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September 22, 2025

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Katrina Kessler, Commissioner

Minnesota Pollution Control Agency

520 Lafayette Rd.

St. Paul, MN 55155

RE: U.S. Steel Corp. NPDES/SDS Permit for Keetac Mining Area (MN0031879)  
U.S. Steel Corp. NPDES/SDS Permit for Keetac Tailings Basin (MN0055948)  
U.S. Steel Corp. Application for Variance from Wild Rice Sulfate Standard

Dear Commissioner Kessler, MPCA Staff,

These comments are submitted on behalf of WaterLegacy in connection with the Minnesota Pollution Control Agency's ("MPCA") draft NPDES/SDS permits for the U.S. Steel Corporation ("U.S. Steel") Keetac mining area (MN0031879) and Keetac tailings basin (MN0055948), and the MPCA's preliminary determination to deny U.S. Steel's application for a variance from compliance with Minnesota's wild rice sulfate standard at these Keetac facilities.

WaterLegacy supports MPCA draft permit requirements that U.S. Steel (or any successor permittee) comply with Minnesota's 10 milligrams per liter ("mg/L") wild rice sulfate standard applicable to Keetac mining area and tailings basin discharge to surface waters. WaterLegacy also supports MPCA's preliminary determination to deny U.S. Steel (recently purchased by Nippon Steel) a variance from compliance with the wild rice sulfate standard. The first section of WaterLegacy's comments provides additional support for these positions taken by MPCA.

- A. **Sulfate Limitations** (pages 2-14). Water quality-based effluent limitations ("WQBELs") in MPCA's draft permits for the Keetac mining area and tailings basin to achieve compliance with Minnesota's wild rice sulfate standard are supported by Keetac history, law, current peer-reviewed science, and overwhelming evidence pertaining to impacts of Keetac sulfate discharge on wild rice in Hay Lake.
- B. **Preliminary Denial of U.S. Steel Variance Application** (pages 14-16). MPCA's preliminary determination to deny U.S. Steel a variance from compliance with Minnesota's wild rice sulfate standard at the Keetac mining area and tailings basin is correct because U.S. Steel's application fails to support a variance under applicable law.
- C. **Additional Support for Variance Denial** (pages 16-18). Additional information in U.S. Steel's disclosures and new facts arising from Nippon Steel's purchase of U.S. Steel further underscore the appropriateness of MPCA's denial of the requested variance.

In addition to supporting these critical issues that have been subject to public controversy, WaterLegacy believes that MPCA's draft permits for the Keetac facilities have some significant

gaps and insufficiencies. WaterLegacy's requests for changes, additional analyses, and clarifications prior to MPCA's issuance of final permits are summarized below:

1. **Time for Compliance** (pages 18-20). MPCA should not give U.S. Steel another five years to comply with Minnesota's wild rice sulfate standard. Based on federal regulations and compliance history, no Keetac permit compliance schedule is appropriate or necessary.
  2. **WQBELs Specific Conductance** (pages 20-23). MPCA should establish numeric WQBELs for specific conductance in Keetac permits consistent with toxicity thresholds for Minnesota Ecoregion 50 effective concurrent with final sulfate effluent limitations.
  3. **Biological Assessments and Toxicity Testing** (pages 23-24). MPCA should require that U.S. Steel conduct macroinvertebrate and fish biological assessments and begin chronic whole effluent toxicity testing upon Keetac permit issuance.
  4. **Mass Loading and Non-Degradation** (pages 24-27). MPCA should provide mass loading limits for Keetac sulfate WQBELs, analyze discharge volumes and sulfate loading, and provide antidegradation and net precipitation analysis and requirements in final permits.
  5. **Functional Equivalent Analysis** (pages 27-29). MPCA should require broader functional equivalent analysis in the Keetac permits and monitoring of waste streams, groundwater, and surface water to support this analysis and the exercise of MPCA authority to regulate discharge through groundwater to surface water under both the NPDES and SDS programs.
  6. **Groundwater Protection** (pages 30-32). MPCA should require groundwater monitoring at the Keetac mining area, reservoirs, and tailings basin to determine whether discharge to groundwater violates Minnesota groundwater standards or threatens local drinking water.
  7. **Unauthorized Discharge** (pages 32-33). MPCA should clarify the prohibition on unauthorized discharge in Keetac permits to ensure that both surface water and groundwater are protected from unauthorized releases.
  8. **Impaired Waters** (pages 33-34). In addition to Hay Lake, Keetac permits and fact sheets should identify other impaired waters potentially affected by Keetac discharge and describe the benefits of sulfate reduction to reduce nutrients, methylmercury contamination of fish, and extirpation of sensitive biota.
- I. MPCA'S REQUIREMENTS FOR SULFATE EFFLUENT LIMITATIONS IN KEETAC PERMITS AND ITS PRELIMINARY VARIANCE DENIAL ARE WELL SUPPORTED BY LAW AND EVIDENCE.**
- A. History, Law, Current Science, and Facts at Hay Lake Require that Keetac Discharge Comply with Minnesota's Statewide Wild Rice Sulfate Standard.**

WaterLegacy supports final Phase 2 water quality-based effluent limitations ("WQBELs") in MPCA's draft Keetac permits limiting sulfate to 14 mg/L (monthly average) and 24 mg/L (maximum) at outfalls SD 002, SD 003, and SD 012 at the Keetac mining area and at SD 001, SD

005, and future SD 009 at the Keetac tailings basin.<sup>1</sup> WaterLegacy also agrees with MPCA's Phase 1 interim sulfate effluent limitations of 167 mg/L at SD 002, 81 mg/L at SD 003, 30 mg/L at SD 012, 135.3 mg/L at SD 001, and 135.3 mg/L at SD 005. *Id.* (same permit pages). U.S. Steel's proposal to allow an increase in sulfate discharge at each of these surface discharge locations by 20% over the maximum recorded sulfate concentration<sup>2</sup> would result in degradation of water quality and increase impairment of beneficial use of waters for production of wild rice.

Opposition to enforcement of Minnesota's 10 mg/L wild rice sulfate standard is ingrained in a segment of Minnesota's population for long-standing cultural as well as economic reasons. History specific to the Keetac facilities and applicable federal and state law require that Keetac permits contain effluent limits to ensure compliance with the wild rice sulfate standard. Vehement assertions made by supporters of U.S. Steel's interests that there is no science supporting the sulfate standard since the field work published by John Moyle in the 1940s and that wild rice in Hay Lake is "thriving" are simply false.

1. *History Requires Keetac Compliance with the Wild Rice Sulfate Standard.*

The MPCA adopted the wild rice sulfate standard of 10 mg/L in waters used for the production of wild rice in 1973. That standard was approved by the U.S. Environmental Protection Agency ("EPA") and applied in 1975 to limit sulfate discharge from the Clay Boswell coal-fired power plant.<sup>3</sup>

The MPCA issued U.S. Steel Keetac mining area (MN0031879) and tailings basin (MN0055948) NPDES/SDS permits in October 2011 that required compliance with WQBELs derived from Minnesota's wild rice sulfate standard.<sup>4</sup> U.S. Steel did not challenge those permits.<sup>5</sup> The 2011 Permits set sulfate limits with a 14 mg/L calendar month average and 24 mg/L maximum for surface discharge from mining area and tailings basin discharge stations.<sup>6</sup>

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<sup>1</sup> Draft NPDES/SDS Permit for U.S. Steel Keetac Mining Area MN0031879 ("Mine Permit") at 44-47; Draft NPDES/SDS Permit for U.S. Steel Keetac Tailings Basin MN0055948 ("TB Permit") at 50-54.

<sup>2</sup> Application for a Variance from the Class 4A Sulfate Water Quality Standard for Waters Used for Production of Wild Rice NPDES/SDS Permit No. MN0055948 and No. MN0031879, prepared for U.S. Steel by Barr Engineering, May 2025 ("Variance Application") at 13.

<sup>3</sup> *Minn. Chamber of Com. v. Minn. Pollution Control Agency*, No. 62-CV-10-1184, 2012 WL 2872026 (Minn. Dist. Ct., 2nd Jud. Dist., May 10, 2012), Exhibit 1, at ¶¶ 3, 7-8.

<sup>4</sup> MPCA Board Packet, *In re U.S. Steel Corp., Minnesota Ore Operations, Keetac NPDES/SDS Permits MN0031879 and MN0055948*, October 14, 2011 ("2011 Keetac Permits"), Exhibit 2.

<sup>5</sup> *Minn. Chamber of Com. v. Minn. Pollution Control Agency*, A12-0950, 2012 WL 6554544 at \*2 (Minn. Ct. App. Dec. 17, 2012).

<sup>6</sup> 2011 Keetac Permits, Exhibit 2 at pdf 61-62, Mine Permit at 11-12 (limits at SD 002, SD 003, SD 012); pdf at 97-98, TB Permit at 9-10 (limits at SD 001, SD 005, SD 009).

The 2011 Keetac permits included a lengthy schedule of compliance with several studies and milestones, finally requiring compliance with the sulfate effluent limits for discharge from the Mine “as soon as possible and in no case later than August 17, 2018 for non-tailings basin discharges, and August 17, 2019 for tailings basin discharges, unless the permit is modified pursuant to 40 C.F.R. 122.62.”<sup>7</sup> The 2011 Keetac permits were neither modified nor revoked. But Keetac mining area and tailings basin discharge monitoring reports (“DMRs”) from 2018 through 2024 reflect hundreds of exceedances of the sulfate effluent limits.<sup>8</sup>

The EPA investigated Keetac DMRs from January 2019 through September 2022 and found 253 permit violations at the Keetac mining area and 46 violations at the tailings basin.<sup>9</sup> The EPA issued a Notice of Violation on May 15, 2024, finding that by October 2022, U.S. Steel had violated its Keetac permits nearly 300 times: “Each instance in which U.S. Steel discharged sulfate in amounts exceeding the final sulfate effluent limits contained in the Mining Operations Permit or the Tailings Basin Permit is a violation of NPDES Permit No. MN0031879 or NPDES Permit No. MN0055948, respectively . . . U.S. Steel has violated the terms of these permits a total of 299 times.”<sup>10</sup> EPA explained that “U.S. Steel’s failure to comply with the final effluent limits in the Mining Operations and Tailings Basin Permits at the Facility is a violation of Section 301(a) of the CWA, 33 U.S.C. § 1311(a).” *Id.*, ¶ 30. EPA’s Notice of Violation was provided to U.S. Steel.<sup>11</sup>

## 2. *MPCA is Required by Law to Apply Minnesota’s Sulfate Standard to Hay Lake.*

MPCA lacks discretion to apply a less stringent sulfate standard or weaker effluent limits to Keetac mining area or tailings basin discharge. In 1974, Minnesota sought and secured approval from EPA to administer the federal Clean Water Act (“CWA”) NPDES permit program for discharges into waters of the United States within Minnesota.<sup>12</sup> MPCA’s authority to issue NPDES permits for U.S. Steel discharge to Hay Lake or any other point source discharge to navigable waters is contingent on compliance with the CWA. 33 U.S.C. § 1342(a)-(c).

The CWA and its implementing regulations require that NPDES permits include effluent

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<sup>7</sup> Exhibit 2 at pdf 25, Findings of Fact ¶¶ 39-40.

<sup>8</sup> Discharge Monitoring Reports, Bulk Exports for Keetac Permits MN0031879, MN0055948 Sulfate and Specific Conductance, 2018-2024, Exhibit 3.

<sup>9</sup> EPA, NEIC Civil Investigation Report, U.S. Steel – Keetac, Keewatin, Minnesota, 55753, October 2022 (“EPA Keetac Investigation”), Exhibit 4, at 16-17.

<sup>10</sup> EPA, *In re U.S. Steel Corp. Keetac Mining Operations and Tailings Basin*, Notice of Violation, May 15, 2024 (“EPA Keetac NOV”), Exhibit 5 at ¶ 29.

<sup>11</sup> EPA, Letter to C. Bartovich, U.S. Steel Environmental Director, re Notice of Clean Water Act Violations, May 14, 2024 (“EPA NOV Letter”), Exhibit 6.

<sup>12</sup> Approval of Minnesota’s NPDES is found at 39 Fed. Reg. 26061 (July 16, 1974). The Memorandum of Agreement between the EPA and the MPCA for the Approval of the State NPDES Program is available at <https://www.epa.gov/sites/default/files/2013-09/documents/mn-moa-npdes.pdf>.

limitations necessary to achieve a state’s approved water quality standards. 33 U.S.C. § 1311(b)(1)(C); 40 C.F.R. §§ 122.44(d)(1)-(5), 123.25(a)(15). A standard approved by EPA—as Minnesota’s wild rice sulfate standard was in 1973—becomes the “standard for the applicable waters of that State” and can only be modified or repealed if the new standard is approved by the EPA. 33 U.S.C. § 1313(c)(2)-(3). Although the MPCA undertook rulemaking efforts to change the wild rice sulfate standard pursuant to a 2011 Session Law,<sup>13</sup> the Office of Administrative Hearings rejected MPCA’s proposal to repeal the 10 mg/L wild rice sulfate rule as unreasonable and in conflict with CWA requirements.<sup>14</sup>

The EPA advised MPCA in February of 2022 that Minnesota’s 2015 and 2016 Session Laws that attempted to limit MPCA’s ability to include effluent limits in NPDES permits to comply with Minnesota’s federally-approved wild rice sulfate standard and to invalidate existing sulfate effluent limits in state permits are “inconsistent with the Clean Water Act (CWA).”<sup>15</sup> The EPA stated it “disapproves the program revision affected by these laws as an improper modification to MPCA’s authority to implement the NPDES program.” *Id.* (citing 40 C.F.R. § 123.62(b)(3)). The EPA confirmed, “EPA expects that MPCA’s NPDES permits will include effluent limitations to meet all federally-approved WQS as required by the CWA, federal regulations, and EPA-approved Minnesota laws and rules.” *Id.* at 2.

