards apply to both class 2A and 2Bd waters.

121. 33 U.S.C. § 1341 (2006).

122. §§ 1311, 1314, 1316 (2006).

123. § 1311(b)(1)(c) (2006).

124. State Program Requirements, 40 C.F.R. § 123.25(a) (2009).

125. *Id.*

126. MINN. R. 7001.0150, subp. 2; MINN. R. 7001.1080 (2009).

meet applicable water quality standards, a permit may only be issued where there are sufficient pollutant load allocations to allow for the discharge and the existing discharges are subject to compliance schedules to bring the waters in compliance with standards:

> No permit may be issued:
>
> (i) To a new source or a new discharger, if the discharge from its construction or operation will cause or contribute to the violation of water quality standards. The owner or operator of a new source or new discharger proposing to discharge into a water segment which does not meet applicable water quality standards or is not expected to meet those standards even after the application of the effluent limitations required by sections 301(b)(1)(A) and 301(b)(1)(B) of CWA, and for which the State or interstate agency has performed a pollutants load allocation for the pollutant to be discharged, must demonstrate, before the close of the public comment period, that:
>
> (1) There are sufficient remaining pollutant load allocations to allow for the discharge; and
>
> (2) The existing dischargers into that segment are subject to compliance schedules designed to bring the segment into compliance with applicable water quality standards.[127]

Recent cases have interpreted this standard both as it applies to discharge from a mine and discharge from public wastewater treatment facilities.[128]

C. Violation of Water Quality Standards—Mining Pinto Creek

The case of *Friends of Pinto Creek v. EPA*,[129] decided by the Ninth Circuit in 2007, explicitly analyzed whether a permit could be granted under the CWA and the NPDES permitting program for mining-related discharges by the Carlota Copper Company into a creek that was already in excess of water quality standards for copper.[130] In that

127. EPA Administered Permit Programs: the National Pollutant Discharge Elimination System, 40 C.F.R. § 122.4(i) (2009).

128. *See, e.g.*, *In re* City of Annandale, 731 N.W.2d 502 (Minn. 2007). *See also* Friends of Pinto Creek v. U.S. Envtl. Prot. Agency, 504 F.3d 1007 (9th Cir. 2007) (interpreting water quality standard from 40 C.F.R. § 122.4(i) as it applies to discharge from a mine); Sierra Club of Miss., Inc. v. City of Jackson, 136 F. Supp. 2d 620 (S.D. Miss. 2001) (applying water quality standards to wastewater treatment discharges).

129. *Friends of Pinto Creek*, 504 F.3d at 1007.

130. *Id.*

case, Carlota proposed to construct and operate an open pit copper mine and processing facility covering over 3000 acres while extracting 100 million tons of ore,[131] a project approximately half the scale of the proposed PolyMet project.

Petitioners challenged the NPDES initially issued for the project on the basis that no Total Maximum Daily Load (TMDL) study had been completed for Pinto Creek.[132] The U.S. EPA then withdrew portions of the NPDES permit, completed a TMDL for dissolved copper in the Pinto Creek and reissued the permit.[133]

The court in *Pinto Creek* analyzed whether the new copper discharge would cause or contribute to violation of water quality standards, precluding issuance of a permit under 40 C.F.R. § 122.4(i).[134] The EPA asserted that partial remediation of discharge from another mine operated by Carlota within the watershed would offset the pollution, allowing the permit to be issued.[135] The court rejected this argument:

> [T]here is nothing in the Clean Water Act or the regulation that provides an exception for an offset when the waters remain impaired and the new source is discharging pollution into that impaired water . . . . The plain language of this exception to the prohibited discharge by a new source provides that the exception does not apply unless the new source can demonstrate that, under the TMDL, the plan is designed to bring the waters into compliance with applicable water quality standards.[136]

The court explained that the key requirement of § 122.4(i) of title 40 is that there be a plan to bring the affected water body within water quality standards.[137] The existence of remaining pollutant load allocations of itself is insufficient to allow issuance of a permit where there is no indication of a plan that will effectuate load allocations and bring the affected water body into compliance with water quality standards.[138] A permittee or a regulator must show not simply a "lessening of pollution" but how the water quality standard will be met if

131. *Id.* at 1009.
132. *Id.* at 1010.
133. *Id.* at 1010–11.
134. *Id.* at 1009, 1011–12.
135. *Id.* at 1012.
136. *Id.*
137. *Id.*
138. *Id.*

new discharge of pollutants into impaired waters is permitted.[139] This analysis requires compliance schedules for existing dischargers as well as for the new source seeking a permit.[140] The NPDES permit issued for the Carlota Copper Mine was vacated and remanded due to errors of law under the Clean Water Act, 40 C.F.R. § 122.4(i).[141]

Since the *Pinto Creek* case was decided, internal EPA documents have identified the strengths of the *Pinto Creek* holding:

- A new discharger will not be allowed . . . if the discharge will cause or contribute to violation of [a water quality standard].
- Compliance schedules for existing point sources . . . are required when a new discharger proposes discharging to [an impaired water segment].
- Compliance schedules provide milestones/accountability for bringing a discharger into compliance with [effluent limits].[142]

D. Violation of Standards—Wastewater Treatment in Minnesota

Less than four months before the *Pinto Creek* case was decided, the Minnesota Supreme Court approved an NPDES permit issued by the Minnesota Pollution Control Agency (MPCA) for the Annandale/Maple Lake wastewater treatment plant to discharge phosphorous into waters classified as impaired for dissolved oxygen.[143] In *In re City of Annandale*, the court granted deference to the MPCA's interpretation of 40 C.F.R. § 122.4(i), on the basis that it was a regulation that the MPCA was charged with enforcing.[144] It cited the EPA's administrative decision that was overturned by the Ninth Circuit in *Pinto Creek*, among other bases, for its conclusion that 40 C.F.R. § 122.4(i) was unclear and susceptible to various interpretations.[145] Then, *Annandale* held the MPCA's interpretation "reasonable" because the new discharge of phosphorous from the Annandale/Maple Lake facility would not "cause or contribute" to the violation of water quality standards since the proposed increase was significantly less than a

139. *Id.* at 1014.
140. *Id.* at 1012–13.
141. *Id.* at 1016.
142. U.S. EPA, NUTRIENT INNOVATIONS TASK GROUP, AN URGENT CALL TO ACTION, app. D, at p. D-27 (2009), *available at* http://www.epa.gov/waterscience/criteria/nutrient/nitgreport.pdf.
143. *See In re* City of Annandale, 731 N.W.2d 502, 525–26 (Minn. 2007).
144. *Id.* at 512–13.
145. *Id.* at 520–22.

contemporaneous upgrade in the Litchfield wastewater treatment facility that had reduced the net discharge of phosphorous to the same watershed.[146]

A strong argument can be made that the *Annandale* court's deference to the MPCA is inconsistent with federal precedent.[147] The facts upon which the court found the MPCA's interpretation "reasonable" in *Annandale* would also limit its application to offsets of mercury from mining and minerals processing in northern Minnesota.

The court in *Annandale* held that a new discharge to impaired waters could reasonably be interpreted not to "cause or contribute" to water quality violations to "a situation like the one presented in this case . "[148] The court cited the fact that there were "two aging wastewater treatment facilities with expired NPDES permits, which are at or near capacity in a region of the state that is experiencing significant growth" and that the 2200-pound per year of phosphorus discharge from the Annandale/Maple Lake wastewater treatment facility would "be offset by a contemporaneous 53,500-pound per year decrease in a nearby facility that is located in the same watershed."[149]

There is no indication that the findings of *Annandale* would apply to facilities that were not public wastewater treatment works, such as new mining projects in impaired waters. At the very least, applying *Annandale's* criteria would require contemporaneous reductions of a significant order of magnitude (the Litchfield reductions were more than twenty times the proposed Annandale discharge) from a nearby facility within the same watershed.[150] In response to a challenge by the dissent, the supreme court in *Annandale* specifically denied that pollution offsets remote in time or geographic location would be allowed to circumvent the CWA mandate:

> [W]e disagree with the dissent's conclusion that, based on this opinion, the MPCA can use discharge reductions from the "distant past" or "unknown future" or "geographically distant locales" to "largely circumvent" its mandate. Given our conclusion that, under our standard deference analysis, reasonableness is necessarily determined using a case-by-case

146. *Id.* at 518–19, 524.

147. *See generally* Mehmet K. Konar-Steenberg, *In re Annandale and the Disconnections Between Minnesota and Federal Agency Deference Doctrine*, 34 WM. MITCHELL L. REV. 1375 (2008) (discussing how *Annandale's* analysis differed from the federal agency deference doctrine).

148. *In re City of Annandale*, 731 N.W.2d at 524.

