

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 19

Michael Maleska Declaration with Photos taken at Hay Lake on September 7, 2025,
and Sketches of Wild Rice Locations at Hay Lake.

MINNESOTA POLLUTION CONTROL AGENCY

Wastewater Permits (NPDES/SDS) for U.S.
Steel Corp. Keetac Mining Facility
(MN0031879), Keetac Tailings Basin Facility
(MN0055948) and Request for Variance

**Declaration of
Michael Maleska**

I, MICHAEL MALESKA, in accordance with section 358.116 of Minnesota Statutes and Rule 15 of the Minnesota Rules of General Practice, declare as follows:

1. I am a lifelong resident of Hibbing, Minnesota.
2. After hearing commenters say that wild rice was thick and thriving on Hay Lake at the hearing on September 3, 2025, I asked two friends to come with me to Hay Lake and find out if this was true. I've been to Hay Lake several times in recent years, and these comments were not consistent with what I'd seen in recent years.
3. On the morning of September 7, 2025, we hiked in to Hay Lake from Highway 16 and took pictures from the shore.
4. We found a canoe and paddle on the shore, and my friends borrowed it and took pictures looking for wild rice. After we took pictures, we returned the canoe and paddle to where we'd found them. The pictures in the Maleska Attachment A collection were all taken on September 7, 2025. In my opinion, they show thin, broken, and unhealthy wild rice with few seed heads.
5. Chris Baldwin is my friend and he shared an aerial photo he took of Hay Lake from a small plane on July 1, 2025. I looked at the Hay Lake photo taken by

Chris and circled in red on one copy where we found the wild rice on September 7, 2025. I sketched in black on another copy of that Hay Lake photo the boundary where I remember wild rice growing 50 years ago. The wild rice used to grow from just offshore to the lines shown on my sketch. The photo of Hay Lake taken by Chris Baldwin in July and the copies with my markings are in Maleska Attachment B.

6. From what I know and what I've seen, wild rice is not thick and thriving on Hay Lake. Whatever wild rice remains, or was recently planted, is thin and unhealthy, and has few good seed heads. You could not harvest that rice.

I declare under penalty of perjury that everything I have stated in this document is true and correct.

Dated: September 18, 2025

s/s Michael Maleska
Michael Maleska

ATTACHMENT A



Hay Lake shore, September 7, 2025



Hay Lake algae, lily pads, and wild rice, September 7, 2025



Hay Lake lily pads and wild rice, September 7, 2025



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



Hay Lake lily pads and wild rice, September 7, 2025



Hay Lake shore, September 7, 2025

ATTACHMENT B



Hay Lake from small plane, photo by Chris Baldwin, July 1, 2025



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

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 20

Shanai Matteson Declaration with Photos taken at Hay Lake on September 10, 2025.

MINNESOTA POLLUTION CONTROL AGENCY

Wastewater Permits (NPDES/SDS) for U.S.
Steel Corp. Keetac Mining Facility
(MN0031879), Keetac Tailings Basin Facility
(MN0055948) and Request for Variance

**Declaration of
Shanai Matteson**

I, SHANAI MATTESON, in accordance with section 358.116 of Minnesota Statutes and Rule 15 of the Minnesota Rules of General Practice, declare as follows:

1. I've lived in rural towns in northern Minnesota most of my life. I grew up in Palisade (Aitkin County) and now live in Itasca County. I harvest wild rice and understand its abundance and value to both Native and non-Native communities. I know what healthy wild rice looks like.
2. I come from a mining family and my grandpa worked in the mines near Keewatin. My grandma told me that they initially lived in a trailer house in Keewatin when my mother was little, but the mine dust was so bad they moved back to Palisade.
3. I was at the hearing on the Keetac permits on September 3, 2025, and heard several commenters say that sulfate pollution wasn't harming wild rice in Hay Lake. Some even said they had riced there this season, and that it was very abundant. I was curious if this talking point was true. I had a dentist appointment in Nashwauk on Wednesday, September 10, 2025, so I decided to visit Hay Lake

and see for myself how the wild rice was doing. I invited a friend to come with me.

4. On September 10, 2025, we hiked in to Hay Lake from Highway 16 and took pictures from the shore and from a canoe.

5. We photographed the wild rice and lily pads from the canoe. The wild rice was thin and looked sick and broken. 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. The pictures attached with this declaration were all taken by my friend and me on September 10, 2025.

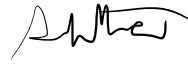
6. This has been a very good year for harvesting wild rice. I've been to other wild rice beds in Minnesota this year where the rice is beautiful, thick, and abundant. The same day my friend and I took photographs at Hay Lake, we went to the Sandy Lake Flowage in Aitkin County to compare the condition of wild rice at Sandy Lake with wild rice in Hay Lake, downstream of Keetac. The last photograph attached to this declaration is an image of lush, healthy, productive wild rice at the Sandy Lake Flowage on September 10, 2025.

7. Hay Lake wild rice downstream of the Keetac mine and tailings basin sulfate discharge is not healthy or productive. It is sick and broken. I saw no wild rice that would support wildlife and certainly none that people could harvest.

8. I declare under penalty of perjury that everything I have stated in this

document is true and correct.

Dated: September 19th, 2025

A handwritten signature in black ink, appearing to read 'Shanai Matteson', written above a horizontal line.

Shanai Matteson



Hay Lake wild rice on September 10, 2025



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



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



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

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 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.

2024
UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549
FORM 10-K

(Mark One)

- ☒ **ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**
For the Fiscal Year Ended December 31, 2024
Or
☐ **TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**
For the transition period from _____ to _____
Commission file number 1-16811



United States Steel Corporation
(Exact name of registrant as specified in its charter)

Delaware **25-1897152**
(State or other jurisdiction of incorporation) (I.R.S. Employer Identification No.)

600 Grant Street, Pittsburgh, PA 15219-2800
(Address of principal executive offices) (Zip Code)

Registrant's telephone number, including area code: (412) 433-1121
Securities registered pursuant to Section 12(b) of the Act:

Title of Each Class	Trading Symbol(s)	Name of Exchange on which Registered
United States Steel Corporation Common Stock, par value \$1.00	X	New York Stock Exchange
United States Steel Corporation Common Stock, par value \$1.00	X	Chicago Stock Exchange

Securities registered pursuant to Section 12(g) of the Act: None

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. Yes ☒ No ☐

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Act. Yes ☐ No ☒

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15 (d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes ☒ No ☐

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T (\$232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit such files). Yes ☒ No ☐

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, a smaller reporting company, or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company," and "emerging growth company" in Rule 12b-2 of the Exchange Act.

Large accelerated filer ☐ Accelerated filer ☒ Non-accelerated filer ☐ Smaller reporting company ☐ Emerging growth company ☐

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act. ☐

Indicate by check mark whether the registrant has filed a report on and attestation to its management's assessment of the effectiveness of its internal control over financial reporting under Section 404(b) of the Sarbanes-Oxley Act (15 U.S.C. 7262(b)) by the registered public accounting firm that prepared or issued its audit report. ☒

If securities are registered pursuant to Section 12(b) of the Act, indicate by check mark whether the financial statements of the registrant included in the filing reflect the correction of an error to previously issued financial statements. ☐

Indicate by check mark whether any of those error corrections are restatements that required a recovery analysis of incentive-based compensation received by any of the registrant's executive officers during the relevant recovery period pursuant to §240.10D-1(b). ☐

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Act). Yes ☐ No ☒

Aggregate market value of Common Stock held by non-affiliates as of June 30, 2024, (the last business day of the registrant's most recently completed second fiscal quarter): \$8.5 billion. The amount shown is based on the closing price of the registrant's Common Stock on the New York Stock Exchange composite tape on that date. Shares of Common Stock held by executive officers and directors of the registrant are not included in the computation. However, the registrant has made no determination that such individuals are "affiliates" within the meaning of Rule 405 under the Securities Act of 1933.

There were 225,216,524 shares of United States Steel Corporation Common Stock outstanding as of January 27, 2025.

Documents Incorporated by Reference:

Portions of the Proxy Statement for the 2025 Annual Meeting of Stockholders are incorporated into Part III.

INDEX

	<u>FORWARD-LOOKING STATEMENTS</u>	<u>3</u>
<u>PART I</u>		
Item 1.	<u>BUSINESS</u>	<u>4</u>
Item 1A.	<u>RISK FACTORS</u>	<u>23</u>
Item 1B.	<u>UNRESOLVED STAFF COMMENTS</u>	<u>34</u>
Item 1C.	<u>CYBERSECURITY</u>	<u>34</u>
Item 2.	<u>PROPERTIES</u>	<u>36</u>
Item 3.	<u>LEGAL PROCEEDINGS</u>	<u>41</u>
Item 4.	<u>MINE SAFETY DISCLOSURE</u>	<u>44</u>
	<u>INFORMATION ABOUT OUR EXECUTIVE OFFICERS</u>	<u>44</u>
<u>PART II</u>		
Item 5.	<u>MARKET FOR REGISTRANT'S COMMON EQUITY, RELATED STOCKHOLDER MATTERS AND ISSUER PURCHASES OF EQUITY SECURITIES</u>	<u>45</u>
Item 6.	<u>RESERVED</u>	<u>46</u>
Item 7.	<u>MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS</u>	<u>46</u>
Item 7A.	<u>QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK</u>	<u>62</u>
Item 8.	<u>CONSOLIDATED FINANCIAL STATEMENTS AND SUPPLEMENTARY DATA</u>	<u>64</u>
Item 9.	<u>CHANGES IN AND DISAGREEMENTS WITH ACCOUNTANTS ON ACCOUNTING AND FINANCIAL DISCLOSURE</u>	<u>118</u>
Item 9A.	<u>CONTROLS AND PROCEDURES</u>	<u>118</u>
Item 9B.	<u>OTHER INFORMATION</u>	<u>118</u>
Item 9C.	<u>DISCLOSURE REGARDING FOREIGN JURISDICTIONS THAT PREVENT INSPECTIONS</u>	<u>118</u>
<u>PART III</u>		
Item 10.	<u>DIRECTORS, EXECUTIVE OFFICERS AND CORPORATE GOVERNANCE</u>	<u>118</u>
Item 11.	<u>EXECUTIVE COMPENSATION</u>	<u>119</u>
Item 12.	<u>SECURITY OWNERSHIP OF CERTAIN BENEFICIAL OWNERS AND MANAGEMENT AND RELATED STOCKHOLDER MATTERS</u>	<u>119</u>
Item 13.	<u>CERTAIN RELATIONSHIPS AND RELATED TRANSACTIONS, AND DIRECTOR INDEPENDENCE</u>	<u>119</u>
Item 14.	<u>PRINCIPAL ACCOUNTANT FEES AND SERVICES</u>	<u>119</u>
<u>PART IV</u>		
Item 15.	<u>EXHIBITS AND FINANCIAL STATEMENT SCHEDULE</u>	<u>120</u>
	<u>SCHEDULE II</u>	<u>128</u>
Item 16.	<u>10-K SUMMARY</u>	<u>128</u>
	<u>SIGNATURES</u>	<u>129</u>
	<u>GLOSSARY OF CERTAIN DEFINED TERMS</u>	<u>130</u>

FORWARD-LOOKING STATEMENTS

This report contains information regarding the Company that may constitute “forward-looking statements,” as that term is defined under the Private Securities Litigation Reform Act of 1995 and other securities laws, that are subject to risks and uncertainties. We intend the forward-looking statements to be covered by the safe harbor provisions for forward-looking statements in those sections. Generally, we have identified such forward-looking statements by using the words “believe,” “expect,” “intend,” “estimate,” “anticipate,” “project,” “target,” “forecast,” “aim,” “should,” “plan,” “goal,” “future,” “will,” “may” and similar expressions or by using future dates in connection with any discussion of, among other things, statements expressing general views about future operating or financial results, operating or financial performance, trends, events or developments that we expect or anticipate will occur in the future, anticipated cost savings, potential capital and operational cash improvements and changes in the global economic environment, anticipated capital expenditures, the construction or operation of new or existing facilities or capabilities and the costs associated with such matters, statements regarding our greenhouse gas emissions reduction goals, as well as statements regarding the merger between the Company and Nippon Steel Corporation (the “Merger”), including the timing of the completion of the Merger. However, the absence of these words or similar expressions does not mean that a statement is not forward-looking. Forward-looking statements include all statements that are not historical facts, but instead represent only the Company’s beliefs regarding future goals, plans and expectations about our prospects for the future and other events, many of which, by their nature, are inherently uncertain and outside of the Company’s control. It is possible that the Company’s actual results and financial condition may differ, possibly materially, from the anticipated results and financial condition indicated in these forward-looking statements. Management of the Company believes that these forward-looking statements are reasonable as of the time made. However, caution should be taken not to place undue reliance on any such forward-looking statements because such statements speak only as of the date when made. In addition, forward looking statements are subject to certain risks and uncertainties that could cause actual results to differ materially from the Company’s historical experience and our present expectations or projections. Risks and uncertainties include without limitation: the ability of the parties to consummate the Merger on a timely basis or at all; the occurrence of any event, change or other circumstances that could give rise to the termination of the definitive agreement and plan of merger relating to the Merger (the “Merger Agreement”); risks arising from litigation related to the Merger, either brought by or against the parties; the risk that the parties to the Merger Agreement may not be able to satisfy the conditions to the Merger in a timely manner or at all; risks related to disruption of management time from ongoing business operations due to the Merger and related litigation; certain restrictions during the pendency of the Merger that may impact the Company’s ability to pursue certain business opportunities or strategic transactions; the risk that any announcements relating to the Merger could have adverse effects on the market price of the Company’s common stock; the risk of any unexpected costs or expenses resulting from the Merger; the risk that the Merger and its announcement could have an adverse effect on the ability of the Company to retain customers and retain and hire key personnel and maintain relationships with customers, suppliers, employees, stockholders and other business relationships and on its operating results and business generally; and the risk the pending Merger could distract management of the Company. The Company directs readers to Item 1A of this Annual Report on Form 10-K, and the other documents it files with the SEC for other risks associated with the Company’s future performance. These documents contain and identify important factors that could cause actual results to differ materially from those contained in the forward-looking statements. All information in this report is as of the date above. The Company does not undertake any duty to update any forward-looking statement to conform the statement to actual results or changes in the Company’s expectations whether as a result of new information, future events or otherwise, except as required by law.

References in this Annual Report on Form 10-K to (i) “U. S. Steel,” “the Company,” “we,” “us” and “our” refer to United States Steel Corporation and its consolidated subsidiaries unless otherwise indicated by the context, (ii) “Big River Steel” refers to Big River Steel Holdings LLC and its direct and indirect subsidiaries unless otherwise indicated by the context and (iii) “Transtar” refers to Transtar LLC and its direct and indirect subsidiaries unless otherwise indicated by the context.

Non-Generally Accepted Accounting Principles (non-GAAP) Financial Measures

This report contains the non-GAAP financial measure cash conversion cycle. We believe the cash conversion cycle is a useful measure in providing investors with information regarding our cash management performance and is a widely accepted measure of working capital management efficiency. The cash conversion cycle should not be considered in isolation or as an alternative to other Generally Accepted Accounting Principles (GAAP) metrics as an indicator of performance.

PART I

Item 1. BUSINESS

United States Steel Corporation, with operations in the United States of America and Central Europe, is a steelmaker that is pursuing a customer-centric, competitive, Best for All[®], differentiated strategy by investing in our competitive advantages. We are executing on our strategy by investing where we have distinct cost and capability advantages so that we are a superior steel solutions provider for our customers. By offering the new steels that our customers are increasingly demanding, we aim to achieve world-competitive positioning in strategic, high-margin end markets and deliver high-quality, value-added products and innovative solutions utilizing a lower carbon footprint than previously available through our traditional integrated steelmaking model.

U. S. Steel has annual raw steel production capability of 25.4 million net tons (20.4 million tons in North America and 5.0 million tons in Europe). U. S. Steel performs a wide range of applied research, development and technical support functions at facilities in Pennsylvania, Michigan, Texas and Slovakia. U. S. Steel supplies customers throughout the world primarily in the automotive, construction, consumer (packaging and appliance), electrical, industrial equipment, service center/distribution, structural tubing and energy (oil country tubular goods (OCTG) and line pipe) markets. According to the worldsteel Association's latest published statistics, U. S. Steel is the third largest U.S. based steel producer and the twenty-fourth largest steel producer in the world. U. S. Steel is a Delaware corporation established in 1901.

Agreement and Plan of Merger with Nippon Steel Corporation

On December 18, 2023, the Company entered into an Agreement and Plan of Merger (such agreement, as it may be amended, modified or supplemented from time to time, the "Merger Agreement") by and among the Company, Nippon Steel North America, Inc., a New York corporation ("Purchaser"), 2023 Merger Subsidiary, Inc., a Delaware corporation and a wholly owned subsidiary of Purchaser ("Merger Sub"), and solely as provided in Section 9.13 therein, Nippon Steel Corporation, a Japanese corporation ("NSC"). Pursuant to the Merger Agreement, and upon the terms and subject to the conditions described therein, Merger Sub will merge with and into the Company, with the Company continuing as the surviving corporation and a wholly owned subsidiary of Purchaser (the "Merger"). On April 12, 2024, the Company obtained the approval of its stockholders required to adopt the Merger Agreement. The Company's stockholders approved the Merger with 98.8% approval of shares voted, satisfying a condition to closing. Subject to the terms and conditions set forth in the Merger Agreement, each share of the Company's common stock, par value \$1.00 per share, outstanding immediately prior to the effective time of the Merger (the "Effective Time") will, at the Effective Time, automatically be converted into the right to receive \$55.00 per share in cash, without interest, subject to any required tax withholding. The parties have substantially complied with the Second Requests issued on April 3, 2024 and the statutory waiting period under the Hart-Scott-Rodino Antitrust Improvements Act of 1976 has now expired. In addition, all required regulatory approvals outside of the United States related to the Merger have been received. The closing conditions to the Merger include clearance by the Committee on Foreign Investment in the United States ("CFIUS") under the Defense Production Act of 1950, as amended. Following referral of the transaction by CFIUS to the President of the United States, on January 3, 2025, the President of the United States issued an order prohibiting the Merger and requiring the parties to abandon the Merger Agreement within thirty days. On January 10, 2025, CFIUS granted an extension of that deadline to June 18, 2025.

On January 6, 2025, the Company, NSC and Purchaser jointly filed a lawsuit in the United States Court of Appeals for the District of Columbia Circuit alleging that the President's order blocking the Merger was issued for purely political reasons, which are irrelevant to U.S. national security, challenging the decision by the President of the United States and the CFIUS process as violating the constitutional due process rights of the Company, NSC and Purchaser, as well as the applicable statute governing CFIUS and the Administrative Procedure Act, and as an exercise of power that exceeded the authority provided to the President of the United States under the applicable statute. On the same day, the Company, NSC and Purchaser also filed a lawsuit in the United States District Court for the Western District of Pennsylvania against Cleveland-Cliffs Inc. ("Cliffs"), Cliffs' Chief Executive Officer Lourenco Goncalves, and the President of the United Steel, Paper and Forestry, Rubber, Manufacturing, Energy, Allied Industrial and Service Workers International Union (the "USW"), David McCall, for engaging in a coordinated series of anticompetitive and racketeering activities illegally designed to prevent any party other than Cliffs from acquiring the Company as part of an illegal campaign to monopolize critical domestic steel markets.

Segments

U. S. Steel has four reportable segments: North American Flat-Rolled (Flat-Rolled), Mini Mill, U. S. Steel Europe (USSE) and Tubular Products (Tubular). The Tubular segment includes the electric arc furnace at our Fairfield Tubular Operations in Fairfield, Alabama. The Other category includes the results of our real estate business.

Flat-Rolled

The Flat-Rolled segment includes the operating results of U. S. Steel's integrated steel plants and equity investees in North America involved in the production of slabs, strip mill plates, sheets and tin mill products, as well as all iron ore, direct reduced grade pellets, pig iron, and coke production facilities in the United States. These operations primarily serve North American

customers in the automotive, appliance, construction, container, pipe and tube, sheet converter, solar, industrial equipment and service center markets.

During 2024, Flat-Rolled had aggregate annual raw steel production capability of 13.2 million tons at our Gary Works, Mon Valley Works, and Granite City Works facilities. Raw steel production was 8.4 million tons in 2024, 9.4 million tons in 2023, and 8.8 million tons in 2022. Raw steel production averaged 63 percent of capability in 2024, 71 percent of capability in 2023, and 67 percent of capability in 2022.

Mini Mill

The Mini Mill segment includes the operating results of U. S. Steel's Big River Steel facility and a second mini mill facility, Big River Steel 2 (Big River 2 or BR2), which produced its first coil in October 2024. Both facilities are located in Osceola, Arkansas. The Mini Mill segment produces hot-rolled, cold-rolled, coated sheets and electrical steels. This operation primarily serves North American customers in the automotive, construction, pipe and tube, sheet converter, electrical, solar, industrial equipment and service center markets.

Mini Mill had aggregate annual raw steel production capability of 3.3 million tons at our Big River Steel facility through the third quarter of 2024, which increased to 6.3 million tons at our Big River Steel and BR2 facilities during the fourth quarter of 2024. Raw steel production was 2.8 million tons in 2024, 3.0 million tons in 2023, and 2.7 million tons in 2022. Raw steel production averaged 80 percent of capability in 2024, 89 percent of capability in 2023, and 80 percent of capability in 2022.

European Operations

The USSE segment includes the operating results of U. S. Steel Košice (USSK), U. S. Steel's integrated steel plant and coke production facilities in Slovakia, and its subsidiaries. USSE conducts its business mainly in Central and Western Europe and primarily serves customers in the European transportation (including automotive), construction, container, appliance, electrical, service center, conversion and oil, gas and petrochemical markets. USSE produces and sells slabs, hot-rolled, cold-rolled, hot-dip galvanized, and color-coated coils, electrical steel, strip mill plate, sheet, tin mill products and spiral welded pipe.

USSE has annual raw steel production capability of 5.0 million tons. USSE's raw steel production was 3.8 million tons in 2024, 4.4 million tons in 2023, and 3.8 million tons in 2022. USSE's raw steel production averaged 77 percent of capability in 2024, 88 percent of capability in 2023, and 77 percent of capability in 2022.