U.S. Steel then sought a site-specific sulfate standard for Hay Lake nearly 800% less stringent than Minnesota’s statewide 10 mg/L standard in 2022. MPCA rejected that 79 mg/L site-specific sulfate standard as inconsistent with federal and state law.<sup>16</sup> MPCA determined that U.S. Steel failed to demonstrate any of the following: 1) that “the wild rice beneficial use is met, or will be met, in Hay Lake” at the proposed less stringent standard<sup>17</sup>; 2) that the method proposed by U.S. Steel to derive its proposed standard was “scientifically defensible”<sup>18</sup>; or 3) that Hay Lake had “unique” or “exceptional” circumstances that “would allow wild rice to thrive and the beneficial use to be

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<sup>13</sup> See 2011 Minn. Laws, 1st Spec. Sess., ch. 2, art. 4, § 32(a).

<sup>14</sup> Report of the Administrative Law Judge (“ALJ”), *In re Proposed Rules of the MPCA Amending the Sulfate Water Quality Standard Applicable to Wild Rice (In re Sulfate Standard)*, 80-9003-34519, 2018 WL 1059648 at \*4 (Minn. Off. Admin. Hr’gs Jan. 9, 2018); Report of the Chief ALJ, *In re Sulfate Standard*, 80-9003-34519, 2018 WL 1059649 at \*1 (Minn. Off. Admin. Hr’gs Jan. 11, 2018); Order of the Chief ALJ, *In re Sulfate Standard*, 80-9003-34519, 2018 WL 2000782 at \*11 (Minn. Off. Admin. Hr’gs Apr. 12, 2018).

<sup>15</sup> EPA, Letter to MPCA Commissioner Kessler re Minnesota laws revising MPCA’s authority to regulate sulfate in NPDES permits, Feb. 16, 2022 (“EPA NPDES Letter”), Exhibit 7 at 1.

<sup>16</sup> MPCA, Denial of U.S. Steel Application for a Sulfate Site-Specific Standard for Hay Lake, February 14, 2024 (“Denial of Site-Specific Standard”), Exhibit 8.

<sup>17</sup> *Id.* at 2, citing 40 C.F.R. § 131.11(a)(1).

<sup>18</sup> *Id.* at 3, citing 40 C.F.R. § 131.11(a)(1) and (b)(1)(iii).

protected under a less stringent standard at this location” and make a modified standard “more appropriate than the statewide standard”<sup>19</sup>

The Minnesota Court of Appeals upheld MPCA’s denial of a 79 mg/L site-specific standard for Hay Lake. *In re Sulfate Site-Specific Standard for Hay Lake*, A24-0428, 2025 WL 959092 (Minn. Ct. App. Mar. 31, 2025). The Court of Appeals cited Minnesota Supreme Court precedent to conclude, “MPCA has the duty and authority to enforce the wild rice rule by issuing National Pollutant Discharge Elimination System (NPDES) permits and State Disposal System (SDS) permits.” *Id.* at \*1 (citing *In re Denial of Contested Case Hearing Requests and Issuance of NPDES/SDS Permit for Proposed NorthMet Project*, 993 N.W.2d 627, 638 (Minn. 2023)).<sup>20</sup>

MPCA’s Brief to the Court of Appeals in the *Sulfate Site-Specific Standard* case summarized, “MPCA has no choice but to apply the Sulfate Standard to Hay Lake. Further, any state legislation that purports to prevent the MPCA from doing so is preempted by the MPCA’s obligations under the CWA. *See Hous. And Redev. Auth. of Duluth v. Lee*, 832 N.W.2d 868, 873 (Minn. Ct. App. 2013) ([S]tate law is preempted to the extent that it actually conflicts with federal law.’).”<sup>21</sup> MPCA has also informed the public that “the 1973 sulfate water quality standard remains in effect. MPCA is committed to implementing this standard.”<sup>22</sup> Further, “MPCA is currently working to “fully implement” the 10 mg/L sulfate standard “to protect wild rice from excess sulfate.” *Id.*

Not only must MPCA apply the 10 mg/L wild rice sulfate standard to Keetac mining area and tailings basin surface discharge at Hay Lake, MPCA must set sulfate effluent limitations that are at least as stringent as those in the 2011 Keetac NPDES permits. As stated *supra* 2-3, those 2011 Keetac permits required U.S. Steel to limit sulfate to a 14 mg/L average and a 24 mg/L maximum at all surface discharge outfalls.

In addition to requiring that permits set water quality-based effluent limitations (WQBELs), CWA regulations also prevent permit issuers from “backsliding” in renewing or reissuing an NPDES permit. With very limited exceptions, these regulations state that “when a permit is renewed or reissued, interim effluent limitations, standards or conditions must be at least as stringent as the final effluent limitations, standards, or conditions in the previous permit.” 40 C.F.R. 122.44(l)(1)-(2). U.S. Steel cannot prove any exceptions, such as that new information would have justified a less stringent effluent limitation in 2011, that a less stringent effluent limit is needed because of events outside permittee’s control, or that treatment required under the prior permit was properly installed and operated and still has not yet attained compliance. 40 C.F.R. 122.45(2)(i)-(ii).

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<sup>19</sup> *Id.* at 3-4, citing Minn. R. 7050.0220, subp. 7.

<sup>20</sup> The Minnesota Supreme Court denied U.S. Steel’s petition for further review in the *Hay Lake* case on June 25, 2025.

<sup>21</sup> MPCA Brief, *In re Sulfate Site-Specific Standard for Hay Lake*, Oct. 11, 2024, Exhibit 9 at 27.

<sup>22</sup> MPCA, Protecting Wild Rice Waters, last visited Sept. 11, 2025, Exhibit 10.

MPCA is required by federal and state law and Minnesota court cases to reissue permits for Keetac mining area and tailings basin surface discharge that contain effluent limitations to achieve compliance with Minnesota's 10 mg/L sulfate standard that are at least as stringent as limits previously set in 2011 for these U.S. Steel facilities.

3. *Current Peer-Reviewed Science Overwhelmingly Supports Application of Minnesota's 10 mg/L Wild Rice Sulfate Standard to Hay Lake.*

Opponents of enforcement of Minnesota's wild rice sulfate standard criticize the MPCA for exclusively relying on field studies published by John Moyle in the 1940s. They are misguided. First, Moyle's comprehensive field studies published in the 1940s are still valid today, and cannot be replicated due to the impacts of sulfate pollution and other anthropogenic conditions since then on wild rice. Moyle, who worked for decades at the Minnesota Department of Natural Resources ("DNR") estimated that the Minnesota harvest of wild rice was 1,586,000 pounds or 793 tons of parched or processed grain.<sup>23</sup> Moyle found that "no large stands of rice occur in waters having a SO<sub>4</sub> [sulfate] content greater than 10 p.p.m. [equivalent to mg/L], and wild rice generally is absent from water with more than 50 p.p.m." *Id.*

In accordance with Minnesota's 2011 Session Law, scientists at the MPCA and the University of Minnesota ("UMN") updated scientific research on the relationship between sulfate and wild rice population growth and viability. Although the ALJ did not reject the theory behind MPCA's proposed equation-based rule in denying MPCA's proposal to repeal Minnesota's wild rice sulfate standard, the ALJ stated *In re Sulfate Standard*, 2018 WL 1059648 at \*47, that MPCA "did not offer a convincing response" to Dr. John Pastor's wild rice "mesocosm research" which conducted controlled experiments simulating aquatic environments in large outdoor tanks. The ALJ summarized:

Dr. Pastor's continuing mesocosm research has indicated that, while increased iron may counter the toxicity of sulfide to wild rice seedlings in the springtime, iron sulfide plaques form and precipitate on the plants' roots during the flowering and seed production phases of the wild rice life cycle. These plaques result in fewer and smaller seeds, with reduced nitrogen content, leading to extinction of the wild rice plant within 4 or 5 years at about 300 mg/L of sulfate, and greatly reducing wild rice plant population viability at lower concentrations of sulfate.

*Id.* The sole reason why the ALJ did not reject MPCA's proposed equation-based rule as scientifically inadequate was that Dr. Pastor's research regarding the harmful effects of increased sulfate despite increased iron were "not yet the subject of peer-reviewed publication." *Id.* at \*48. That situation was soon remedied.

Later in 2018, published research by UMN scientists John Pastor, Sophia LaFond-Hudson, Nathan Johnson, and others confirmed that iron sulfide plaques formed on wild rice roots when rice was exposed to added sulfate and iron, resulting in "fewer and lighter seeds with less nitrogen than

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<sup>23</sup> Moyle JB (1944) Wild rice in Minnesota. *J. Wildlife Management* 8(3):177-84, Exhibit 11 at 178.

unamended plants.”<sup>24</sup> Their research, *id.* at 100, provided the illustration below of wild rice roots in water to which sulfate and iron had and had not been added.



**Fig. 2** Sulfate-amended (left) and unamended (right) roots. Sulfate-amended root has black color extending from about 0.5 cm above the root ball down to the tips of the roots. Unamended root has amber color characteristic of iron (hydr)oxides, especially in the 2–3 cm below root ball. (LaFond-Hudson *et al.* 2018).

Additional research published in 2019 by UMN and MPCA scientists confirmed that sulfate converted to sulfide in anoxic sediments, resulting over time in “sulfide-dominated porewater chemistry” accompanied by “detrimental effects to, and eventually extirpation of, self-perpetuating wild rice populations.”<sup>25</sup>

Ongoing research published in 2020 detailed the effects of sulfate and iron on wild rice, explaining that iron sulfide precipitation on wild rice root surfaces happened at “the beginning of seed production,” and sulfate-amended plants had lower nitrogen in seeds, fewer seeds, lower seedhead mass, and lower biomass (leaves and stems) during late flowering, all to a statistically significant degree.<sup>26</sup> By 2022, this peer-reviewed research confirmed that high iron concentrations did not protect wild rice from elevated sulfate over time. The plain language summary explained: “Nearly

<sup>24</sup> LaFond-Hudson S, Johnson NW, Pastor J, Dewey B (2018) Iron sulfide formation on root surfaces controlled by the life cycle of wild rice (*Zizania palustris*). *Biogeochemistry* 141:95-106, Exhibit 12 at 95.

<sup>25</sup> Johnson NW, Pastor J, Swain EB (2019) Cumulative sulfate loads shift porewater to sulfidic conditions in freshwater wetland sediment. *Environmental Toxicology and Chemistry* 38(6):1231-1244, Exhibit 13 at 1231, 1242.

<sup>26</sup> LaFond-Hudson S, Johnson NW, Pastor J, Dewey B (2020) Interactions between sulfide and reproductive phenology of an annual aquatic plant, wild rice (*Zizania palustris*). *Aquatic Botany* 164:103230, Exhibit 14 at 5.

all plant populations exposed to high sulfate had died by 6 years into the experiment, regardless of iron concentration or litter removal.”<sup>27</sup>

MPCA’s webpage committing to enforcement of the wild rice sulfate standard, Exhibit 10, cited these and other modern peer-reviewed publications by UMN and MPCA scientists from 2017 through 2022, as well as John Moyle’s field work published in 1944. In denying U.S. Steel’s application for a site-specific standard, MPCA also cited these and other recent publications to conclude that U.S. Steel’s proposed standard was not scientifically defensible and that “recent concerns have emerged that suggest the degree of protection against sulfide that is afforded by iron may not be as great as originally conceived.” Denial of Site-Specific Standard, Exhibit 8 at 3; cited in *In re Sulfate Site-Specific Standard for Hay Lake*, 2025 WL 959092 at \*4. The Court of Appeals concluded that MPCA used reasoned judgment and was not arbitrary and capricious “when determining that the sediment-based equation was not scientifically defensible.” *Id.* at \*5.

In its argument on appeal in the Hay Lake case, U.S. Steel cited one study prepared by its own consultant, O’Niell Tedrow at Northeast Technical Services, Inc.<sup>28</sup> Even with its unorthodox methodology (reseeding one paddy mid-experiment and loss of seeds due to “freezer failure,” *id.* at 940, 944) and short duration, the Tedrow study showed reductions in seed biomass, seeds per panicle, stem height and shoot biomass within a year or two in paddies where sulfate was added. *Id.* at 948. The court of appeals found that MPCA did not act unreasonably in rejecting the Tedrow study. *In re Sulfate Site-Specific Standard for Hay Lake*, 2025 WL 959092 at \*6.

Current peer-reviewed science, along with field studies published before the mining industry had degraded wild rice waters, provide clear and overwhelming support for MPCA’s draft Keetac permit effluent limits applying Minnesota’s wild rice sulfate standard of 10 mg/L to U.S. Steel Keetac mining area and tailings basin discharge affecting wild rice beneficial use in Hay Lake.

#### 4. *Data Collected by U.S. Steel from 2009-2021 and Current Conditions in Hay Lake Demonstrate that Wild Rice in Hay Lake is Impaired and Unhealthy.*

Although U.S. Steel’s application for a 79 mg/L site-specific sulfate standard for Hay Lake sought to demonstrate that wild rice in Hay Lake was healthy despite ongoing sulfate levels in excess of 10 mg/L, data in its application proved the opposite.<sup>29</sup> Sulfate discharges from the U.S. Steel Keetac mining area and tailings basin both flow into Hay Lake. Exhibit 17 at MPCA000727. As a

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<sup>27</sup> LaFond-Hudson S, Johnson NW, Pastor J, Dewey B (2022) Sulfur geochemistry destabilizes population oscillations of wild rice (*Zizania palustris*). *J. Geophysical Research Biogeosciences* 10.1029, Exhibit 15 at 1.