149. *Id.*

150. *See id.*

> inquiry, our opinion does not authorize, much less invite, the MPCA to interpret 40 C.F.R. § 122.4(i) to allow discharge permits in cases involving offsets that are remote in either time or place.[151]

Application of the CWA to mercury discharge from a mining project and analysis of potential offsets applicable to that discharge is based not only on the generally applicable provisions of the CWA, but on legal standards specifically applicable to mercury, particularly in the Great Lakes System of waters. These standards are described below.

IV. MERCURY WATER QUALITY STANDARDS

A. Great Lakes Initiative

The governments of the United States of America and of Canada entered into agreements in 1972 and 1978 pertaining to Great Lakes water quality.[152] Then, in the late 1980s, the governors of the eight states surrounding the Great Lakes entered into an agreement to protect and preserve the environmental integrity of the Great Lakes waters.[153]

Congress followed up by enacting the Great Lakes Critical Programs Act of 1990, which amended section 118 of the CWA.[154] In this amendment to the CWA, Congress instructed the EPA to promulgate regulations to protect the Great Lakes System and required that the Great Lakes states and tribes authorized to implement the CWA "adopt water quality standards, antidegradation policies, and implementation procedures for waters within the Great Lakes System which are consistent with such guidance."[155] States were precluded from adopting water quality standards or procedures to determine toxicity that are less protective than the Guidance for the Great Lakes States promulgated by the EPA.[156]

Federal regulations promulgated under the 1990 amendments to section 118 of the CWA require Great Lakes states or authorized tri-

151. *Id.* at 525–26.

152. *See, e.g.*, Agreement on Great Lakes Water Quality, U.S.-Can., Nov. 22 1978, 30 U.S.T. 1383.

153. The Great Lakes Charter (1985), *available at* http://www.cglg.org/projects/water/docs/GreatLakesCharter.pdf.

154. 33 U.S.C. § 1268 (2006).

155. *Id.* § 1268(c)(2)(C).

156. *See, e.g.*, Ne. Ohio Reg'l Sewer Dist. v. U.S. Envtl. Prot. Agency, 411 F.3d 726, 734 (6th Cir. 2005).

bes to adopt provisions consistent with federal regulations for "waters in the Great Lakes System or be subject to EPA promulgation of its terms" governing these waters.[157] These statutes and rules protecting Great Lakes System waters are often referred to as the Great Lakes Initiative.[158]

The Great Lakes System was defined to include "all the streams, rivers, lakes and other bodies of water within the drainage basin of the Great Lakes within the United States."[159] The St. Louis River system, into which the Embarrass River, the Partridge River, and their associated wetlands drain, is wholly within the Lake Superior basin, so the Great Lakes Initiative water quality standards apply to all surface waters impacted by the PolyMet NorthMet project.[160]

Great Lakes states and tribes must adopt requirements applicable to waters of the Great Lakes System consistent with definitions, methodologies, water quality criteria, and values and implementation procedures as provided in § 132 of title 40 of the Code of Federal Regulations.[161] These standards must be at least as stringent as federal regulations, although states and tribes may adopt "numeric water quality criteria, narrative criteria, or water quality values that are more stringent than criteria or values specified in § 132.3 or that would be derived from . . . the methodologies set forth in [its appendices]."[162]

Federal regulations set mercury water quality criteria for the protection of wildlife in the Great Lakes at 0.0013 micrograms per liter (μg/L) (including methylmercury).[163] This water concentration standard is based on the potential of mercury to bioaccumulate and appear in much higher concentrations in the tissue of organisms at the upper levels of the food chain.[164] To protect human health and piscivorous wildlife, bioaccumulation factors relate the concentration of mercury in water to its expected concentration in fish.[165] In *American Iron & Steel Institute v. EPA*,[166] a case in which industry challenged the Great Lakes mercury standards, the Court of Appeals for the District of Columbia affirmed that failure to account for bioaccumulation in

157. 40 C.F.R. § 132.1(c) (2009).
158. *See* U.S. Envtl. Prot. Agency, Great Lakes Initiative, http://www.epa.gov/waterscience/standards/gli (last visited Mar. 2, 2010).
159. 40 C.F.R. § 132.2 (2009).
160. *See* POLYMET DEIS, *supra* note 46, at 4.1-27, 4.1-33.
161. 40 C.F.R. § 132.4(a) (2009).
162. *Id.* § 132.4(i).
163. *Id.* § 132, tbl.4.
164. *See id.* § 132, app. D, tbl.D–1.
165. *See, e.g.*, *id.* § 132, app. B.
166. 115 F.3d 979 (D.C. Cir. 1997).

setting limits for mercury concentration in water "could result in underestimation of the amount that humans and wildlife ingest."[167]

B. Minnesota Standards for Mercury in Water and Fish Tissue

Pursuant to federal requirements, in Chapter 7052 of the Minnesota Rules, Minnesota has adopted a water concentration limit for mercury of 0.0013 micrograms per liter (μg/L) or 1.3 nanograms per liter (ng/L) as the wildlife chronic standard and the applicable chronic standard for the Lake Superior watershed of the Great Lakes System.[168]

In addition to water concentration limits, in 2001 the EPA recommended a methylmercury fish tissue-based criterion of 0.3 mg/kg to protect human health throughout the United States.[169] Neither the EPA's methylmercury fish tissue criterion nor EPA's recommendations for its implementation supersede the requirements of the Great Lakes Initiative in 40 C.F.R. § 132.[170] The EPA Methylmercury Guidance suggests that, in most instances, the Great Lakes Initiative wildlife water column criterion of 1.3 ng/L will be the most stringent criterion applicable to mercury and will therefore be the controlling basis for calculation of mercury total maximum daily loads to a watershed or NPDES permit limits.[171]

Minnesota sets water quality standards to protect surface waters for multiple beneficial uses, including drinking water, cold water sport fishing, and cool and warm water fishing.[172] Minnesota Rules state that "[t]he numeric and narrative water quality standards . . . prescribe the qualities or properties of the waters of the state that are necessary for the designated public uses and benefits."[173] The rules further state that "[i]f the standards . . . are exceeded, it is considered indicative of a polluted condition which is actually or potentially deleterious, harmful, detrimental, or injurious with respect to designated uses or established classes of the waters of the state."[174]

Minnesota's fish tissue standard for mercury in edible fish tissue,

167. *Id.* at 1003–04.
168. MINN. R. 7052.0100, subp. 2 (2009).
169. OFFICE OF SCI. & TECH., U.S. ENVTL. PROT. AGENCY, WATER QUALITY CRITERION FOR THE PROTECTION OF HUMAN HEALTH: METHYLMERCURY 7-1 (2001), *available at* http://www.epa.gov/waterscience/criteria/methylmercury/pdf/mercury-criterion.pdf.
170. METHYLMERCURY GUIDANCE, *supra* note 9, at 63.
171. *Id. at* 64.
172. Minn. R. 7050.0220, subp. 1 (2009).
173. *Id.*
174. *Id.*

applicable across the range of waters used for fishing and drinking water, is 0.2 micrograms per kilogram (mg/kg), equivalent to 0.2 parts per million (ppm).[175] This standard is based on the EPA's methylmercury criterion for fish tissue to protect human health and the particular pattern of fish consumption in Minnesota.[176] Because of the higher fish consumption rate in the state, Minnesota has a lower fish tissue mercury criterion than the EPA's rate at 0.3 [mg/kg].[177] Minnesota's fish consumption advisory threshold is 0.2 [mg/kg]; this number corresponds to "one meal per week—above that mercury concentration the consumption advice is one meal per month—for women who are pregnant or intending to become pregnant and children under 15 years of age."[178] Chapter 7052 in Minnesota Rules also establishes "nondegradation standards for surface waters of the state in the Lake Superior Basin . . . and implementation procedures for deriving effluent limitations from these standards and criteria."[179]

C. No Variances or Mixing Zones for New Mercury Discharge

Although variances may be applicable to methylmercury criteria outside the Great Lakes System under limited circumstances,[180] federal requirements for the Great Lakes System greatly limit the authority of Great Lakes States or Tribes to grant variances for pollutants. States or tribes may adopt water quality standards variance procedures and grant water quality standards variances for point sources only to the extent "consistent with (as protective as) the provisions" of the procedure in Appendix F to part 132 of title 40 of the Code of Federal Regulations.[181]

Although there are conditions applicable to *existing* discharges under which a state or tribe may grant a variance for water quality-based effluent limitations included in a NPDES, the authority to grant a variance from Great Lakes Initiative standards does not extend to new discharges. Procedure 2 in Appendix F to part 132, implementing the Great Lakes amendment to the CWA, clearly states with refer-

175. Minn. R. 7050.0220, subp. 3a (classes 1B, 2A, 3B, 4A, 4B), subp. 4a (class 2Bd), subp. 5a (classes 2B, 2C, 2D).

176. MINN. POLLUTION CONTROL AGENCY, MINNESOTA STATEWIDE MERCURY TOTAL MAXIMUM DAILY LOAD ix (2007), *available at* http://www.pca.state.mn.us/publications/wq-iw4-01b.pdf [hereinafter MINN. STATEWIDE MERCURY TMDL].