Tubular

The Tubular segment includes the operating results of U. S. Steel's tubular production facilities and an equity investee in the United States. These operations can produce and sell rounds, seamless and electric resistance welded (ERW) steel casing and tubing (commonly known as OCTG), and standard and line pipe and mechanical tubing and primarily serve customers in the oil, gas and petrochemical markets. U. S. Steel Tubular Products LLC (USSTP), a wholly owned subsidiary of U. S. Steel, designs and develops a range of premium and semi-premium connections to address our customers' needs. The Tubular segment has annual raw steel production capability of 900 thousand tons. Raw steel production was 575 thousand tons in 2024, 568 thousand tons in 2023, and 634 thousand tons in 2022. Raw steel production averaged 64 percent of capability in 2024, 63 percent of capability in 2023, and 70 percent of capability in 2022. Tubular has total production capability of 1.9 million tons.

For further information, see "Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations" and Note 4 to the Consolidated Financial Statements.

Steel Shipments by Market and Segment

The following table, except as noted in Footnote 1 below, does not include shipments to end customers by joint ventures and other equity investees of U. S. Steel. Shipments of materials to these entities are included in the “Further Conversion – Joint Ventures” market classification. During 2024, sales to one customer of the Flat-Rolled segment were approximately \$2.0 billion which exceeded 10 percent of U. S. Steel’s total consolidated net sales. During 2023 and 2022, no single customer accounted for more than 10 percent of U. S. Steel’s total consolidated net sales.

<i>(Thousands of Tons)</i>	Flat-Rolled	Mini Mill	USSE	Tubular	Total
<u>Major Market – 2024</u>					
Steel Service Centers	1,039	941	877	—	2,857
Further Conversion – Trade Customers	1,709	673	245	—	2,627
– Joint Ventures ⁽¹⁾	193	—	—	—	193
Transportation and Automotive ⁽¹⁾	3,389	14	559	—	3,962
Construction and Construction Products	584	591	1,224	11	2,410
Containers and Packaging	358	6	223	—	587
Appliances and Electrical Equipment	441	82	176	—	699
Oil, Gas and Petrochemicals	—	—	1	465	466
All Other	132	—	273	—	405
TOTAL	7,845	2,307	3,578	476	14,206
<u>Major Market – 2023</u>					
Steel Service Centers	1,506	1,116	848	—	3,470
Further Conversion – Trade Customers	1,940	729	293	—	2,962
– Joint Ventures ⁽¹⁾	211	—	—	—	211
Transportation and Automotive ⁽¹⁾	2,876	17	636	—	3,529
Construction and Construction Products	908	483	1,319	31	2,741
Containers and Packaging	570	1	312	—	883
Appliances and Electrical Equipment	429	78	172	—	679
Oil, Gas and Petrochemicals	—	—	—	447	447
All Other	266	—	319	—	585
TOTAL	8,706	2,424	3,899	478	15,507
<u>Major Market – 2022</u>					
Steel Service Centers	1,128	1,080	839	—	3,047
Further Conversion – Trade Customers	2,163	772	289	—	3,224
– Joint Ventures ⁽¹⁾	256	—	—	—	256
Transportation and Automotive ⁽¹⁾	2,611	20	619	—	3,250
Construction and Construction Products	922	310	1,052	30	2,314
Containers and Packaging	693	13	423	—	1,129
Appliances and Electrical Equipment	416	93	225	—	734
Oil, Gas and Petrochemicals	—	—	3	494	497
All Other	183	—	309	—	492
TOTAL	8,372	2,288	3,759	524	14,943

⁽¹⁾ PRO-TEC automotive substrate shipments are included in the Transportation and Automotive category.

Steel Industry Background and Competition

The global steel industry is cyclical, highly competitive and has historically been characterized by global overcapacity.

U. S. Steel's competitive position may be affected by, among other things, differences among U. S. Steel's and its competitors' cost structure, labor costs, environmental remediation and compliance costs, global capacity, achievement of innovations in new technologies and sustainable products and the existence and magnitude of government support.

U. S. Steel competes with many North American and international steel producers. Competitors include 1) integrated producers, which use iron ore and coke as the primary raw materials for steel production, 2) Electric Arc Furnace (EAF) producers, which primarily use steel scrap and other iron-bearing feedstocks as raw materials and 3) slab re-rollers, who purchase mostly imported, but some domestic, semi-finished products and convert them into sheet products. In addition, other materials, such as aluminum, plastics and composites, compete with steel in several applications. According to worldsteel Association, global steel production in 2024 of approximately 1.88 billion metric tons was consistent compared to 2023. Among the top ten steel producing countries, steel production in China, Japan, the United States, and Russia decreased, while production in India, Germany, and Brazil increased. The top five steel producing countries accounted for approximately 74 percent of the world's steel production in 2024.

See "International Trade" below for a discussion of global overcapacity and the Company's efforts to mitigate the competitive impact.

EAF producers typically require lower capital expenditures for construction and operation of facilities and may have lower total employment costs. Some EAF producers utilize thin slab casting technology to produce flat-rolled products and are increasingly able to compete directly with integrated producers in many flat-rolled product applications previously produced only by integrated steelmakers. Slab re-rollers do not incur the cost of melting steel; their input costs are largely driven by the market price of slabs.

U. S. Steel provides defined benefit pension and/or other post-employment benefits to approximately 55,000 current employees, retirees and their beneficiaries. Many of our competitors do not have comparable retiree obligations. Participation in U. S. Steel's main defined benefit pension plan was closed to new entrants on July 1, 2003 and benefit accruals for all non-represented participants were frozen effective December 31, 2015. Participation in U. S. Steel's retiree medical and life insurance programs for USW-represented employees was closed to employees hired or rehired (except in limited circumstances) on or after January 1, 2016. For non-represented employees, retiree medical benefits were eliminated December 31, 2017, and retiree life insurance benefits were eliminated for those who retired after December 31, 2017.

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 with regard to such competitors will be materially affected by the impact of environmental laws and regulations. However, if future regulations do not recognize that the integrated steel process involves a series of chemical reactions involving carbon that create carbon dioxide (CO₂) emissions without linking these emissions to steel scrap as well, the competitive position of our integrated operations will be adversely impacted compared to mini mills. Our competitive position compared to producers in developing nations such as China, Russia, Brazil and India will be harmed unless such nations require commensurate reductions in CO₂ emissions or there are policies to adjust for the carbon emissions disparities. Competing materials such as plastics may not be similarly impacted. The specific impact on each competitor will vary depending on a number of factors, including the age and location of its operating facilities and its production methods. U. S. Steel is also responsible for remediation costs related to former and present operating locations and disposal of environmentally sensitive materials. Many of our competitors, including North American producers, or their successors, that have been the subject of bankruptcy relief have no or substantially lower liabilities for such environmental remediation matters.

In 2025, we expect additional steelmaking capacity will enter the domestic steel market as competitors' growth projects come on-line or ramp up to full production in North America throughout the year.

Business Strategy

We are executing on our Best for All[®] strategy to provide customers with profitable steel solutions for people and planet. Our strategy is focused on developing quality products and customer process solutions by investing where we have distinct cost or capability competitive advantages. We are expanding our competitive advantages in low-cost iron ore, mini mill steelmaking, and best-in-class finishing assets with innovative solutions and commercial acumen. These competitive advantages are built on a foundation of research, innovation and deep customer relationships. In executing our strategy, we aim to enhance our earnings profile, deliver long-term cash flow through industry cycles and reduce our cost, capital, and carbon intensity. By offering the product capabilities, including the more sustainable steels (steels made with lower greenhouse gas emissions), our customers are increasingly demanding, we can achieve more competitive positioning in strategic, high-margin end markets, and deliver high-quality, sustainable, value-added products and innovative solutions.

Our strategy is informed by our critical success factors, which are the bedrock of the Best for All[®] strategy: (1) Win in Strategic Markets; (2) Move Up the Talent Curve; and (3) Move Down the Cost Curve.

We are focused on strategic markets, where there is the greatest opportunity to provide differentiated, innovative and value-added solutions that will help our customers succeed. We are investing in new technologies to improve our cost position and increase our capabilities, including our mini mill steelmaking and best-in-class finishing capabilities. Beginning in 2021, we began investing nearly \$4 billion in the Mini Mill segment to enhance our finishing and EAF capabilities. In 2023, we completed construction of a 200-thousand-ton, non-grain oriented (NGO) electrical steel line at our Big River Steel facility, which produced its first coil in September 2023, and shipped the first prime coil in early 2024. This construction project was completed on-time and on-budget. Construction of BR2 near Osceola, Arkansas continued throughout 2024 and BR2 produced its first coil in October 2024. This new mini mill has about 3 million tons per year of steelmaking capability and combines two state-of-the-art EAFs with differentiated steelmaking and finishing technology, including endless casting and rolling equipment and an advanced high-strength steel (AHSS) finishing line. Total capital spend for BR2 is expected to be approximately \$3.6 billion. In addition, the construction of a 325-thousand-ton dual Galvalume[®]/galvanized coating line at Big River Steel was completed in the second quarter of 2024. We are enhancing our competitive advantage in low-cost iron ore by expanding this advantage to serve our growing fleet of EAF producers. In our Flat-rolled segment, construction of a direct reduced (DR) grade pellet facility at the Company's Keetac ore operations was completed on-time and on-budget in December 2023. We also completed our 500-thousand-ton, pig iron machine at Gary Works in 2022 and ramped to full run-rate production in 2023. Capital expenditures for strategic projects were \$1.6 billion during the year ended December 31, 2024.

We know that to accomplish our objectives, we also need to continue to move up the talent curve. We are investing in our employees and providing the training and resources they need to succeed. This will help reinforce our culture of caring, where accountability, fairness and respect are foundational, and high performance and inclusion in all its forms are valued and celebrated. See "Human Capital Management" below for additional information on our talent attraction, development, and retention initiatives.

From time to time, U. S. Steel evaluates potential strategic and organizational opportunities, which may include the acquisition, divestiture or consolidation of assets. Given the cyclicity of our industry, we are focused on strategically deploying our capital, in-line with our capital allocation framework, in order to invest in areas consistent with the execution of our Best for All[®] strategy and are considering various possibilities, including exiting lines of business and the sale of certain assets, that we believe would ultimately result in greater stockholder value. The Merger Agreement contains customary limitations on U. S. Steel's ability to engage in such transactions without the consent of Purchaser.

As the Company advances and expands its mini mill capability, it seeks to become better, not bigger and will adjust its footprint accordingly by re-evaluating cost and capability advantages within its evolving footprint. In December 2021 and June 2022, the Company permanently idled the steelmaking and ironmaking operations, respectively, at its Great Lakes Works facility. In addition, in March 2022, the Company permanently idled the finishing facilities at its East Chicago Tin operations, which had been idled on a temporary basis during 2019. The coil finishing process at Great Lakes Works continues to operate and remains a component of the Company's operating plans. In December 2022, the Company indefinitely idled the majority of tin operations at our Gary Works facility. In November 2023, the steel and ironmaking production facilities at Granite City Works were indefinitely idled. The plant continues to process slabs to produce hot-rolled, cold-rolled and coated sheets. Production at USS-UPI, LLC (UPI) was indefinitely idled in December 2023.

Commercial Strategy

Our commercial strategy is focused on providing customer-centric solutions with differentiated and value-added steel products, which includes AHSS such as our newer grades of generation 3 (GEN3) steel, coated sheets for the automotive and appliance industries, electrical steel sheets for the manufacture of motors and electrical equipment, a wide variety of bare, laminated and pre-painted corrosion-resistant sheets for construction and related applications, hot rolled coils used in the production of construction and agricultural-related heavy machinery as well as skelp for line pipe used for energy transmission as well as

extraction, tin mill products for the packaging industry and OCTG pipe, connections, accessories and rig site services for use in drilling for oil and gas. In addition, our portfolio of customers serves a variety of different traditional and emerging industries meeting the needs of numerous markets.

U. S. Steel is committed to leveraging our Best for All[®] strategy to develop and commercialize our low-carbon footprint and high value-add steels for our current and future customers. The Company's current five-year plan includes objectives to develop and commercialize numerous differentiated grades of low-carbon, high rate of recycled-content steels, providing compelling new options for customers in automotive, appliance, industrial equipment, construction, renewable energy and other markets to enhance the sustainability of their products. For example, in April 2021, we announced a new sustainable steel product line, verdeX[™], which is made with up to 90% recycled steel content and a reduced carbon footprint - as much as 70-80% less carbon emissions than traditional integrated steelmaking methods. After launching our verdeX[™] brand of sustainable steel products in 2021, we have worked closely with customers on their own sustainability goals. In 2022, we achieved our first agreements with customers on the sale of verdeX[™] products moving forward, and more agreements have been put in place for use in various industries, setting the stage for increased adoption of verdeX[™] in existing and developing steel products produced by our customers. In 2023, with the completion of the NGO electrical steel line at our Big River Steel facility, the Company began production of its InduX[™] electrical steel products which have the magnetic properties necessary for electric vehicles as well as generators. InduX[™] electrical steel products are wide, ultra-thin, light-weight and infinitely recyclable. In addition, we continue to work with customers in numerous industries to help them implement AHSS solutions in the products they manufacture. While the automotive industry has been most active in the adoption of these products in vehicle platforms, and continues to accelerate the deployment of AHSS solutions in new vehicle launches, U. S. Steel is successfully introducing AHSS in other industries as well. In January 2023, we also enhanced our construction product portfolio by offering a best-in-class warranty of up to 60 years for our Galvalume[®] products, and in October 2023 launched Coastalume[®], the first carbon steel solution designed for use in coastal construction applications, offering a combination of superior corrosion resistance and durability in a more cost-effective product than other widely used options. Most recently, U. S. Steel launched a new coated steel product in September 2024 called ZMAG[™], a product designed to offer more strength, corrosion resistance, and sustainable steel benefits in numerous industries, but developed specifically for the growing solar segment.

We are responsive to our customers' changing needs by developing new steel products and uses for steel that meet their evolving markets and regulatory demands. We have research centers in Munhall, Pennsylvania, Košice, Slovakia, and Houston, Texas, as well as an automotive technology center in Troy, Michigan. The focus of these centers is to engineer new products and to co-create innovative solutions that meet our customers' toughest challenges to reduce carbon emissions, increase strength, improve longevity and serve the needs of their customers.

For automotive customers leveraging AHSS, we commissioned a first of its kind GEN3 hot dipped galvanize line at our PRO-TEC Coating Company (PRO-TEC) joint venture in 2020, and have embedded application engineers at original equipment manufacturers (OEMs) to demonstrate how to best utilize the strong, yet highly formable, cost effective material in body design to meet passenger safety requirements while significantly reducing weight to meet future vehicle fuel efficiency standards.

In our tubular markets, we continue development of premium and semi-premium tubular connections designed for our customers that operate in challenging drilling environments. These connections optimize well construction activities and provide outstanding sealing capabilities for onshore and offshore oil and gas drilling in North America. An example is the USS-TALON HTQ[™], which was introduced in 2020 for customers that are constructing onshore natural gas and oil wells with long laterals requiring best-in-class torque capacity and optimized well-bore clearances.

Commercial Sales of Product

U. S. Steel characterizes sales as contract sales if sold pursuant to an agreement with a defined volume and pricing and a duration of longer than three months, and as spot if sold without a defined volume and pricing agreement, typically three months or less. In 2024, approximately 76 percent, 56 percent, 50 percent and 82 percent of sales by Flat-Rolled, Mini Mill, USSE and Tubular, respectively, were contract sales. Some contract pricing agreements include fixed prices while others are adjusted periodically based upon published prices of steel products or cost components.

Human Capital Management

At U. S. Steel, we are focused on attracting and retaining the top talent needed to support our strategic transformation and meet our customers' evolving needs as a sustainable steel solutions provider. The support and development of our people is foundational to achieving our Best for All[®] strategy. We refer to this strategic talent pillar as "Moving Up the Talent Curve."

Our focus on people extends to our current and future employees. We aim to have an engaged workforce and foster an environment that promotes new ideas and innovation, reflects the communities where we operate, and delivers exceptional customer service. To achieve the Best for All[®] strategy, we must have the "Best from All."

Active Employees as of December 31, 2024

North America	14,341
Slovakia	7,712
Total	22,053

Ethics & Compliance

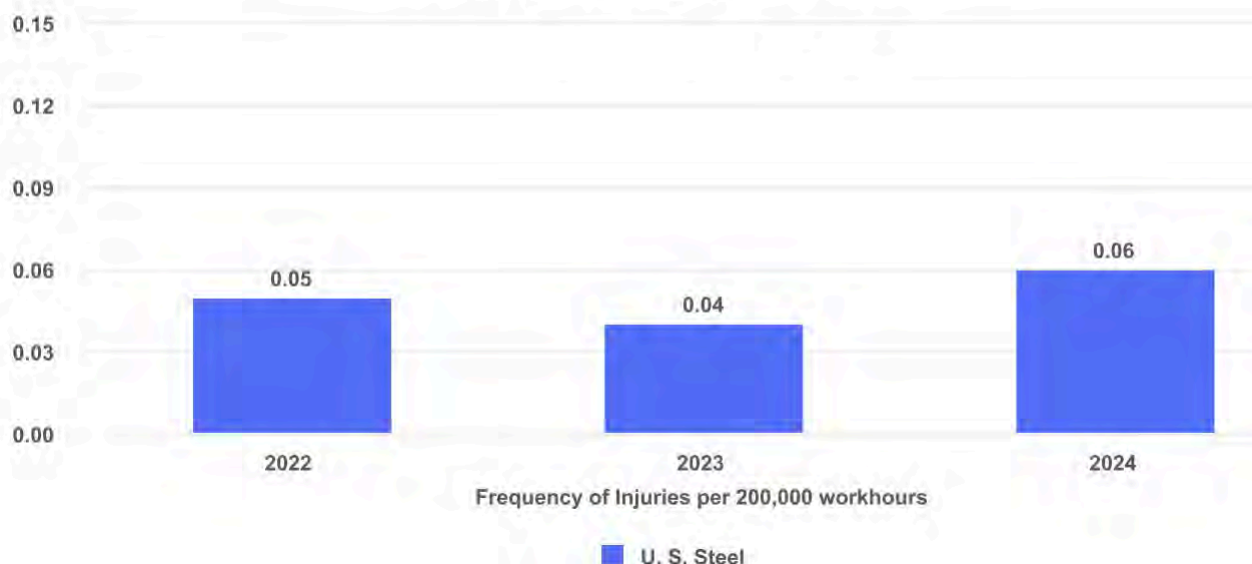
Our culture is based on our S.T.E.E.L. Principles: **S**afety First; **T**rust and Respect; **E**nvironmental Stewardship; **E**xcellence and Accountability; and **L**awful and Ethical Conduct. We expect our employees and members of our board of directors to take personal responsibility to “do what’s right,” and our Code of Ethical Business Conduct serves as the foundation for the actions of our employees and directors. To further ensure that employees understand the Company’s expectations and all applicable rules, we provide annual formal ethics and compliance training to our employees and have frequent communications with information about key compliance topics, which include messages from senior management underscoring the importance of doing business with integrity. Employees also receive summaries of current events that demonstrate the need to do business lawfully and ethically that include reminders of the Company’s expectations for all employees. In addition, through our annual policy certification process, employees of USSK, non-represented employees in the United States, and members of our board of directors certify their ongoing compliance with our Code of Ethical Business Conduct.

Employee Health & Safety

At U. S. Steel, we have a long-standing commitment to the safety and health of every person who works in our facilities. Every employee deserves to return home safely at the end of every day, and we are working to eliminate all injuries and incidents. In addition, the psychological safety of all employees is important to us. We have combined physical safety and psychological safety into the construct of 360° safety. Ensuring a safe workplace also improves productivity, quality, reliability and financial performance. By making safety and health a personal responsibility, our employees are making a daily commitment to follow safe work practices, look out for the safety of co-workers and ensure safe working conditions for everyone. A “Safety First” mindset is as essential to our success as the tools and technologies we rely on to do business.

Our objective is to attain a sustainable zero harm culture supported by leadership and owned by an engaged and highly skilled workforce, empowered with the capabilities and resources needed to assess, reduce and eliminate workplace risks and hazards. In support of these objectives, we have developed an enhanced Safety Management System, initiated new safety communication methods and enhanced contractor safety processes. One of our most important safety protocols is our fatality prevention audit program. These proactive assessments of the processes and protocols we have in place, and adherence to them, to avoid fatalities and severe injuries are conducted annually at the enterprise level and more frequently at each of our facilities. We assess our safety performance through a variety of lagging and leading indicators, including OSHA Days Away From Work (DAFW). This measurement allows us to evaluate the frequency of injuries sustained at our facilities requiring an employee to stay at home for more than one day. U. S. Steel has achieved record-safety performance in this measurement in the last several years, routinely achieving performance better than industry benchmarks.

OSHA Global Days Away From Work (DAFW) Incidence Rates
January 2022 through December 2024



For 2024, we had a corporate DAFW rate of 0.06, which is 10 times better than the U.S. Bureau of Labor Statistics' Iron and Steel benchmark DAFW rate of 0.60.

Talent Attraction, Development and Retention

Attracting, developing, and retaining a workforce of talented people with unique experiences and skillsets is essential to having high-performing teams that drive results for our Company's stakeholders. As part of our commitment to cultivating a culture of caring, we have inclusive benefits available for our U.S. non-represented workforce, including expanded parental leave, back-up dependent care, infertility coverage and healthcare continuation for the families of employees who suffered work-related or military service fatalities. We also support several employee resource groups (ERGs) to enhance employee engagement and promote a culture of belonging. Our ERGs also provide training and education, mentorship and networking opportunities for their members.

We believe that attraction, development and retention of talent is essential to our success, especially in today's competitive labor market. We offer internship programs, partner with universities, community colleges and technical schools, and collaborate with community employment centers and economic development nonprofit organizations to build strong and diverse internal and external sources of potential employees and opportunities for our existing employees' growth and development.

Once at U. S. Steel, we seek to provide opportunities for continuous learning and development. All of our employees at a director-level and above have a formal professional development plan that is assessed at least annually. In addition, we proactively monitor our attrition rates and take targeted actions to ensure our highest potential and performing employees are motivated to remain with the Company. Over the past five years, our regrettable voluntary turnover rate has been at or below 5.5 percent.

We offer a competitive total rewards package of compensation and benefits that we regularly evaluate and benchmark across the manufacturing industry to ensure that we position U. S. Steel as an employer of choice.