<sup>28</sup> Tedrow O, and Lee P (2022) Use of Wild Rice (*Zizania palustris* L.) in paddy-scale bioassays for assessing potential use of mining-influenced water for irrigation. *Mine Water and the Environment* 41:938-953, Exhibit 16.

<sup>29</sup> U.S. Steel, Application for Sulfate Site-Specific Standard, August 2022, Exhibit 17 (excerpts). Page citations use Bates numbering in the administrative record of *In re Sulfate Site-Specific Standard for Hay Lake*.

result, from 2009-2021, average sulfate in Hay Lake was 34 mg/L, and from 2017-2022 average sulfate input to Hay Lake was 47.63. *Id.* at MPCA000735 (text), MPCA000744.

MPCA’s brief opposing a less stringent sulfate site-specific standard for Hay Lake in the court of appeals illustrated that, under existing sulfate conditions, U.S. Steel’s wild rice monitoring was inadequate to demonstrate unimpaired wild rice. Exhibit 9 at 19.

Summary Chart of U.S. Steel’s Wild Rice Monitoring Outcomes

| Year              | 2009 | 2010    | 2011 | 2012    | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|-------------------|------|---------|------|---------|------|------|------|------|------|------|------|------|------|------|
| Wild Rice Density | >75% | 25%-50% | 0%   | 10%-50% | N/A  | >75% | N/A  | N/A  | N/A  | N/A  | N/A  | N/A  | 0%   | N/A  |

In fact, U.S. Steel’s application for a sulfate site-specific standard for Hay Lake documented impairments of wild rice by harvest time in both 2009 and 2011. DNR’s field report from September 2009 was included in the application. DNR found that by September the wild rice in Hay Creek “was very un-healthy and had virtually no seeds” and the wild rice in Hay Lake “was severely damaged (rotten) and appeared to be un-harvestable.” Exhibit 17 at MPCA000789. Photos from the application shown below illustrate these conditions. *Id.* at MPCA000792-93.

### HAY LAKE - HAY CREEK WILD RICE SURVEY, 15 SEPT 2009



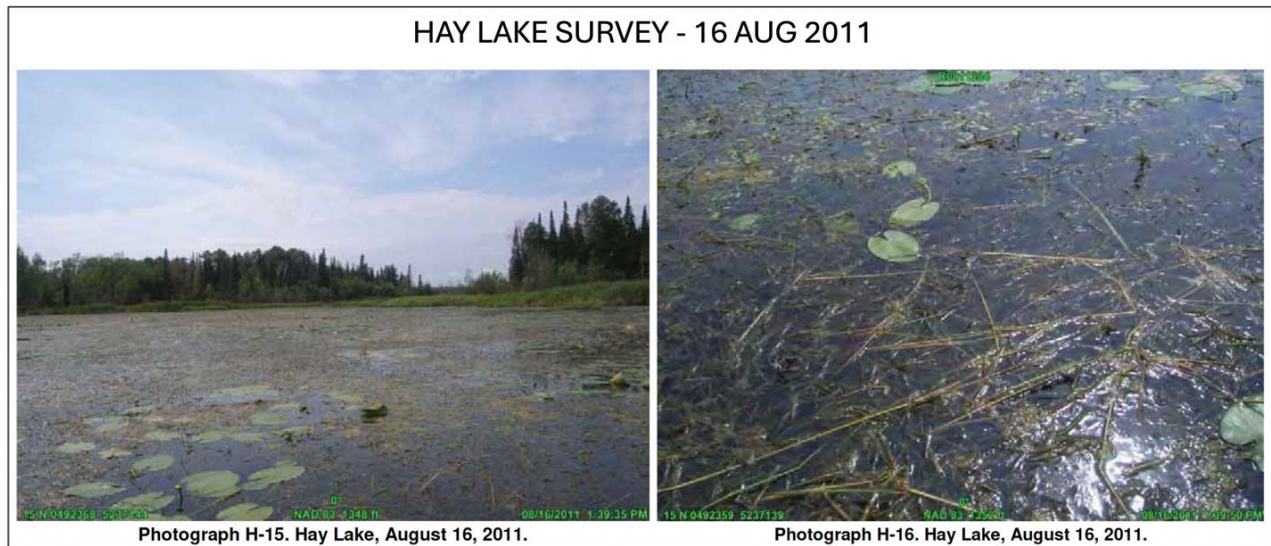
Hay Lake wild rice



Hay Lake wild rice - very unhealthy/rotten

The poor condition of Hay Lake wild rice by harvest time in 2009 was not an anomaly.

In 2011, U.S. Steel’s application acknowledge that by August in Hay Lake “the majority of wild rice stands were found uprooted and dead in the water.” *Id.* at MPCA000736. Photos from U.S. Steel’s 2011 Hay Lake wild rice survey are reproduced on the next page. *Id.* at MPCA001190.



U.S. Steel’s application did not document the condition of wild rice in 2010 or in any year from 2013 through 2021.

But in 2021 U.S. Steel’s application stated that early growth was noted in June, wild rice was “sparse” in July, and that “[n]o wild rice was observed after July.” *Id.*, MPCA000737. Thus, no rice was present in August or September for seed production, support of wildlife, or harvesting. Based on U.S. Steel’s site-specific standard application, in 50% of the years for which U.S. Steel reported data—2009, 2011, and 2021—wild rice was rotten or absent from Hay Lake after July.

| Summary of Wild Rice Monitoring in U.S. Steel Application |        |      |      |      |      |      |      |      |      |      |      |      |      |      |
|-----------------------------------------------------------|--------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| YEAR                                                      | 2009   | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2018 | 2019 | 2020 | 2021 |
| Wild Rice Data                                            | X      | X    | X    | X    | No   | X    | No   | No   | No   | No   | No   | No   | No   | X    |
| Present After July                                        | Rotten | Yes  | No   | Yes  |      | Yes  |      |      |      |      |      |      |      | No   |

U.S. Steel’s application for a site-specific standard also demonstrated that real-world conditions at Hay Lake produce toxic levels of sulfide in porewater. In 2021, measured porewater sulfide exceeded MPCA’s wild rice toxicity threshold of 0.12 mg/L in one-third of the Hay Lake samples and exceeded levels where MPCA experts found that wild rice cover declines (0.10 mg/L) in almost half of the Hay Lake samples, as shown in the table attached as Exhibit 17.<sup>30</sup> This porewater chemistry provides additional confirmation that sulfate conversion to sulfide in sediments has created an unfavorable environment for wild rice in Hay Lake.

Various commenters suggested at the MPCA’s September 3, 2025 public hearing on the Keetac permits that wild rice in Hay Lake is thick and thriving. It is not.

<sup>30</sup> Hay Lake Porewater Sulfide Monitoring Results Summary and Evaluation Table, Exhibit 18, is based on Exhibit 17 at MPCA002445 and MPCA’s July 2017 SONAR pages in the Exhibit.

After the Keetac hearing on September 3, 2025, Hibbing resident and former miner Mike Maleska went to Hay Lake to see for himself the condition of wild rice.<sup>31</sup> Mr. Maleska's photos below show wild rice on Hay Lake on September 7, 2025. The wild rice was sparse and unhealthy, with many bent, broken, or rotten stems and few, if any, filled seed heads. Exhibit 19.



Hay Lake wild rice Sept. 7, 2025.



Hay Lake wild rice Sept. 7, 2025 (close-up).

Hay Lake and Hay Creek are shown below on a photo taken from a small plane July 1, 2025. *Id.* Mr. Maleska has designated on this photo where wild rice was observed on September 7, 2025 (left) as compared with the historic extent of wild rice approximately 50 years ago (right). *Id.*



Location of Hay Lake wild rice on September 7, 2025, (red line) by Mike Maleska



Historic location of Hay Lake wild rice (black lines) by Mike Maleska

<sup>31</sup> Michael Maleska Declaration with Photos taken at Hay Lake on September 7, 2025, and Sketches of Wild Rice Locations at Hay Lake, Exhibit 19.

Independently, northern Minnesota resident Shanai Matteson went with a friend to Hay Lake on September 10, 2025 to view the condition of the wild rice. Photographs taken on September 10, 2025 show sparse wild rice among the lily beds.<sup>32</sup>



Hay Lake wild rice and lily pads on September 10, 2025

Ms. Matteson’s declaration explains, “Up close, we could see that many wild rice stems were cracked or rotten-looking. There were few heads containing seeds and the seeds we found looked dry and unripe.” Exhibit 20 at ¶5.



Hay Lake wild rice on September 10, 2025

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<sup>32</sup> Shanai Matteson Declaration with Photos taken at Hay Lake on September 10, 2025, Exhibit 20.

Ms. Matteson explained that on the same September 10, 2025 day that Hay Lake had wild rice that was “sick and broken,” she saw “lush, healthy, productive wild rice at the Sandy Lake Flowage.” *Id.* at ¶¶ 6-7. At Hay Lake, there was “no wild rice that would support wildlife and certainly none that people could harvest.” *Id.* at ¶7.

The history of Keetac permitting and violations, state and federal law, current peer-reviewed science, and overwhelming evidence of wild rice impairment in Hay Lake support and require WQBELs to comply with Minnesota’s 10 mg/L wild rice sulfate standard in Keetac permits.

### **B. MPCA’s Preliminary Denial of Variance to U.S. Steel is Well Supported.**

WaterLegacy supports MPCA’s preliminary denial of U.S. Steel’s application for a variance from the wild rice sulfate standard in the draft Keetac permits. In its preliminary denial,<sup>33</sup> MPCA staff determined that “the Permittee has not satisfied the conditions necessary to receive a variance under either Factor 3 [40 C.F.R. § 131.10(g)(3); Minn. R. 7050.0190, subp. 4(A)(3)] or Factor 6 [40 C.F.R. § 131.10(g)(6); Minn. R. 7050.0190, subp. 4(A)(6)] and, as a result, recommend[ed] the Commissioner deny the sulfate variance request.”

MPCA explained that Factor 3 variances can be appropriate where pollution is from an indirect cause outside the control of the permittee. But U.S. Steel did not even attempt to explain how Keetac sulfate pollution is a human caused condition “not caused or contributed to by their own processes and discharge.” *Id.* at 4. U.S. Steel did not satisfy this Factor 3 variance condition.

MPCA also rejected U.S. Steel’s argument under the second clause of Factor 3 that either the pollution cannot be treated or that treatment will cause more environmental harm than leaving the pollution in place. *Id.* at 5. MPCA correctly found that U.S. Steel’s variance application actually demonstrates that sulfate pollution *can* be treated to meet permit WQBELs using the identified treatment. *Id.* In fact, Barr determined for U.S. Steel, “Based on Barr’s experience, previous studies, and pilot testing, the water treatment technology proposed in this study is expected to allow Keetac to meet these permit limits for sulfate.”<sup>34</sup> MPCA agreed that the treatment methods proposed by Barr for U.S. Steel would be effective. Preliminary Variance Denial at 5.

MPCA found that U.S. Steel’s application addressed environmental costs of treatment, such as energy use and waste management, but failed to address the benefits of treatment, thus failing to make a Factor 3 showing. *Id.* WaterLegacy supports MPCA’s analysis and suggests that a more comprehensive discussion of impaired waters would underscore the benefits of treatment to wild rice, aquatic life, reduction of excessive nutrients, and public health.

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<sup>33</sup> MPCA, Water Quality Program Facility-specific Preliminary Determination Water Quality Standard Variance for Sulfate, U. S. Steel Corp. U.S. Steel Keetac Facility and Tailings Basin Permits MN0031879 and MN0055948, July 8, 2025 (“Preliminary Variance Denial”) at 2.

<sup>34</sup> Barr Engineering, Application for a Variance from the Class 4A Sulfate Water Quality Standard for Waters Used for Production of Wild Rice NPDES/SDS Permit Nos. MN0055948 and No. MN0031879, Prepared for U.S. Steel Corp., May 2025 (“Variance Application”) at 3.

Both MPCA and U.S. Steel applied the tests in longstanding EPA guidance to determine whether the costs of treatment of Keetac sulfate pollution would result in “substantial and widespread” economic impacts or “economic burden” to justify a Factor 6 variance under either federal regulations or state rules. Preliminary Variance Denial at 5-7; Variance Application at 15. U.S. Steel’s Variance Application stated that a reduction of profits by nine percent was significant, but did not suggest there were any issues with the corporation’s solvency. *Id.*

MPCA concluded that U.S. Steel does not meet the requirements for a Factor 6 variance because: 1) “U.S. Steel has sufficient profits to pay for pollution control costs,” and its profit rate with or without pollution controls would still be seven percent using 2024 fiscal data and U.S. Steel’s estimated costs; 2) U.S. Steel’s average liquidity ratio for the past three years is 1.76, which does not show serious liquidity problems, even though it is slightly lower than EPA’s general recommendation; and 3) U.S. Steel’s long-term solvency is strong, with an average ratio for the past three years of 0.52, substantially above the 2.0 ratio recommended by EPA. Preliminary Variance Denial at 6-7. WaterLegacy believes that this conclusion is correct.

Additional information in U.S. Steel’s Application also weighs against the requested variance. U.S. Steel asked that variances from application of the sulfate standard “remain in place for ten years” to “allow U.S. Steel to collect additional data” regarding water quality and sulfate reduction alternatives. Variance Application at 14. No federal or state law authorizes the grant of a variance to collect better data; such a practice would swallow up any requirement to apply water quality standards. Since 14 years have already elapsed since sulfate WQBELs were set for Keetac mining area and tailings basin discharge, in effect U.S. Steel’s variance application is requesting a quarter century of delay.