177. *Id.*

178. *Id.*

179. Minn. R. 7052.0005.

180. METHYLMERCURY GUIDANCE, *supra* note 9, at 42–44.

181. 40 C.F.R. § 132, app. F, Procedure 2 (2009).

ence to variance procedures that "[t]his provision shall not apply to new Great Lakes dischargers or recommencing dischargers."[182] Corresponding Minnesota Rules state that variances from individual point source discharge in the Lake Superior Basin do not apply to new dischargers "unless the proposed discharge is necessary to alleviate an imminent and substantial danger to public health and welfare."[183] The "imminent and substantial danger" provision has not been tested to determine how it might be applied or whether, if challenged, it would be determined to be as protective as the requirements of title 40, part 132 of the federal regulations. As of October 1, 2009, no active variances from Minnesota water quality standards (Chapter 7050) or effluent discharge rules (Chapter 7053) had been granted for mercury, and no variances were identified to pertain to the Great Lakes Initiative (Chapter 7052).[184]

In calculating compliance of a new mercury discharge with the Great Lakes Initiative concentration standard, no "mixing zone," within which an effluent might be diluted, can be considered.[185] Federal regulations for new discharge of bioaccumulative chemicals of concern (BCCs), including mercury, preclude mixing zones;[186] and states and tribes may not establish mixing zones for new discharge.[187] New discharge includes discharge from a newly constructed facility, newly commenced discharge from an existing Great Lakes discharge, or an expanded discharge from an existing discharge.[188] Minnesota Rules also prohibit mixing zones for new and expanded discharge within the Lake Superior Basin.[189]

The U.S. EPA has explained that the question of mixing zones is not relevant, in any case, when applying a fish tissue-based criterion, since the total load of mercury in the waterbody taking into account the methylation rate and bioaccumulation is what determines the level of methyl mercury in fish tissue.[190] NPDES limitations for mercury discharged to any surface waters in the Great Lakes System must not

182. *Id.* § 132, app. F, Procedure 2.A.1.
183. MINN. R. 7052.0280, subp. 1.
184. Minnesota Pollution Control Agency, Water Quality Standards, http://www.pca.state.mn.us/water/standards/index.html (last visited Mar 2., 2010).
185. 40 C.F.R. § 132, app. F, Procedure 3, cl. C.1 (2009).
186. *Id.*
187. *Id.* § 132, app. F, Procedure 3, cl. C.4.
188. *Id.* § 132, app. F, Procedure 3, cl. C.2 (made applicable to WLAs in the absence of a TMDL by Procedure 3.E).
189. MINN. R. 7052.0210, subp. 3 (2009) (prohibition on mixing zones effective after March 9, 1998).
190. METHYLMERCURY GUIDANCE, *supra* note 9, at 65.

exceed the Great Lakes Initiative mercury criterion.[191]

D. Non-Degradation of Water Quality

In addition to setting mercury standards, federal regulations for the Great Lakes System contain requirements for policies and implementation procedures to protect water quality from degradation. Great Lakes States must apply an antidegradation policy at least as stringent as federal standards, although states and tribes may adopt antidegradation standards and implementation procedures more stringent than those set forth in appendices E and F of part 132.[192]

At a minimum, a state antidegradation policy and implementation methods must be consistent with the following policy: "Existing instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected."[193] Where designated uses of a waterbody (such as drinking or fishing) are impaired, "there shall be no lowering of the water quality with respect to the pollutant or pollutants which are causing the impairment."[194] Where water quality does not support the designated uses of a waterbody or where ambient pollutant concentrations exceed water quality criteria applicable to that waterbody, the EPA director or an implementing state authority "shall not allow a lowering of water quality for the pollutant or pollutants preventing the attainment of such uses or exceeding such criteria."[195]

In the Great Lakes, mercury is identified as a BCC, and as one of the Lake Superior bioaccumulative substances of immediate concern (BSIC).[196] Under the federal regulations, by definition a "Significant Lowering of Water Quality" for purposes of nondegradation occurs "when there is a new or increased loading of any BCC from any regulated existing or new facility, either point or nonpoint source for which there is a control document or reviewable action."[197]

Minnesota Rules identify a BCC as any toxic chemical that has a human health bioaccumulation factor greater than 1000[198] and include mercury among the BSICs, consistent with federal rules and the

191. *Id.* at 66.
192. 40 C.F.R. §132.4(f).
193. *Id.* §131.12(a)(1).
194. *Id.* § 132, app. E, I.A.
195. *Id.* § 132, app. E, II.B.
196. *Id.* § 132.2, Table 6 (BCC), app. E, II.A (BSIC).
197. *Id.* § 132, app. E, II.A.
198. MINN. R. 7052.0010, subp. 4 (2009).

Bi-National Program.[199] Minnesota Rules apply a nondegradation standard to any new or expanded discharge of BCC to all surface waters in the Lake Superior Basin, except a narrowly-defined class of limited resource value waters.[200] Minnesota's nondegradation standards explicitly apply both to point source discharges and to nonpoint source discharge of BCCs, including mercury.[201]

Any discharger of BSIC, such as mercury, into outstanding international resource waters including surface waters of the Lake Superior Basin[202] must provide a complete nondegradation demonstration, including an analysis of the best technology in process and treatment to eliminate or reduce the extent of the new or expanded discharge.[203] Although lowering of water quality to accommodate important economic or social development in the area in which the water is located may be permitted under limited circumstances in waters where water quality is *better* than the quality necessary to protect all applicable uses,[204] no such flexibility is allowed for a discharge to impaired waters. An agency may not allow water quality to be lowered below the level required to fully support existing and designated beneficial uses.[205] Since Minnesota's nondegradation analysis explicitly includes nonpoint sources, it must include releases of mercury from mobilization of mercury stored in rock, peat, and soil as a result of peat and rock excavation and stockpiling and from storm water runoff.[206]

199. *Id.* subp. 5; MINN. R. 7052.0350 (2009).
200. MINN. R. 7052.0010, subp. 1 (2009).
201. *Id.* subp. 1.A(1) (2009); MINN. R. 7050.0185, subp. 3 (2009).
202. *See* MINN. R. 7052.0010, subp. 34 (2009).
203. *Id.* subp. 3. Specific requirements:

> A. The BTPT analysis must evaluate the opportunities and technologies the discharger has to reduce loadings and minimize the generation of BSICs including pollution prevention, minimization and toxics reduction, and state-of-the-art or advanced process technologies. . . .
> B. The BTPT analysis must evaluate the effects of the transfer of pollutants to other media in addition to water as a result of the implementation of a process technology, pollution prevention technique, or treatment technology used to implement BTPT. . . .
> E. The BTPT proposed must be the most advanced technology available, viable in the marketplace.

Id.
204. MINN. R. 7052.0300, subp. 4 (2009); MINN. R. 7052.0310, subp. 3 (2009).
205. MINN. R. 7052.0310, subp. 2 (2009); MINN. R. 7052.0320, subp. 2 to subp. 3 (2009).
206. *See* POLYMET DEIS, *supra* note 46, at 4.1-122 ("Mercury can be released to surface or groundwaters through mobilization of mercury stored in rock, soil, peat, and vegetation."). *See generally, id.* at 4.1-122 to 4.1-124 (noting mercury sources in

E. Reasonable Potential to Exceed Water Quality Standards for Great Lakes Mercury

Regulations pertaining to the Great Lakes System address one of the issues that has become particularly salient in recent cases: whether the discharge of a pollutant into impaired waters should be interpreted to have the potential to cause or contribute to a water quality violation. Procedure 5 of Appendix F to part 132 of the Code of Federal Regulations provides that once it is determined that a pollutant in the Great Lakes system exceeds a fish tissue-based standard for that pollutant, "each facility that discharges detectable levels of such pollutant to that water has the reasonable potential to cause or contribute to an excursion above" the criteria or value.[207] The finding of a detectable level of discharge of the pollutant is sufficient to require a water quality-based effluent limitation (WQBEL) in an NPDES permit.[208]

Minnesota has adopted a corresponding rule providing that each facility discharging *detectable* levels of a Great Lakes Initiative pollutant exceeding fish tissue standards has the reasonable potential to cause or contribute to an excursion above water quality standards and requires a WQBEL.[209] This standard is more definitive than the Minnesota Rule generally applicable to Great Lakes Initiative pollutants not found to violate fish tissue standards, which requires the agency to make a determination under title 40, § 122.44, paragraph (d)(1) of the Code of Federal Regulation that the discharge is at a level which has the reasonable potential to cause or contribute to an excursion above any water quality standard.[210]

The provision in the code of federal regulations[211] providing that if fish tissue levels of a pollutant exceed standards, any facility that discharges "detectable" levels of that pollutant will be deemed to have a reasonable potential to cause an exceedance of a water quality standard was challenged by the American Iron and Steel Institute when the EPA issued its rules implementing the Great Lakes Initiative.[212] The D.C. Circuit Court in *American Iron & Steel Institute v. EPA* upheld the procedure, agreeing with the EPA that "it is not arbitrary and ca-

NorthMet waste rock, rainfall, and as a result of forest clear-cutting).