Labor Relations

Approximately 80% of our employees in North America and Slovakia are covered by collective bargaining agreements. We work closely with union representatives to provide safe and productive workplaces that enable our employees to deliver high-quality products and meet the needs of our customers. Our relationship with the USW includes not only a commitment to safety programs, but also a common approach to combating the unfairly traded imports that threaten our industry, our company and ultimately the jobs of our employees.

Certain hourly employees of U. S. Steel's flat-rolled, tubular, cokemaking and iron ore operations in the United States are covered by collective bargaining agreements with the USW entered into effective September 1, 2022 (the 2022 Labor Agreements) that expire on September 1, 2026. The 2022 Labor Agreements include a signing bonus for each eligible USW-represented employee and annual 5% wage increases effective September 1, 2022, 2023, 2024, and 2025. The 2022 Labor Agreements also provide for certain increases to pension and retirement benefits, including increases in our defined benefit pension plan, retiree healthcare account contributions, and to the contribution rate to the Steelworkers Pension Trust from \$3.50 to \$4.00 per hour, effective January 1, 2023. During the fourth quarter of 2022, U. S. Steel recorded a charge of approximately \$67 million for the 2022 Labor Agreements signing bonus and related costs.

In addition, as part of the collective bargaining process, U. S. Steel and the USW agreed to leverage the overfunded Other Post-Employment Benefit (OPEB) plans to support the benefits provided to active represented employees. The OPEB plans were modified to allow the Company to utilize a certain amount of surplus assets to pay additional legally permissible benefits previously paid by the Company. The arrangement permits the Company to utilize a target of \$75 million annually for active and retiree employee benefits, with an annual minimum of \$50 million, beginning in 2023 and continuing through December 31, 2026. For additional information, see Note 18 to the Consolidated Financial Statements in Part II Item 8 of this Form 10-K.

Capital Structure, Liquidity and Capital Allocation

Our strategy's primary financial goal is to enhance stockholder value by utilizing our capital structure, liquidity and enhanced capital allocation priorities to advance the Company's strategic objectives, generate long-term value and reward stockholders. Our cash deployment strategy is aligned with our corporate strategy and includes executing on strategic projects and portfolio moves, maintaining a strong balance sheet and a healthy pension plan, and delivering sustainable growth with a focus on core values such as safety and environmental stewardship and rewarding stockholders for the continued progress we make. Cash deployment is also performed with a customer-centric focus on improving safety, our environment, quality, delivery and cost.

Our liquidity supports our ability to satisfy short-term obligations, fund working capital requirements and provides a foundation to execute key strategic priorities. We are focused on maintaining a strong balance sheet and may proactively refinance or repay our debt from time to time to protect our capital structure from unforeseen external events and re-financing risks.

In 2024, we repaid approximately \$128 million in debt, and we ended the year with \$3.62 billion of total liquidity.

On May 18, 2023, U. S. Steel closed on an offering consisting of an aggregate principal amount of \$240 million unsecured Arkansas Development Finance Authority environmental improvement revenue bonds, which carry a green bond designation. The bonds, issued through Arkansas Development Finance Authority, have a coupon rate of 5.700% and carry a final maturity of 2053 (2053 ADFA Green Bonds). U. S. Steel received net proceeds of approximately \$238 million after fees of approximately \$2 million related to the underwriting and third-party expenses and will pay semiannual interest. The net proceeds from the issuance of the 2053 ADFA Green Bonds were used to partially fund work related to the BR2 facility.

The Merger Agreement contains customary limitations on U. S. Steel's ability to incur additional indebtedness without the consent of Purchaser.

On July 25, 2022, following the completion of previously authorized \$800 million share repurchase programs, the Board of Directors authorized a share repurchase program for the repurchase of up to \$500 million of the Company's outstanding common stock from time to time in the open market or privately negotiated transactions at the discretion of management. The Company's share repurchase program does not obligate it to acquire any specific number of shares.

U. S. Steel repurchased 7.1 million shares of its common stock for approximately \$175 million during the year ended December 31, 2023. No share repurchases were completed in 2024, and there is approximately \$126 million remaining under the current stock repurchase authorization. We do not expect to utilize the remainder of this authorization. In addition, the Board of Directors declared quarterly dividends of five cents per common share for each of the quarters in 2024. The Merger Agreement contains a customary prohibition on U. S. Steel's ability to engage in additional share repurchases without the consent of Purchaser.

Facilities and Locations as of December 31, 2024
Location Overview

Flat-Rolled Segment

- 1 Gary Works
- 2 Great Lakes Works
- 3 4 Mon Valley Works
- 5 Granite City Works
- 6 Fairfield Sheet
- 7 Minntac
- 7 Keetac
- 7 Hibbing Taconite

- 8 USS-UP, LLC
- 9 PRO-TEC Coating Company
- 10 Double G Coatings Company
- 1 Chrome Deposit*
- 2 Automotive Center

Mini Mill Segment

- 17 Big River Steel
- 17 Big River Steel 2

Tubular Segment

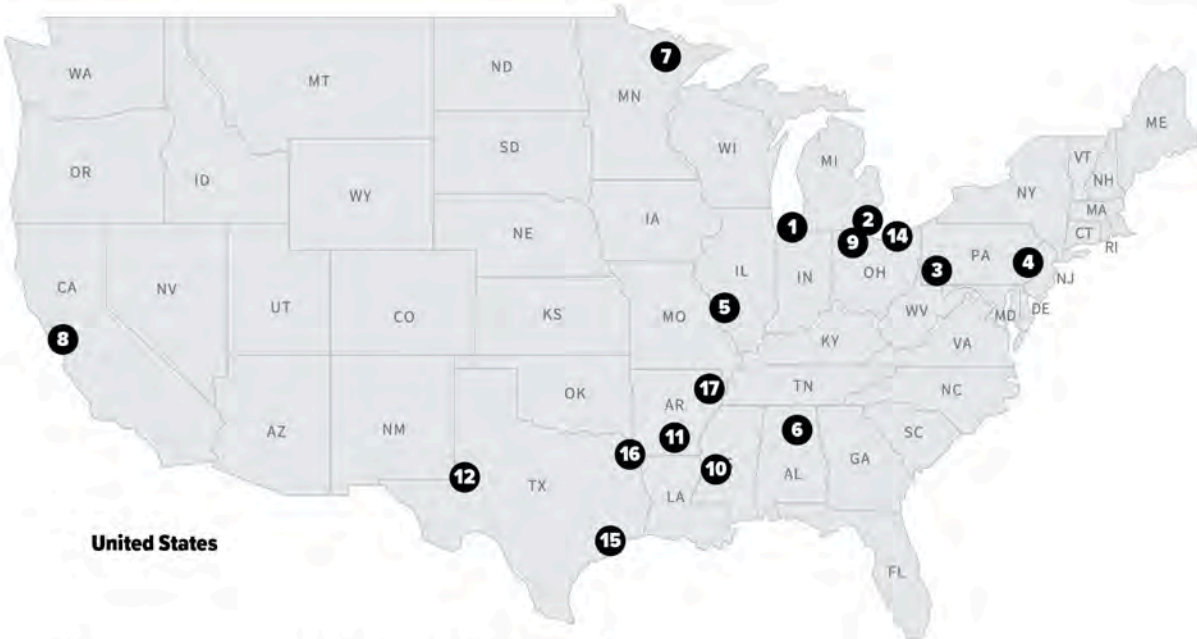
- 6 Fairfield Tubular
- 14 Lorain Tubular
- 15 Offshore Operations Houston
- 16 Lone Star Tubular
- 11 16 Wheeling Machine Products
- 12 Patriot Premium Threading Services

USSE Segment

- 13 U. S. Steel Košice

Administrative and Research

- 3 Corporate Headquarters
- 3 Research and Technology Center
- 15 U. S. Steel Tubular Products Innovation
- 13 USSE Research



United States

*Chrome Deposit locations are near major steel mills and are not reflected on the map above.



Europe

Maps not drawn to scale.

Flat-Rolled

The operating results of all of U. S. Steel's domestic-integrated steel and sheet plants, coke and iron ore operations and ore and sheet production joint ventures are included in Flat-Rolled. Also included within Flat-Rolled is a research and technology center located in Munhall, Pennsylvania (near Pittsburgh) and an automotive technology center in Troy, Michigan. The research and technology center carries out a wide range of applied research, development and technical support functions. The automotive technology center brings automotive sales, service, distribution and logistics services, product technology and applications research into one location and much of U. S. Steel's work in developing new grades of steel to meet the demands of automakers for high-strength, light-weight and formable materials is carried out at this location.

Flat-Rolled Operations Table

Operations, (Property Location)	Annual Production Capability	Principal Products and/or Services
Gary Works , (Gary, Indiana) ^(a)	7.5 million tons of raw steel which includes 0.5 million tons of pig iron capability	strip mill plate in coil; hot-rolled, cold-rolled and coated sheets; tin mill products and pig iron
Midwest , (Portage, Indiana)	finishing facility	hot-rolled, cold-rolled and coated sheets; tin mill products
Great Lakes Works ^(b) , (Ecorse, River Rouge and Dearborn, Michigan)	finishing facility	cold-rolled and coated sheets
Mon Valley Works ^(c) : Edgar Thompson, (Braddock, Pennsylvania), Irvin, (West Mifflin, Pennsylvania), Fairless, (Fairless Hills, Pennsylvania), and Clairton, (Clairton, Pennsylvania)	2.9 million tons of raw steel and 3.6 million tons of coke	hot-rolled, cold-rolled and coated sheets; coke and coke by-products
Granite City Works ^(d) , (Granite City, Illinois)	2.8 million tons of raw steel	hot-rolled, cold-rolled and coated sheets
USS-UPI, LLC (UPI) ^(e) , (Pittsburg, California)	finishing facility	cold-rolled and coated sheets; tin mill products
Fairfield Works , (Fairfield, Alabama)	finishing facility	coated sheets
Minnesota Ore Operations : Minntac, (Mt. Iron, Minnesota) and Keetac, (Keewatin, Minnesota)	22.4 million tons of iron ore pellets which includes 4.0 million tons of DR-grade pellet capability	iron ore pellets and DR (direct reduced) grade pellets

^(a) The majority of tin operations were indefinitely idled as of December 31, 2022. Pig iron is sold on an intercompany basis to Big River Steel and BR2.

^(b) The steel and ironmaking production facilities were permanently idled in December of 2021 and June of 2022, respectively. Great Lakes Works' pickle line, cold mill and CGL continue to operate, while the DESCO and electrolytic galvanizing lines are indefinitely idled.

^(c) From time to time, we may swap coke with other domestic steel producers or sell on the open market. Coke by-products are sold to the chemicals and raw materials industries.

^(d) In November 2023, the steel and ironmaking production facilities at Granite City Works were indefinitely idled. The plant continues to process slabs to produce hot-rolled, cold-rolled and coated sheets.

^(e) In December 2023, production at UPI was indefinitely idled.

Joint Ventures Within Flat-Rolled

U. S. Steel participates in a number of joint ventures that are included in Flat-Rolled, most of which are conducted through subsidiaries. All of these joint ventures are accounted for under the equity method. The significant joint ventures and other investments are described below.

Joint Ventures ^(a) Within Flat-Rolled Table

Joint Venture, (Property Location)	U. S. Steel's Ownership Percentage	Annual Production Capability
Hibbing Taconite Company (Hibbing); (Hibbing, Minnesota)	14.7%	9.0 million tons of which U. S. Steel's share is 1.3 million tons
PRO-TEC Coating Company (PRO-TEC), (Leipsic, Ohio)	50.0%	2.0 million tons ^(b)
Double G Coatings Company (Double G) ^(c) ; Jackson, Mississippi	50.0%	315 thousand tons
Chrome Deposit Corporation (CDC), (six locations near major steel plants)	50.0%	not applicable

^(a) See further information about our equity investees in Note 12 to the Consolidated Financial Statements.

^(b) U. S. Steel's domestic production facilities supply PRO-TEC with cold-rolled sheets and U. S. Steel markets all of PRO-TEC's products.

^(c) Each partner supplies its own steel to Double G and markets what is processed by Double G.

Mini Mill

The operations of Big River Steel and Big River Steel 2 are included in Mini Mill. The Big River Steel and BR2 facilities, located in Osceola, Arkansas, are EAF sheet steel production facilities.

Mini Mill Operations Table

Operations, (Property Location)	Annual Production Capability	Principal Products and/or Services
Big River Steel , (Osceola, Arkansas)	3.3 million tons of raw steel	hot-rolled, cold-rolled and coated sheets; electrical steels
Big River Steel 2 , (Osceola, Arkansas)	3.0 million tons of raw steel	hot-rolled, cold-rolled and coated sheets; electrical steels

USSE

USSE operates in Košice, Slovakia an integrated facility and a research laboratory, which, in conjunction with our Research and Technology Center, supports efforts in coke making, electrical steels, other value-added products and design and instrumentation.

USSE Operations Table

Operations, (Property Location)	Annual Production Capability	Principal Products and/or Services
U. S. Steel Košice , (Košice, Slovakia)	5.0 million tons of raw steel	coke; slabs; strip mill plate: hot, cold and coated sheets; tin mill products; spiral welded pipe

Tubular

Tubular manufactures seamless and welded OCTG, standard pipe, line pipe and mechanical tubing.

Tubular Operations Table

Operations, (Property Location)	Production Capability	Principal Products and/or Services
Fairfield Tubular Operations , (Fairfield, Alabama)	0.9 million tons of raw steel ^(a) and 750 thousand tons of tubular	seamless tubular pipe
Lorain Tubular Operations ^(b) , (Lorain, Ohio)	380 thousand tons of tubular	seamless tubular pipe
Lone Star Tubular ^(b) , (Lone Star, Texas)	#1 electric-weld pipe mill (EWPM) 400 thousand tons and #2 EWPM 380 thousand tons of tubular	welded tubular pipe
Wheeling Machine Products ^(c) , (Pine Bluff, Arkansas and Hughes Springs, Texas)	not applicable	tubular couplings
Offshore Operations , (Houston, Texas)	not applicable	tubular threading, inspection, accessories and storage services and premium connections
Tubular Processing ^(d) , (Houston, Texas)	not applicable	tubular processing

^(a) Based on the rounds caster capacity which is its constraining production unit.

^(b) In April 2020, the Lorain Tubular and Lone Star Tubular operations were indefinitely idled.

^(c) In April 2020, the Wheeling Machine Products at Hughes Springs, Texas was indefinitely idled.

^(d) Tubular Processing has been indefinitely idled since 2015.

Joint Ventures ^(a) Within Tubular Table

Operations, (Property Location)	U. S. Steel's Ownership Percentage	Production Capability	Principal Products and/or Services
Patriot Premium Threading Services , (Midland, Texas)	50%	not applicable	Tubular threading, accessories and premium connections

^(a) See further information about our equity investees in Note 12 to the Consolidated Financial Statements.

Other

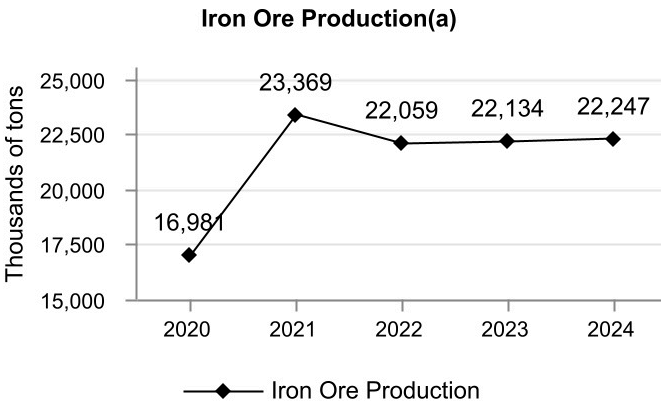
U. S. Steel’s Other category includes the operating results relating to our real estate operations. The Company owns approximately 43,000 acres of real estate assets, either held for development or managed, in Alabama, California, Illinois, Michigan, Minnesota, Ohio, Pennsylvania and Texas.

Raw Materials and Energy

As a predominantly integrated producer, U. S. Steel’s primary raw materials are iron units in the form of iron ore pellets and sinter ore, carbon units in the form of coal and coke (which is produced from coking coal) and steel scrap. For our EAF production, our primary raw material is scrap. U. S. Steel’s raw materials supply strategy consists of acquiring and expanding captive sources of certain primary raw materials and entering into flexible supply contracts for certain other raw materials at competitive market prices that are subject to fluctuations based on market conditions at the time.

The amounts of such raw materials needed to produce a ton of steel will fluctuate based upon the specifications of the final steel products, the quality of raw materials and, to a lesser extent, differences among steel producing equipment. In broad terms, the Company’s integrated steel process consumes approximately 1.4 tons of coal to produce one ton of coke and then it consumes approximately 0.3 tons of coke, 0.3 tons of steel scrap (approximately 60 percent of which is internally generated) and 1.3 tons of iron ore pellets to produce one ton of raw steel. In addition, we consume approximately 10 mmbtu’s of natural gas per ton produced. Generally, the Company’s mini mill operations consume approximately 0.8 tons of steel scrap, 0.3 tons of pig iron, and 0.1 tons of HBI to produce one ton of raw steel. In addition, the mini mill operations consume approximately 0.6 MKWH of electricity per ton of raw steel produced. While we believe that these estimated consumption amounts are useful for planning purposes, and are presented to give a general sense of raw material and energy consumption related to steel production, substantial variations may occur.

Iron Ore



(a) Includes our share of production from Hibbing through December 31, 2024.

The iron ore facilities at Minntac and Keetac contain approximately 900 million short tons of indicated resources and probable reserves and our share of recoverable reserves at the Hibbing joint venture is approximately 4 million short tons. Refer to Mining Properties in Item 2 of this Form 10-K for additional information. Recoverable reserves are defined as the tons of product that can be used internally or delivered to a customer after considering mining and beneficiation or preparation losses. Minntac and Keetac’s annual capability and our share of annual capability for the Hibbing joint venture total approximately 23 million tons. We have iron ore pellet production capability that exceeds our steelmaking capability in the U.S.

We historically have sold iron ore pellets to third parties, including in 2024, 2023, and 2022. The Company has agreements to supply iron ore pellets to third-party customers over the next several years.

All of USSE’s iron ore requirements are purchased from outside sources, primarily Ukrainian mining companies. Prices are determined in long-term contracts with strategic suppliers or as spot prices negotiated monthly or quarterly. We believe that supplies of iron ore adequate to meet USSE’s needs are available at competitive market prices.

During 2024, USSE protected approximately 25 percent of its operation’s iron ore purchases with financial swaps to manage exposure to iron ore price fluctuations.

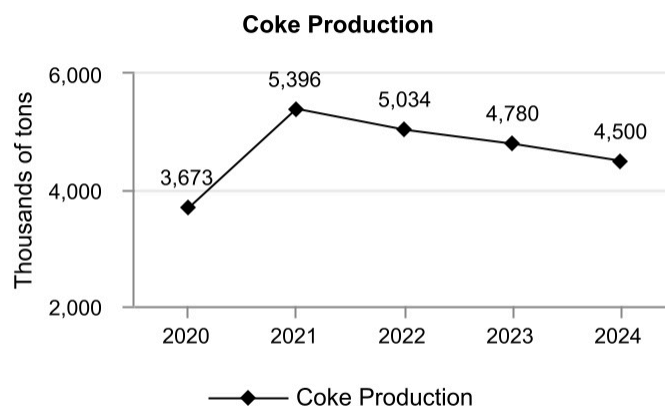
Coking Coal

All of U. S. Steel's coal requirements for our cokemaking facilities are purchased from outside sources. Pricing for Flat-Rolled's coking coal contracts is typically negotiated on a yearly basis, and from time to time we have entered into multi-year agreements for a portion of our coking coal requirements.

Prices for European contracts are negotiated quarterly, annually or determined as index-based prices.

We believe that supplies of coking coal adequate to meet our needs are available from outside sources at competitive market prices. The main source of coking coal for Flat-Rolled is the United States, and sources for USSE include Poland, Ukraine, Canada, Australia and the United States.

Coke



In North America, the Flat-Rolled segment operates a cokemaking facility at the Clairton Plant of Mon Valley Works. At our Granite City Works, we have a coke supply agreement with Gateway that expires on June 30, 2025, with a U. S. Steel option to extend the supply agreement for an additional six months to December 31, 2025. Blast furnace injection of coal, and self-generated coke oven gas is also used to reduce coke usage.

With Flat-Rolled's cokemaking facilities, it has the capability to be nearly self-sufficient with respect to its annual coke requirements at normal operating levels. Coke from time to time has been purchased from, sold to, or swapped with suppliers and other end-users to adjust for production needs and reduce transportation costs.

In Europe, the USSE segment operates cokemaking facilities at USSK. While USSE is self-sufficient for coke at normal operating levels, it periodically purchases coke from Polish and Czech coke producers to meet production needs. Volume and price are negotiated quarterly.

Steel Scrap and Other Materials

We believe that supplies of steel scrap and alloys that are adequate to meet our needs are readily available from outside sources at competitive market prices for the Flat-Rolled, Mini Mill and USSE segments. Generally, approximately 38 percent of our steel scrap requirements were internally generated through normal operations for these segments.

Limestone

All of Flat-Rolled's limestone requirements and USSE's lime and limestone requirements are purchased from outside sources. We believe that supplies of limestone and lime adequate to meet our needs are readily available from outside sources at competitive market prices.

Zinc and Tin

We believe that supplies of zinc and tin required to fulfill the requirements for Flat-Rolled, Mini Mill and USSE are available from outside sources at competitive market prices. For Flat-Rolled and Mini Mill the main sources of zinc are Canada, Mexico and the United States and the main sources of tin are Bolivia, Brazil and Peru. For USSE, the main sources of zinc are Poland and Finland, and the main sources of tin are Peru, Indonesia, and Brazil.

During 2024, Flat-Rolled protected approximately 70 percent of its operation's zinc and tin requirements with financial swap derivatives to manage exposure to zinc and tin price fluctuations. For further information, see Note 16 to the Consolidated Financial Statements.

Natural Gas

All of U. S. Steel's natural gas requirements are purchased from outside sources.

We believe that adequate supplies to meet Flat-Rolled's, Mini Mill's and Tubular's needs are available at competitive market prices. For 2024, approximately 70 percent of our natural gas purchases in Flat-Rolled were based on bids solicited on a monthly basis from various vendors; the remainder were made daily or with term agreements.