Variance Application estimates of water treatment costs may also be somewhat high. The Variance Application states in its text at page 14 that capital expenditures are estimated at \$595,000,000, but Appendix B of the Application at page 2, Table 1, estimates total capital expenditures of \$538,000,000 within a wide range (30 percent less to 50 percent more) of uncertainty. U.S. Steel’s cost projections are based on construction of four similar treatment systems, “one for each active surface discharge station,” *id.* at 9, although one discharge station (SD 002) only intermittently discharges to a wild rice waters and another (SD 005) “does not discharge” under high demand and/or low water inventory conditions. *Id.* at 12. The Variance Application does not evaluate whether capital and operating costs for four treatment systems are higher than if fewer treatment plants were built. But Barr does acknowledge that actual costs of treatment may be less than projected, “necessitating the requirement to reevaluate the worksheets and financial evaluation.” *Id.* at 15, 21.

Although U.S. Steel’s Variance Application cites “economic hardship, notably one that others in the industry and within the state do not share,” *id.* at 14, U.S. Steel does not claim in its Application, let alone demonstrate, that Keetac mine facilities would be closed or that operations would be suspended if a variance were not granted. Without minimizing either the real economic costs of treatment or the need for fair application of pollution control requirements within the industry, U.S. Steel’s Variance Application does not meet the requirements for a variance from the

wild rice sulfate standard. MPCA's preliminary determination to deny the variance is well-supported.

**C. Additional Information in U.S. Steel Disclosures and Arising from Nippon Steel's Purchase of U.S. Steel Supports Denial of the Variance.**

U.S. Steel was required to file an Annual Report (Form 10-K) pursuant to the Securities Exchange Act of 1934 for the fiscal year ending on December 31, 2024, the substance of which was declared true and accurate by U.S. Steel's CEO and other top officials as required to avoid perjury under securities laws.<sup>35</sup> That Annual Report contains disclosures that further support MPCA's denial of a variance for environmental compliance with Minnesota's wild rice sulfate standard.

U.S. Steel's 2024 Annual Report explains that its overall environmental expenditures from 2022 through 2024 represented "approximately 2 percent of U.S. Steel's total costs and expenses in 2024, 2023, and 2022." *Id.* at 19. U.S. Steel's total capital expenditures were \$2.576 billion in 2023 and \$2.287 billion in 2024. *Id.* at 58. Yet, in 2024 U.S. Steel "repaid approximately \$128 million in debt, and we ended the year with \$3.62 billion of total liquidity." *Id.* at 11. U.S. Steel's total assets at the end of 2024 were \$20.235 billion. *Id.* at 80.

U.S. Steel's 2024 Annual Report specifically acknowledged that it was subject to environmental laws, including the wild rice sulfate standard: "Our U.S. facilities are subject to environmental laws applicable in the U.S., including . . . the Clean Water Act (CWA). . . The State of Minnesota has a sulfate wild rice water quality standard (WQS) set at 10 mg/L, which was established in 1973." *Id.* at 20. The Annual Report explained that environmental expenditures "are capitalized if the costs mitigate or prevent future contamination or if the costs improve existing assets' environmental safety or efficiency." *Id.* at 76. U.S. Steel explicitly acknowledged: "New or expanded environmental requirements, which could increase U.S. Steel's environmental costs, may arise in the future." *Id.* at 62. Immediately after recognizing the potential for increased costs, U.S. Steel's Annual Report added the sentence, "U.S. Steel intends to comply with all legal requirements regarding the environment." *Id.*

These statements in U.S. Steel's 2024 Annual Report support MPCA's findings that U.S. Steel has sufficient assets and liquidity to pay for water quality treatment needed for environmental compliance. The Report also suggests that—at its highest levels—U.S. Steel has considered the need to comply with the wild rice sulfate standard as another potential capitalized cost of lawful environmental compliance.

In addition, the 2024 Annual Report undermines claims that environmental compliance creates a competitive disadvantage for U.S. Steel. The Report states: "We believe that our major North American and many European integrated steel competitors are confronted with substantially similar environmental regulatory conditions and therefore do not believe that our relative position

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<sup>35</sup> U.S. Steel Corp., Annual Report Pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934 (Form 10-K) for the fiscal year ended on December 31, 2024, ("Annual Report"), Exhibit 21 at 129. False statements in SEC filings are criminalized in 18 U.S.C. § 1001 and ch. 240 SEC rules.

with regard to such competitors will be materially affected by the impact of environmental laws and regulations.” *Id.* at 7.

Information arising from Nippon Steel’s purchase of U.S. Steel also supports MPCA’s denial of a variance from environmental compliance. As of June 18, 2025, U.S. Steel is now a wholly-owned subsidiary of parent corporation Nippon Steel.<sup>36</sup> Nippon Steel is the largest producer of crude steel in Japan and the fourth largest in the world.

Nippon Steel bought U.S. Steel for \$14.9 billion in June 2025.<sup>37</sup> On August 28, 2025, Nippon Steel then announced that it would make an \$11 billion investment, running through 2028, to transfer advanced technologies to U.S. Steel and increase U.S. Steel’s profit contribution to Nippon Steel to \$1.70 billion (250 billion yen) a year. *Id.* This is more than triple the amount of profit (80 billion yen) expected to be contributed by U.S. Steel this year. *Id.*

Although U.S. Steel has made no such claims, commenters opposing Keetac compliance with Minnesota’s sulfate standard have stated that Keetac and other U.S. Steel facilities will close rather than pay the costs of water treatment. These fears are baseless.

The Keetac mine still has 153.3 million tons measured and indicated mineral resources and 125.9 million tons probable mineral reserves. Annual Report, Exhibit 21 at 39. Publicly reported information suggests that Keetac facilities are uniquely valuable to U.S. Steel—and now to Nippon Steel—because they were recently upgraded at a cost of \$150 million to produce high value direct reduction pellets that feed electric arc furnaces for low-carbon steel production.<sup>38</sup>

Moreover, when U.S. Steel was purchased by Nippon Steel on June 18, 2025, U.S. Steel’s Certificate of Incorporation was amended to include a National Security Agreement stating that the Corporation, absent a Force Majeure Event “shall not, either directly or indirectly . . . prior to June 18, 2035, close, idle or sell” any U.S. Steel Production Location.<sup>39</sup> “Production Location” for this prohibition on closure, idling, or sale, is specifically defined to include “Minnesota Ore Operations (including Keetac and Minntac).” *Id.* Article VI(2)(d). In addition, a schedule attached to U.S. Steel’s Fifth Amended Certificate of Incorporation pledged an investment of \$800 million in Minnesota’s Keetac/Minntac facilities from 2025 through 2028.<sup>40</sup>

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<sup>36</sup> U.S. Steel Corp., Current Report (Form 8-K) Pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934, June 18, 2025 (“Form 8-K Report”), Exhibit 22 at Item 5.01.

<sup>37</sup> Obayashi, Y. (2025, August 28) Nippon Steel bets on \$11 billion investment, tech transfer to lift U.S. Steel profit, *Reuters*, Exhibit 23.

<sup>38</sup> Lovrien, J. (2024, May 23) Keetac’s new DR-grade plant up and running, *Duluth News Tribune*, Exhibit 24.

<sup>39</sup> Form 8-K Report, Exhibit 22 at Ex. No. 3.1, Fifth Amended and Restated Certificate of Incorporation of the Company at Article VI(1)(d).

<sup>40</sup> *Id.*, Schedule 2 to Fifth Amended and Restated Certificate of Incorporation.

U.S. Steel's reports to the Securities Exchange Commission confirm that MPCA should deny U.S. Steel a variance from compliance with Minnesota's wild rice sulfate standard. Even before Nippon Steel's purchase of the corporation, U.S. Steel had sufficient liquidity to capitalize environmental compliance costs, recognized the potential need to comply with Minnesota's sulfate standard, and denied that environmental compliance resulted in a competitive disadvantage. Nippon Steel's purchase of U.S. Steel has increased U.S. Steel's resources, promised greater U.S. Steel annual profitability—which would make membrane water quality treatment more affordable—and specifically committed to \$800 million in capital investments at Keetac and Minntac by 2028. The prohibition on closure of Keetac or Minntac before June 18, 2035 both undermines any claim of widespread economic impacts and suggests that timing of capital improvements for Keetac sulfate compliance to take place without delay would be beneficial.

## **II. RECOMMENDATIONS FOR CHANGE, ADDITIONAL ANALYSIS, AND CLARIFICATION OF MPCA DRAFT KEETAC PERMITS.**

MPCA's draft permits for the Keetac mining area (MN0031879) and Keetac tailings basin (MN0055948) and their corresponding fact sheets contain compelling analysis to support sulfate WQBELs requiring U.S. Steel's compliance with the wild rice sulfate standard at Hay Lake. However, on other issues pertinent to NPDES/SDS compliance and protection of surface water and groundwater, these documents contain ambiguities and gaps which may undermine their efficacy in achieving pollution control. The balance of WaterLegacy's comments address these areas where changes, additional analysis, or clarification are needed before MPCA approves final permits.

### **1. Keetac Permits Should Require Timely Construction of Water Treatment.**

MPCA's draft Keetac mine and tailings basin permits provide a compliance schedule and require that final, Phase 2 effluent limits be achieved "as soon as possible, but no later than April 30, 2030." *See* Mine Permit at 19 (5.13.59); TB Permit at 23 (5.24.83). WaterLegacy supports MPCA's inclusion of a deadline for compliance. However, WaterLegacy agrees with EPA that a compliance schedule is not supportable under federal antibacksliding regulations. A compliance schedule is also redundant and unnecessary since planning, agreement on the type of proposed treatment, and pilot studies have already been completed. U.S. Steel's compliance deadline should be based solely on the time need to develop design specifications, construct, and test the operation of the "proposed water treatment system" described by Barr in Appendix B of U.S. Steel's Variance Application.

The timeframe for developing design specifications should start now, if it hasn't already begun, and compliance could be achieved in 2027, rather than 2030. That timeframe would better coordinate with Nippon Steel's promises of capital investment as well as more effectively protecting water quality and wild rice.

#### *1. Federal law does not support an additional compliance schedule.*

The Keetac permits issued in 2011 contained a detailed compliance schedule to meet identical sulfate effluent limitations by August 17, 2018, in the case of mining area permit (MN0031879) and by August 17, 2019, in the case of the tailings basin permit (MN0055948). These permits are

still in effect. As the EPA commented in its 2024 review of the drafts for Keetac permit reissuance: “By extending the date for compliance with the WQBELs beyond the dates specified in the current permits, the draft permits include less stringent effluent limitations and conditions than the prior permits. This approach is in conflict with the backsliding prohibition in 33 U.S.C. § 1342(o) and 40 C.F.R. § 122.44(l)(1) unless one of the exceptions in those statutory and regulatory provisions applies, which does not appear to be the case.”<sup>41</sup>

EPA further found that MPCA had not made a finding supported by evidence that the draft compliance schedule was appropriate, 40 C.F.R. § 122.47, or that it required compliance with final sulfate effluent limitations “as soon as possible.” *Id.* at (a)(1).

MPCA has agreed that “Sulfate WQBELs were introduced in Keetac’s NPDES permits in 2011 and are enforceable under the federal Clean Water Act.” Preliminary Variance Denial at 1. These current effluent limitations set a 14 mg/L monthly average and 24 mg/L daily maximum for sulfate. *Id.* However, MPCA argues that a 2016 Minnesota Session Law provides “new information” qualifying the compliance schedule in the draft Keetac permits “for the exception to antibacksliding.” Mine Fact Sheet at 43.

WaterLegacy disagrees that the 2016 Session Law supports an antibacksliding exception allowing a new compliance schedule. In fact, the Session Law’s plain language precludes this interpretation. The 2016 Session law stated that the “final sulfate limits resulting from implementation of the wild rice sulfate water quality standard . . . are no longer valid” and that permit conditions “relating to those final limits” are no longer valid. Minn. Laws 2016, Ch. 165, Sec. 1(a). However, the Session Law also stated, “Nothing in this section shall relieve the permittee from its obligation to satisfy requirements contained in any schedule of compliance that is in effect as of May 1, 2016.” *Id.*, Sec. 1(b). The Legislature clearly intended that U.S. Steel was obligated to meet all compliance requirements up to the point of expending money to design and implement sulfate treatment technology. *See also* Minn. Laws 2015, 1st Spec. Sess., Ch. 4, Art. 4, Sec. 136.

By January 2017, with MPCA oversight, U.S. Steel had done just that. The Company performed various studies and selected an ultrafiltration and nanofiltration treatment technology to meet the wild rice sulfate standard. U.S. Steel then piloted that treatment and reported positive results in December 2016. *See* Attachment 1 to Mine and TB Fact Sheets. The only remaining steps before actual compliance with the Keetac permits’ final Phase 2 WQBELs for sulfate are for U.S. Steel to prepare detailed design specifications, construct the proposed water treatment, and verify its operations. These steps do not require an exception to antibacksliding or a schedule of compliance.

## *2. Final Keetac permits should require construction of the selected membrane treatment.*

U.S. Steel and MPCA have agreed on the proposed wastewater treatment to attain compliance with the wild rice sulfate standard at the Keetac mining area and tailings basin facilities. MPCA’s

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<sup>41</sup> EPA, Comments on Review of Two Draft NPDES Permits, U.S. Steel Keetac Mining Area (MN0031879) and U.S. Steel Keetac Tailings Basin (MN0055948), Keewatin, Minnesota, Sept. 6, 2024 (“EPA Permit Comments”), Exhibit 25 at 1. EPA noted that all cited federal regulations are made applicable to states by 33 U.S.C. §§ 1314(i), 1342(c)(2) and 40 C.F.R. § 123.25.