207. 40 C.F.R. § 132, app. F, Procedure 5, F.4 (2009).

208. *Id.*

209. MINN. R. 7052.0220, subp. 7 (2009).

210. *Id.* subp. 1.

211. 40 C.F.R. § 132, app. F, Procedure 5, F.4 (2009).

212. *See* Am. Iron & Steel Inst. v. Envlt. Prot. Agency, 115 F.3d 979 (D.C. Cir. 1997).

pricious to presume that a source that contributes a pollutant to a body of water in which the standard for that pollutant has been exceeded has the reasonable potential to contribute to that exceedance."[213] A precise causal connection need not be demonstrated between a particular discharge and the relevant exceedance in Great Lakes System waters.[214]

Once the potential to cause or contribute to a water quality violation is established for mercury in Great Lakes waters that already exceed mercury fish tissue standards, a wasteload allocation analysis must be done to determine whether the discharge complies with Clean Water Act permitting standards.[215] As described previously, to permit new discharge consistent with the Clean Water Act, it must be demonstrated under title 40, part 122.4(i) of the Code of Federal Regulations both that there are sufficient pollutant load allocations to allow for the discharge, and that the existing dischargers into the water segment are subject to compliance schedules designed to bring the segment into compliance with applicable water quality standards.[216]

Federal regulations also define wasteload allocation for waters within the Great Lakes system for purposes of this analysis. In the absence of an approved TMDL or assessment and remediation plan for waters within the Great Lakes System, a wasteload allocation is the allocation for an individual point source "that ensures that the level of water quality to be achieved by the point source is derived from and complies with all applicable water quality standards."[217]

An implementing Great Lakes state is required to establish TMDLs in accordance with the listing and priority setting process established in section 303(d) of the Clean Water Act. Where water quality standards cannot be attained immediately, TMDLs "must reflect reasonable assurances that water quality standards will be attained in a reasonable period of time."[218] Specific procedures are set forth for preparing a TMDL under the Great Lakes Initiative.[219]

Procedures for calculating waste load allocations of mercury within the Great Lakes System in the absence of a TMDL are also specified under federal regulations. As with a TMDL, waste load allocations in

213. *Id.* at 1000.
214. *Id.*
215. 40 C.F.R. § 122.4 (2000).
216. *Id.* § 122.4 (i).
217. *Id.* § 132.2.
218. *Id.* §132, App. F, Procedure 3, B.1.
219. *Id.* at App. F, Procedure 3.

the absence of a TMDL must account for all "background" loadings to the watershed.[220] Background includes all loadings that "flow from upstream waters into the specified watershed, waterbody or waterbody segment," all loadings that "enter the specified watershed, waterbody or waterbody segment through atmospheric deposition or sediment release or resuspension," and all loadings that "occur within the watershed, waterbody or waterbody segment as a result of chemical reactions."[221] Waste load allocations shall be set no higher than the most stringent applicable water quality criteria or values for the bioaccumulative chemical in question.[222] States must use procedures at least as stringent as federal regulations in performing TMDL or waste allocations.[223]

Minnesota Rules state that TMDLs must be established in accordance with the listing and priority-setting process provided by section 303(d) of the CWA, 33 U.S.C. § 1313(d), and implementing regulations,[224] and adopt various EPA technical instructions for calculating waste load allocation in the absence of a TMDL.[225] The definition of "background" for loadings of a watershed also corresponds to the federal definition.[226]

The Final Water Quality Guidance for the Great Lakes System issued by the EPA explained that the water quality criteria and the antidegradation provisions of the final Great Lakes System rules apply to the waters of the Great Lakes System "regardless of whether discharges to the water are from point or nonpoint sources."[227] "Accordingly," the Guidance explained, "any regulatory programs for nonpoint sources that require compliance with water quality standards would also be subject to the criteria and anti-degradation provisions of the final Guidance once they are adopted into State or Tribal stan-

220. *Id.* at App. F, Procedure 3.B.9 (made applicable to WLAs in the absence of a TMDL by Procedure 3.E).

221. *Id.* at App. F, Procedure 3, B.9.(a) (made applicable to WLAs in the absence of a TMDL by Procedure 3.E).

222. *Id.* at App. F, Procedure 3, cl.1, cl.4 (made applicable to WLAs in the absence of a TMDL by Procedure 3.E).

223. *Id.* at App. F, Procedure 3, cl.4 (made applicable to WLAs in the absence of a TMDL by Procedure 3.E).

224. MINN. R. 7052.0200, subp. 1A (2007).

225. *Id.* at subp. 3, subp. 5.

226. MINN. R. 7052.0010, subp. 3.

227. Final Water Quality Guidance for the Great Lakes System, 60 Fed. Reg. 15,365 (Mar. 23, 1995), *available at* http://www.epa.gov/owow/tmdl/1995mar23fedreg.html.

dards."[228]

The inclusion of nonpoint source pollution in the EPA's water quality criteria and anti-degradation provisions was challenged by the American Iron and Steel Institute in *American Iron and Steel Institute v. EPA*.[229] The D.C. Circuit Court held that the inclusion of nonpoint sources, including industrial emissions to the air and resuspension of pollutants from contaminated sediments, was consistent both with the amendment of the CWA to include the Great Lakes Initiative and with the Great Lakes Water Quality Agreement entered into between the United States and Canada.[230]

F. Minnesota's Statewide Mercury TMDL

Minnesota's fish tissue standard for mercury came out of the Minnesota Statewide Mercury Total Maximum Daily Load study completed by the MPCA and approved by the EPA in 2007.[231] The TMDL study concluded that two-thirds of the waters on Minnesota's 2004 Impaired Waters List are impaired because of mercury.[232]

Waters were listed as impaired if mercury in fish tissue was greater than 0.2 mg/kg (equivalent to 0.2 parts per million), which corresponds to Minnesota's human health-based standard, or if the concentration of mercury in water exceeded chronic wildlife-based standards, which are 1.3 ng/L (nanograms per liter) in the Lake Superior Basin and northeast portion of the state and 6.9 ng/L in the southwestern parts of the state.[233] Interestingly, the calculated water concentration for Minnesota's 0.2 mg/kg mercury fish-tissue standard using the mean bioaccumulation factor for mercury is 0.52 ng/L, well below even the Lake Superior Basin water concentration limits.[234] However, Minnesota's TMDL references the Great Lakes Initiative standard of 1.3 ng/L rather than adopting a water quality standard of 0.52 ng/L for wastewater dischargers.[235] Although each impaired wastewater discharger customarily has its own TMDL study evaluating pollutant sources, load reductions needed to meet water quality standards and

228. *Id.*
229. Am. Iron & Steel Inst. v. U.S. Envtl. Prot. Agency, 115 F. 3d 979 (D.C. Cir. 1997).
230. *Id.* at 1002. *See also* Clean Water Act § 118(c)(2), 33 U.S.C. § 1268 (2006) (addressing "[n]avigation and [n]avigable waters").
231. MINN. STATEWIDE MERCURY TMDL, *supra* note 176, at xi.
232. *Id.* at 1.
233. *Id.* at 1, 4.
234. *Id.*
235. *Id.* at 18.

allocation of the acceptable load.[236] Minnesota concluded that since the source of nearly all of the mercury in Minnesota waters is atmospheric deposition shared by all mercury-impaired waters of the state, the primary pollutant reduction and source allocation for atmospheric sources would be the same statewide.[237] The Minnesota statewide TMDL aimed to set targets for in-state reduction of anthropogenic mercury from the various sectors responsible for mercury emissions.[238]