We believe that adequate natural gas supplies to meet USSE's needs are available at competitive market prices. During 2024, due to the uncertainty in the energy market, the procurement of natural gas in USSE was based on bids solicited primarily on a quarterly or monthly basis, with the remainder balanced on a daily basis.

Flat-Rolled and USSE use self-generated coke oven and blast furnace gas to reduce consumption of natural gas. USSE uses self-generated coke oven, converter and blast furnace gas to reduce consumption of steam coal that results in lower CO₂ emissions production.

Additionally, Russian supply of natural gas to Europe has decreased significantly in response to enacted sanctions. However, Slovakia has natural gas storage and access to additional supply from other locations including Norway, the U.S. and Africa. Together, these sources are enough to support the country's expected consumption through the 2025 winter season, which includes demand for natural gas for our USSE segment operations.

Industrial Gases

U. S. Steel purchases industrial gas in the U.S. under long-term contracts with various suppliers, with an exception being at our Fairfield Works where the Company's air separation plant provides for the facility's industrial gas needs. USSE owns and operates its own industrial gas facility, but also may purchase industrial gases from time to time from third parties.

International Trade

U. S. Steel continues to face import competition, much of which is unfairly traded and fueled by massive global steel overcapacity, currently estimated to be over 630 million net tons per year—more than six times the entire U.S. steel market and over twenty times total U.S. steel imports. These imports and overcapacity negatively impact the Company's operational and financial performance. U. S. Steel continues to lead efforts to address these challenges that threaten the Company, our workers, our stockholders and our country's national and economic security.

As of the date of this filing, pursuant to a series of Presidential Proclamations issued in accordance with Section 232 of the Trade Expansion Act of 1962, U.S. imports of certain steel products are subject to a 25 percent tariff, except imports from: (1) Argentina, Brazil, and South Korea, which are subject to restrictive quotas; (2) the European Union (EU) that are melted and poured in the EU, within tariff rate quota (TRQ) limits through December 2025; (3) Japan that are melted and poured in Japan within TRQ limits; (4) United Kingdom (UK) that are melted and poured in the UK within TRQ limits; (5) Canada; (6) Mexico, if melted and poured in North America; (7) Ukraine, if melted and poured in Ukraine or the EU, until June 1, 2025; and (8) Australia.

The U.S. Department of Commerce (DOC) is managing a process in which U.S. companies may request and/or oppose temporary product exclusions from the Section 232 tariffs and quotas. U. S. Steel opposes exclusion requests for imported products that are the same as, or substitutes for, products manufactured by U. S. Steel.

Multiple legal challenges to the Section 232 action continue before the U.S. Court of International Trade (CIT) and the U.S. Court of Appeals for the Federal Circuit (CAFC), the latter of which has consistently rejected constitutional and statutory challenges to the Section 232 action. Several challenges to the Section 232 action and retaliation thereto continue at the World Trade Organization (WTO).

Since its implementation in March 2018, the Section 232 action has supported the U.S. steel industry's and U. S. Steel's investments in advanced steel production capabilities, technology, and skills, strengthening U.S. national and economic security. The Company continues to actively defend the Section 232 action.

In February 2019, the European Commission (EC) implemented a definitive safeguard on global steel imports in the form of TRQs that impose 25 percent tariffs on steel imports that exceed the TRQ limit. The EC's safeguard is currently set to expire in June 2026.

Antidumping duties (AD) and countervailing duties (CVD or antisubsidy duties) apply in addition to the Section 232 tariffs, quotas, TRQs and the EC's safeguard, and AD/CVD (antidumping and countervailing duty) orders may continue beyond the Section 232 action and the EC's safeguard. U. S. Steel continues to actively defend and maintain the 69 U.S. AD/CVD orders and 14 EU AD/CVD orders covering U. S. Steel products in multiple proceedings before the DOC, U.S. International Trade Commission (ITC), CIT, CAFC, the EC and European courts, and the WTO.

In May 2024, the ITC voted to continue the AD order on tin mill products from Japan for another five years in the fourth “sunset” review of that order.

Also in May 2024, the EC initiated a new AD investigation on tin plate from China.

In August 2024, the EC initiated new AD investigations on EU imports of hot-rolled steel from Egypt, India, Japan, and Vietnam, with a preliminary decision expected by March 2025.

In September 2024, the DOC initiated new AD/CVD investigations on U.S. imports of corrosion-resistant steel (CORE) from ten countries based on petitions filed by U. S. Steel, Wheeling-Nippon, the USW, Nucor, and Steel Dynamics. On October 18, 2024, the ITC made affirmative preliminary determinations on all ten countries. The DOC will issue preliminary determinations in the first half of 2025.

Additional tariffs of 7.5 to 25 percent continue to apply to certain U.S. imports from China, including certain raw materials used in steel production, semi-finished and finished steel products, and downstream steel-intensive products, pursuant to Section 301 of the Trade Act of 1974. In September 2024, the Office of the United States Trade Representative (USTR) revised certain Section 301 tariffs on U.S. imports from China, including increasing tariffs on steel from 7.5 to 25 percent; batteries from 7.5 to 25 percent; solar cells/modules from 25 to 50 percent; and electric vehicles from 25 to 100 percent.

The United States and EU are currently negotiating a global sustainable steel arrangement to restore market-oriented conditions and address carbon intensity. In June 2023, to inform these ongoing discussions with the EU, USTR requested that the ITC conduct a Section 332 investigation to assess greenhouse gas emissions intensity of steel produced in the United States. The ITC initiated the Section 332 proceeding in July 2023, held a hearing on December 7, 2023, collected information from domestic producers through mid-2024 and will issue a report in the first quarter of 2025. U. S. Steel is actively participating in this Section 332 investigation. In the fourth quarter of 2023, the U.S. agreed to continue the Section 232 TRQs on U.S. imports from Europe through December 2025 and the EU agreed to continue to suspend retaliation on U.S. exports through March 2025.

U. S. Steel will continue to execute a broad, global strategy to maximize opportunities and navigate challenges presented by imports, global steel overcapacity, and international trade law and policy developments.

Environmental Stewardship

U. S. Steel is committed to effective environmental stewardship. We have implemented and continue to develop business practices that are designed to reduce negative environmental impacts of our operations. We believe part of being a good corporate citizen requires a dedicated focus on how our industry affects the environment. We have taken the actions described below in furtherance of that goal. U. S. Steel's environmental expenditures totaled \$354 million in 2024, \$345 million in 2023, and \$334 million in 2022. Overall, environmental compliance expenditures represented approximately 2 percent of U. S. Steel's total costs and expenses in 2024, 2023, and 2022. For further information, see “Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations – Environmental Matters.”

We continue to work on the promotion of cost-effective environmental strategies by supporting the development of appropriate air, water and waste laws and regulations at the local, state, national and international levels. We are committed to reducing our emissions and are investigating, creating and implementing innovative, best practice solutions throughout our operations to improve our environmental performance and to manage and reduce energy consumption.

U. S. Steel's North America operations recycled 4.8 million and 4.9 million tons of purchased and produced steel scrap annually in 2024 and 2023, respectively. USSK recycled approximately 787 thousand tons and 895 thousand tons of produced steel scrap in 2024 and 2023, respectively. Because of steel's physical properties, our products can be recycled at the end of their useful life without loss of quality, contributing to steel's high recycling rate and affordability. In 2024, our North America operations recycled approximately 2.5 million tons of blast furnace slag, 26 thousand tons of Basic Oxygen Process steel slag, and 114 thousand tons of electric arc furnace slag by selling it for use as aggregate and in highway and other construction. In 2024, USSK recycled approximately 1.0 million tons of blast furnace slag, and 287 thousand tons of Basic Oxygen Process steel slag.

Many of our major production facilities have Environmental Management Systems that are certified to the ISO 14001 Standard. This standard, published by the International Organization for Standardization (ISO), provides the framework for the measurement and improvement of environmental impacts of the certified facility.

In 2019, and in each succeeding year since, we published the Clairton Operating and Environmental Report related to our Clairton Plant of Mon Valley Works. While U. S. Steel agreed to publish an annual report as part of the 2019 Allegheny County Health Department Settlement Order and Agreement, we took the opportunity to enhance the report by including detailed descriptions of our operations, our safety and environmental performance and community involvement in order to provide easily accessible information for the public. The report details battery combustion stack and fugitive emission performance at Clairton and Clairton's continued commitment to environmental stewardship. In 2021, we published a similar report for the Edgar Thomson facility.

Reduction of Greenhouse Gas Emissions

In 2019, the Company announced its commitment to reduce greenhouse gas emissions intensity across its global footprint by 20 percent, as measured by the rate of CO₂ equivalents emitted per ton of finished steel shipped, by 2030 based on 2018 baseline levels. Then, in 2021, the Company announced its goal to achieve net-zero emissions by 2050, as measured by the rate of CO₂ equivalents emitted per ton of finished steel shipped. These targets apply to U. S. Steel's global operations.

U. S. Steel plans to achieve its greenhouse gas emissions intensity reduction goals through the execution of multiple initiatives. These include the use of EAF steelmaking technology at U. S. Steel's Fairfield Works, at Big River Steel, the first LEED-certified steel mill in the United States and the first steel mill in North America to receive ResponsibleSteel™ site certification, and at Big River Steel 2. EAF steelmaking primarily relies on recycled scrap, rather than iron ore, to produce new steel products, which is a less carbon intensive process and leverages the ability to continuously recycle steel. Further carbon intensity reductions are expected to come from the implementation of ongoing energy efficiency measures, continued use of renewable energy sources and other process improvements to be developed.

The carbon reduction targets reflect our continued commitment to improvement in production efficiency and the manufacture of products that are environmentally friendly. In addition to a commitment to reduce its own greenhouse gas emissions intensity, U. S. Steel is committed to helping its customers achieve their environmental goals. Our industry-leading XG3™ advanced high-strength steel enables automakers to manufacture lighter weight vehicles that meet federal Corporate Average Fuel Economy (CAFE) standards with reduced carbon emissions. As part of our innovation efforts, we continue to look at new steelmaking technologies so that we can produce steels made with low greenhouse gas emissions intensity (green steels) and further reduce carbon emissions.

Environmental Matters, Litigation and Contingencies

Some of U. S. Steel's facilities were in operation before 1900. Although the Company believes that its environmental practices have either led the industry or at least been consistent with prevailing industry practices, hazardous materials have been and may continue to be released at current or former operating sites or delivered to sites operated by third parties.

Our U.S. facilities are subject to environmental laws applicable in the U.S., including the Clean Air Act (CAA), the Clean Water Act (CWA), the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as well as state and local laws and regulations.

U. S. Steel has incurred and will continue to incur substantial capital, operating and maintenance and remediation expenditures as a result of environmental laws and regulations, related to release of hazardous materials, which in recent years have been mainly for process changes to meet CAA obligations and similar obligations in Europe.

EU Environmental Requirements and Slovak Operations

Phase IV of the EU Emissions Trading System (the EU ETS) commenced on January 1, 2021, and will finish on December 31, 2030. The European Commission issued final approval of the updated 2021-2025 Slovak National Allocation table in February 2022. The Slovak Ministry of Environment allocated 6.2 million metric tons of European Union Emission Allowances (EUA) at no charge (free allowances or free allocation) to USSE in March 2024. As of December 31, 2024, we have pre-purchased approximately 2.22 million EUA totaling €161 million (approximately \$167 million) via spot purchases or settled forwards to cover the 2024 shortfall of emission allowances and expected shortfall in subsequent years.

The EU's Industrial Emissions Directive requires implementation of EU determined best available techniques (BAT) for Iron and Steel production to reduce environmental impacts as well as compliance with BAT associated emission levels. Total capital expenditures for projects to go beyond BAT requirements were €138 million (approximately \$143 million). These costs were partially offset by the EU funding received and may be mitigated over the next measurement periods if USSK complies with certain financial covenants, which are assessed annually. If we are unable to meet these covenants in the future, USSK might be required to provide additional collateral (e.g., bank guarantee) to secure 50 percent of the EU funding received. USSK complied with these covenants as of December 31, 2024, and no additional collateral will be required by the end of June 30, 2025. By this next assessment date, we expect that nine of the fifteen total projects will pass the sustainability monitoring and will be excluded from further assessment to provide additional collateral if the covenants are not met. The last assessment of financial covenants will be performed as of June 30, 2026.

For further discussion of laws applicable in Slovakia and the EU and their impact on USSE, see Note 26 to the Consolidated Financial Statements, "Contingencies and Commitments, Environmental Matters, EU Environmental Requirements."

Minnesota Mining Operations - Water

The State of Minnesota has a sulfate wild rice water quality standard (WQS) set at 10mg/L, which was established in 1973. Since then, industry has been working with the legislature and the Minnesota Pollution Control Agency (MPCA) to reevaluate the environmental protection and science behind the 10 mg/L standard. In 2011, the legislature passed a law requiring MPCA to revise the sulfate standard. MPCA started the process to revise the rulemaking for the sulfate WQS, but it was never completed. During the interim the Keetac National Pollutant Discharge Elimination System (NPDES) permits were issued in November 2011,

with a sulfate standard of 14 mg/L and a compliance schedule. Then in 2015, the Minnesota legislature passed a law that MPCA could not require businesses to expend funds to comply with the sulfate limit until the rulemaking was revised by MPCA as directed by the legislature in 2011. To date the sulfate WQS rulemaking has not been revised.

Keetac has been working to determine the best options to address sulfate. One of the options in process is a site-specific standard (SSS) request to MPCA for Keetac, first applied for in 2014 and then updated in 2022. The SSS presents data specific to the waterbody and explains the actual impact of sulfate. MPCA denied the Keetac SSS based on new agency guidance. U. S. Steel appealed the denial of the SSS and oral argument occurred on January 22, 2025. The United States Environmental Protection Agency (the U.S. EPA) partially rejected the CWA 303(d) list for impaired waters submitted by MPCA for 2021. The MPCA's impaired waters list was in part rejected to add Hay Lake as being impaired for wild rice sulfate. In February 2022, the U.S. EPA Region V sent a letter to MPCA recognizing the conflict between state law and the CWA. In October 2023, MPCA indicated that Dark Lake is now a designated Wild Rice Water, carrying a 10 mg/L sulfate limit. Also in October, MPCA and U. S. Steel entered into a voluntary Sulfate Monitoring Plan related to operational changes with the Keetac DR pellet project. U. S. Steel is currently in discussions with U.S. EPA Region V concerning sulfate compliance at Keetac. This is based upon required monitoring submitted to the MPCA and the interpretation of the WQS for sulfate related to wild rice, even though there is an acknowledged conflict. It is not possible to accurately predict the outcome of this matter at this time.

U. S. Steel is continuing to work to determine the most efficient and effective options to meet the applicable sulfate standards. However, if MPCA does not revise the sulfate standard of 10mg/L for the receiving waters of Keetac or approve the SSS, an impact on mining operations is likely as a result of extensive changes to water collection and treatment that will be required.

New and Emerging Environmental Regulations

United States and European Greenhouse Gas Emissions Regulations

The Phase IV EU ETS period spans 2021-2030 and is divided into two sub periods (2021-2025 and 2026-2030). Currently, the overall EU ETS target is a 40 percent reduction of 1990 emissions by 2030. Free allocation of CO₂ allowances is based on reduced benchmark values and historical levels of production from 2014-2018. Allocations to individual installations may be adjusted annually to reflect relevant increases and decreases in production. The threshold for adjustments is set at 15 percent and is assessed based on a rolling average of two precedent years. In 2023 and 2024, USSK received an allocation for hot metal in the amount corresponding to its historical average, while the allocation for sinter was slightly lower due to lower production.

Lower production in 2019 through 2023 will have an impact on the future free allocation for 2026-2030, where the historical production median for the years 2019-2023 is assessed. During the third quarter of 2024, USSK submitted a request for free allocation for the second sub period 2026-2030 to the European Commission via the Slovak Ministry of Environment. The decision on volume of free allocation is expected at the end of 2025.

In order to achieve the EU political goal of carbon emissions neutrality by 2050, on July 14, 2021, the European Commission released a package of legislative proposals called Fit for 55. The proposals contain significant changes to current EU ETS functions and requirements, including: a new carbon border adjustment mechanism (CBAM) to impose carbon fees on EU imports, further reduction of free CO₂ allowance allocation to heavy industry and measures to strengthen the supply of carbon allowances. The initial phase started on October 1, 2023, with only a reporting obligation without financial impact. The full scale of CBAM will commence on January 1, 2026. CBAM will have an impact on USSK's free allocation starting in 2026 where initial reduction to 97.5% starts until 2035 with no free allocation. Another implication of CBAM is the customs duty that will require USSK to cover all its imports from third parties with CBAM Certificates representing embedded emissions in goods imported. The legislative process is being impacted by the ongoing Russia-Ukraine conflict. The proposals are subject to the EU legislative process, and we cannot predict their future impact.

U. S. Steel continues to monitor emerging regulations on Per- and Polyfluoroalkyl Substances (PFAS). The U.S. EPA has issued regulations on PFAS under several environmental statutes and continues to introduce additional regulations. The Company does not knowingly introduce PFAS in its manufacturing processes, but U. S. Steel continues to review new regulations related to PFAS and their potential impact to the Company.

United States - Air

The CAA imposes stringent limits on air emissions with a federally mandated operating permit program and civil and criminal enforcement sanctions. The CAA requires, among other things, the regulation of hazardous air pollutants through the development and promulgation of National Emission Standards for Hazardous Air Pollutants (NESHAP) and Maximum Achievable Control Technology (MACT) Standards. The U.S. EPA has developed various industry-specific MACT standards pursuant to this requirement. The CAA requires the U.S. EPA to promulgate regulations establishing emission standards for each category of Hazardous Air Pollutants. The U.S. EPA also must conduct risk assessments on each source category that is already subject to MACT standards and determine if additional standards are needed to reduce residual risks.

While our operations are subject to several different CAA rules and categories of NESHAP and MACT standards, the principal impact of these standards on U. S. Steel's operations includes those that are specific to coke making, iron making, steel making

and iron ore processing. The U.S. EPA has several rules under consideration that will impact our operations, as described in the sections below. While many of these rules are not finalized and the impacts are not estimable at this time, the overall cumulative impact could be material.

On July 13, 2020, the U.S. EPA published a Residual Risk and Technology Review rule for the Integrated Iron and Steel MACT category in the Federal Register. Based on the results of the U.S. EPA's risk review, the agency determined that risks due to emissions of air toxics from the Integrated Iron and Steel category are acceptable and that the current regulations provided an ample margin of safety to protect public health. Under the technology review, the U.S. EPA determined that there are no developments in practices, processes or control technologies that necessitate revision of the standards. In September 2020, several petitions for review of the rule, including those filed by the Company, the American Iron and Steel Institute (the AISI), Clean Air Council and others, were filed with the United States Court of Appeals for the D.C. Circuit (D.C. Circuit). The cases were consolidated and are being held in abeyance until the U.S. EPA reviews and responds to administrative petitions for review. The U.S. EPA proposed a revised iron and steel rule on July 31, 2023. U. S. Steel and other entities submitted extensive comments to the U.S. EPA on September 28, 2023. The U.S. EPA signed the final integrated iron and steel rule on March 11, 2024, and it was published in the Federal Register on April 3, 2024. U. S. Steel filed a Petition for Reconsideration with the U.S. EPA and a Petition for Review in the D.C. Circuit challenging the final iron and steel rule on June 6, 2024. U. S. Steel sought a stay of the rule pending the legal challenges. The motion for stay was denied by the D.C. Circuit in November 2024 and parties filed a request for En Banc review on December 6, 2024. Any impacts are not estimable at this time.

For the Taconite Iron Ore Processing category, based on the results of the U.S. EPA's risk review, the agency promulgated a final rule on July 28, 2020, in which the U.S. EPA determined that risks from emissions of air toxics from this source category are acceptable and that the existing standards provide an ample margin of safety. Furthermore, under the technology review, the agency identified no cost-effective developments in controls, practices, or processes to achieve further emissions reductions. Petitions for Review of the rule were filed in the D.C. Circuit, in which the Company and the AISI intervened. The U.S. EPA signed the Taconite Rule on January 31, 2024 and it was published in the Federal Register on March 6, 2024. U. S. Steel filed a Petition for Reconsideration with the U.S. EPA and Petitions for Review with the United States Court of Appeals for the Eighth Circuit and the D.C. Circuit on May 3, 2024, challenging the final Taconite Rule. The Petition for Review is now with the D.C. Circuit and briefing is ongoing. A stay was sought and denied by the D.C. Circuit. Any impacts are not estimable at this time.

The U.S. EPA published the final Coke MACT residual risk and technology rule in the Federal Register on July 5, 2024. The final rule imposes lower emission limits as well as new emission limits and work practices for many emission sources at by-product and heat recovery coke plants. U. S. Steel is reviewing the final version of the rule to determine next steps. On August 30, 2024, the Company, through the American Coke and Coal Chemicals Institute (ACCCI) and Coke Environmental Task Force (COETF), filed a Petition for Review of the coke rule with the D.C. Circuit. On September 3, 2024, the Company separately and jointly with the ACCCI and COETF submitted the Petitions for Reconsideration and Administrative Stay of the final coke rule with the U.S. EPA. The Company through ACCCI and COETF filed a motion to stay the final coke rule with the D.C. Circuit which was denied. Briefing will be in 2025. Any impacts are not estimable at this time.

In response to Court orders that invalidated prior U.S. EPA determinations regarding ozone attainment interference, on April 6, 2022, the U.S. EPA proposed a Federal Implementation Plan (that would replace several pending or disapproved State Implementation Plans) for Regional Ozone Transport for the 2015 Ozone National Ambient Air Quality Standard. The proposed rule would affect electric generating units (EGUs) in 26 states and certain non-EU industries, including, among several others, coke ovens, taconite production kilns, boilers, blast furnaces, basic oxygen furnaces, reheating furnaces, and annealing furnaces in 23 states, including those where U. S. Steel has operations. The U.S. EPA announced the final rule on March 15, 2023. The final rule only included regulation of boilers and reheat furnaces for the iron and steel industry limiting the potential impacts on the Company. U. S. Steel filed an administrative petition for review and a petition for judicial review to the rule on August 4, 2023. The matter remains before the U.S. EPA Administrator (administrative) and the D.C. Circuit (judicial). While U. S. Steel's and others' petitions to stay the effectiveness of the rule were denied by the D.C. Circuit, the Company, as well as other petitioners, have filed applications to stay the effectiveness of the rule with the Supreme Court of the United States (U.S. Supreme Court). The U.S. Supreme Court granted the stay on June 27, 2024. The effective dates of the rule will be stayed during the pendency of the lower court challenges. Litigation in the D.C. Circuit, in which U. S. Steel is a petitioner, remains ongoing. The U.S. EPA requested the D.C. Circuit remand the administrative record, which was granted, and the record was remanded on December 4, 2024. Any impacts are not estimable at this time.