Preliminary Variance Denial approved the treatment proposal selected by U.S. Steel, summarized as follows: “The selected wastewater treatment system relies on linking commercially available physical and chemical processes and involves the installation of equalization basins, lime softening, ultrafiltration, nanofiltration, high-efficiency reverse osmosis, evaporators, crystallizers, filter presses, and centrifuges.” Preliminary Variance Denial at 5. Barr confirmed for U.S. Steel that “the water treatment proposed” in its variance application “is expected to allow Keetac to meet these permit limits for sulfate.” Variance Application at pdf 76, Appendix B.

The final Keetac permits should move forward to achieve construction of the selected treatment, rather than sliding back into a planning process. WaterLegacy requests that the final Keetac fact sheets document the legal and practical reasons to proceed with design and construction of the wastewater treatment. The final Keetac permits should then include a summary of the treatment system selected and a compliance date based on the shortest reasonable time for design and construction. That design process may already be underway.

Other than a scheduled milestone for MPCA design review and a plan for inspections and consultation in the event of unforeseen circumstances, the permit would require compliance be achieved as soon as possible and at the latest by a fixed date in 2027, with a brief grace period for non-compliance to allow for operational adjustments. No compliance schedule is necessary or appropriate for Keetac to achieve compliance with wild rice sulfate standard WQBELs.

## **2. MPCA should Establish Numeric WQBELs for Specific Conductance Based on Minnesota’s Toxicity Thresholds for Ecoregion 50.**

In its comments on the draft Keetac permits, the EPA criticized MPCA’s failure to evaluate “whether the discharge of specific conductance or constituent ions from any outfalls will cause, have the reasonable potential to cause, or contribute to an excursion above any state water quality standard, including narrative water quality standards.” EPA Permit Comments, Exhibit 25 at 3. The EPA cited CWA regulations requiring effluent limits to ensure compliance with narrative as well as numeric water quality standards and determinations both by EPA and MPCA that specific conductance may cause violations of Minnesota’s narrative water quality criteria. *Id.*, citing 40 C.F.R. § 122.44(d)(1)(i).

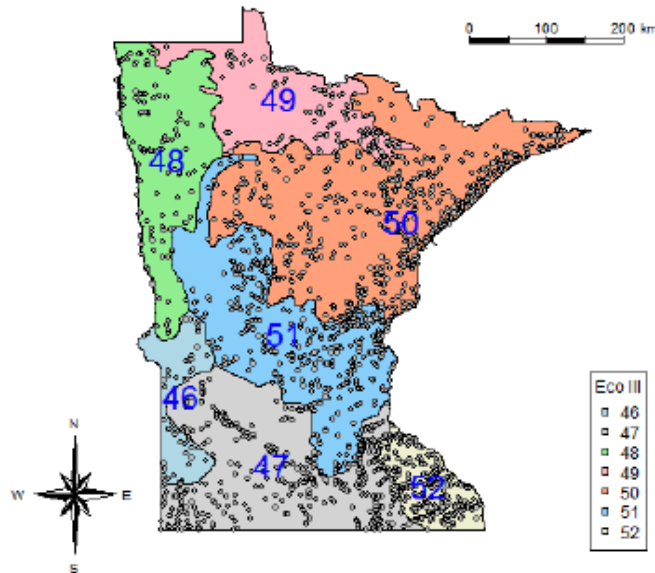
MPCA’s Keetac fact sheets stated that the agency “did not perform a numeric translation of the narrative aquatic life standard to then determine whether Keetac is causing or contributing to an exceedance of the narrative aquatic life standard with regards to specific conductance” because there was “no clear evidence that aquatic life downstream of Keetac are below applicable IBI criteria.” Mine Fact Sheet at 35, TB Fact Sheet at 35.

WaterLegacy believes that MPCA incorrectly made protection of an aquatic community from toxicity contingent on index of biological integrity (“IBI”) findings.

Minnesota rules set general narrative standards to protect aquatic life from undesirable conditions. Minn. R. 7050.0150, subp. 3. In addition, Minnesota rules set objectives to protect surface waters from “toxic pollutants.” Minn. R. 7050.0217. Such rules state that “site-specific water quality criteria for toxic pollutants or chemicals developed in the absence of numeric standards” should

protect “the propagation and maintenance of aquatic biota.” *Id.*, subp. 1. For these criteria, “[p]rotection of the aquatic community from the toxic effects of pollutants means the protection of no less than 95 percent of all the species in any aquatic community.” *Id.*, subp. 2A.

Local scientists, EPA, and MPCA agree that the specific conductivity threshold needed to protect 95 percent of all species in the aquatic community in the Keetac mining area—EPA Ecoregion 50 shown below—is no higher than 329 micro Siemens per centimeter (“ $\mu\text{S}/\text{cm}$ ”).



In 2015, retired Minnesota agency scientists Bruce Johnson and Maureen Johnson compared data on aquatic genera and sensitivities in northeastern Minnesota with EPA’s study setting a specific conductance benchmark for aquatic life in Appalachia; they determined that EPA’s analysis should apply to northeastern Minnesota.<sup>42</sup> EPA’s Office of Research and Development (“ORD”) evaluated the Johnsons’ paper in 2016 and concluded, “Overall, the weight of evidence supports the inference that effluents that increase waterbody SC [specific conductance] to more than 300  $\mu\text{S}/\text{cm}$  have adverse effects in northeast Minnesota waters.”<sup>43</sup>

EPA then analyzed an independent data set of paired benthic invertebrate and specific conductance data from Ecoregion 50 in Minnesota. *Id.* at 2-9. Based on the paired data, EPA confirmed that “more than 5% of genera would be extirpated in streams greater than 320  $\mu\text{S}/\text{cm}$ .” *Id.* at 10. The history of development of a specific conductance criterion in Minnesota’s Ecoregion 50 is summarized in EPA’s approval of the Fond du Lac Band of Lake Superior Chippewa’s 2020 water quality standards revisions adopting a standard of 300  $\mu\text{S}/\text{cm}$  in Reservation waters.<sup>44</sup>

<sup>42</sup> Johnson BL, Johnson MK, An Evaluation of a Field-Based Aquatic Life Benchmark for Specific Conductance in Northeastern Minnesota, November 2015, Exhibit 26.

<sup>43</sup> Susan Cormier, EPA ORD, Review of “An Evaluation of a Field-Based Aquatic Benchmark for Specific Conductance in Northeast Minnesota,” Prepared by B. L. Johnson and M. K. Johnson, February 4, 2016 (“EPA Review”), Exhibit 27 at 2.

<sup>44</sup> EPA, Review of Revisions to the Fond du Lac Band of Lake Superior Chippewa’s Water Quality Standards Under Section 303(c) of the Clean Water Act, October 5, 2020, Exhibit 28 at pdf 9-15.

MPCA conducted its own analysis using a statewide dataset collected by its biological monitoring program from 1996-2018 to set “criterion continuous concentration” values reflecting chronic exposure and “designed to be protective of 95% of the native genera for a region.”<sup>45</sup> MPCA determined criterion continuous concentrations to provide regional benchmarks for specific conductance. In Minnesota Ecoregion 50—Northern Lakes and Forests—MPCA’s criterion continuous concentration value was 329  $\mu\text{S}/\text{cm}$ . *Id.* at 6.

There is no dispute that levels of specific conductance in U.S. Steel’s direct discharge to surface water are more than double the chronic criterion concentration for Ecoregion 50, where the Keetac mine and tailings area are located. Discharge monitoring reports from 2018 to 2024 in Exhibit 3 show that specific conductance discharged from SD 002 (mining area) averaged 789  $\mu\text{S}/\text{cm}$ <sup>46</sup> umhos/cm, while specific conductance discharged from SD 005 (tailings basin) averaged 797  $\mu\text{S}/\text{cm}$ .

MPCA’s proposal that a reasonable potential analysis need not be done for specific conductance—despite these exceedances—until IBI assessments shows “clear evidence” of impairment fails to recognize the difference between protection of aquatic life from extirpation and documenting or remediating conditions once genera have already been killed by toxic pollutants. Minnesota rules recognize that class 2 water quality standards “do not address all pollutants that may be discharged to surface waters and cause toxic effects.” Minn. R. 7050.0218, subp. 2.

Moreover, “chronic criterion” concentrations such as those developed by the MPCA for specific conductance are the methods used “to meet the objectives in part 7050.0217” and protect surface waters from toxic pollutants. Minn. R. 7050.0218, subp. 1, subp. 3(Q). As noted previously, the objectives in part 7050.0217 require “protection of no less than 95 percent of all the species in any aquatic community”; they may even apply greater protection “if economically, recreationally, or ecologically important species are very sensitive.” Minn. R. 7050.0217, subp. 2(A).

If site-specific criteria and effluent limits were only set for toxic pollutants after MPCA found “clear evidence” of impairments documented by IBI assessments—which are infrequent and only performed only for selected waters—it must be expected that more than 5 percent of sensitive genera will be extirpated in many waterbodies long before any reasonable potential analysis is done or effluent limit established. Further delay in controlling Keetac discharge of toxic specific conductance is inconsistent with rules setting criteria for toxic pollutants. It cannot be justified.

WaterLegacy agrees with the EPA that a reasonable potential analysis for specific conductance should be done prior to issuance of the final Keetac permits. If—as is highly likely based on discharge monitoring reports—WQBELs are required to protect aquatic biota, final effective limits for specific conductance should be imposed as soon as possible and in no event later than the date when sulfate WQBELs become effective. That timing will ensure that the proposed water treatment is designed to effectively and efficiently control all harmful ionic pollutants. Since wild

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<sup>45</sup> MPCA, S-5 Implementing the Aquatic Life Narrative Standard, SONAR for Proposed Class 3 and 4 Rule Revisions, December 14, 2020 (“MPCA S-5”), Exhibit 29 at 6.

<sup>46</sup> The discharge monitoring reports use the measurement unit of umhos/cm, which is equivalent to  $\mu\text{S}/\text{cm}$ .

rice is also sensitive to specific conductance pollution at approximately the same level as invertebrates,<sup>47</sup> simultaneous controls of specific conductance and sulfate will also increase the likelihood that water treatment will be effective in reducing impairment of downstream wild rice.

### 3. MPCA Should Require Biological Assessments and Chronic Whole Effluent Toxicity Testing Upon Permit Issuance.

WaterLegacy believes that the draft Keetac Permits downplay the likelihood of impairments of invertebrates in waters affected by Keetac discharge and could allow another five years of delay before sampling of streams in the project area. This delay fails to protect aquatic life.

The 2025 environmental assessment worksheet (“EAW”) for tailings basin expansion contains the following table of streams in Keetac project area, three of which were surveyed in 2015.<sup>48</sup>

**Table 12.4: Water Quality and Index of Biotic Integrity Scores for Streams in the Project Area, 2015 survey\***

| Stream        | Identification No. | Biological Stream Station ID | Nitrogen (mg/L) | Total Phosphorus (mg/L) | TSS (mg/L) | Ammonia (mg/L) | Dissolved Oxygen (mg/L) | pH   | Fish IBI Score | Invertebrate IBI Score |
|---------------|--------------------|------------------------------|-----------------|-------------------------|------------|----------------|-------------------------|------|----------------|------------------------|
| Hay Creek     | 07010103-545       | 99UM061                      | n/a             | 0.039                   | 4.8        | < 0.1          | 8.51                    | 8.02 | 60—good        | 60—Fair                |
| Swan River    | 07010103-753       | 10EM194                      | < 0.05          | 0.03                    | < 4        | < 0.1          | n/a                     | n/a  | 68—good        | 65—Fair                |
| O'Brien Creek | 07010103-583       | 15UM069                      | < 0.05          | 0.022                   | 8.8        | < 0.1          | 9.85                    | 7.3  | 59—good        | 63—Fair                |
| Welcome Creek | 07010103-581       |                              | n/a             | n/a                     | n/a        | n/a            | n/a                     | n/a  | n/a            | n/a                    |

\*No data were available for the West Swan River.

MPCA’s fact sheets acknowledge, that—when last evaluated in 2015—the three surveyed waters above had “fair” invertebrate scores. In addition, there was a 23 point decline in macroinvertebrate index of biological integrity (“M-IBI”) scores at Hay Creek from 1999 to 2015. Mine Permit and TB Fact Sheets at 35. Although some staff believed that Hay Creek “appears to be in a declining pattern and likely in need of additional protection” due to “the decline in both fish and macroinvertebrate scores from 1999-2015,” their suggestion to collect additional sampling was stayed and the MPCA declined to list Hay Creek as impaired for invertebrates even though its IBI scores were below lower confidence intervals. *Id.*

WaterLegacy believes that each of the tailings basin area streams surveyed in 2015 should be sampled again upon permit issuance to allow MPCA to evaluate conditions over time and identify impaired waters. WaterLegacy also supports MPCA’s proposal for sampling of Hay Creek (07010103-545) both upstream and downstream of its confluence with Unnamed Creek (15UM070 & 99UM061) and also sampling Unnamed Creek (07010103-706), which flows immediately from Reservoir 2. In addition, WaterLegacy would suggest that two other stream segments be surveyed:

<sup>47</sup> See MPCA S-5, Exhibit 29 at 8.

<sup>48</sup> EAW, U.S. Steel Keetac Tailings Storage Facility Project, August 7, 2025, Exhibit 30 at 39.

Welcome Creek (07010103-581) from Reservoir 2 to O'Brien Lake, which is listed in DNR's Table 12.4 above, and the segment of O'Brien Creek (07010103-589) flowing into rather than out from O'Brien Lake.

The critical issue is timing. The draft permit for the Keetac tailings basin requires the permittee to sample fish and macroinvertebrates "once every five years for the life of the permit." TB Permit at 20 (5.22.43). This vague requirement would allow U.S. Steel to wait another five years to begin any bioassessment—creating a 10-year assessment gap for streams that were already declining in 2015. That requirement should be changed to require sampling "once every five years for the life of the permit, beginning on the year of permit issuance."