Minnesota's Statewide TMDL determined that Minnesota's contribution to anthropogenic mercury emissions must be reduced by ninety-three percent as compared with 1990 emissions to reach fish-tissue-based water quality standards.[239] As of 2000, annual mercury air emissions were about 3638 pounds, reflecting a sixty-eight percent reduction below estimated 1990 levels. Nearly all of the reductions in Minnesota emissions from 1990 were estimated to have come from restricting mercury in products, such as paint and batteries.[240] As of 2000, fifty-one percent of Minnesota's mercury emissions were from energy sources, twenty-one percent from minerals processing, and twenty-eight from purposeful use in products.[241]

Minnesota's Statewide TMDL set NPDES point source wasteload allocations for mercury at one percent of the total TMDL, or about 4 kg/yr for the northeastern region or the 1990 point source load, whichever is lower.[242] The TMDL noted that this waste load allocation for point sources had sufficient reserve capacity to permit additional wastewater discharge of mercury, but that there could be no *de minimus* level of mercury discharge within the Lake Superior Basin pursuant to Chapter 7052 and the federal Great Lakes Initiative on which it was based.[243]

With respect to the load allocation from nonpoint sources like atmospheric deposition, Minnesota's TMDL emphasized that there was no reserve capacity "because actual nonpoint source loads [were] far in excess of the load allocation."[244] The TMDL stated that, to maintain economic fairness, the MPCA would employ a phased approach with "sector-specific reduction milestones" to achieve a goal

236. *Id.* at vi–viii.
237. *Id.*
238. *Id.* at 44, 46.
239. *Id.* at 39.
240. *Id.* at 27.
241. *Id.* at 22.
242. *Id.* at 37, 40.
243. *Id.* at 37, 44.
244. *Id.* at 40.

of 789 pounds of mercury emissions from all sectors.[245] The first sector-specific emissions reduction target would be implemented when national mercury emission reductions as compared to the 1990 base year reached sixty-five percent.[246] At that time, mercury from all Minnesota sources would be reduced to 1700 pounds per year, and mercury from the materials processing sector would be reduced from the 2000 emissions level of 758 pounds per year to the level of 550 pounds per year.[247] No provision was made in Minnesota's approved TMDL for increases in mercury emissions by any sector of Minnesota sources.

To be included within the scope of the Statewide TMDL, the MPCA had to show that water bodies would meet water-quality standards after the TMDL's atmospheric reduction goals were achieved.[248] Water bodies not expected to meet mercury standards (even if Minnesota's Statewide Mercury TMDL emissions reductions were achieved) were required to remain on the impaired waters list under section 303(d) of the CWA.[249]

The MPCA proposed and the EPA approved a method to quantify which water bodies were not likely to meet mercury standards even if mercury air emissions were reduced as proposed in the Statewide TMDL.[250] A Minnesota lake or river would be placed in Category 5 as an impaired water for which an additional TMDL is needed under the CWA if mercury in fish tissue was greater than 0.572 mg/kg (0.572 ppm).[251]

G. Increases in Sector and Local Mercury Emissions

Although national reductions of mercury are close to the level of the first target in Minnesota's Statewide Mercury TMDL, having decreased by fifty-eight percent from 1990 through the 2005 inventory year,[252] Minnesota's mercury emissions from the materials processing

245. *Id.* at 44.
246. *Id.* at 46.
247. *Id.*
248. MINN. POLLUTION CONTROL AGENCY, IMPLEMENTATION PLAN FOR MINNESOTA'S STATEWIDE MERCURY TOTAL MAXIMUM DAILY LOAD 5 (Oct. 2009), *available at* http://www.pca.state.mn.us/publications/wq-iw4-01p.pdf [hereinafter MPCA 2009 TMDL Implementation Plan].
249. *Id.*
250. MINN. POLLUTION CONTROL AGENCY, TMDL DECISION DOCUMENT: REVISIONS TO MINNESOTA STATEWIDE MERCURY TOTAL MAXIMUM DAILY LOAD 3 (2008), *available at* http://www.pca.state.mn.us/publications/tmdl-mercury-dd.pdf.
251. *Id.*
252. *See* MINN. STATEWIDE MERCURY TMDL, *supra* note 176, at 46 (summarizing state reduction targets); U.S. ENVTL. PROT. AGENCY, REPORT ON THE ENVIRONMENT:

sector, including the mining industry in northeastern Minnesota, are increasing rather than decreasing.

Recent data from the MPCA show that mercury emissions from the materials processing sector were at 735 pounds in 2005 and are anticipated to reach 841 pounds in 2010, increasing the share of mercury produced by the materials sector in Minnesota from approximately twenty-two percent to thirty-two percent.[253] These increases in mercury emissions are attributed to the Minnesota Steel Industries electric arc furnace steel mill and the Mesabi Nugget iron nugget production plant located in the Mesabi Range and Hoyt Lakes areas of Northern Minnesota, for which permits were recently issued, not far from the proposed PolyMet project.[254] The MPCA's 2008 Mercury data notes potential additional emissions from mining and materials processing projects still under environmental review, including the PolyMet project (eight pounds a year) and the Keetac mining expansion (forty-nine pounds per year).[255] The PolyMet Draft Environmental Impact Statement (DEIS) also acknowledges that regional mercury emissions have increased.[256]

Although the approved Statewide TMDL requires sector-specific emissions reductions, the MPCA's most recent plan for its implementation suggests that from 2005 through 2018 the mining and materials processing category will increase emissions of mercury.[257] The

MERCURY EMISSIONS, *available at* http://cfpub.epa.gov/eroe/index.cfm?fuseaction=detail.viewInd&lv=list.listByAlpha&r=188199&subtop=341 (giving an overview of national mercury emission reductions). The data used in this indicator is based on the mercury emissions data in the National Emissions Inventory. *See generally* U.S. ENVTL. PROT. AGENCY, 2002 NATIONAL EMISSIONS INVENTORY DATA AND DOCUMENTATION, *available at* http://www.epa.gov/ttn/chief/net/2002inventory.html.

253. MINN. POLLUTION CONTROL AGENCY, ESTIMATED MERCURY EMISSIONS IN MINNESOTA FOR 2005 TO 2018 2 (2008), *available at* http://www.pca.state.mn.us/publications/wq-iw1-21.pdf [hereinafter MPCA Estimated Mercury Emissions]; MPCA 2009 TMDL Implementation Plan, *supra* note 248, at app. 5.

254. *See* MPCA Estimated Mercury Emissions, *supra* note 253, at 18 (estimating that Mesabi and Hoyt Lakes will add 147 lbs in mercury emissions); *see also* MINN. POLLUTION CONTROL AGENCY, MESABI NUGGET LLC AIR EMISSIONS PERMIT 13700318-001 (Jan. 25, 2007), *available at* http://www.pca.state.mn.us/air/permits/issued/13700318-001-aqpermit.pdf (last visited Mar. 2, 2010) (discussing air emission permit); MINN. POLLUTION CONTROL AGENCY, MINNESOTA STEEL INDUSTRIES AIR EMISSIONS PERMIT 06100067- 002 (2008), *available at* http://www.pca.state.mn.us/air/permits/issued/06100067-002-aqpermit (discussing air emission permit). It is beyond the scope of this note to evaluate the merits of issuance of these permits.

255. MPCA Estimated Mercury Emissions, *supra* note 253, at 18.

256. *See* POLYMET DEIS, *supra* note 46, at 4.6-46 (noting a total emission increase of thirty-four pounds per year).

257. MPCA 2009 TMDL Implementation Plan, *supra* note 248, at 13.

MPCA's new plan contains no reduction schedule for the mining sector, except to suggest that mining and processing facilities will submit reduction plans by 2016.[258] It then proposes, perhaps improbably, that from the 2018 level of 841 pounds, the mining and minerals processing sector will reduce emissions to 210 pounds of mercury per year by 2025.[259]

Recent data on fish tissue mercury in Minnesota provide no basis to challenge the Statewide TMDL's conclusion that there is no reserve pollutant load for nonpoint source mercury. Average fish tissue mercury in Minnesota is no longer declining.[260] Although fish tissue mercury has decreased as compared to the early 1980s, since the mid-1990s the downward trend has reversed.[261]

V. APPLICATION OF STANDARDS TO POLYMET MINE AND PROCESSING

The application of the CWA and Great Lakes Initiative standards, federal and Minnesota regulations, and the requirements of Minnesota's Statewide Mercury TMDL to the PolyMet NorthMet mine and processing facility requires an analysis of the waters potentially impacted by the PolyMet project, the potential sources of mercury and mercury methylation from the project and the cumulative mercury and methylmercury loading within the St. Louis River watershed, into which waters impacted by the PolyMet project would drain.