The CAA also requires the U.S. EPA to develop and implement National Ambient Air Quality Standards (NAAQS) for criteria pollutants, which include, among others, particulate matter (PM) - consisting of PM₁₀ and PM_{2.5}, lead, carbon monoxide, nitrogen dioxide, sulfur dioxide (SO₂) and ozone.

In October 2015, the U.S. EPA lowered the NAAQS for ozone from 75 parts per billion (ppb) to 70 ppb. On November 6, 2017, the U.S. EPA designated most areas in which we operate as attainment with the 2015 ozone standard. In a separate ruling, on June 4, 2018, the U.S. EPA designated other areas in which we operate as "marginal nonattainment" with the 2015 ozone standard. On December 6, 2018, the U.S. EPA published a final rule regarding implementation of the 2015 ozone standard. Because no state regulatory or permitting actions to bring the ozone nonattainment areas into attainment have yet to be proposed or developed for U. S. Steel facilities, the operational and financial impact of the ozone NAAQS cannot be reasonably estimated at this time. On December 31, 2020, the U.S. EPA published a final rule pursuant to its statutorily required review of

NAAQS that retains the ozone NAAQS at 70 ppb. In January 2021, New York, along with several states and non-governmental organizations, filed petitions for judicial review of the action with the D.C. Circuit. Several other states and industry trade groups intervened in support of the U. S. EPA's action. The case remains in abeyance before the court as the U.S. EPA voluntarily reconsiders the ozone NAAQS. On January 3, 2024, the U.S. EPA filed an unopposed motion to voluntarily remand without vacatur the 2020 rulemaking. In its motion, the U.S. EPA advised the court that it intends to conduct the voluntary remand simultaneously as it conducts an entirely new review of the ozone standard; and that it intends to complete the new review (which is already underway) "as expeditiously as possible". Any impacts related to the U.S. EPA's consideration to revise the ozone NAAQS are not estimable at this time.

On December 18, 2020, the U.S. EPA published a final rule pursuant to its statutorily required review of NAAQS that retains the existing PM_{2.5} standards without revision. In early 2021, several states and non-governmental organizations filed petitions for judicial review of the action with the D.C. Circuit. Several industry trade groups intervened in support of the U.S. EPA's action. The case remains in abeyance before the court as the U.S. EPA voluntarily reconsiders the PM_{2.5} NAAQS. On January 6, 2023, the U.S. EPA proposed to lower the annual PM_{2.5} NAAQS from the current 12 ug/m³ standard to within the range of 9.0 to 10.0 ug/m³. On March 6, 2024, the U.S. EPA published a final rule to significantly lower the primary annual PM_{2.5} NAAQS standard from 12 ug/m³ to 9.0 ug/m³. In the rule, the U.S. EPA retained the primary 24-hour PM_{2.5} standard at the level of 35 ug/m³. The rule is being challenged by 24 states as well as trade groups in the D.C. Circuit. Because area designations and State Implementation Plans have not yet been made, any impacts to the Company are not estimable at this time.

Environmental Remediation

For further discussion of relevant environmental matters, including environmental remediation obligations, see "Item 3. Legal Proceedings, Environmental Proceedings."

Property, Plant and Equipment Additions

For property, plant and equipment additions, including finance leases, see "Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations – Liquidity and Capital Resources" and Note 13 to the Consolidated Financial Statements.

Available Information

U. S. Steel's Internet address is www.ussteel.com. We post our Annual Report on Form 10-K, our quarterly reports on Form 10-Q, our proxy statement, our current reports on Form 8-K, amendments to those reports and our interactive data files to our website free of charge as soon as reasonably practicable after such reports are filed with, or furnished to, the Securities and Exchange Commission (SEC). We also post all press releases and earnings releases to our website.

All other filings with the SEC are available via a direct link on the U. S. Steel website to the SEC's website, www.sec.gov.

Also available on the U. S. Steel website are U. S. Steel's Corporate Governance Principles, Code of Ethical Business Conduct and the charters of the Audit Committee, the Compensation & Organization Committee and the Corporate Governance & Sustainability Committee of the Board of Directors. These documents and the Annual Report on Form 10-K and proxy statement are also available in print to any stockholder who requests them. Such requests should be sent to the Office of the Corporate Secretary, United States Steel Corporation, 600 Grant Street, Suite 1844, Pittsburgh, Pennsylvania, 15219-2800 (telephone: 412-433-1121).

U. S. Steel does not incorporate into this document the contents of any website or the documents referred to in the immediately preceding paragraphs.

Other Information

Information on net sales, depreciation, capital expenditures, earnings (loss) before interest, taxes, depreciation and amortization and assets by reportable segment and for business in the Other category and on net sales and assets by geographic area are set forth in Note 4 to the Consolidated Financial Statements.

For significant operating data for U. S. Steel for each of the last five years, see "Five-Year Operating Summary (Unaudited)" within this document.

Item 1A. RISK FACTORS

Merger-Related Risk Factors

Failure to complete the Merger on a timely basis, or at all, would negatively impact our business and financial condition, as well as the price of our common stock.

We may not be able to complete the Merger on a timely basis, or at all, including due to the failure to receive required regulatory approvals. The closing conditions to the Merger include clearance by CFIUS. Following referral of the transaction by CFIUS to the President of the United States, on January 3, 2025, the President of the United States issued an order prohibiting the Merger and requiring the parties to abandon the Merger Agreement within thirty days. On January 10, 2025, CFIUS granted an extension of that deadline to June 18, 2025.

The Company, NSC and Purchaser jointly filed a lawsuit in the United States Court of Appeals for the District of Columbia Circuit alleging that the President's order blocking the Merger was issued for purely political reasons, which are irrelevant to U.S. national security, challenging the decision by the President of the United States and the CFIUS process as violating the constitutional due process rights of the Company, NSC and Purchaser, as well as the applicable statute governing CFIUS and the Administrative Procedure Act, and as an exercise of power that exceeded the authority provided to the President of the United States under the applicable statute. There is no assurance that this lawsuit will be successful, or will ultimately permit the Merger to be consummated. The Company, NSC and Purchaser also filed a lawsuit in the U.S. District Court for the Western District of Pennsylvania against Cliffs, Cliffs' Chief Executive Officer Lourenco Goncalves, and the President of the USW, David McCall, for engaging in a coordinated series of anticompetitive and racketeering activities illegally designed to prevent any party other than Cliffs from acquiring the Company as part of an illegal campaign to monopolize critical domestic steel markets. There is no assurance that this lawsuit will be successful.

If the Merger is not completed, our ongoing business may be adversely affected as follows: (i) we may experience negative reactions from the financial markets, including negative impacts on the market price of our common stock; (ii) some of management's attention will have been directed to the Merger instead of being directed to our own operations and the pursuit of other opportunities that could have been beneficial to us; (iii) the manner in which customers, suppliers and other third parties perceive us may be negatively impacted, which in turn could affect our ability to compete for business; (iv) we may experience negative reactions from employees and there may be further negative impact on the relationship with the leadership of the USW; (v) we will have expended time and resources that could otherwise have been spent on our business; and (vi) we will not obtain the benefits of NSC's commitments to the Company, including the commitments to invest at least \$2.7 billion of capital and to share technology to protect and grow the Company. In addition, further delay in consummating the Merger could have an adverse effect on our operating results and adversely affect our relationships with customers and suppliers and would likely lead to a significant diversion of management and employee attention.

Additionally, in approving the Merger Agreement, the Board of Directors considered a number of factors and potential benefits, including the fact that the merger consideration to be received by holders of common stock represented a significant premium over the unaffected trading price, including a premium of 142% to the Company's unaffected closing stock price of \$22.72 on August 11, 2023, the last trading day before the Company's announcement of the strategic alternatives review process and a premium of 40% to the Company's closing stock price of \$39.33 on December 15, 2023, the last trading day before public announcement of the Merger Agreement. If the Merger is not completed, neither the Company nor the holders of our common stock will realize this benefit of the Merger. Moreover, we would also have nevertheless incurred substantial transaction-related fees and costs and the loss of management time and resources.

Expenses related to the pending Merger are significant and will adversely affect our operating results.

We have incurred and expect to continue to incur significant expenses in connection with the pending Merger, including legal and investment banking fees and fees incurred in connection with the Merger-related litigation. We expect these costs to have an adverse effect on our operating results.

We are subject to business uncertainties and contractual restrictions while the Merger is pending, which could adversely affect our business.

The Merger Agreement requires us to operate in the ordinary course of business and restricts us, without the consent of Purchaser, from taking certain specified actions agreed by the parties to be outside the ordinary course of business until the pending Merger occurs or the Merger Agreement terminates. These restrictions may prevent us from pursuing otherwise attractive business opportunities and making other changes to our business before completion of the Merger or, if the Merger is not completed, termination of the Merger Agreement. In addition, matters relating to the Merger (including integration planning) will require substantial commitments of time and resources by our management, which could divert their time and attention.

Litigation and union grievances and disputes could result in substantial costs or other negative impacts on the Company.

In connection with the Merger, we (along with our directors and officers) may face lawsuits, disputes and/or other actions (including union grievances or actions), in addition to the lawsuits jointly filed by the Company, NSC and Purchaser described above. We may face additional lawsuits, disputes and/or other actions, including those brought by stockholders of the Company or those arising from the Merger-related litigation filed by the Company and NSC, which may seek to enjoin, prevent, and/or delay us from consummating the Merger or may seek damages or other relief from the Company.

One of the conditions to the closing of the Merger is the absence of any injunction or similar order issued by any government entity in the U.S. or other specified jurisdiction or law in the U.S. or other specified jurisdiction that has the effect of prohibiting the consummation of the Merger or that makes consummation of the Merger illegal. Accordingly, if any plaintiff is successful in obtaining an injunction prohibiting the consummation of the Merger, then such injunction may prevent the Merger from becoming effective, or delay its becoming effective within the expected time frame. The ultimate resolution of any such proceedings cannot be predicted, and defending against such claims, even those without merit, could result in substantial costs (including costs in connection with the defense or settlement of stockholder litigation in connection with the Merger and costs associated with our indemnification obligations to our directors and officers), delay, and diversion of management's time and resources, which may negatively impact our financial condition and adversely affect our business and results of operations. We may also file actions to assert our rights in connection with the Merger.

The announcement and pendency of the Merger may adversely affect our business, financial condition and results of operations.

Whether or not the Merger is consummated, the Merger may disrupt our current plans and operations, which could have an adverse effect on our business and financial results. We cannot predict how our customers, distributors, suppliers and strategic partners will view or react to the pendency of the Merger or any of the actions being taken in pursuit of consummating the Merger. If we are unable to reassure our customers, distributors, suppliers and strategic partners to continue transacting business with us, our sales, financial condition, results of operations, cash flows and stock price may be adversely affected.

In addition, uncertainty about the effect of the Merger on our employees may have an adverse effect on our business. These uncertainties may impair our ability to attract, retain and motivate key personnel until the Merger is completed and for a period of time thereafter. Employee retention may be particularly challenging during the pendency of the Merger. If key employees depart and as we face additional uncertainties relating to the Merger, our business relationships may be subject to disruption as customers, suppliers and other third parties attempt to negotiate changes in existing business relationships or consider entering into business relationships with parties other than the Company. If key employees depart or if our existing business relationships suffer, our results of operations may be adversely affected. The adverse effects of such disruptions could be exacerbated by further delay in the completion of the Merger.

The Merger Agreement contains provisions that eliminate our ability to consider alternative transaction proposals.

The Merger Agreement contains non-solicitation provisions that, subject to limited exceptions which applied prior to obtaining the requisite stockholder approval of the Merger, restrict our ability to solicit, initiate, or knowingly encourage or induce competing third-party proposals (or engage in, continue or otherwise participate in negotiations or discussions regarding such third-party proposals) for the acquisition of our stock or assets.

While the Merger Agreement remains in effect, these provisions would prevent us from being able to consider, negotiate or accept a transaction with a potential third-party acquirer that might have an interest in acquiring all or a significant portion of us, even if the acquirer was prepared to pay consideration with a higher per share cash or market value than the market value proposed to be received or realized in the Merger.

If the Merger Agreement is terminated and we decide to seek another business combination, we may not be able to negotiate or consummate a transaction with another party on terms comparable to, or better than, the terms of the Merger Agreement.

All of the matters described above, alone or in combination, could materially and adversely affect our business, financial condition, results of operations and stock price.

Economic and Market Risk Factors

The changing global economic climate is having adverse impacts on our business, which may create new risks and exacerbate certain other risks set forth below.

Changes in the global economic environment, inflation, elevated interest rates, recessions or prolonged periods of slow economic growth, and global instability and actual and threatened geopolitical conflict, could have an adverse effect on our industry and business, as well as those of our customers and suppliers.

Overall economic conditions in the U.S. and globally, including in Europe, including adverse factors such as inflation, rising or sustained elevated interest rates, supply chain disruptions and geopolitical conflicts, including the impacts of the war in Ukraine, significantly impact our business. Periods of economic downturn or continued uncertainty could result in difficulty increasing or maintaining our level of sales or profitability and we may experience an adverse effect on our business, results of operations, financial condition and cash flows.

Our U.S. operations are subject to economic conditions, including credit and capital market conditions, inflation, prevailing interest rates, and political factors, which if changed could negatively affect our results of operations, cash flows and liquidity. Political factors include, but are not limited to, changes to tax laws and regulations resulting in increased income tax liability,

changes in administration resulting in increased or newly imposed tariffs, increased regulation, such as carbon emissions limitations or trading mechanisms, limitations on exports of energy and raw materials, and trade remedies. Actions taken by the U.S. government could affect our results of operations, cash flows and liquidity.

USSE is subject to economic conditions and political factors associated with the EU, Slovakia and neighboring countries, and the euro currency. Changes in any of these economic conditions or political factors could negatively affect our results of operations, cash flows and liquidity. Political factors include, but are not limited to, taxation, nationalization, inflation, government instability, regional conflict, civil unrest, increased regulation and quotas, tariffs, sanctions and other market-distorting measures. Continued uncertainty and economic downturn in the European market throughout 2024, as well as the ongoing war in Ukraine, have had a broad range of adverse impacts on global economic conditions, many of which have had and are likely to continue to have adverse impacts on our USSE business, including increased raw material and energy costs, softer customer demand and lower steel prices, which led to the temporary idling of a portion of USSE's raw steel capability at the end of 2024 until the demand environment improves. These uncertain conditions in the European market could lead to adverse effects on the valuation of USSE's long-lived assets, which could negatively affect our results of operations through potential impairment charges. USSE also purchases a significant portion of its iron ore and coal from suppliers based in Ukraine.

Additionally, we are also exposed to risks associated with the business success and creditworthiness of our suppliers and customers. If our customers or suppliers are negatively impacted by a slowdown in economic markets, we may face the reduction, delay or cancellation of customer orders, delays or interruptions of the supply of raw materials, and increased risk of insolvency and other credit related issues of customers or suppliers, which could delay payments from customers, result in increased customer defaults and cause our suppliers to delay filling, or to be unable to fill, our needs at all or on a timely or cost-effective basis. The occurrence of any of these events may adversely affect our business, results of operations, financial condition and cash flows.

The steel industry, as well as the industries of our customers and suppliers upon whom we are reliant, is highly cyclical, which may have an adverse effect on our customer demand and results of operations.

Steel consumption is highly cyclical and generally follows economic and industrial conditions both worldwide and in regional markets. Price fluctuations are impacted by the timing, magnitude and duration of these cycles, and are difficult to predict. This volatility makes it difficult to balance the procurement of raw materials and energy with global steel prices, our steel production and customer product demand. U. S. Steel has implemented strategic initiatives to produce more stable and consistent results, even during periods of economic and market downturns, but this may not be enough to mitigate the effect that the volatility inherent in the steel industry has on our results of operations.

Additionally, our business is reliant on certain other industries that are cyclical in nature. We sell to the automotive, service center, converter, energy and appliance and construction-related industries. Some of these industries are highly sensitive to general economic conditions and may also face meaningful fluctuations in demand based on a number of factors outside of our control, including regulatory factors, supply chain disruptions, changing customer demand, economic conditions and raw material and energy costs. As a result, downturns or volatility in any of the markets we serve could adversely affect our financial position, results of operations and cash flows.

U. S. Steel has been and continues to be adversely affected by unfairly traded imports and global overcapacity, which may cause downward pricing pressure, lost sales and revenue and decreased market share, production, investment, and profitability.

Currently, global steel production capacity significantly exceeds global steel demand, which adversely affects U.S. and global steel prices. Global overcapacity continues to result in high levels of dumped and subsidized steel imports into the markets we serve. Domestic and international trade laws provide mechanisms to address the injury caused by such imports to domestic industries. Excessive steel imports have resulted and may continue to result in downward pricing pressure and lost sales and revenue, which adversely impacts our business, operations, financial condition and cash flows.

Although U. S. Steel currently benefits from 69 U.S. AD and CVD or anti-subsidy duty orders and 14 EU AD/CVD orders, petitions for trade relief are not always successful or effective. When implemented, such relief is generally subject to periodic reviews and challenges, which can result in revocation of AD/CVD orders or reduction of effective duty rates. There can be no assurance that any relief will be obtained or continued in the future or that such relief will adequately combat unfairly traded imports.

As of the date of this filing, pursuant to a series of Presidential Proclamations issued in accordance with Section 232 of the Trade Expansion Act of 1962, U.S. imports of certain steel products are subject to a 25 percent tariff, except imports from: (1) Argentina, Brazil, and South Korea, which are subject to restrictive quotas; (2) the European Union (EU) that are melted and poured in the EU, within TRQ limits through December 2025; (3) Japan that are melted and poured in Japan within TRQ limits; (4) United Kingdom (UK) that are melted and poured in the UK within TRQ limits; (5) Canada; (6) Mexico, if melted and poured in North America; (7) Ukraine, if melted and poured in Ukraine or the EU, until June 1, 2025; and (8) Australia. The Section 232 national security action on steel imports currently provides U. S. Steel and other domestic steel producers critical relief from imports. With no scheduled end date, the future coverage and duration of the Section 232 action is not known. Further, the U.S.

government may negotiate alternatives to the Section 232 tariffs for certain countries, similar to TRQ agreements with the EU, Japan, and the UK.

USTR's review of additional tariffs of 7.5 to 25 percent on certain U.S. imports from China, including certain raw materials used in steel production, semi-finished and finished steel products, and downstream steel-intensive products, pursuant to Section 301 of the Trade Act of 1974 could change the coverage and levels of such tariffs. In September 2024, USTR revised certain Section 301 tariffs on U.S. imports from China, including increasing tariffs on steel from 7.5 to 25 percent; batteries from 7.5 to 25 percent; solar cells/modules from 25 to 50 percent; and electric vehicles from 25 to 100 percent.

In February 2019, the EC implemented a definitive safeguard on global steel imports in the form of TRQs. The TRQs, which impose 25 percent tariffs on steel imports that exceed the TRQ limit, are currently effective through June 2026.

All of the above factors present a degree of uncertainty to our financial and operational performance, our customers, and overall economic conditions, all of which could impact steel demand and our performance. Faced with significant import competition and overcapacity in various markets, we will continue to evaluate potential strategic and organizational opportunities, which may include exiting lines of business and the sale of certain assets, temporary shutdowns or closures of facilities.

Shortages of skilled labor, increased labor costs or our failure to attract and retain other highly qualified personnel in the future could disrupt our operations and adversely affect our financial results.

We depend on skilled labor for the manufacture of our products. Some of our facilities are located in areas where demand for skilled labor often exceeds supply. Shortages of some types of skilled labor, such as electricians and qualified maintenance technicians, could restrict our ability to maintain or increase production rates, lead to production inefficiencies and increase our labor costs. Our strategic investments also require a set of job skills that is different from our prior needs. Our continued success executing on our strategy, and constructing and commercializing depends on the active participation of our key employees and ability to attract employees with different skills. We have recently observed an overall tightening and increasingly competitive labor market. The competitive nature of the labor markets in which we operate, the cyclical nature of the steel industry and our resulting needs for skilled employees increase our risk of not being able to recruit, train and retain the employees we require at efficient costs and on reasonable terms, and could lead to increased costs, such as increased overtime to meet demand and increased compensation to attract and retain employees. In addition, many companies, including U. S. Steel, have had employee layoffs as a result of reduced business activities during industry downturns. The loss of our key people or our inability to attract new key employees could adversely affect our operations. Additionally, layoffs or other adverse actions could result in an adverse relationship with our workforce or third-party labor providers. If we are unable to recruit, train and retain adequate numbers of qualified employees and third-party labor providers on a timely basis or at a reasonable cost or on reasonable terms, our business and results of operations could be adversely affected. Additionally, an overall labor shortage, lack of skilled labor, increased turnover, labor strikes or labor inflation as a result of general macroeconomic factors that affect our customers or suppliers could have a material adverse impact on the Company's operations, results of operations, liquidity or cash flows.

Strategic Risk Factors

Commercialization of our strategic investments in new technologies and products may not be fully successful.

Execution of our Best for All® strategy depends, in part, on the successful commercialization of a number of investments we have made in new facilities, technologies and products and successfully transitioning our footprint to a lower-cost, carbon and capital intensive model. Our Best for All® strategy is centered around expanding our competitive advantages in low-cost iron ore, mini mill steelmaking, and best-in-class finishing capabilities. These competitive advantages are built on a foundation of research, innovation and deep customer relationships. We have expanded our low-cost iron ore competitive advantage by investing in ways to translate the advantage to feed our growing EAF footprint. This includes investments in a pig iron caster at the Gary Works facility in the fourth quarter of 2022, and DR-grade pellet capabilities in Keetac, Minnesota, completed in December 2023. We have expanded our mini mill steelmaking capabilities through the construction of a second mini mill facility in Osceola, Arkansas, which produced its first coil in October 2024. We also expanded our best-in-class finishing capabilities through investments in a non-grain oriented electrical steel line and galvanizing construction line at Big River Steel. In executing our strategy, we aim to enhance our earnings profile, deliver long-term cash flow through industry cycles and reduce our cost, capital, and carbon intensity. By offering the product capabilities, including the more sustainable steels our customers are increasingly demanding, we believe that we can achieve more competitive positioning in strategic, high-margin end markets, and deliver high-quality, sustainable, value-added products and innovative solutions.