Current and complete biological assessments in these streams upon permit issuance are needed to provide a foundation to protect of fish and macroinvertebrates in Keetac watersheds.

Similarly, the draft Keetac permits must be strengthened to protect aquatic life from chronic toxicity. The draft Keetac permits delay quarterly chronic whole effluent toxicity ("WET") testing until year three of the permits. *See* Mine Permit at 9, 11, 13; TB Permit at 10, 12, 14. This delay is not justified. Further, while the Keetac permits state that chronic toxicity will be measured against a "monitoring threshold value" of 1.0 chronic toxicity unit (TUC) and require submittal of a plan for "toxicity reduction evaluation" if repeated tests confirm toxicity, there is no time after which permits require that toxicity be reduced below 1.0 TUC. *See* Mine Permit at 10-15, TB Permit at 11-16.

WaterLegacy requests that quarterly WET testing for toxicity begin the year of permit issuance that the permits require toxicity reduction if the calculated chronic toxicity unit (TUC) exceeds 1.0.

#### **4. MPCA Should Include Mass Loading Limits in Sulfate WQBELs and Analyze Discharge Volumes and Pollutant Loading.**

Sulfate effluent limits in draft Keetac permits lack mass loading limits, and the permits specify neither actual nor allowable discharge volume. The draft Keetac permits do not include an antidegradation analysis of changes in tailings size, discharge levels, and sulfate discharge concentrations over time. Although the Keetac permits describe the federal net precipitation formula that limits total discharge, neither the permits nor fact sheets apply this formula. WaterLegacy requests that the Keetac permits include mass loading limits for sulfate to prevent dilution, and a transparent and quantitative antidegradation analysis and projection of net precipitation discharge limits under federal regulations.

##### *a. Mass Loading Limits for Sulfate.*

Effluent limitations in the draft Keetac permits should contain limits on the mass loading of sulfate in discharge. Under CWA regulations, "effluent limitations" include restrictions on "quantities, discharge rates, and concentrations" of pollutants. 40 C.F.R. § 122.2. Except for pollutants (like temperature or pH) that cannot appropriately be expressed by mass, "[a]ll pollutants limited in permits shall have limitations, standards, or prohibitions expressed in terms of mass." 40 C.F.R. 122.45(f)(1). Permits may have limits on both mass and concentration and the permit "shall require

the permittee to comply with both limitations.” *Id.* (f)(2). If a case-by case determination is made that mass-based limits are not feasible, permit conditions must “ensure that dilution will not be used as a substitute for treatment.” *Id.* (f)(1)(iii).

Minnesota rules define “effluent limitation” to mean a restriction “on quantities, discharge rates, and concentrations of pollutants” discharged from point sources. Minn. R. 7001.1020, subps. 13. For antidegradation and NPDES permits, Minnesota rules also define “loading” as “the quantity of pollutants, expressed as mass, resulting from a discharge or proposed discharge to a surface water.” Minn. R. 7050.0255 subps. 1, 22. Where downstream waters are impaired and no TMDL study has set waste load allocations, Minnesota courts have approved effluent limitations that limit both concentration and mass loading to ensure that “the effluent limits comply with the applicable narrative water quality standard and protect the lake against any further degradation until the TMDL study is completed.” *In re Alexandria Lake Sanitary Dist. NPDES/SDS Permit*, 763 N.W. 2d 303, 314 (Minn. 2009). For the Keetac permits, no draft or final waste load allocations have been established for any of the downstream impairments. TB Fact Sheet at 39.

Effluent load limits are particularly important for the Keetac permits because Keetac discharge volumes fluctuate depending on processing needs, creating the potential for dilution. *See* Mine Permit at 4, TB Permit at 4. Discharge flow volumes are neither clear nor consistently stated. The draft Mine Permit states that there is *periodic* discharge from SD 001 at less than 0.01 million gallons per day (“mgd”); *average* discharge from SD 002 of 2.56 mgd; *average* discharge from SD 003 of 2.7 mgd; and an *allowable* discharge rate from SD 012 at an average rate of 1.77 mgd. Mine Permit at 4. The draft Tailings Basin Permit states that the *maximum* rate of discharge through SD 001 (from outfalls 011, 012, and 013) is 9.4 mgd; *average* flow from SD 005 is 4.6 mgd; and the *allowable* flow from yet unconstructed SD 009 is 4.7 mgd. *Id.* Neither actual nor allowable discharge volumes are stated or can be calculated from this information.

WaterLegacy requests that the MPCA include sulfate mass loading limits as well as concentration limitations in the final Keetac mining area and tailings basin permits. The permits should also provide a transparent analysis of average and allowable surface discharge volumes.

## 2. Antidegradation analysis of discharge volume and pollutant loading.

MPCA’s fact sheets dismiss the need for an antidegradation analysis, stating that that the permits issued in 2011 “permitted an expansion of the taconite processing plant and included new proposed discharge from the Sargent Pit. There have been no changes to the facility since the last permit issuance.” TB Fact Sheet at 13. The fact sheets state: “There are no associated changes in the sources of wastewater, no changes to the existing wastewater discharges, no net increase in sulfate mass loading, and no increase of flow in the wastewater discharges associated with this project.” *Id.*; Mine Fact Sheet at 12.

However, these statements are not well supported. Neither the draft Keetac permits nor the 2011 Keetac permits state the baseline for comparison, the permitted discharge flow, or the maximum loading of pollutants authorized by the permits. Without this quantitative information, there is no way to substantiate if there have been or will be changes in flow or loading of sulfate and other pollutants requiring an antidegradation analysis or additional actions to prevent degradation.

WaterLegacy was able to locate an antidegradation analysis in U.S. Steel's 2009 application for an NPDES/SDS permit and tailings basin modification.<sup>49</sup> U.S. Steel's consultants calculated that the allowable discharge flow rate in 1986 was 5,297 million gallons a year (14.5 mgd). *Id.* at 22. Based on 1988 discharge monitoring reports showing an average sulfate concentration of 62.1 mg/L in tailings basin discharge, U.S. Steel's application calculated a maximum allowable sulfate discharge of 1,370 tons per year. *Id.* at 23.

The draft Keetac permits and fact sheets do not review this or any other historic flow rate or compare current or allowable discharge volumes. However, Keetac sulfate levels in 2018-2024 DMRs exceed 1988 levels, with average sulfate of 141 mg/L at SD 002 (mine site) and 105 mg/L at SD 005 (tailings basin). Exhibit 3. Sulfate monitoring submitted to MPCA for the most recent 12 months shows an average of 144 mg/L at SD 002. Mine Fact Sheet at 14.

The final Keetac permits and fact sheets should provide a transparent antidegradation analysis that compares the discharge flow rates, sulfate concentrations, and sulfate mass loading in 1986 and 1988 to proposed permit conditions during both Phase 1 and Phase 2. This analysis will ensure both that future wasteload allocations can be set to restore impaired waters and that dilution cannot be used to circumvent sulfate concentration limits.

### *3. Estimates of annual net precipitation discharge limits with proposed project.*

The final Keetac permit and fact sheet for the tailings basin should also estimate the annual net precipitation limit on discharge using the formula set in federal regulations, 40 C.F.R. § 440.104(b)(2)(i), based on current and predicted tailings basin acreage and open water areas. *See* TB Permit at 26-27 (5.27.137). This transparency is important since the factors from which the federal regulatory limit on discharge is set are likely to change.

Annual net precipitation is subject to change if the area covered by mine tailings increases or the open water area of the tailings basin decreases. *Id.* MPCA has estimated the tailings basin area as 6,178 acres. TB Fact Sheet at 11. But U.S. Steel is currently proposing to modify the tailings basin, including extending the dam and dikes and *increasing* tailings basin acreage by approximately 608.6 acres. Keetac EAW, Exhibit 30 at 6, 10, Fig. 8-1. The proposed Project would also *decrease* open water within the tailings storage facility area by approximately 420 acres. *Id.* at 21. Since the net precipitation formula<sup>50</sup> *increases* allowable discharge both when tailings acreage increases and when open water decreases, these changes are additive, rather than countervailing. Both would increase allowable discharge from the Keetac tailings basin, creating additional potential for degradation or increased mass loading of pollutants even if concentrations remain similar.

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<sup>49</sup> U.S. Steel Corp., Minnesota Ore Operations, Keetac Tailings Basin NPDES/SDS Permit Application, December 2009 ("2009 U.S. Steel Application"), Exhibit 31.

<sup>50</sup> In simple terms for Keetac, annual net precipitation (amount of allowable discharge) = (area of tailings basin plus drainage area X annual precipitation) – (area of tailings basin open water plus Reservoir 6 area X annual evaporation from open water). TB Permit at 26-27.

WaterLegacy requests that the final Keetac permits and fact sheets provide a transparent analysis of antidegradation and annual net precipitation limits on discharge, along with including sulfate mass loading limits during Phase 1 and Phase 2 for the Keetac tailings basin and mining area.

### **5. MPCA Should Require Broader Functional Equivalent Analysis and Comprehensive Data Collection to Support its Regulatory Authority.**

MPCA's draft Keetac permit for the tailings basin acknowledges the need to determine whether discharge through groundwater to surface water should "be considered the functional equivalent to a NPDES direct discharge" and regulated under the CWA. TB Permit at 26 (5.27.131-34). WaterLegacy appreciates the Agency's recognition of its obligation to comply with the Supreme Court decision in *County of Maui, Hawaii v. Hawaii Wildlife Fund*, 140 S. Ct. 1462 (2020).

However, the draft Keetac permits and facts sheets are insufficient to address the requirements of *Maui* for the following reasons: 1) the scope of functional equivalent analysis is improperly restricted to the Keetac tailings basin; 2) permit requirements fail to gather sufficient data to allow a functional equivalent analysis; and 3) MPCA hasn't yet assumed its full responsibility for protecting surface waters affected by discharge through groundwater.

#### *1. Insufficient scope of functional equivalent analysis.*

EPA's comments on review of the draft Keetac permits recommended that the mining area permit be revised to specifically prohibit "point source discharges to waters of the United States through ground water that are the functional equivalent of direct discharges" under the *Maui* case. Exhibit 25 at 4. A similar prohibition is already provided in the draft Keetac permit for the tailings basin. TB Permit at 26 (5.27.132).

WaterLegacy agrees that this change is needed. Mine area facilities containing contact and process water should be evaluated to determine if they are the functional equivalent of point sources discharging to surface water. The final permit for the Keetac mining area should also clarify which mine pits and facilities are within and outside of the "permitted facility" boundaries.<sup>51</sup>

There may be an additional regulatory gap. Reservoirs 2 and 6 seem to be active water containment facilities for Keetac mining and processing operations that contain surface drainage from the tailings basin, process water from the tailings basin, groundwater from the mine pits, and facility wastewater. TB Fact Sheet at 7-8, 11-12.<sup>52</sup> They may be sources of discharge through groundwater that are the functional equivalent of direct NPDES discharge. It is not clear how the MPCA regulates these Reservoirs, which appear neither to be included in the "Facility Description" for the mining area nor for the tailings basin. Mine Permit at 6; TB Permit at 6.

WaterLegacy requests that the MPCA ensure that its final Keetac permits encompass all Keetac

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<sup>51</sup> Mine Permit at 6-7; *see also* 2009 U.S. Steel Application, Exhibit 31, Appendix A Figures 1-3 at pdf 46-48 showing Keetac facilities.

<sup>52</sup> *See also* Exhibit 31 at 15-17 and Appendix A Figures 2-3 at 47-48.

process water containment facilities, including mine facilities and reservoirs, and require evaluation whether these facilities are point sources discharging pollutants through groundwater that is the functional equivalent of direct discharge to surface water.

*2. Insufficient data collection to support a functional equivalent evaluation.*

EPA performed a functional equivalent analysis of the U.S. Steel Minntac tailings basin applying the seven factors identified by the Supreme Court in *Maui* and concluded in July 2023 that the Minntac tailings basin and its components “are a point source that discharges pollutants to jurisdictional surface waters in the Sand and Dark River watersheds.”<sup>53</sup> MPCA should use this analysis as a model and ensure that monitoring is sufficient to evaluate the seven *Maui* factors: 1) transit time, 2) distance traveled, 3) the nature of the material through which the pollutant travels, 4) the extent to which the pollutant is diluted or chemically changed as it travels, 5) the amount of pollutant entering the navigable waters relative to the amount of the pollutant that leaves the point source, 6) the manner by or area in which the pollutant enters the navigable waters, and 7) the degree to which the pollution (at that point) has maintained its specific identity. *Maui*, 140 S. CT. at 1476-77. EPA’s analysis suggests that at least the following data are needed for a functional equivalent evaluation:

- Historic and background surface water and groundwater quality;
- Water quality information in facility waste streams, groundwater, and proximate and downstream surface waters;
- Subsurface flow in groundwater, hydrological connection between groundwater and surface water, and surface water flow<sup>54</sup>;
- Chemical composition data to evaluate if there is dilution or chemical change; and
- Applicable water quality standards and the location of impaired waters.

The draft Keetac permits collect insufficient data for a functional equivalent analysis. Neither Keetac draft permit requires any groundwater monitoring. The draft mining area permit does not require monitoring of surface water or mine pit water quality. Mine Permit at 6-7. The draft tailings basin permit requires monitoring at only two waste streams within the tailings basin, three surface water stations, and five downstream locations—all on the same side of the basin—and only a single surface water site potentially impacted by a reservoir. TB Permit at 6-7. Monitoring required in the Keetac draft permits is well-suited to address sulfate discharge flowing to Hay Lake, but insufficient to support a functional equivalent analysis.