A. Impaired Great Lakes System Waters

The Embarrass River and Partridge River, into which the PolyMet NorthMet Project would discharge mercury and sulfates, are tributaries of the St. Louis River, which is part of the Lake Superior watershed.[262] Throughout this watershed, many bodies of water remain listed as category 5C impaired waters requiring a TMDL under section 303(d) of the CWA, since the reductions in emissions proposed in the Statewide Mercury TMDL would not bring these waters into com-

258. *Id.* at 11.
259. *Id.* at 13.
260. *See* Bruce A. Monson, *Trend Reversal of Mercury Concentrations in Piscivorous Fish from Minnesota Lakes: 1982–2006*, 43 ENVTL. SCI. & TECH. 1750, 1750 (2009) (summarizing evidence of mercury concentrations in fish between 1982–2006).
261. *Id.*
262. *Cf.* POLYMET DEIS, *supra* note 46, at 4.1-33 (noting that the Project is in the Lake Superior Basin and therefore the Great Lakes Initiative water quality standards apply).

pliance with mercury water quality standards.[263] All segments of the St. Louis River through the St. Louis County region, including the segments fed by the Partridge and Embarrass Rivers, the Colby Lake reservoir in the Partridge River just downstream of the proposed PolyMet project and the Embarrass chain of lakes downstream of the proposed PolyMet Project are specifically listed in Minnesota's inventory of section 303(d) impaired waters.[264]

Although some of the waters that could be impacted by discharge of mercury or sulfates from the PolyMet Project are not explicitly listed on Minnesota's section 303(d) impaired waters list, regulations under the CWA require that states "take into consideration the water quality standards of downstream waters" and "provide for the attainment and maintenance of the water quality standards of downstream waters."[265] In addition, for the PolyMet project, testing in the course of environmental review has confirmed that all of the receiving waters, including the Partridge and Embarrass Rivers, have mercury concentrations in water exceeding the Great Lakes Initiative standard of 1.3 ng/L.[266] Thus, all waters potentially impacted by the PolyMet mine and processing plant exceed water quality standards for mercury.

B. Potential for Mercury Discharge and Mercury Loadings to the Watershed

The PolyMet DEIS does not explicitly state what levels of mercury will be contained in discharge to wetlands, streams, rivers and other surface waters or to ground water hydrologically connected to these surface waters from the NorthMet mine and processing plant sites.[267]

263. *See* MINN. POLLUTION CONTROL AGENCY, 2010 INVENTORY OF ALL IMPAIRED WATERS (2010), *available at* http://www.pca.state.mn.us/publications/wq-iw3-15.xls.

264. *See id.* The St. Louis River and Colby Lake have been listed since 1998 and were targeted for completion of a TMDL in 2011, but as of January 2010, the process to perform a TMDL on these waters had not begun.

265. 40 C.F.R. §131.10(b) (2010). *Cf.* MINN. R. 7053.0245, subp. 3 (2008) (requiring highest levels of effluent quality to be maintained in water treatment works).

266. POLYMET DEIS, *supra* note 46, at 4.1-36, 4.1-42, 4.1-48. All of the mine site and the southern portion of the LTVSMC tailings basin drain into the Partridge River. *Id.* at 4.1-21. The northern portion of the LTVSMC tailings basin drains into the Embarrass River. *Id.* at 4.1-7.

267. Even where the DEIS predicts water quality parameters related to the project, data from mercury is lacking. *See* POLYMET DEIS, *supra* note 46, at 4.1-111 tbl.4.1-62; Predicted Water Quality along the Upper Partridge River for the Proposed Action, DEIS, at 4.1-112 tbl. 4.1-63; Estimated Wetland Removal Efficiencies, DEIS, at 4.1-114 tbl. 4.1-64; Summary of West Pit Water Quality at Post-Closure under Proposed Action, DEIS, at 4.1-116 tbl.4.1-65; Predicted Water Quality at Colby Lake for the Proposed Action, DEIS, at 4.1-116; Table 4.1-119 tbl.4.1-66; Predicted Water Quality

However, information regarding the PolyMet project contained in environmental review documents suggests not only that mercury discharge to impaired waters will be detectable, but that in some circumstances it is likely to exceed water concentration limits of 1.3 ng/L.[268]

As described previously, runoff water, treated process water and flotation tailings from the PolyMet plant will be collected and dumped on top of a large existing tailings basin from a closed taconite processing facility.[269] Water draining through this material will seep through groundwater to connected wetlands that drain into the Embarrass River or may be collected from the perimeter of the tailings basin and then discharged, possibly to the Partridge River.[270] The level of mercury in the surficial ground water aquifer at the existing tailings basin ranges from 4.2 ng/L to 7.7 ng/L, significantly exceeding surface water quality standards (1.3ng/L).[271]

As noted previously with reference to sulfate transport, the ground water seepage rate from the tailings basin would exceed the capacity of the aquifer and is expected to upwell into the wetland complex north of the tailings basin connected to the Embarrass River.[272] Whether through release to hydrologically connected ground water or through direct discharge, mercury as well as sulfates from the tailings basin could be discharged to surface waters within the Lake Superior Basin.

Existing surface discharge from the tailings basin also consistently exceeds mercury water quality standards, with average concentrations ranging from 2.6 ng/L to 5.5 ng/L.[273] It should not be assumed that future seeps from the tailings basin and surface discharge from the tailings basin will have mercury concentrations complying with Great Lakes standards, let alone that future seeps and surface discharge will have no detectable mercury concentrations that might impact impaired waters.

The removal and stockpiling of peat as a result of excavation on the mine site is likely to mobilize a large reservoir of mercury bound to organic matter. As explained in the DEIS, desiccation-induced aci-

along the Embarrass River for the Proposed Action, at 4.1-119.

268. A more rigorous and transparent environmental review analysis may be required to identify the nature and extent of discharges.

269. *See supra* Part II.B.

270. *See supra* Part II.B.

271. POLYMET DEIS, *supra* note 46, at 4.1-12 tbl. 4.1-6.

272. *Id.* at 4.1-126, 4.1-129.

273. *Id.* at 4.1-43 tbl. 4.1-30.

dification of the peat can also be expected to mobilize mercury bound to the peat. Periodic rewetting of exposed peat by precipitation and water level fluctuations may then promote methylation of mercury by sulfate-reducing bacteria within the oxidizing peat material and thereby mobilize mercury that has accumulated over many years.[274]

Excavated peat would be placed in stockpiles, along with waste rock or overburden. Although some drainage from these stockpiles will be collected, treated at an internal wastewater treatment facility, and then pumped either to the tailings basin or to the mine pits, the treatment facility is not predicted to be very effective in removing mercury.[275] The average mercury concentration in this drainage before treatment is predicted to be 8.5 ng/L, while the average after treatment is predicted to be 7.1 ng/L.[276] The DEIS proposes that channeling effluent through the tailings basin would be the means used to remove mercury from the effluent.[277]

The DEIS also proposes to construct a 160-acre wetland at the east pit once ore has been extracted.[278] This east pit would receive water that had not passed through the tailings basin.[279] The DEIS acknowledges that there is "very limited data regarding the effectiveness of constructed wetlands in removing mercury" and that, at the PolyMet mine site east pit, "the constructed wetlands would be expected to be variably effective in removing total mercury, and could function as a source for methylmercury production."[280]

Experience with mercury discharge from the nearby Dunka Pit, an abandoned open-pit taconite mine in Duluth Complex Material similar to that at the PolyMet mine site,[281] demonstrates that mercury removal is inconsistent, ranging from zero to seventy-five percent.[282]

274. *Id.* at 4.1-123. Current wetlands delineation estimates that most of the mine site is comprised of peat bogs. *Id.* at 4.1-4, 4.1-62.

275. *Id.* at 4.1-123.

276. *Id.* at 4.1-123.

277. *Id.* at 4.1-124. The PolyMet DEIS relies on laboratory bench studies with precipitation and taconite tailings to model compliance with the 1.3 ng/L standard. This conclusion is contested by tribal agencies serving as cooperating agencies in the preparation of the DEIS. *Id. See also id.* at 4.1-16, 4.1-50, 4.1-51.

278. *Id.* at 4.1-123.

279. *Id.*

280. *Id.*

281. *See* U.S. EPA, 3 TECHNICAL RESOURCE DOCUMENT: EXTRACTION AND BENEFICIATION OF ORES AND MINERALS, 1-39, 2-41 to 2-49 (1994). The EPA has been concerned about acid mine drainage at the Dunka iron mine since the 1990s, attributing mine drainage typical to that of a copper-nickel mine to the presence of sulfur-containing Duluth Complex Material.