Successful commercialization of our strategic investments and execution of our strategy are subject to changing market conditions and demand for our new products, capability and cost performance, and customer adoption of new technologies. New product development or modification is costly, may be restricted by regulatory requirements, involves significant research, development, time, expense and human capital and may not necessarily result in the successful commercialization of new products, customer adoption of new technologies or products or new technologies may not perform as intended or expected. Unsuccessful commercialization and execution of these strategic investments, underperformance of any of these assets, failure of new products to gain market acceptance, delays or inability to achieve customer qualification standards, or limited or reduced demand in the marketplace could adversely affect our business, results of operations and financial condition and may limit the benefits of our stockholder value creation strategy.

From time to time, we engage in acquisitions, divestitures and joint ventures and may encounter difficulties in integrating and separating these businesses and therefore we may not realize the anticipated benefits.

As we pursue our Best for All® strategy, we may seek growth opportunities through strategic acquisitions as well as evaluate our portfolio for potential divestitures to optimize our business footprint and portfolio. The success of these transactions will depend on our ability to integrate or separate, as applicable, assets and personnel in these transactions and to cooperate with our strategic partners. We may encounter difficulties in integrating acquisitions with our operations as well as separating divested businesses, and in managing strategic investments. Furthermore, we may not realize the degree, or timing, of benefits we anticipate when we first enter into a transaction.

Additionally, we seek opportunities to monetize non-core and excess iron assets, including through real estate sales, third party agreements and option agreements. These opportunities may not materialize or generate the financial benefits expected. For example, Stelco Inc. (Stelco), a subsidiary of Cliffs, holds an option (Option) to acquire an undivided 25 percent interest in a to-be-formed entity that will own the Company's current iron ore mine located in Mt. Iron, Minnesota. There is a possibility that Stelco may not exercise its Option in the anticipated timeframe or at all. If the proposed joint venture with Stelco is not successful, fails to provide the benefits we expect, or is not created at all, we may in the future have more iron ore than we need to support the business. Additionally, the existence of the Option may deter future potential opportunities to monetize the iron ore assets. Any of the foregoing could adversely affect our business and results of operations.

Operational and Commercial Risk Factors

Our operational footprint, unplanned equipment outages and other unforeseen disruptions may adversely impact our results of operations or result in idle facility costs or impairment charges.

U. S. Steel has adjusted its operating configuration to advance its Best for All® strategy, in response to market conditions, including global economic volatility, declining steel prices, oil and gas industry disruption, global overcapacity and unfairly traded imports, and to optimize capability and cost performance, by idling and restarting production at certain facilities. Due to our existing operational footprint, the Company may not be able to respond in an efficient manner to fully realize the benefits from changing market conditions that are favorable to integrated steel producers or most efficiently mitigate the negative impacts of such changes. Our decisions concerning which facilities to operate and at what levels are made based upon execution of our Best for All® strategy, market conditions, our customers' orders for products as well as the capabilities and cost performance of our locations. We may concentrate production operations at several plant locations and not operate others, and as a result we may incur idle facility costs or impairment charges.

Our steel production depends on the operation of critical structures and pieces of equipment, such as blast furnaces, electric arc furnaces, steel shops, casters, hot strip mills and various structures and operations, including information technology systems, that support them, as well as finishing lines at our facilities and certain of our joint ventures. While we invested in operational and reliability enhancements to our assets through the asset revitalization program, launched in 2017, and continue to implement initiatives focused on proactive maintenance of key machinery and equipment at our production facilities, we may experience prolonged periods of reduced production and increased maintenance and repair costs due to equipment failures at our facilities or those of our key suppliers.

It is also possible that operations may be disrupted due to other unforeseen circumstances such as power outages, explosions, fires, floods, earthquakes, pandemics, terrorism, accidents, severe weather conditions, changes in U.S., European Union and other foreign tariffs, free trade agreements, trade regulations, laws and policies. We are also exposed to similar risks involving major customers and suppliers such as force majeure events of raw materials suppliers that have occurred and may occur in the future. Availability of raw materials and delivery of products to customers could be affected by logistical disruptions, such as shortages of barges, ocean vessels, rail cars or trucks or unavailability of rail lines or of the locks on the Great Lakes or other bodies of water. To the extent that lost production could not be compensated for at unaffected facilities and depending on the length of the outage, our sales and our unit production costs could be adversely affected.

We are subject to outbreaks of infectious disease, such as risks related to the global COVID-19 pandemic, which had adverse impacts on economic and market conditions and our business. Public health crises, including COVID-19, have created and may create significant volatility, uncertainty and economic disruption in the regions in which we operate.

The physical impacts of climate change may also have a material adverse effect on our results of operations. Climate change may be associated with increased occurrence of extreme weather conditions, which could include, among other things, increased risk of flooding, extreme cold or potential heat stress at facilities and other natural disasters that may lead our customers to curtail or shut down production or to supply chain and operational disruptions.

We face increased competition within our industry and from alternative materials and risks concerning innovation, new technologies, products and increasing customer demand for lower-carbon products.

As a result of increasingly stringent regulatory requirements and increased market and technological changes driven by broader trends such as decarbonization and electrification efforts in response to climate change, designers, engineers and industrial manufacturers, especially those in the automotive industry, are increasing their use of lighter weight, less carbon intense and alternative materials, such as aluminum, composites, plastics and carbon fiber. Use of such materials could reduce the demand for our steel products or steel products generally, which may reduce our profitability and cash flow. Additionally, the trend toward light weighting in the automotive industry, which requires lighter gauges of steel at higher strengths, could result in lower steel volumes required by that industry over time.

Additionally, technologies such as direct iron reduction, oxygen-coal injection and experimental technologies such as molten oxide electrolysis and hydrogen flash smelting may be more cost effective than our current production methods. However, we may not have sufficient capital to invest in such technologies and may incur difficulties adapting and fully integrating these technologies into our existing operations. We may also encounter production restrictions, or not realize the cost benefit from such capital intensive technology adaptations to our current production processes.

Finally, we may face increased competition due to the rapid development and rising use of digital, artificial intelligence (AI) and machine learning technologies. Failure to early adopt and incorporate such technologies to improve productivity, yields, manufacturing technology or support functional teams may put us at a long-term competitive disadvantage.

Limited availability, or volatility in prices of raw materials, scrap and energy may constrain operating levels and reduce profit margins.

U. S. Steel and other steel producers have periodically faced problems obtaining sufficient raw materials and energy in a timely manner due to delays, defaults, severe weather conditions, or force majeure events, shortages or transportation problems (such as shortages of barges, ore vessels, rail cars or trucks, or disruption of rail lines, waterways, or natural gas transmission lines), resulting in production curtailments. As a result, we may be exposed to risks concerning pricing and availability of raw materials and energy resources from third parties as well as logistics constraints moving our own raw materials and scrap to our plants. USSE purchases substantially all of its iron ore and coking coal requirements from outside sources. Any curtailments or escalated costs may further reduce profit margins.

U. S. Steel has agreed, and may continue to agree, to purchase raw materials and energy at prices that have been, and may be, above future market prices or in greater volumes than required in the future. Additionally, any future decreases in iron ore, scrap, natural gas, electricity and oil prices may place downward pressure on steel prices. If steel prices decline, our profit margins on indexed contracts and spot business could be reduced.

A failure of our information technology infrastructure and cybersecurity threats may adversely affect our business operations.

Despite efforts to protect confidential business information, personally identifiable information (PII), and the control systems of manufacturing plants, U. S. Steel systems and those of our joint ventures and third-party service providers have been and may be subject to cyberattacks or system breaches. System breaches can lead to theft, unauthorized disclosure, modification or destruction of proprietary business data, PII, or other sensitive information, to defective products, production downtime and damage to production assets, and the inaccessibility of key systems, with a resulting impact to our reputation, competitiveness and operations. We have experienced cybersecurity attacks that have resulted in unauthorized persons gaining access to our information technology systems and networks, and we could in the future experience similar attacks. To date, no cybersecurity attack has had a material impact on our financial condition, results of operations or liquidity.

While the Company continually works to safeguard our systems and mitigate potential risks, there can be no assurance that such actions will be sufficient to prevent cyberattacks or security breaches or mitigate all potential risks to our systems, networks and data, particularly with the recent proliferation and sophistication of cyberattacks and cyber intrusions around the world. The number of threats and events has increased substantially every year, which is expected to continue, particularly as the use of artificial intelligence makes these attempts look more legitimate. The potential consequences of a material cybersecurity attack include reputational damage, investigations and/or adverse proceedings with government regulators or enforcement agencies, litigation with third parties, disruption to our systems, including production capabilities, unauthorized release of confidential, personally identifiable or otherwise protected information, corruption of data, diminution in the value of our investment in research, development and engineering and increased cybersecurity protection and remediation costs, which in turn could adversely affect our competitiveness, results of operations and financial condition. The amount of insurance coverage we maintain may be inadequate to cover claims or liabilities resulting from a cybersecurity attack.

We depend on third parties for transportation services and increases in costs or the availability of transportation may adversely affect our business and operations.

Our business depends on the transportation of a large number of products, both domestically and internationally. We rely primarily on third parties, including the divested Transtar business, for transportation of the products we manufacture as well as delivery of our raw materials. Any increase in the cost of the transportation of our raw materials or products, as a result of increases in fuel or labor costs, higher demand for logistics services, consolidation in the transportation industry or otherwise, may adversely affect our results of operations as we may not be able to pass such cost increases on to our customers.

Our transportation service providers may face disruptions due to weather conditions or events, strikes, labor shortages or other constraints. If any of these providers were to fail to deliver raw materials to us or deliver our products in a timely manner, we may be unable to manufacture and deliver our products in response to customer demand. In addition, if any of these third parties were to cease operations or cease doing business with us, we may be unable to replace them at a reasonable cost. Such failure of a third-party transportation provider could harm our reputation, negatively affect our customer relationships and have a material adverse effect on our financial position and results of operations.

Our 2022 Labor Agreements with the USW contain provisions that may impact certain business activities.

Our 2022 Labor Agreements with the USW contain provisions that grant the USW a limited right to bid on the Company's sale of a facility (or sale of a controlling interest in an entity owning a facility) covered by the 2022 Labor Agreements, excluding public equity offerings and/or the transfer of assets between U. S. Steel and its wholly owned subsidiaries. The 2022 Labor Agreements also require a minimum level of capital expenditures (subject to approval of the Board of Directors) to maintain the competitive status of the covered facilities, and place certain limited restrictions on our ability to replace product produced at a covered facility with product produced at other than Company facilities or affiliates or U.S. or Canadian facilities with employee protections similar to the protections found in the 2022 Labor Agreements when the Company is operating covered facilities below capacity. The provisions in the 2022 Labor Agreements, as well as current or future proposed labor legislation or regulations, could unfavorably impact certain business activities including pricing, operating costs, margins and/or our competitiveness in the marketplace.

Financial Risk Factors

Our business and execution of our strategy require substantial expenditures for capital investments, debt service obligations, operating leases and maintenance that we may be unable to fund, which may require other actions to satisfy our obligations under our debt.

We have approximately \$4.1 billion of long-term debt (see Note 17 to the Consolidated Financial Statements). If our cash flows and capital resources are insufficient to fund our planned capital expenditures or debt service obligations, we may face substantial liquidity problems and may be forced to reduce or delay investments and capital expenditures, terminate strategic projects, or to dispose of material assets or operations or issue additional debt or equity. We may not be able to take such actions, if necessary, on commercially reasonable terms or at all. The Credit Facility Agreement, the documents governing the USSK Credit Facility, the documents governing the Big River Steel ABL (Asset Based Loan) Facility and Big River Steel notes, and the indentures governing our existing senior unsecured notes may restrict our ability to dispose of assets and may also restrict our ability to raise debt or equity capital to be used to repay other debt when it becomes due. We may not be able to consummate those dispositions or to obtain proceeds in an amount sufficient to meet any debt service obligations then due. Our inability to generate sufficient cash flows to satisfy our debt obligations, or to refinance our indebtedness on commercially reasonable terms or at all, would materially and adversely affect our financial position and results of operations and may place us at a competitive disadvantage with competitors who may have less indebtedness and other obligations or greater access to financing. In addition, the availability under our Credit Facility Agreement and Big River ABL Facility may be reduced if we have insufficient collateral, or if we do not meet a fixed charge coverage ratio test. Availability under the USSK Credit Agreement could be limited if USSK does not meet certain financial covenants.

Our ability to service or refinance our debt or fund investments and capital expenditures required to maintain or expand our business operations depends on our financial condition and operating performance, which are subject to prevailing economic and competitive conditions and to certain financial, business, legislative, regulatory and other factors beyond our control, such as supply and demand conditions, inflation, prevailing interest rates, supply chain disruptions and the impacts of the war in Ukraine. We may not be able to maintain a level of cash flows from operating activities sufficient to permit us to satisfy our liquidity needs. In addition, the availability under certain of our debt instruments may be limited if we do not meet certain financial covenants. Furthermore, the agreements governing the BRS (Big River Steel) ABL Facility and other outstanding indebtedness of Big River Steel LLC and its subsidiaries limit their ability, subject to certain exceptions, to pay dividends or distributions or make other restricted payments, such that we may not be able to access the cash generated by these subsidiaries to fund our other expenditures.

If we cannot make scheduled payments on our debt, we will be in default and holders of our senior unsecured notes could declare all outstanding principal and interest to be due and payable, the lenders under the Sixth Amended and Restated Credit

Agreement, the USSK Credit Facility and the Export Credit Agreement could terminate their commitments to loan money, accelerate full repayment of any or all amounts outstanding (which may result in the cross acceleration of certain of our other debt obligations) and the lenders could foreclose against the assets securing their borrowings and we could be forced into bankruptcy or liquidation. All of these events would materially and adversely affect our financial position and results of operations.

Furthermore, ratings agencies could downgrade our ratings either due to factors specific to our business, a prolonged cyclical downturn in the steel industry, macroeconomic trends such as global or regional recessions and trends in credit and capital markets more generally. Ratings agencies also may lower, suspend or withdraw ratings on the outstanding securities of U. S. Steel or Big River Steel. Any lowering, suspension or withdrawal of such ratings may have an adverse effect on the market prices of such securities.

Any decline in our operating results or downgrades in our credit ratings may make raising capital or entering into any business transaction more difficult, lead to reductions in the availability of credit or increased cost of credit, adversely affect the terms of future borrowings, may limit our ability to take advantage of potential business opportunities, may have an adverse effect on the terms under which we purchase goods and services, and lead to reductions in the availability of credit.

We have significant retiree health care, retiree life insurance and pension plan costs, which may negatively affect our results of operations and cash flows.

We maintain retiree health care and life insurance and defined benefit pension plans covering many of our domestic employees and former employees upon their retirement. Some of these benefit plans are not fully funded, and thus will require cash funding in future years. Minimum contributions to domestic qualified pension plans (other than contributions to the Steelworkers Pension Trust (SPT) described below) are regulated under the Employee Retirement Income Security Act of 1974 (ERISA) and the Pension Protection Act of 2006 (PPA).

The level of cash funding for our defined benefit pension plans in future years depends upon various factors, including voluntary contributions that we may make, future pension plan asset performance, actual interest rates under the law, the impact of business acquisitions or divestitures, union negotiated benefit changes and future government regulations, many of which are not within our control. In addition, assets held by the trusts for our pension plan and our trust for retiree health care and life insurance benefits are subject to the risks, uncertainties and variability of the financial markets. Future funding requirements could also be materially affected by differences between expected and actual returns on plan assets, actuarial data and assumptions relating to plan participants, the discount rate used to measure the pension obligations and changes to regulatory funding requirements. See "Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations" and Note 18 to the Consolidated Financial Statements for a discussion of assumptions and further information associated with these benefit plans.

U. S. Steel contributes to a domestic multiemployer defined benefit pension plan, the SPT, for USW-represented employees formerly employed by National Steel and represented employees hired after May 2003. We have legal requirements for future funding of this plan should the SPT become significantly underfunded or we decide to withdraw from the plan. Either of these scenarios may negatively impact our future cash flows. The 2022 Labor Agreements increased the contribution rate for most steelworker employees. Collectively bargained company contributions to the plan could increase further as a result of future changes agreed to by the Company and the USW.

The accounting treatment of goodwill, equity method investments and other long-lived assets could result in future asset impairments, which would reduce our earnings.

We periodically test our goodwill, equity method investments and other long-lived assets to determine whether their estimated fair value is less than their value recorded on our balance sheet. The results of this testing for potential impairment may be adversely affected by uncertain market conditions for the global steel industry and general economic conditions. If we determine that the fair value of any of these assets is less than the value recorded on our balance sheet, and, in the case of equity method investments the decline is other than temporary, we would likely incur a non-cash impairment loss that would negatively impact our results of operations. We have incurred asset impairment charges in recent years, including during the year ended December 31, 2024, and there can be no assurances that continued market dynamics or other factors may not result in future impairment charges.

We are subject to foreign currency risks, which may negatively impact our profitability and cash flows.

The financial condition and results of operations of USSE are reported in euros and then translated into U.S. dollars at the applicable exchange rate for inclusion in our financial statements. The appreciation of the U.S. dollar against the euro negatively affects our Consolidated Results of Operations. International cash requirements have been and in the future may be funded by intercompany loans, which may create intercompany monetary assets and liabilities in currencies other than the functional currencies of the entities involved, which can have a non-cash impact on income when they are remeasured at the end of each period. Procurement of equipment of announced strategic projects may be denominated in foreign currencies, which could adversely affect the costs of these projects.

In addition, foreign producers, including foreign producers of subsidized or unfairly traded steel with foreign currency denominated costs may gain additional competitive advantages or target our home markets if the U.S. dollar or euro exchange rates strengthen relative to those producers' currencies. Volatility in the markets and exchange rates for foreign currencies and contracts in foreign currencies could have a significant impact on our reported financial results and condition.

Financial regulatory frameworks introduced by U.S. and EU regulators may limit our financial flexibility or increase our costs.

We use swaps, forward contracts and similar agreements to mitigate our exposure to volatility, which entails a variety of risks. The Commodity Future Trading Commission's Dodd Frank and the EU's European Market Infrastructure Regulation and other government agencies' regulatory frameworks can limit the Company's ability to hedge interest rate, foreign exchange (FX), or commodity pricing exposures, which could expose us to increased economic risk. These frameworks may introduce additional compliance costs or liquidity requirements. Some counterparties may cease hedging as a result of increased regulatory cost burdens, which in turn may reduce U. S. Steel's ability to hedge its interest rate, FX or commodity exposures.

We are a party to various legal proceedings, the resolution of which could negatively affect our profitability and cash flows in a particular period.

We are involved at any given time in various litigation matters, including administrative and regulatory proceedings, governmental investigations, environmental matters and commercial disputes. Our profitability and cash flows in a particular period could be negatively affected by an adverse ruling or settlement in any legal proceeding or investigation. While we believe that we have taken appropriate actions to mitigate and effectively manage these risks, due to the nature of our operations, these risks will continue to exist and additional legal proceedings or investigations may arise from time to time.

Additionally, we may be subject to product liability claims that may have an adverse effect on our financial position, results of operations and cash flows. Events such as well failures, line pipe leaks, blowouts, bursts, fires and product recalls could result in claims that our products or services were defective and caused death, personal injury, property damage or environmental pollution. The insurance we maintain may not be adequate, available to protect us in the event of a claim, or its coverage may be limited, canceled or otherwise terminated, or the amount of our insurance may be less than the related impact on our enterprise value after a loss. We establish reserves based on our assessment of contingencies, including contingencies for claims asserted against us in connection with litigation, arbitrations and environmental issues. Adverse developments in litigation, arbitrations, environmental issues or other legal proceedings may affect our assessment and estimates of the loss contingency recorded as a reserve and require us to make payments in excess of our reserves, which could negatively affect our operations, financial results and cash flows. See "Item 3. Legal Proceedings" and Note 26 to the Consolidated Financial Statements for further details.

Regulatory Risk Factors

Compliance with existing and new environmental regulations, environmental permitting and approval requirements may result in delays or other adverse impacts on planned projects, our results of operations and cash flows.

Steel producers in the U.S., along with their customers and suppliers, are subject to numerous federal, state and local laws and regulations relating to the protection of the environment. These laws and regulations concern the generation, storage, transportation, treatment, disposal, release, emission or discharge of pollutants, contaminants, petroleum, and hazardous substances into the environment, the reporting of such matters, and the general protection of public health and safety, natural resources, wildlife and the environment. Steel producers in the EU are subject to similar laws. These laws and regulations continue to evolve and are becoming increasingly stringent. For example, the U.S. EPA has proposed to lower the NAAQS for fine particulate matter (PM_{2.5}), which would result in stringent and costly requirements to control emissions from existing operations and restrictions on new projects. The ultimate impact of complying with such laws and regulations is not always clearly known or determinable because regulations under some of these laws have not yet been promulgated, and the subject of ongoing litigation or are undergoing revision, and new versions or interpretations of existing laws may take effect. Additionally, compliance with certain of these laws and regulations, such as the CAA and state and local requirements governing air emissions, could result in substantially increased capital requirements and operating costs and could require changes to the equipment or facilities we operate. Compliance with current or future laws and regulations could entail substantial costs and could have a negative impact on our results of operations and cash flows. The amount and timing of environmental expenditures is difficult to predict.

In addition, the Company must obtain, maintain and comply with numerous permits, leases, approvals, consents and certificates from various governmental authorities in connection with the construction and operation of new production facilities or modifications to existing facilities. In connection with such activities, the Company may need to make significant capital and operating expenditures to detect, repair and/or control air emissions, to control water discharges or to perform certain corrective actions to meet the conditions of the permits issued pursuant to applicable environmental laws and regulations.

There can be no assurance that future approvals, licenses and permits will be granted or that we will be able to maintain and renew the approvals, licenses and permits we currently hold. Failure to do so could have a material adverse effect on our results of operations and cash flows. Furthermore, compliance with environmental permitting and approval requirements may be costly and time consuming and could result in delays or other adverse impacts on planned projects, our results of operations and cash flows.

Failure to comply with legal requirements, including permits, leases, approvals, consents and certificates, may result in administrative, civil and criminal penalties, and revocation of permits and our authority to conduct business or construct certain facilities, substantial fines or sanctions, or citizens' suits or enforcement actions (including orders limiting our operations or requiring corrective measures), among other consequences.