WaterLegacy requests that the final Keetac permits include hydrological flow investigation, groundwater monitoring at the mining area, tailings basin, and reservoirs, waste stream monitoring within mine pits and reservoirs, and additional surface monitoring at the perimeter of the tailings basin, reservoirs, and any other potential point sources where discharge through groundwater to

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<sup>53</sup> EPA, U.S. Steel’s Minntac Tailings Basin Wastewater Discharge, Functional Equivalent of a Direct Discharge Technical Assistance, July 2023 (EPA Maui Analysis), Exhibit 32 at viii.

<sup>54</sup> *See id.* at 49, describing thermal imagery for hydrological investigation; at 54, describing monitoring wells, soil borings, geoprobes, and piezometers.

surface water may be functionally equivalent to direct surface water discharge. MPCA should also identify and monitor the nearest surface waters in various directions, recognizing that discharge through groundwater may contain other parameters of concern in addition to sulfate.

WaterLegacy recommends that MPCA consult with technical experts to determine the type, number, and location of wells, surface sampling, piezometers, and other data collection methods that should be required in final Keetac permits.

*3. Responsibility to consider all impacts of discharge through groundwater.*

The draft Keetac permit places responsibility on the permittee to “conduct an evaluation of whether there is a functionally equivalent discharge of seepage from the tailings basin to nearby surface waters.” TB Permit at 46-47 (6.21.11). However, the Supreme Court in *Maui* did not propose that permittees would determine functional equivalence, but that regulators would do so. *See Maui* 140 S. Ct. at 1477 (“EPA and the States have often considered the Act’s application to discharges through groundwater . . . EPA and the States also have tools to mitigate those harms, should they arise, by (for example) developing general permits for recurring situations.”)

WaterLegacy believes that U.S. Steel (Nippon Steel) should be required to gather data for submittal to MPCA on a specific schedule. But the final Keetac permits should state that the MPCA will make the determination whether any Keetac discharges through groundwater are the functional equivalent of direct discharge to surface water.

In addition, MPCA should consider that its SDS authority includes regulating discharge through groundwater to surface water that may cause or contribute to exceedances of surface water quality standards. *See* Minn. Stat. § 115.03; Minn. R. 7001.1000. MPCA’s SDS authority applies to all pollutants affecting waters of the State, not just to sulfate. For example, Keetac’s internal waste stream WS 012, which is routed to the tailings basin, has contained an average of 810 nanograms per liter (ng/L) of mercury in recent years and one measurement of 4,980 ng/L, more than 710 times higher than Minnesota’s surface water quality standard for mercury.<sup>55</sup> MPCA’s functional equivalent analysis and exercise of SDS authority should evaluate the fate and transport of mercury and other pollutants that discharge through groundwater to surface water and have the potential to harm and contaminate aquatic life consumed by wildlife and humans.

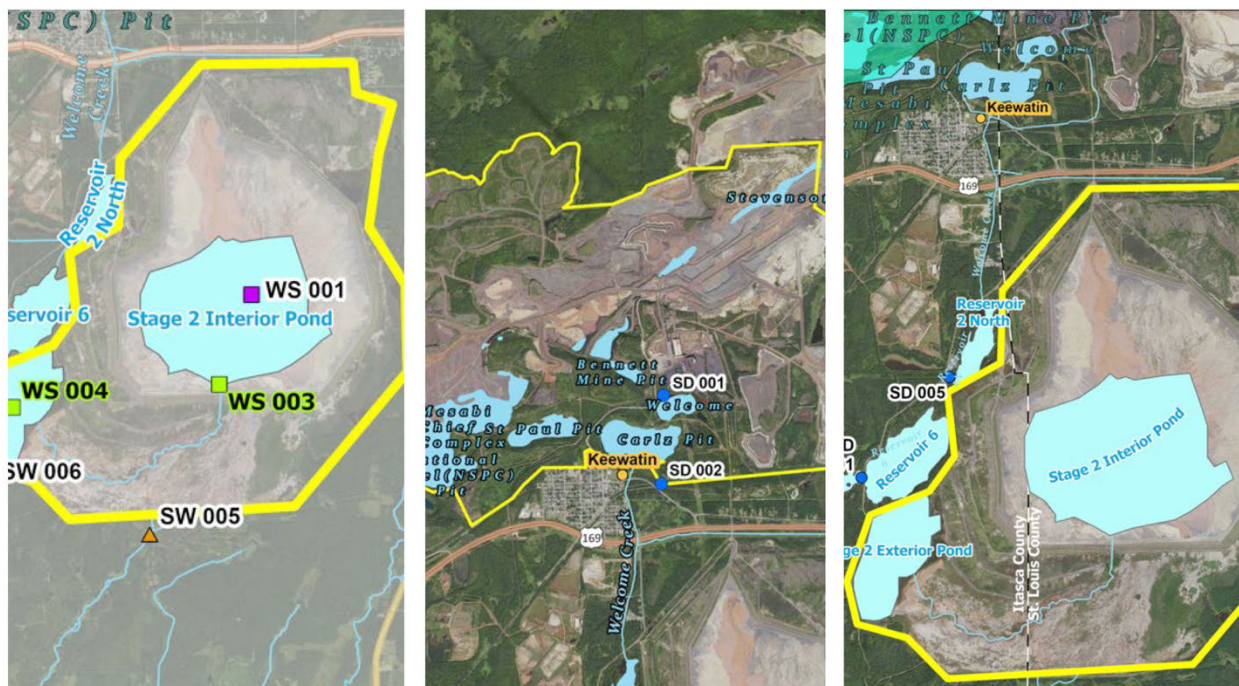
To fully address the *Maui* factors and protect water quality, Keetac permits should require functional equivalent analysis for mine area facilities and reservoirs—as well as the tailings basin; should require comprehensive monitoring and hydrological investigation to support the analysis; and should reflect MPCA’s authority under both NPDES and SDS rules to regulate discharge of pollutants through groundwater that cause or contribute to violations of surface water quality standards.

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<sup>55</sup> Discharge Monitoring Reports, Bulk Exports for Keetac Permit MN0031879, Mercury in scrubber blowdown after treatment, 2018-2024, Exhibit 33. Minnesota’s water quality standard for mercury in surface water near Keetac is 6.9 ng/L. Minn. R. 7050.0220, subp. 5a(11).

## 6. MPCA Should Require Groundwater Monitoring and Evaluate the Potential for Exceedances of Groundwater Rules and Class 1 Standards.

In addition to the need for groundwater monitoring to support functional equivalent analysis, MPCA should also require groundwater monitoring at the Keetac mine area, tailings basin, and reservoirs to determine whether Keetac discharge violates groundwater standards. As illustrated by the maps below,<sup>56</sup> the draft Mine Permit and Tailing Basin Permit do not require U.S. Steel to conduct any groundwater monitoring.



The Minnesota Supreme Court has already determined that Minnesota groundwater protection rules apply to water beneath mine waste containment facilities. *In re Denial of Contested Case Hearing Requests and Issuance of NPDES/SDS Permit for the Proposed NorthMet Project* (“*In re NorthMet NPDES/SDS Permit*”), 993 N.W.2d 627, 664 (Minn. 2023) (“We conclude that the prohibition on a ‘discharge or deposit’ that ‘may pollute the underground waters’ under Rule 7060.0600, subpart 2, applies with equal force to groundwater within the planned containment systems at the NorthMet facility as it does to groundwater outside the planned containment system. Nothing in chapter 7060 contemplates an exclusion for the underground waters within a containment system.”).

MPCA has historically interpreted its rules to mean that “all groundwater is Class 1 water” protected as an actual or potential source of drinking water, whether or not it has been specifically classified as such. *In re Reissuance of an NPDES/SDS Permit to U.S. Steel*, 954 N.W.2d 572, 581-82 (Minn. 2021). In the *U.S. Steel* case, the Minnesota Supreme Court ruled that MPCA’s

<sup>56</sup> Maps are copied from Mine Permit at 6, TB Permit at 6-7.

interpretation of chapters 7050 and 7060 to mean that all groundwater is a Class 1 water is “reasonable, longstanding, and supported by the evolution of the regulatory scheme”; that “groundwater is a Class 1 water”; and that MPCA “properly exercised its authority in applying the Class 1 secondary drinking water standards,” including the sulfate standard, to groundwater. *Id.*, at 583.

Thus, Minnesota groundwater rules and Class 1 standards apply to groundwater beneath the Keetac tailings basin and mining area facilities. Monitoring groundwater in Keetac permits is particularly important due to the number of domestic drinking water wells (royal blue) in proximity to Keetac tailings basin, reservoirs, and mine features, as shown below.<sup>57</sup>



MPCA’s final Keetac permits should require groundwater monitoring for parameters such as arsenic, aluminum, lead, manganese, nitrate, and PFAS that are sometimes elevated in connection with mining activities and have adverse health effects in drinking water at concentrations that do not harm aquatic life. Manganese, for example, causes neurologic harm to children at very low concentrations in drinking water, but is not regulated to protect class 2 aquatic life.<sup>58</sup>

<sup>57</sup> Map was produced from publicly available ArcGIS layers.

<sup>58</sup> See Minn. R. 7050.0220, subp. 4a(B)(15), providing a manganese limit of 50 µg/L for surface water used for drinking and Minn. R. 7050.0220, subp. 5a providing no manganese limit to protect of aquatic life. Minn. R. 4717.7860 sets a health risk limit of 100 µg/L due to “developmental, nervous system” endpoints.

In addition to comprehensive groundwater monitoring, final Keetac permits should include a reopener clause allowing MPCA to require pollution evaluation and reduction if monitoring discloses a reasonable potential for exceedances of groundwater standards.

## **7. MPCA Should Clarify Prohibitions on Unauthorized Discharge to Protect Groundwater and Surface Water from Run-off and Seepage.**

General prohibitions against unauthorized releases of wastewater in the Keetac permits contain ambiguities that may interfere with protection of both surface water and groundwater. Draft Keetac permits prohibit “releases of wastewater or materials to the environment, whether intentional or not, except for discharges from outfalls specifically authorized by this permit.” Mine Permit at 34 (5.20.377); Tailings Basin Permit at 38-39 (5.29.377).

First, as stated *supra* 27, WaterLegacy supports the EPA’s recommendation that the final Keetac mining area permit specifically prohibit “point source discharges to waters of the United States through ground water that are the functional equivalent of direct discharges.”

Second, because “environment” is not defined in the permits, WaterLegacy suggests in light of the Minnesota Supreme Court decision enforcing prohibitions on discharge into groundwater, *In re NorthMet NPDES/SDS Permit*, 993 N.W.2d at 664, *supra* 30, that the paragraphs pertaining to unauthorized releases be clarified to specifically include “discharges into the saturated or unsaturated zone of groundwater.”

Third, WaterLegacy recommends that MPCA revise provisions in the draft Keetac permit for the tailings basin that seem to authorize surface drainage outside authorized outfalls, while providing no monitoring or actionable steps to prevent that surface drainage from causing or contributing to exceedance of surface water quality standards.

MPCA acknowledges that “[s]urface drainage from the tailings basin area, in the form of surface run-off from the exterior dikes, flows to the West Swan River, unnamed wetlands, Hay Creek to Swan Lake, Reservoir 2, Reservoir 2 North and Welcome Creek.” TB Permit at 4. MPCA and the courts have agreed that the wild rice sulfate standard must apply to surface seepage from a tailing basin dam exterior. *In re Reissuance of NPDES/SDS Permit to U.S. Steel Corp.*, 937 N.W. 2d at 789 (“MPCA states that it ‘would enforce the wild rice sulfate water quality standard by imposing a WQBEL on U.S. Steel’s surface seepage discharges, if applicable.’”).

The draft Keetac permit seems to be addressing surface drainage in stating that the permittee “shall operate and maintain the facility and shall control runoff, including stormwater, from the facility to prevent the exceedance of water quality standards specified in Minnesota Rules, chs. 7050 and 7060.” TB Permit at 28 (5.28.284). This provision should be clarified to include “surface seepage” as well as “run-off.”

The permit requirement for “capping” when “necessary to minimize pollutant discharges,” *id.* at 33 (5.28.325), also seems to be an attempt to address surface seepage as well as run-off. To make this provision actionable and protective, the final Keetac permit should require monthly inspections of the tailings dam perimeter and identification and monitoring of areas where surface

seepage or run-off flow is detected. The final permit should also set specific flow thresholds for surface drainage, including seepage or run-off, that require action to cap or collect and treat surface drainage to ensure compliance with numeric and narrative water quality standards.

#### **8. MPCA Should Identify all Impaired Waters Potentially Affected by Keetac Discharge and Consider all Benefits of Controlling Sulfate Pollution.**

Applying wild rice sulfate WQBELs to Hay Lake to address direct surface discharge is a critical objective for the Keetac permits. However, WaterLegacy believes that final Keetac permits and fact sheets should also recognize the adverse effects of excess sulfate on water quality, aquatic life and human health. Peer-reviewed literature authored by UMN and MPCA scientists in 2017 found that increasing sulfate could double release of nitrogen and phosphorus from sediments, double the release of mercury from sediments, and increase mercury methylation nearly six-fold.<sup>59</sup>

Release of sulfate through outfalls, groundwater, and surface drainage could indirectly result in impairments for fish consumption due to mercury in fish tissue and impairment of aquatic life. In addition, release of sulfate, ionic pollutants, or metals could cause impairments of receiving and downstream waters.