282. POLYMET DEIS, *supra* note 46, at 4.1-123.

Discharge from the west pit lake that would be created by flooding the west pit after ores have been extracted has the potential to violate Great Lakes Initiative surface water quality standards.[283] The PolyMet DEIS does not specifically predict the concentration of mercury within the west pit lake, but the DEIS repeatedly notes "some uncertainty" as to whether west pit lake overflow would meet water quality standards for mercury.[284] Under applicable federal law, to the extent that seeps from pit lake waters hydrologically connect with and impact wetlands and surface waters draining into the Partridge River, CWA standards may apply long before the pit lake overflows. Minnesota's classification of other pit lakes as waters of the state also suggests that mercury water quality standards could apply to the west pit lake itself.[285]

The PolyMet processing plant site would receive inputs of mercury of approximately 107.5 pounds per year from trace concentrations in the ore and approximately 5.5 pounds per year from processing materials.[286] The process water from the plant would be discharged to the tailings basin.

In addition to mercury discharges to water, the PolyMet project would increase sulfate loadings to wetlands and to the Embarrass and Partridge Rivers, the level of which could vary depending on mitigation alternatives selected.[287] The impacts of sulfate loadings to the Partridge and Embarrass Rivers must be considered with substantial cumulative sulfate loadings from other mining and minerals processing activities.[288]

The PolyMet project may increase mercury methylation, as explained previously,[289] as a result of disrupting wetlands and mobilizing mercury currently sequestered in peat and as a result of water fluctuations, sulfate seeps, and discharges from the mine and plant sites.[290] Without quantification, the DEIS acknowledges that the PolyMet project "may contribute to cumulative effects on methylmercury con-

283. *See id.*at S-9.

284. *Id.* at S-9, 4.1-124, 4.1-146. The summary of west pit water quality post-closure, 4.1-114, Table 4.1-64, does not contain concentration levels for mercury.

285. The PolyMet Company's suggestion that water quality violations might be monitored and addressed at some future post-closure stage of the project would be inconsistent with these standards. *Id.* at 4.1-130 tbl. 4.1-68, 4.1-147 tbl. 4.1-77, 5-8 tbl. 5.1-1.

286. *Id.* at 4.1-124.

287. *See id.* at 4.1-159 tbl. 4.1-85, 4.1-160, tbl. 4.1-86, 4.1-188 tbl. 4.1-96.

288. *Id.* at 4.1-188 tbl. 4.1-96, 4.1-192 tbl. 4.1-99.

289. *See supra* Parts II.A, V.A–B.

290. *See* POLYMET DEIS, *supra* note 46, at 3-22.

centrations in downstream lakes that are already on the 303(d) list."[291]

The DEIS notes that little information is available on methylmercury formation in the St. Louis River as it approaches the estuary where the mouth of the river enters Lake Superior.[292] Although there is a question regarding the degree to which the PolyMet project would contribute to cumulative effects of mercury and methylmercury in the St. Louis River, it is highly probable that the project would have some impact on this downstream river, which has been placed on the 303(d) impaired waters list.[293]

In addition to discharge of mercury and sulfates impacting methylation of mercury, the PolyMet plant hydrometallurgical process is expected to emit approximately 8.3 pounds of mercury per year, assuming a high level of efficiency from the facility's wet scrubber system.[294] These air emissions are significant in evaluating nonpoint source mercury loadings to the watershed in a TMDL or wasteload allocation in the absence of a TMDL.[295] Minnesota's Statewide Mercury TMDL also provides parameters within which mercury emissions increases should be evaluated. Minnesota's approved mercury TMDL provides that each sector should meet targets for emissions reduction,[296] suggesting that impacts of mercury air emissions from minerals processing should be evaluated on a sector basis as well as in connection with watershed mercury loading.

VI. APPLICATION AND ANALYSIS

This section provides some guidance as to how applicable laws

291. *Id.* at 4.1-194. The most recent prior draft of the DEIS released to the agencies in July 2009, predicted that increased methylation from sulfate could as much as double in receiving waters: Sulfate mobilization, water level fluctuation, and mobilization and methylation of mercury sequestered in peat all tend to increase the potential for mercury bioaccumulation in fish. Finally, the effects of sulfate and mercury mobilization and their effects on mercury methylation are cumulative although not necessarily strictly additive. Individually and collectively these factors may significantly increase the potential for bioaccumulation in fish by increasing the production and bioavailability of methylmercury. Increased sulfate can be expected to no more than double mean methylmercury bioavailability upstream of the USGS gage above Colby Lake, in the Embarrass River, and in the St. Louis River basin upstream of the Embarrass River confluence. *Id.* at 4.5-17 to 4.5-18.

292. *Id.* at 4.1-196.

293. *Id.* at 4.1-196. The DEIS states that the project is not expected to "contribute significantly" to cumulative effects of mercury and methylmercury in the St. Louis River. *Id.*

294. *Id.* at 4.6-23 tbl. 4.6-16, 4.6-34, 4.6-39.

295. *Id.* at 4.6-39.

296. MINN. STATEWIDE MERCURY TMDL, *supra* note 176, at 44, 46.

and standards pertinent to the CWA and the Great Lakes Initiative may be applied in connection with the PolyMet NorthMet mine and minerals processing facility.[297] The first step in this analysis would be to determine if the proposed facility would discharge mercury to waters of the United States or waters of the State of Minnesota.[298] Applicable law would likely consider the PolyMet NorthMet mining and processing facility to discharge mercury in several ways: through leaks and seeps resulting from channelization of runoff and process water, from disposal in the tailings basin welling up through wetlands, from seeps from the east pit and the west pit, from direct discharges to surface water from the east pit wetland and the west pit overflow, or from any direct discharge of tailings basin seeps to the Partridge River.[299]

The PolyMet DEIS recognizes the connection between the tailings basin and surface waters, including wetlands adjacent to and connected to the Embarrass River. The hydrology at the mine site, a wetlands area with shallow surficial aquifer adjacent to and draining into the Partridge River, demonstrates a clear and substantial nexus with traditional navigable waters.[300]

The next step of the analysis would be to recognize that the waters into which the project would discharge are within the Lake Superior Basin of the Great Lakes System and that the pollutant of concern, mercury, is both a bioaccumulative chemical of concern and a bioaccumulative substance of immediate concern under the Great Lakes Initiative.[301] Water quality standards are more stringent due to this characterization.

The third step in evaluating the application of law to a mine and minerals processing project would be to determine if any of the waters

297. *See supra* Part IV.A (discussing the statutes and rules protecting Great Lakes System waters often referred to as the Great Lakes Initiative).

298. *See generally* 40 C.F.R. § 122.4 (2009) (providing standards for issuing permits based on discharge into waterways). *See also* § 132, tbl. 6 (1990) (listing a table of pollutants, including mercury, that are bioaccumulative chemicals of concern under the Great Lakes Water Quality Initiative).

299. *See* 33 U.S.C. §1311 (2006) (the CWA prohibits the discharge of any pollutant, including mercury, unless that discharge complies with certain enumerated provisions). *See also supra* notes 71–79 and accompanying text (describing the proposed process for completing the PolyMet NorthMet project with regard to the east and west pits and stormwater runoff).

300. *See* N. Cal. River Watch v. Healdsburg, 496 F.3d 993, 1002–03 (9th Cir. 2007) (holding an on-site quarry pit is subject to Clean Water Act regulation because the pit waters seeped into a navigable river and affected the physical, biological integrity of the river), *cert. denied* 128 S. Ct. 1225 (2008).

301. 40 C.F.R. § 132 (2009) (giving water quality requirements for the Great Lakes water system).

to which the project would discharge are impaired for mercury. All of the waters impacted by the PolyMet NorthMet project are impaired due to mercury pollution.[302] The project drains into downstream waters that are listed under section 303(d) of the CWA because the level of mercury in fish tissue is so high that even achievement of the mercury reductions in Minnesota's Statewide Mercury TMDL would not permit these waters to meet health-based standards.[303] Testing during the environmental review process has also demonstrated that mercury concentrations in the waters immediately impacted by the mine and processing plant sites exceed water concentration limits for mercury under the Great Lake Initiative, so they are also impaired for mercury.[304]

Given these factual determinations and the law described previously, the first condition to be met before a project such as the PolyMet NorthMet mine and processing facility could be permitted would be to demonstrate that no discharge to any waters of the state, including wetlands, pit lakes and groundwater hydrologically connected to surface waters, would exceed state-mandated mercury concentrations.[305] Neither a mixing zone nor any variance from this requirement could be considered under applicable federal and state regulations implementing the Great Lakes Initiative.[306]

Based on historical data on mercury concentrations from seeps in the area, including data from the existing tailings basin, compliance with this requirement may be difficult.[307] Information in the environmental review process raises additional questions about compliance with this standard, since treatment for mercury in constructed wetlands or a wastewater treatment facility on the site is likely to be

302. *See supra* Part IV.B (discussing the relationship between the PolyMet NorthMet mine and processing facility and mercury pollution).