We have significant environmental remediation costs that negatively affect our results of operations and cash flows.

Various environmental laws impose liability on a current or former owner or operator of real property for investigation or cleanup of hazardous substances or petroleum products at, on, under or migrating from our currently or formerly owned or leased real property. Some of U. S. Steel's current and former facilities were in operation before such environmental regulations were in place. Hazardous materials associated with those facilities have been and may continue to be encountered at current or former operating sites or delivered to sites operated by third parties. In some cases, liability may be imposed without regard to contribution or to whether we knew of, or caused, the release of hazardous substances. Liability under these laws may be joint and several, meaning that we could be required to bear 100% of the liability even if other parties are also liable. U. S. Steel is involved in numerous remediation projects at currently operating facilities, facilities that have been closed or sold to unrelated parties and other sites where material generated by U. S. Steel was deposited. In addition, there are numerous other former operating or disposal sites that could become subject to remediation, which may negatively affect our results of operations and cash flows. Contamination at our current properties could result in limitations on or interruptions to our operations and liens in favor of the government for costs the government incurs in cleaning up contamination. In addition, we may be liable for the costs of investigating or remediating contamination at off-site waste facilities where we have arranged for the disposal, or treatment of hazardous substances, without regard to whether we complied with environmental laws in doing so.

Reducing greenhouse gas (GHG) emissions from steelmaking operations to meet corporate targets or comply with new regulations as well as stakeholder expectations and mitigate potential physical impacts of climate change could significantly increase costs to manufacture future materials or reduce the amount of materials being manufactured.

Iron and steel producers around the world are facing mounting pressure to reduce greenhouse gas emissions from operations. The majority of greenhouse gas emissions from the production of iron and steel are caused by the combustion of fossil fuels, the use of electrical energy, and the use of coal, lime, and iron ore as feedstock. The two main production processes are the integrated route of blast furnace ironmaking in combination with basic oxygen furnace steelmaking (BOF) and the alternative route of electric arc furnace steelmaking. Both routes generate greenhouse gas emissions with the latter process, involving the electric arc melting of a majority of steel scrap, generating less than half that of the traditional integrated steelmaking process.

Federal, state and local governmental agencies within the United States may introduce regulatory changes in response to the potential impacts of climate change, including the introduction of carbon emissions limitations or trading mechanisms, and changes in U.S. administration may result in new or significantly different regulations than those currently impacting or likely to impact the Company. Any such regulation regarding climate change and GHG emissions could impose significant costs on our operations and on the operations of our customers and suppliers, including increased energy, capital equipment, emissions controls, environmental monitoring and reporting and other costs in order to comply with current or future laws or regulations concerning climate change and GHG emissions. Any adopted future climate change and GHG regulations could negatively impact our ability, and that of our customers and suppliers, to compete with companies situated in areas not subject to or not complying with such limitations. Inconsistency of regulations may also change the attractiveness of the locations of some of the Company's assets and investments. In addition, changes in certain environmental regulations, including those that may impose output limitations or higher costs associated with climate change or greenhouse gas emissions, could substantially increase the cost of manufacturing and raw materials to us and other steel producers. For additional details, see "Part I – Item 1, Business – New and Emerging Environmental Regulations – United States and European Greenhouse Gas Emissions Regulations" above.

Additionally, the European Union has established aggressive CO₂ reduction targets of 40 percent by 2030, against a 1990 baseline, and full carbon neutrality by 2050. As part of the European Green Deal the Commission proposed in September 2020 to raise the 2030 reduction target to at least 55 percent compared to 1990. The new target has since been endorsed by the European Parliament. An emission trading system (ETS) was established to encourage compliance with set emissions reduction targets. These aggressive targets require drastic measures within the steel industry to comply. The transition to EAF technology, as well as incremental gains in energy reduction, use of renewable energy, hydrogen-based steelmaking and continued asset and process improvements are expected to reduce our GHG footprint. However, the development of breakthrough technologies is likely required to continue the path of low to no carbon footprint in the steel industry. Implementation of new technologies will most likely require significant amounts of capital and an abundant source of low-cost hydrogen and/or green power, most likely leading to an increase in the cost of future steelmaking. In addition, the cost of emission allowances is forecast to increase, along with the number of allowances decreasing in the next several years. The price of CO₂ emission allowances was 71 euro per metric ton as of December 31, 2024, and forecasts call for potential prices exceeding 100 euro per metric ton in future years.

Environmental, social and governance matters may impact our business and reputation.

In addition to the changing rules and regulations related to environmental, social and governance (ESG) matters imposed by governmental and self-regulatory organizations such as the SEC and the New York Stock Exchange, a variety of third-party organizations, institutional investors and customers evaluate the performance of companies on ESG topics, and the results of these assessments are widely publicized. These changing rules, regulations and stakeholder expectations have resulted in, and are likely to continue to result in, increased general and administrative expenses and increased management time and attention spent complying with or meeting such regulations and expectations. Reduced access to or increased cost of capital may occur as financial institutions and investors increase expectations related to ESG matters.

Developing and acting on initiatives within the scope of ESG, and collecting, measuring and reporting ESG-related information and metrics can be costly, difficult and time consuming and is subject to evolving reporting standards. We may also communicate certain initiatives and goals, regarding environmental matters, diversity, social investments and other ESG-related matters, in our SEC filings or in other public disclosures. These initiatives and goals within the scope of ESG could be difficult and expensive to implement, the technologies needed to implement them may not be cost effective and may not advance at a sufficient pace, and we could be criticized for the accuracy, adequacy or completeness of the disclosure. Furthermore, statements about our ESG-related initiatives and goals, and progress against those goals, may be based on standards for measuring progress that are still developing, internal controls and processes that continue to evolve and assumptions that are subject to change in the future. In addition, we could be criticized for the scope or nature of such initiatives or goals, or for any revisions to these goals. If our ESG-related data, processes and reporting are incomplete or inaccurate, or if we fail to achieve progress with respect to our goals, including our previously announced commitments to reduce greenhouse gas emissions, within the scope of ESG on a timely basis, or at all, our reputation, business, financial performance and growth could be adversely affected. In addition, in recent years “anti-ESG” sentiment has gained momentum across the U.S., with several states and Congress having proposed or enacted “anti-ESG” policies, legislation, or initiatives or issued related legal opinions, and the President having recently issued an executive order opposing diversity equity and inclusion (“DEI”) initiatives in the private sector. Such anti-ESG and anti-DEI-related policies, legislation, initiatives, litigation, legal opinions, and scrutiny could result in U. S. Steel facing additional compliance obligations, becoming the subject of investigations and enforcement actions, or sustaining reputational harm.

New and changing data privacy laws and cross-border transfer requirements could have a negative impact on our business and operations.

Our business depends on the processing and transfer of data between our affiliated entities, to and from our business partners, and with third-party service providers, and of our employees, which may be subject to data privacy laws and/or cross-border transfer restrictions. In North America and Europe, new legislation and changes to the requirements or applicability of existing laws, as well as evolving standards and judicial and regulatory interpretations of such laws, may impact U. S. Steel’s ability to effectively process and transfer data both within the United States and across borders in support of our business operations and/or keep pace with specific requirements regarding processing and safeguarding personal information. While U. S. Steel takes steps to comply with these legal requirements, non-compliance could lead to possible administrative, civil, or criminal liability, as well as reputational harm to the Company and its employees. The costs of compliance with privacy laws and the potential for fines and penalties in the event of a breach may have a negative impact on our business and operations.

Item 1B. UNRESOLVED STAFF COMMENTS

None.

Item 1C. CYBERSECURITY**Risk Management and Strategy**

U. S. Steel maintains robust processes for identifying, assessing, and managing material risks from cybersecurity threats. U. S. Steel’s cybersecurity program is based on the National Institute of Standards and Technology (“NIST”) Cybersecurity Framework, and the risk of cybersecurity threats is integrated into the Company’s Enterprise Risk Management (“ERM”) program, led by the Chief Risk Officer. The ERM program includes an annual risk prioritization process to identify key enterprise risks. Each key risk is assigned risk owners to establish action plans and implement risk mitigation strategies. The cybersecurity threat risk action plan is managed at the enterprise level by the Senior Vice President – Business Development and President, USSE, the Vice President & Chief Information Officer (the “CIO”) and the Chief Information Security Officer (the “CISO”). Each quarter, the risk owners review and update the cybersecurity threat risk action plan to provide the status on specific risk mitigation actions and to identify new threats. U. S. Steel works closely with its internal and external auditors to assess, plan for, prevent and mitigate cybersecurity risks.

The Company maintains a Cybersecurity Incident Response Plan (CSIRP), which establishes an organizational framework and guidelines intended to facilitate an effective response and handling of cybersecurity incidents that could jeopardize the availability, integrity, or confidentiality of U. S. Steel’s assets. The CSIRP outlines roles and responsibilities, criteria for measuring the severity of a cybersecurity incident, and an escalation framework. The CSIRP also addresses senior management responsibility with respect to disclosure determinations related to a cybersecurity incident and provides for Audit Committee and Board briefings as appropriate. Along with the CSIRP, management sustains numerous programs and processes to stay

informed about and monitor the prevention, detection, mitigation and remediation of cybersecurity incidents. The list of cybersecurity programs and processes described below is not meant to be exhaustive, but to provide examples of such programs and processes.

The Company engages with third party cybersecurity specialists to provide an independent assessment of U. S. Steel's cybersecurity programs and to prepare a 5-year plan to maintain compliance and operational excellence. Management periodically reviews the 5-year plan and modifies it in response to changes in the threat landscape and otherwise as needed. Management employs in-depth defense mechanisms throughout the enterprise, including, but not limited to, employee training, vulnerability management, multi-factor authentication, cybersecurity insurance and table top exercises to mitigate and/or prevent cybersecurity incidents. The Company conducts security assessments of certain third party providers before and periodically throughout their engagement and has established procedures intended to mitigate risks related to security incidents originating from third parties. For example, management assesses the cybersecurity proficiency of potential third party cloud suppliers before utilizing their services. The assessment identifies cybersecurity-related risks and makes recommendations to enhance the security of new cloud computing services.

A cybersecurity incident may be detected in a number of ways, including, but not limited to, through automated reporting mechanisms, network and system indicators, intrusion detection systems, internal investigations, employee reports, law enforcement reports, or other third party notification. To oversee and identify cybersecurity threat risks on a day-to-day basis, including from third party service providers, the Company maintains a security operations center with round-the-clock monitoring, and the CIO receives regular reports on industry activity.

Upon receiving notification of a cybersecurity incident, the cybersecurity operations team acts to isolate and contain the threat. The CISO, along with the Chief Safety & Security Officer, will consult and determine the incident severity level, which determines whether the incident should be escalated. Critical and high severity incidents must be reported to the General Counsel. The Company may engage third party experts for assistance with crisis management, including forensic investigations, ransom negotiation, or crisis communication. During this process, the cybersecurity operations team will take steps to preserve evidence as soon as possible, including, but not limited to, memory dumps, log preservation and forensic hard drive collection. In addition, the General Counsel, in consultation with the CISO and others as necessary and appropriate, will promptly evaluate whether the incident requires legal notifications or disclosure, including whether the incident requires disclosure under the U. S. securities laws.

Following a cybersecurity incident, the General Counsel will direct the development of documentation regarding lessons learned in the response, including evaluation of preparedness capability, to continuously strengthen the cybersecurity posture of the Corporation.

Management has not identified risks from cybersecurity threats, including as a result of any previous cybersecurity incidents, that have materially affected or are reasonably likely to materially affect U. S. Steel, including its business strategy, results of operations or financial condition. See "Item 1A. Risk Factors, *A failure of our information technology infrastructure and cybersecurity threats may adversely affect our business operations.*" above for more information. While we continually work to safeguard the information systems we use, and the proprietary, confidential and personal information residing therein, and mitigate potential risks, there can be no assurance that such actions will be sufficient to prevent cybersecurity incidents or mitigate all potential risks to such systems, networks and data or those of our third party providers.

Governance

The Board of Directors is responsible for overseeing the assessment and management of enterprise-level risks that may impact U. S. Steel. The Audit Committee has primary responsibility for overseeing risk management, including oversight of risks from cybersecurity threats. Management, including the CIO and CISO, reports on cybersecurity matters regularly to the Board, primarily through the Audit Committee, including an annual report regarding specific risks and mitigation efforts within U. S. Steel and a 5-year cybersecurity threat assessment conducted by third party experts. Management provides benchmarking information and updates on key operational and compliance metrics to the Board. In addition, cybersecurity training is provided to the full Board of Directors, including training by third party experts, to educate directors on the current cybersecurity threat environment and measures companies can take to mitigate risk and impact of cyberattacks.

As described above, management is actively involved in assessing and managing U. S. Steel's material cybersecurity risks. The CIO and the CISO primarily lead these efforts. The CIO is responsible for the oversight of U. S. Steel's entire global IT operation, including the cybersecurity program, and holds a Bachelor of Science in operations research and industrial engineering and a Bachelor of Arts in economics from Cornell University, as well as a Master of Science in engineering and Master of Business Administration from Massachusetts Institute of Technology. The CIO's previous work experience includes holding the position of CIO at a \$25 billion manufacturing conglomerate and a \$7 billion energy company. The CISO reports directly to the CIO and has responsibility for leadership of U. S. Steel's global cybersecurity program. She holds a bachelor's degree in Information Systems Management, a master's degree in Internet Information Systems, and a doctorate in Instructional Management and Leadership. The CISO also completed the Chief Information Security Officer Certificate program at Carnegie Mellon University, where she now serves as a coach for the program, and holds a Certified Information Systems Security Professional (CISSP) certification.

She is an active member of the Greater Pittsburgh CISO Group and the Steel City OTSEC Information Sharing Group, and serves on the Editorial Review Board for two peer-reviewed journals (International Journal of Cyber Research and International Journal of Information and Communication Technology Education).

Item 2. PROPERTIES

See Item 1. Business, Facilities and Locations for listings of U. S. Steel's main properties, their locations and their products and services.

U. S. Steel and its predecessors have owned their properties for many years with no material adverse title claims asserted. In the case of Great Lakes Works, Granite City Works, the Midwest Plant and Keetac iron ore operations, U. S. Steel or its subsidiaries are the beneficiaries of bankruptcy laws and orders providing that properties are held free and clear of past liens and liabilities. In addition, U. S. Steel or its predecessors obtained title insurance, local counsel opinions or similar protections when significant properties were initially acquired or since acquisition.

At the Midwest Plant in Indiana, U. S. Steel has a supply agreement for various utility services with a company that owns a cogeneration facility located on U. S. Steel property. The Midwest Plant agreement expires in 2028.

U. S. Steel leases its headquarters office space in Pittsburgh, Pennsylvania.

For property, plant and equipment additions, including finance leases, see "Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations, Liquidity and Capital Resources" and Note 13 to the Consolidated Financial Statements.

Mining Properties

Summary Overview of Mining Operations

U. S. Steel operates two surface iron ore mining complexes in Minnesota consisting of the Minntac Mine and Pellet Plant and the Keetac Mine and Pellet Plant, which are wholly owned by the Company. As of December 31, 2024, U. S. Steel owns a minority interest in the iron ore mining assets of Hibbing Taconite Company.

The following table provides a summary of the net book value of the land and PP&E at the Minntac and Keetac mines as of December 31, 2024:

(in millions)	Gross Value	Accumulated Depreciation	Net Book Value
Minntac Mine and Pellet Plant			
Land	\$ 35	\$ —	\$ 35
Other property, plant and equipment	1,780	1,359	421
Total	\$ 1,815	\$ 1,359	\$ 456
Keetac Mine and Pellet Plant			
Land	\$ 7	\$ —	\$ 7
Other property, plant and equipment	505	224	281
Total	\$ 512	\$ 224	\$ 288

The following table provides a summary of our mineral production by mining complex for each reportable period:

Iron Ore Pellets	Production		
(Millions of short tons)	2024	2023	2022
Iron Ore Pellets			
Minntac Mine and Pellet Plant	15.5	15.5	15.1
Keetac Mine and Pellet Plant	5.8	5.5	5.9
Hibbing Taconite Company ⁽¹⁾	0.9	1.1	0.9
Total	22.2	22.1	21.9

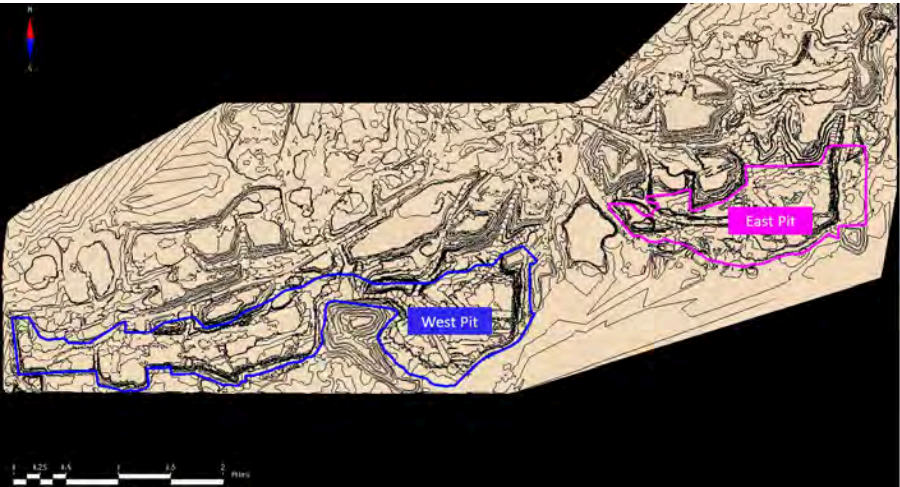
⁽¹⁾ Represents U. S. Steel's proportionate share of production as these investments are unconsolidated equity affiliates.

We engaged DRA Global and Barr Engineering Co. ("DRA") to provide feasibility studies and technical report summaries for our material mining operations at Minntac and Keetac in 2023. Indicated and inferred mineral resources and probable mineral reserve information for the Minntac and Keetac mines were updated based on those DRA estimations. Changes as a result of this study were due to improved resource and reserve estimation methodology. The majority shareholders of the Hibbing Taconite Company separately engaged qualified persons to perform the same procedures at the Hibbing Taconite Mine in 2024. Accordingly, the figures below for the Hibbing Taconite Mine were provided by the majority shareholders using the reports provided by the qualified persons. The tables showing resources and reserves by mining property were prepared using the results of the procedures performed by the qualified persons designated by each organization, which have no affiliation with or interest in our material mining properties.

Item 302 of Regulation S-K requires registrants to file the technical report summary as an exhibit to the Form 10-K filing when disclosing for the first time mineral reserves or resources or when there has been a material change in the mineral reserves or resources since the last technical report summary filed for the properties. The Company did not have material changes to its reserves or resources during 2024, nor is it disclosing mineral reserves or resources for the first time. Accordingly, the technical report summary is not filed as an exhibit with this Form 10-K.

Minntac Mine and Pellet Plant

The Minntac Mine and Pellet Plant is located in Mountain Iron, Minnesota and is wholly owned and operated by U. S. Steel. On April 30, 2020, the Company granted Stelco Inc. (Stelco), a subsidiary of Cleveland-Cliffs Inc., a purchase option to acquire a 25 percent interest in the Minntac mining operations. The option can be exercised at any time before January 31, 2027. For more information regarding the purchase option, please see Note 20 to the Consolidated Financial Statements. The Minntac Mine has 25,420 acres of surface rights. The surface mine is in the production stage whereby taconite iron ore is mined using the Truck-Shovel method. The mine is approximately 57 years old and has been operated by U. S. Steel since 1967. For discussions regarding encumbrances, violations, fines, etc. related to the Minntac Mine, see Item 3. Legal Proceedings.

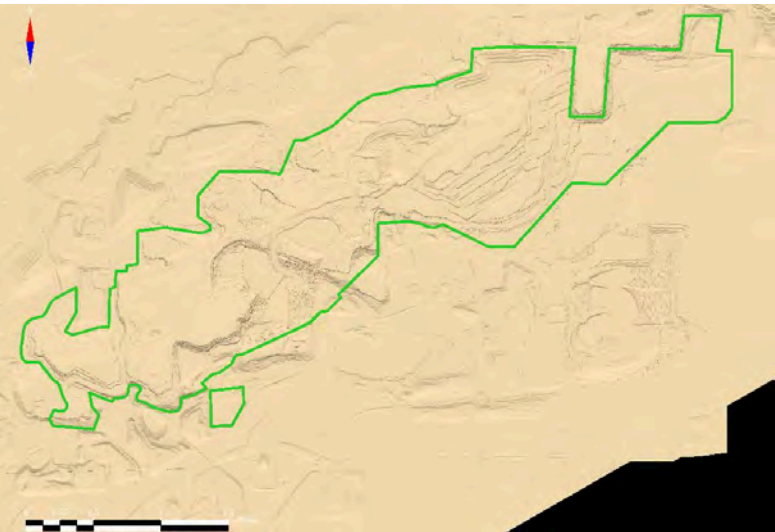


The following table provides details of our iron ore resources and reserves at Minntac as of December 31, 2024, and December 31, 2023. Resources below are stated exclusive of reserves.

Minntac Mine and Pellet Plant								
(Millions of short tons)	Amount			Grades/Qualities		Cut-off Grades		Metallurgical Recovery
	Pellets 2024	Pellets 2023	Change (%)	MagFe%	Concentrate Silica %	Min MagFe %	Max Concentrate Silica %	Weight Recovery %
Measured mineral resources	—	—	— %	—	—	—	—	—
Indicated mineral resources	234.2	234.2	— %	18.19	5.82	14.00	9.99	26.98
Measured + indicated mineral resources	234.2	234.2	— %	18.19	5.82	14.00	9.99	26.98
Inferred mineral resources	96.7	96.7	— %	18.29	6.22	14.00	9.99	27.31
Proven mineral reserves	—	—	— %	—	—	—	—	—
Probable mineral reserves	265.0	280.5	(6)%	19.11	6.20	14.00	9.99	28.55
Total mineral reserves	265.0	280.5	(6)%	19.11	6.20	14.00	9.99	28.55

Keetac Mine and Pellet Plant

The Keetac Mine and Pellet Plant is located in Keewatin, Minnesota and is wholly owned and operated by U. S. Steel. The Keetac Mine has 18,020 acres of surface rights. The surface mine is in the production stage whereby taconite iron ore is mined using the Truck-Shovel method. The mine is approximately 57 years old and has been operated by U. S. Steel since 2003, when it was acquired as part of the Company's purchase of National Steel Corporation. For discussions regarding encumbrances, violations, fines, etc. related to the Keetac Mine, see Item 3. Legal Proceedings.