WaterLegacy requests that MPCA identify all potentially affected impaired waters, including but not limited to the following:

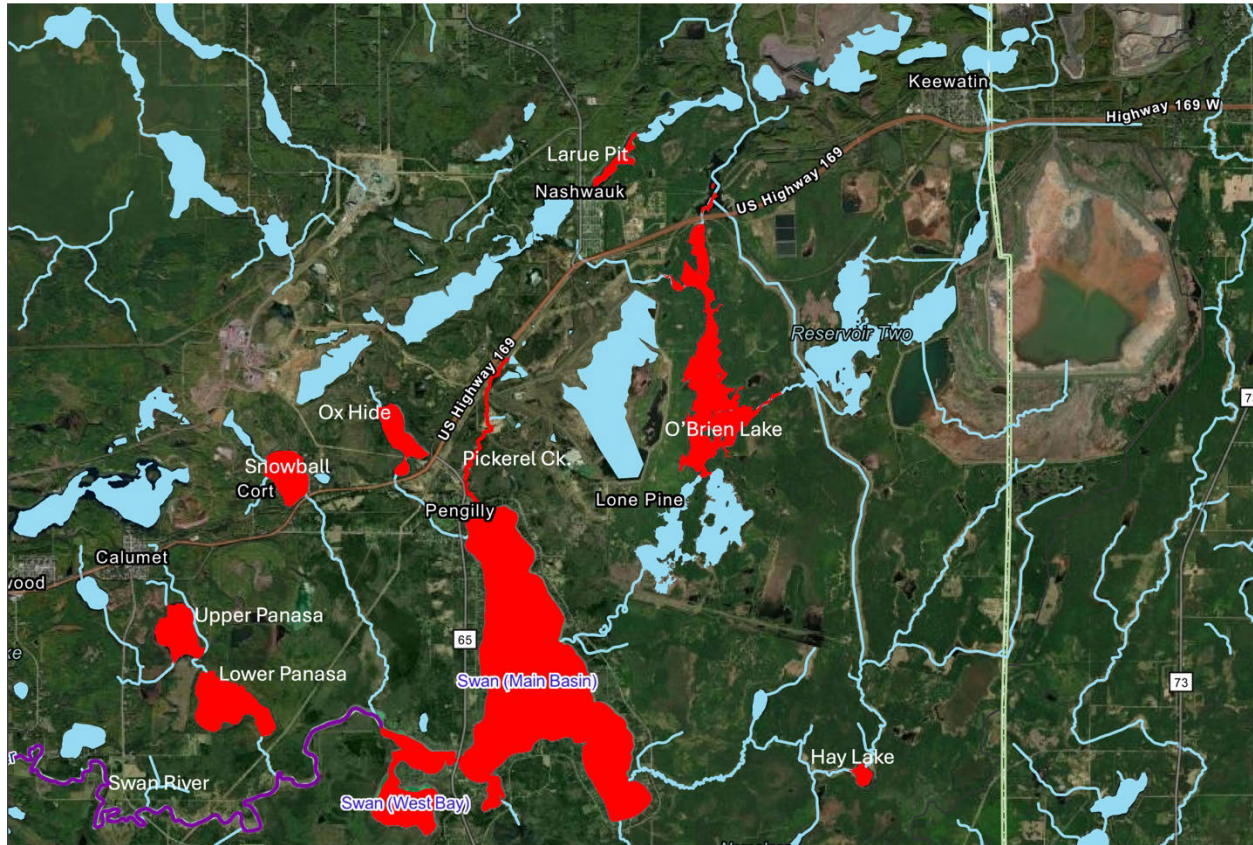
| <b>Waterbody</b>          | <b>ID#</b>   | <b>Impairment</b>                                            |
|---------------------------|--------------|--------------------------------------------------------------|
| Hay Lake                  | 31-0037-00   | Sulfate - wild rice                                          |
| O'Brien Lake (North)      | 31-0032-01   | Mercury - fish consumption                                   |
| O'Brien Lake South        | 31-0032-02   | Mercury - fish consumption                                   |
| Swan Lake (Main Basin)    | 31-0067-02   | Mercury - fish consumption                                   |
| Swan Lake (Southwest Bay) | 31-0067-03   | Sulfate - wild rice                                          |
| Swan Lake (West Basin)    | 31-0067-01   | Mercury - fish consumption                                   |
| Swan River                | 07010103-753 | Sulfate - wild rice<br>Mercury - fish consumption<br>E. coli |

As shown by MPCA data, levels of mercury in fish tissue in both Swan Lake and O'Brien Lake have been measured at more than twice the safe level set in Minnesota water quality standards<sup>60</sup> in order to protect the health of humans who consume fish.

<sup>59</sup> Myrbo A, Swain EB, Johnson NW, Engstrom DR, Pastor J, Dewey B, Monson P, Brenner J, Dykhuizen Shore M, Peters EB (2017) Increase in nutrients, mercury, and methylmercury as a consequence of elevated sulfate reduction to sulfide in experimental wetland mesocosms. *J. Geophysical Research: Biogeosciences* 10.1002: 2769-85, Exhibit 34 at 2774, Table 1.

<sup>60</sup> MPCA Allfish (mercury in fish tissue) data for O'Brien Lake, O'Brien Reservoir, and Swan Lake, through January 19, 2024, Exhibit 35. Average concentration is more than twice the 0.2 parts per million (mg/kg) mercury in edible fish tissue limit in Minn. R. 7050.0220, subp. 5a(B)(12).

The map below<sup>61</sup> shows the above impaired waters, along with other impaired waters in proximity to the Keetac mining area and tailings basin that may be affected primarily by other mining facilities.



MPCA's final Keetac permits should identify and consider impacts to all pertinent impaired waters—along with the loss of beneficial use of wild rice in Hay Lake—to support additional analysis and control of pollution. This broader analysis may also make it more difficult for opponents of compliance to trivialize the requirement that U.S. Steel Keetac facilities comply with the wild rice sulfate standard reflected in effluent limitations in the draft Keetac permits and MPCA's preliminary denial of U.S. Steel's application for a variance.

## CONCLUSION

On the basis of the evidence and arguments in these comments, attached exhibits, and documents submitted to and prepared by the MPCA, WaterLegacy strongly supports the MPCA in its highly contested permitting decisions related to the Keetac mining area and tailings basin discharge: 1) requiring U.S. Steel (Nippon Steel) to comply with effluent limits of 14 mg/L average and 24 mg/L maximum based on Minnesota's 10 mg/L wild rice sulfate standard; and 2) making the

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<sup>61</sup> Map of Additional Keetac Area Impaired Waters produced from MPCA impaired waters data and other publicly available ArcGIS databases, Exhibit 36.

preliminary determination that U.S. Steel's application for a variance from this standard should be denied.

In addition to providing analysis and materials that support MPCA's draft permits and preliminary determination, WaterLegacy has offered eight recommendations to strengthen protection of surface and groundwater in compliance with state and federal law. We would welcome the opportunity to discuss these recommendations with MPCA staff or to provide any additional references that might be requested.

In the context of scientific investigations, federal oversight, agency progress, and court rulings over the past decade, the Keetac NPDES/SDS permits provide a unique opportunity to set a standard that will remove uncertainty and increase protection of water, wild rice, aquatic life, and human health for decades to come. WaterLegacy respectfully requests that the MPCA embrace this opportunity.

Respectfully submitted,



Paula G. Maccabee

Executive Director and Counsel for WaterLegacy

Enclosure: Exhibit List and Exhibits 1-36 are enclosed with these comments.

cc: Sent by electronic mail with link to Exhibits  
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WaterLegacy September 22, 2025 Comments on U.S. Steel Corp NPDES/SDS Permits for Keetac Mining Area (MN0031879) and Keetac Tailings Basin (MN0055948) and on U.S. Steel Corp Application for Variance from Wild Rice Sulfate Standard

**EXHIBIT LIST**

- Exhibit 1** *Minn. Chamber of Com. v. Minn. Pollution Control Agency*, No. 62-CV-10-1184, 2012 WL 2872026 (Minn. Dist. Ct., 2nd Jud. Dist., May 10, 2012).
- Exhibit 2** MPCA Board Packet *In re U.S. Steel Corp., Minnesota Ore Operations, Keetac NPDES/SDS Permits MN0031879 and MN0055948*, October 14, 2011.
- Exhibit 3** Discharge Monitoring Reports, Bulk Exports for Keetac Permits MN 0031879, MN0055948 Sulfate and Specific Conductance, 2018-2024.
- Exhibit 4** EPA, NEIC Civil Investigation Report, U.S. Steel – Keetac, Keewatin, Minnesota, 55753, October 2022.
- Exhibit 5** EPA, *In re U.S. Steel Corp. Keetac Mining Operations and Tailings Basin*, Notice of Violation, May 15, 2024.
- Exhibit 6** EPA, Letter to C. Bartovich, U.S. Steel Environmental Director, re Notice of Clean Water Act Violations, May 14, 2024.
- Exhibit 7** EPA, Letter to MPCA Commissioner Kessler re Minnesota laws revising MPCA’s authority to regulate sulfate in NPDES permits, Feb. 16, 2022.
- Exhibit 8** MPCA, Denial of U.S. Steel Application for a Sulfate Site-Specific Standard for Hay Lake, February 14, 2024.
- Exhibit 9** MPCA Brief, *In re Sulfate Site-Specific Standard for Hay Lake*, Oct. 11, 2024 (excerpt).
- Exhibit 10** MPCA, Protecting Wild Rice Waters, September 2025.
- Exhibit 11** Moyle JB (1944) Wild rice in Minnesota. *J. Wildlife Management* 8(3):177-84.
- Exhibit 12** LaFond-Hudson S, Johnson NW, Pastor J, Dewey B (2018) Iron sulfide formation on root surfaces controlled by the life cycle of wild rice (*Zizania palustris*). *Biogeochemistry* 141:95-106.
- Exhibit 13** Johnson NW, Pastor J, Swain EB (2019) Cumulative sulfate loads shift porewater to sulfidic conditions in freshwater wetland sediment. *Environmental Toxicology and Chemistry* 38(6):1231-1244.

- Exhibit 14** LaFond-Hudson S, Johnson NW, Pastor J, Dewey B (2020) Interactions between sulfide and reproductive phenology of an annual aquatic plant, wild rice (*Zizania palustris*). *Aquatic Botany* 164:103230.
- Exhibit 15** LaFond-Hudson S, Johnson NW, Pastor J, Dewey B (2022) Sulfur geochemistry destabilizes population oscillations of wild rice (*Zizania palustris*). *J. Geophysical Research Biogeosciences* 10.1029.
- Exhibit 16** Tedrow O, and Lee P (2022) Use of Wild Rice (*Zizania palustris* L.) in paddy-scale bioassays for assessing potential use of mining-influenced water for irrigation. *Mine Water and the Environment* 41:938-953.
- Exhibit 17** U.S. Steel, Application for Sulfate Site-Specific Standard, August 2022 (excerpt).
- Exhibit 18** Hay Lake Porewater Sulfide Monitoring Results Summary and Evaluation Table with MPCA July 2017 SONAR Pages.
- Exhibit 19** Michael Maleska Declaration with Photos taken at Hay Lake on September 7, 2025, and Sketches of Wild Rice Locations at Hay Lake.
- Exhibit 20** Shanai Matteson Declaration with Photos taken at Hay Lake on September 10, 2025.
- Exhibit 21** U.S. Steel Corp., Annual Report Pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934 (Form 10-K) for the fiscal year ended on December 31, 2024.
- Exhibit 22** U.S. Steel Corp., Current Report (Form 8-K) Pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934, June 18, 2025.
- Exhibit 23** Obayashi, Y. (2025, August 28) Nippon Steel bets on \$11 billion investment, tech transfer to lift U.S. Steel profit, *Reuters*.
- Exhibit 24** Lovrien, J. (2024, May 23) Keetac’s new DR-grade plant up and running, *Duluth News Tribune*.
- Exhibit 25** EPA, Comments on Review of Two Draft NPDES Permits, U.S. Steel Keetac Mining Area (MN0031879) and U.S. Steel Keetac Tailings Basin (MN0055948), Keewatin, Minnesota, Sept. 6, 2024.
- Exhibit 26** Johnson BL, Johnson MK, An Evaluation of a Field-Based Aquatic Life Benchmark for Specific Conductance in Northeastern Minnesota, November 2015.
- Exhibit 27** Susan Cormier, EPA ORD, Review of “An Evaluation of a Field-Based Aquatic Benchmark for Specific Conductance in Northeast Minnesota,” Prepared by B. L. Johnson and M. K. Johnson, February 4, 2016.

- Exhibit 28** EPA, Review of Revisions to the Fond du Lac Band of Lake Superior Chippewa’s Water Quality Standards Under Section 303(c) of the Clean Water Act, October 5, 2020.
- Exhibit 29** MPCA, S-5 Implementing the Aquatic Life Narrative Standard, SONAR for Proposed Class 3 and 4 Rule Revisions, December 14, 2020 (excerpt).
- Exhibit 30** EAW, U.S. Steel Keetac Tailings Storage Facility Project, August 7, 2025.
- Exhibit 31** U.S. Steel Corp., Minnesota Ore Operations, Keetac Tailings Basin NPDES/SDS Permit Application, December 2009.
- Exhibit 32** EPA, U.S. Steel’s Minntac Tailings Basin Wastewater Discharge, Functional Equivalent of a Direct Discharge Technical Assistance, July 2023.
- Exhibit 33** Discharge Monitoring Reports, Bulk Exports for Keetac Permit MN0031879, Mercury in scrubber blowdown after treatment, 2018-2024.
- Exhibit 34** Myrbo A, Swain EB, Johnson NW, Engstrom DR, Pastor J, Dewey B, Monson P, Brenner J, Dykhuizen Shore M, Peters EB (2017) Increase in nutrients, mercury, and methylmercury as a consequence of elevated sulfate reduction to sulfide in experimental wetland mesocosms. *J. Geophysical Research: Biogeosciences* 10.1002: 2769-85.
- Exhibit 35** MPCA Allfish (mercury in fish tissue) data for O’Brien Lake, O’Brien Reservoir, and Swan Lake, through January 19, 2024.
- Exhibit 36** Map of Additional Keetac Area Impaired Waters.