303. *See* 33 U.S.C. § 1313(d) (2006) (mandating that states establish a list of waters in a priority system based on water pollution and TMDL). For Minnesota, these waters include the Embarrass chain of lakes downstream of the PolyMet NorthMet project on the Embarrass River: Colby Lake, downstream on the Partridge River, and the segments of the St. Louis River into which the Embarrass and Partridge tributaries drain. *See* MINN. DEP'T OF NATURAL RES., NORTHMET PROJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT (2009), *available at* http://files.dnr.state.mn.us/input/environmentalreview/polymet/draft_eis/summary_document.pdf.

304. *See supra* note 263; *see also* 40 C.F.R. § 132 (giving water quality requirements for the Great Lakes water system, including for mercury pollutants).

305. MINN. R. 7052.0100, subp. 2 (2009).

306. 40 C.F.R. § 132.

307. *See supra* notes 91–92, 102 and accompanying text. *See also* 33 U.S.C. § 1311 (2006) (regulating the discharge of mercury under the CWA).

ineffective.[308] Once it has been determined that a detectable quantity of mercury will be discharged by a mining and minerals processing project, law narrowly applicable to bioaccumulative chemicals in waters impaired for mercury within the Great Lakes System suggests that a detectable level of discharge has the potential to cause or contribute to the violation of water quality standards under the CWA.[309]

The proposed project must comply with the requirements of 40 C.F.R. § 122.4(i), which requires a demonstration that there are both sufficient remaining pollutant load allocations to allow for the discharge, and that the existing dischargers into that segment are subject to compliance schedules designed to bring the segment into compliance with applicable water quality standards.[310]

EPA guidance states that it is preferable that this analysis be performed in a TMDL for the affected watershed where a metals mining and processing activity could increase methylmercury:

> Cumulative loads from point sources and localized nonpoint sources such as abandoned mines, contaminated sediments, and naturally occurring sources can potentially combine to cause localized mercury impairment. These situations are more complicated because the specific location and magnitude of each source could significantly affect fish tissue concentrations. In these situations, a TMDL provides the best basis for developing the appropriate permit limits.[311]

The EPA's 2009 Guidance for Implementing the Methylmercury Water Quality Criterion summarizes mercury TMDLs developed or approved by EPA.[312] These TMDLs take into account impacts of mercury in parent rock, mercury residue from mine tailings and mine seeps, point source discharges, and atmospheric deposition onto the watershed, including deposition and storage in snowpack.[313] TMDLs approved by the EPA also analyze local air emissions sources of mercury that contribute to local atmospheric deposition and mercury loading of the watershed.[314] In addition to direct point source discharges of mercury to surface waters, approved TMDLs for areas im-

308. *See supra* notes 89, 98.
309. *See* 33 U.S.C. § 1311; 40 C.F.R. § 132.
310. *See* 40 C.F.R. § 122.4(i) (1980).
311. METHYLMERCURY GUIDANCE, *supra* note 9, at 113.
312. *Id.* at 1.
313. *Id.* at 159–60, 166 (Arivaca Lake, Arizona TMDL and McPhee and Narraguinnep Reservoirs TMDL).
314. *Id.* at 160, 167 (Arivaca Lake, Arizona TMDL and McPhee and Narraguinnep Reservoirs TMDL).

pacted by mining also analyze the impacts of mercury in groundwater entering waters through subsurface flows and acidic mine drainage containing high sulfate concentrations that enhance the rate of mercury methylation.[315] Strategies for meeting fish tissue mercury criteria in a mining setting may require passive and active remediation of contaminated lake sediments and control of mercury entering surface waters through ground water from the mine site.[316]

Whether done in a TMDL or in a waste load allocation in the absence of a TMDL, the analysis of sources, pollution loads, and allocations must be similar to what would be provided in a TMDL.[317] This analysis must evaluate both point and nonpoint sources, including air emissions of mercury from the facility and from other dischargers, runoff, release of mercury from sediment, and chemical reactions to determine what conditions and compliance schedules for the proposed permittee and existing discharges are needed to bring the segment into compliance with applicable water quality standards.[318]

A project such as the PolyMet NorthMet mine and processing facility would also need to demonstrate that it would comply with water quality standards and nondegradation requirements. The combination of other pollutant source reductions and development of a water quality-based effluent limitation must ensure that the level of water quality complies with water quality standards.[319] Nondegradation requirements and Great Lakes Initiative mercury standards would apply to wetlands, streams and rivers, and in Minnesota are likely to apply to pit lake waters as well.[320]

Given Minnesota's conclusion in a Statewide Mercury TMDL that the primary source of mercury in fish is atmospheric deposition, air emissions analysis may come under scrutiny in connection with CWA requirements. Current data suggest that mercury emissions from the mining and materials processing sector has increased, rather than decreased, as would be required by Minnesota's Statewide TMDL. Emissions have also increased in the mining region near the PolyMet

315. *Id.* at 169–170 (Clear Lake, California TMDL).

316. *Id.* at 171 (Clear Lake, California TMDL).

317. *See* 40 C.F.R. § 132 (2009) (specifying requirements for TMDLs). *See also* METHYLMERCURY GUIDANCE, *supra* note 9, at 195 (explaining that "[a] number of national deposition monitoring networks might be useful for developing TMDLs.").

318. METHYLMERCURY GUIDANCE, *supra* note 9, at 195.

319. 40 C.F.R. § 122.44(d)(1)(vii)(A) (2009); METHYLMERCURY GUIDANCE, *supra* note 9, at 114.

320. *See supra* notes 111–119 and accompanying text.

project watershed.[321]

The chemistry of mercury methylation would also be included in both a § 122.4(i) analysis of new mercury discharge and in nondegradation analysis pertaining to methylmercury. It is recognized by state and federal authorities that point and nonpoint sources of sulfate discharge from waste rock piles, mine pits and tailings dumps, mine dewatering, hydrological changes resulting in a wetting and drying cycle, wetlands inundation, and stockpiling of wetlands in mining and minerals processing activities can all increase the methylation of mercury and the bioaccumulation of mercury in fish tissue.[322] A TMDL, waste load allocation, or nondegradation analysis would also look at the impacts of these facets of operations.

Under the *Pinto Creek* case,[323] in order to permit a project such as the PolyMet NorthMet mine and processing facility, it must be demonstrated that there are compliance schedules for existing sources of mercury and existing contributors to mercury methylation such that downstream impaired waters would attain water quality standards within a reasonable period of time.[324] That demonstration would be made in the context of a TMDL study, as recommended by the EPA. Before new mercury impacts could be permitted, the project would need to demonstrate quantifiable and contemporaneous reductions in mercury and methylmercury from other sources within the watershed, if the *Annandale* standards[325] were found applicable to a situation involving mining and bioaccumulative chemicals in the Great Lakes System. Arguably, these reductions might also need to be many times the order of magnitude of the proposed new mercury and methylmercury impacts.

In the case of mercury air emissions, once the CWA has been triggered, it is likely that any new emissions would also be evaluated for consistency with Minnesota's Statewide Mercury TMDL. Consistent with this TMDL, any new discharge might be offset only with mercury reductions within the minerals processing sector as well as within the watershed area of local deposition.

Permitting of new mercury discharge from mining and materials processing into mercury-contaminated waters in Minnesota's Lake

321. *See supra* notes 248–250 and accompanying text.

322. *See supra* notes 29–30. *See also* METHYLMERCURY GUIDANCE, *supra* note 9, at 14 (explaining how "methylmercury get[s] into fish").

323. Friends of Pinto Creek v. U.S. Envtl. Prot. Agency, 504 F.3d 1007 (9th Cir. 2007), *cert. denied*,129 S. Ct. 896 (2009).

324. *See id.* at 1016.

325. *In re* City of Annandale, 731 N.W.2d 502, 524–25 (Minn. 2007).

Superior Basin is not precluded under either CWA or the Great Lakes Initiative laws and regulations.[326] However, in order to permit a project such as the PolyMet NorthMet project—which brings the potential for new mercury discharge to these waters, increased mercury air emissions, and increased mercury methylation—it is necessary to analyze watershed and sector impacts. Pollution reductions from existing sources must be considered, along with the full range of project impacts, to ensure non-degradation of water quality and to bring impaired waters on a compliance schedule to meet water quality standards for mercury. This process provides both a challenge and an opportunity for change.

326. *See* Arkansas v. Oklahoma, 503 U.S. 91,107–108 (1992) (holding that nothing in the Clean Water Act mandates a complete ban on discharge into a waterway that is in violation of standards). *See also* Friends of Pinto Creek, 504 F.3d at 1015 ("In Carlota's case, there is nothing in [federal regulation] that compels the EPA to act against point sources that are violating the CWA by their discharges into Pinto Creek or requiring judicial review of the EPA's ordering of priorities in any failure to act.").