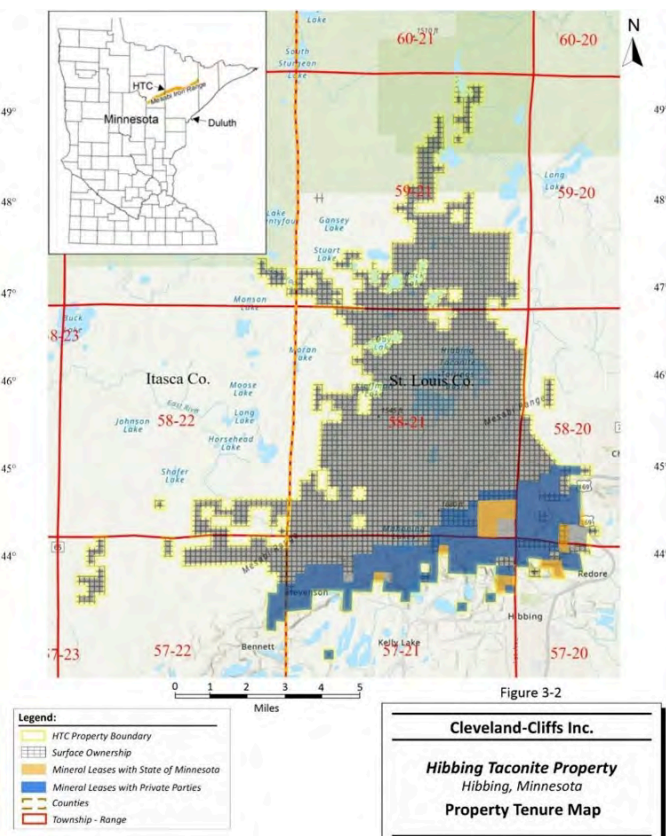


The following table provides details of our iron ore resources and reserves at Keetac as of December 31, 2024, and December 31, 2023. Resources below are stated exclusive of reserves.

Keetac Mine and Pellet Plant										
	Amount					Grades/Qualities		Cut-off Grades		Metallurgical Recovery
(Millions of short tons)	DR Grade Pellets 2024	DR Grade Pellets 2023	Pellets 2024	Pellets 2023	Change (%)	MagFe%	Concentrate Silica %	Min MagFe %	Max Concentrate Silica %	Weight Recovery %
Measured mineral resources	—	—	—	—	— %	—	—	—	—	—
Indicated mineral resources	153.3	153.3	214.7	214.7	— %	18.88	3.45	14.00	9.99	27.31
Measured + indicated mineral resources	153.3	153.3	214.7	214.7	— %	18.88	3.45	14.00	9.99	27.31
Inferred mineral resources	108.9	108.9	163.2	163.2	— %	18.39	4.37	14.00	9.99	26.83
Proven mineral reserves	—	—	—	—	— %	—	—	—	—	—
Probable mineral reserves	125.9	126.4	175.3	180.6	(2)%	19.36	3.82	14.00	9.99	28.00
Total mineral reserves	125.9	126.4	175.3	180.6	(2)%	19.36	3.82	14.00	9.99	28.00

Hibbing Taconite Mine

U. S. Steel maintains a minority interest in the Hibbing Taconite Mine, which is majority-owned by Cleveland-Cliffs Inc. and located in Hibbing, Minnesota. The Hibbing Mine has 30,705 acres of surface rights, of which 1,150 acres are associated with mineral leases. The majority of the mineral rights are leased. The property is comprised of 7,417 acres of mineral leases expiring between 2025 and 2056. The taconite iron ore mine is currently in the production stage.



The following table provides details of our proportionate share of iron ore pellet resources and reserves at Hibbing as of December 31, 2024, and December 31, 2023. Resources below are stated exclusive of reserves.

Hibbing Taconite Company ⁽¹⁾				
(Millions of short tons)	Amount			Grades/Qualities
	Pellets 2024	Pellets 2023	Change (%)	MagFe%
Measured mineral resources	0.4	0.4	— %	19.20
Indicated mineral resources	—	—	— %	18.70
Measured + indicated mineral resources	0.4	0.4	— %	19.20
Inferred mineral resources	—	—	— %	—
Proven mineral reserves	3.1	2.2	40.91 %	18.96
Probable mineral reserves	0.2	0.4	(50.00)%	18.96
Total mineral reserves	3.3	2.6	26.92 %	18.96

⁽¹⁾ Represents U. S. Steel's proportionate share of proven and probable reserves and production as these investments are unconsolidated equity affiliates.

Internal Controls

U. S. Steel estimates its iron ore resources and reserves using exploration drill holes, physical inspections, sampling, laboratory testing, 3-D computer models, economic pit analysis and fully-developed pit designs for its operating mines. Estimates for our share of unconsolidated equity affiliates are based upon information supplied by the joint ventures. Refer to sections 2 and 3 of the technical report summaries filed as Exhibit 96.1 to the 2023 Form 10-K for further details.

Item 3. LEGAL PROCEEDINGS

On January 6, 2025, the Company, NSC and Purchaser jointly filed lawsuits related to the Merger. A Petition for Review was filed in the United States Court of Appeals for the District of Columbia Circuit alleging that the President's order blocking the Merger was issued for purely political reasons, which are irrelevant to U.S. national security, challenging the decision by the President of the United States and the CFIUS process as violating the constitutional due process rights of the Company, NSC and Purchaser, as well as the applicable statute governing CFIUS and the Administrative Procedure Act, and as an exercise of power that exceeded the authority provided to the President of the United States under the applicable statute. The Petition names as respondents Joseph R. Biden, in his official capacity as President of the United States, CFIUS, Janet L. Yellen, in her official capacity as Secretary of the Treasury and Chairperson of CFIUS, and Merrick B. Garland, in his official capacity as United States Attorney General. The Petition asks the Court to set aside the unlawful CFIUS review process and the President's accompanying order, and to instruct CFIUS to conduct a new review of the Merger that is consistent with the petitioners' due process rights and its own statutory obligations. Also on January 6, 2025, the Company, NSC and Purchaser jointly filed a Complaint and motion for a preliminary injunction and for an expedited hearing in the United States District Court for the Western District of Pennsylvania against Cliffs, Cliffs' Chief Executive Officer Lourenco Goncalves, and the President of the USW, David McCall, for engaging in a coordinated series of anticompetitive and racketeering activities illegally designed to prevent any party other than Cliffs from acquiring the Company as part of an illegal campaign to monopolize critical domestic steel markets. This suit asserts antitrust claims under Sections 1 and 2 of the Sherman Act, violations of the Racketeer Influenced and Corrupt Organizations (RICO) Act, and tortious interference claims and seeks an injunction preventing Cliffs, Mr. Goncalves, and Mr. McCall from engaging in further collusive and anticompetitive behavior, and to impose substantial monetary damages for their conduct.

Following announcement of the Merger, the Company received eleven demand letters from putative stockholders (collectively, the "Demand Letters") alleging that the disclosures contained in the preliminary proxy statement, as amended, and/or the definitive proxy statement, in each case filed with the Securities and Exchange Commission in connection with a special meeting of stockholders to consider the Merger, were deficient and demanding that certain corrective disclosures be made. The Company believes that the Demand Letters are without merit; however solely in order to mitigate any risk of the Demand Letters delaying or otherwise adversely affecting the consummation of the Merger and to minimize any costs, risks, and uncertainties inherent in any potential litigation related thereto, and without admitting any liability or wrongdoing, voluntarily made supplemental disclosures on a Form 8-K.

General Litigation

On June 8, 2021, JSW Steel (USA) Inc. and JSW Steel USA Ohio, Inc. (collectively, JSW), U.S. based subsidiaries of Indian steelmaker JSW Steel, filed suit in the United States District Court for the Southern District of Texas against Nucor, U. S. Steel, AK Steel Holding Group and Cleveland-Cliffs Inc. (collectively, the JSW Defendants) alleging that the Defendants operated as a cartel and formed a conspiracy to boycott JSW from obtaining semi-finished steel slabs. JSW alleges that the JSW Defendants acted in violation of Section 1 of the Sherman Act and the Clayton Act (federal antitrust), and violation of the Texas Free Enterprise and Antitrust Act. JSW also alleges that the JSW Defendants formed a civil conspiracy in violation of Texas common law, and that the JSW Defendants tortiously interfered with JSW's business relationships. The basis for JSW's allegations relate to the JSW Defendants' participation in the DOC's Section 232 process, including the JSW Defendants' support of the enactment of the President's Section 232 proclamation, statements made by the JSW Defendants after the enactment of Section 232, and the JSW Defendants' participation in the Section 232 exclusion process. Plaintiffs seek monetary damages including \$45 million for payment of Section 232 tariffs and unspecified amounts for financial penalties, termination fees and lost profits as well as other damages. U. S. Steel, along with the other JSW Defendants, filed a Motion to Dismiss the case on August 17, 2021. On February 17, 2022, the Court issued an opinion dismissing JSW's antitrust complaint with prejudice. JSW filed a timely notice of appeal with the United States Court of Appeals for the Fifth Circuit. The Fifth Circuit held oral argument on the appeal on February 6, 2023, and we are awaiting a ruling from the Court. The Company continues to vigorously defend the matter.

On December 24, 2018, U. S. Steel's Clairton Plant experienced a fire, affecting portions of the facility involved in desulfurization of the coke oven gas generated during the coking process. With the desulfurization process out of operation as a result of the fire, U. S. Steel was not able to certify compliance with Clairton Plant's Title V permit levels for sulfur emissions. U. S. Steel promptly notified ACHD (Allegheny County Health Department), which has regulatory jurisdiction for the Title V permit, and updated the ACHD regularly on efforts to mitigate any potential environmental impacts until the desulfurization process was returned to normal operations. Of the approximately 2,400 hours between the date of the fire and April 4, 2019, when the Company resumed desulfurization, there were ten intermittent hours where average SO₂ emissions exceeded the hourly NAAQS for SO₂ at the Allegheny County regional air quality monitors located in Liberty and North Braddock boroughs, which are near U. S. Steel's Mon Valley Works facilities. On April 29, 2019, PennEnvironment and Clean Air Council, both environmental, non-governmental organizations, filed a Complaint in Federal Court in the Western District of Pennsylvania. The ACHD was subsequently granted intervenor status. The parties entered into a Consent Decree that was authorized by the U.S. Department of Justice and U.S. EPA and subsequently approved by the Court on March 26, 2024 that resolved all claims in the suit. The Consent Decree required the Company to undertake operational improvements at Clairton Works, permanently idle Coke Battery #15, pay a \$500,000 penalty to the ACHD, fund community-beneficial projects throughout the Mon Valley over a period of five years through contributions which total \$4.5 million and pay counsel fees in the amount of \$3.0 million. The Consent Decree also established a new H₂S Coke Oven Gas standard for Clairton Works. Separately, a class action has been filed in the Court of Common Pleas of Allegheny County on behalf of approximately 123,000 persons who claim that the impacts from the fire created

a nuisance and seek damages for loss of use and enjoyment of properties. That action has been certified as a class action and the Company continues to vigorously defend against it.

Asbestos Litigation

See Note 26 to our Consolidated Financial Statements, Contingencies and Commitments for a description of our asbestos litigation.

ENVIRONMENTAL PROCEEDINGS

The following is a summary of the proceedings of U. S. Steel that were pending or contemplated as of December 31, 2024, under federal and state environmental laws, and which U. S. Steel reasonably believes may result in monetary sanctions of at least \$1 million (the threshold chosen by U. S. Steel as permitted by Item 103 of Regulation S-K). Information about specific sites where U. S. Steel is or has been engaged in significant clean up or remediation activities is also summarized below. Except as described herein, it is not possible to accurately predict the ultimate outcome of these matters.

CERCLA Remediation Sites

Claims under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) have been raised with respect to the cleanup of various waste disposal and other sites. Under CERCLA, potentially responsible parties (each, a PRP) for a site include current owners and operators, past owners and operators at the time of disposal, persons who arranged for disposal of a hazardous substance at a site and persons who transported a hazardous substance to a site. CERCLA imposes strict and joint and several liabilities. Because of various factors, including the ambiguity of the regulations, the difficulty of identifying the responsible parties for any particular site, the complexity of determining the relative liability among them, the uncertainty as to the most desirable remediation techniques, and the amount of damages and cleanup costs and the time period during which such costs may be incurred, we are unable to reasonably estimate U. S. Steel's ultimate liabilities under CERCLA.

As of December 31, 2024, U. S. Steel has received information requests or been identified as a PRP at a total of four CERCLA sites, three of which have liabilities that have not been resolved. Based on currently available information, which is in many cases preliminary and incomplete, management believes that U. S. Steel's liability for CERCLA cleanup and remediation costs at one of the other sites will be over \$5 million as described below.

Duluth Works

The former U. S. Steel Duluth Works site was placed on the National Priorities List under CERCLA in 1983 and on the State of Minnesota's Superfund list in 1984. Liability for environmental remediation at the site is governed by a Response Order by Consent executed with the MPCA in 1985 and a Record of Decision signed by MPCA in 1989. U. S. Steel has partnered with the Great Lakes National Program Office (GLNPO) of the U.S. EPA Region 5 to address contaminated sediments in the St. Louis River Estuary and several other operable units that could impact the estuary if not addressed. An amendment to the Project Agreement between U. S. Steel and GLNPO was executed during the second quarter of 2018 to recognize the initial costs associated with implementing the first two phases of the proposed remedial plan at the site.

Remediation contracts were issued by both U. S. Steel and GLNPO for the first phase of the remedial work at the site during the fourth quarter of 2020. U. S. Steel and GLNPO have completed the second phase of work at the site which extended through early 2022. The final phase of the remedial design has been defined and another amendment to the Project Agreement between U. S. Steel and GLNPO was executed in December 2021. Execution of this final phase is in progress and is expected to extend through mid-2025 for habitat restoration. U. S. Steel's portion of additional design, oversight costs, and implementation of all three phases of the preferred remedial alternative on the upland property and Estuary are currently estimated as of December 31, 2024, at approximately \$6 million.

Resource Conservation Recovery Act and Other Remediation Sites

U. S. Steel may be liable for remediation costs under other environmental statutes, both federal and state, or where private parties are seeking to impose liability on U. S. Steel for remediation costs through discussions or litigation. There are nine such sites where remediation is being sought involving amounts in excess of \$1 million. Based on currently available information, which is in many cases preliminary and incomplete, management believes that liability for cleanup and remediation costs in connection with four sites may involve remediation costs between \$1 million and \$5 million per site and five sites are estimated to, or could have, costs for remediation, investigation, restoration or compensation in excess of \$5 million per site.

For more information on the status of remediation activities at U. S. Steel's significant sites, see the discussions below.

Gary Works

On October 23, 1998, the U.S. EPA issued a final Administrative Order on Consent (Order) addressing Corrective Action for Solid Waste Management Units (SWMU) throughout Gary Works. This Order requires U. S. Steel to perform an RCRA Facility

Investigation, a Corrective Measures Study and Corrective Measure Implementation. Evaluations are underway at six groundwater areas on the east side of the facility. A remedial groundwater treatment system has been operating at one of the six areas since 2021. An Interim Stabilization Measure work plan was approved by the U.S. EPA for a second area where installation and start-up of the remedial system was completed in 2023. Until the remaining Phase I work and Phase II field investigations are completed, it is not possible to assess what additional expenditures will be necessary for Corrective Action projects at Gary Works. In total, the accrued liability for Corrective Action projects is approximately \$23 million as of December 31, 2024, based on our current estimate of known remaining costs.

Geneva Works

At U. S. Steel's former Geneva Works, liability for environmental remediation, including the closure of three hazardous waste impoundments and facility-wide corrective action, has been allocated between U. S. Steel and the current property owner pursuant to an agreement and a permit issued by the Utah Department of Environmental Quality (UDEQ). Having completed the investigation on a majority of the remaining areas identified in the permit, U. S. Steel had determined the most effective means to address the remaining impacted material was to manage those materials in a previously approved on-site Corrective Action Management Unit (CAMU). U. S. Steel awarded a contract for the implementation of the CAMU project during the fourth quarter of 2018. Construction, waste stabilization and placement, along with closure of the CAMU, were substantially completed in the fourth quarter of 2020. Work at the site is now focused on addressing groundwater impacts in discrete areas. U. S. Steel has an accrued liability of approximately \$17 million as of December 31, 2024 for our estimated share of the remaining costs of remediation at the site.

USS-UPI LLC

In February 2020, U. S. Steel purchased the remaining 50 percent interest in USS-POSCO Industries, a former joint venture that is located in Pittsburg, California between subsidiaries of U. S. Steel and POSCO, now known as USS-UPI, LLC. Prior to formation of the joint venture, UPI's facilities were previously owned and operated solely by U. S. Steel, which assumed responsibility for the existing environmental conditions. U. S. Steel continues to monitor the impacts of the remedial plan implemented in 2016 to address groundwater impacts from trichloroethylene at SWMU 4. Work began in early 2024 to complete removal of hazardous materials and decommission the northwest portion of Building A (SWMU 4.1) and the 54" and 66" Pickle Lines. Additionally, evaluations continue for the SWMUs, known as the Northern Boundary Group, and it is likely that corrective measures will be required, but it is not possible at this time to define a scope or estimate costs for what may be required by the California Department of Toxic Substances Control. As such, there has been no material change in the status of the project during the year ended December 31, 2024. As of December 31, 2024, approximately \$6 million has been accrued for ongoing remediation, environmental studies, investigations, and remedial monitoring. Significant additional costs associated with this site are possible and are referenced in Note 26 to the Consolidated Financial Statements "Contingencies and Commitments - Environmental Matters - Remediation Projects - Projects with Ongoing Study and Scope Development."

Fairfield Works

A consent decree was signed by U. S. Steel, the U.S. EPA and the U.S. Department of Justice and filed with the United States District Court for the Northern District of Alabama (United States of America v. USX Corporation) in December 1997. In accordance with the consent decree, U. S. Steel initiated a RCRA corrective action program at the Fairfield Works facility. The Alabama Department of Environmental Management (ADEM), with the approval of the U.S. EPA, assumed primary responsibility for regulation and oversight of the RCRA corrective action program at Fairfield Works. Corrective Measure Implementation Plans (CMIPs) have been submitted to and approved by ADEM for the last two areas on site where impacts to soil and sediments are required to be addressed. Plans are being finalized for contracting the work required under the CMIPs. U. S. Steel has an accrued liability of approximately \$8 million at December 31, 2024 for the estimated remaining costs of remediation at the site.

South Works

On August 29, 2017, U. S. Steel was notified by the U.S. Coast Guard of a sheen on the water in the North Vessel Slip at our former South Works in Chicago, Illinois. U. S. Steel has been working with the Illinois Environmental Protection Agency (IEPA) under their voluntary Site Remediation Program since 1993 to evaluate the condition of the property including the North Vessel Slip. The result of this cooperative effort has been the issuance of a series of "No Further Remediation" (NFR) notices to U. S. Steel including one specific to the North Vessel Slip. Following the discovery of the sheen, U. S. Steel notified the IEPA of the changed condition and has since been working closely with the IEPA and the U.S. EPA to determine the source and extent of the sheen as well as options to address the issue. U. S. Steel has also filed a claim against an existing insurance policy at the site and is working closely with the insurers to address the issue. U. S. Steel has an accrued liability of approximately \$1 million as of December 31, 2024. Significant additional costs associated with this site are possible and are referenced in Note 26 to the Consolidated Financial Statements "Contingencies and Commitments - Environmental Matters - Remediation Projects - Projects with Ongoing Study and Scope Development."

Air Related Matters

Granite City Works

In October 2015, Granite City Works received a Notice of Violation (NOV) from the IEPA alleging that U. S. Steel violated the emission limits for nitrogen oxides (NOx) and volatile organic compounds from the Basic Oxygen Furnace Electrostatic Precipitator Stack. In addition, the IEPA alleges that U. S. Steel exceeded its natural gas usage limit at its CoGeneration Boiler. U. S. Steel continues to negotiate resolution of the NOV with the IEPA.

Although discussions with the IEPA regarding the foregoing alleged violations are ongoing and the resolution of these matters is uncertain at this time, it is not anticipated that the result of those discussions will be material to U. S. Steel.

Minnesota Ore Operations

On February 6, 2013, the U.S. EPA published a Federal Implementation Plan (FIP) that applies to taconite facilities in Minnesota. The FIP establishes and requires emission limits and the use of low NOx reduction technology on indurating furnaces as Best Available Retrofit Technology (BART). While U. S. Steel installed low NOx burners on three furnaces at Minntac and is currently obligated to install low NOx burners on the two other furnaces at Minntac pursuant to existing agreements and permits, the rule would require the installation of a low NOx burner on the one furnace at Keetac for which U. S. Steel did not have an otherwise existing obligation. U. S. Steel estimates expenditures associated with the installation of low NOx burners of as much as \$25 million to \$30 million. In 2013, U. S. Steel filed a petition for administrative reconsideration to the U.S. EPA and a petition for judicial review of the 2013 FIP and denial of the Minnesota state implementation plan (SIP) to the Eighth Circuit. In April 2016, the U.S. EPA promulgated a revised FIP with the same substantive requirements for U. S. Steel. In June 2016, U. S. Steel filed a petition for administrative reconsideration of the 2016 FIP to the U.S. EPA and a petition for judicial review of the 2016 FIP before the Eighth Circuit Court of Appeals. While the proceedings regarding the petition for judicial review of the 2013 FIP remained stayed, oral arguments regarding the petition for judicial review of the 2016 FIP were heard by the Eighth Circuit Court of Appeals on November 15, 2017. Thus, both petitions for judicial review remain with the Eighth Circuit. On December 4, 2017, the U.S. EPA published a notification in the Federal Register in which the U.S. EPA denied U. S. Steel's administrative petitions for reconsideration and stay of the 2013 FIP and 2016 FIP. On February 1, 2018, U. S. Steel filed a petition for judicial review of the U.S. EPA's denial of the administrative petitions for reconsideration to the Eighth Circuit Court of Appeals. The U.S. EPA and U. S. Steel reached a settlement regarding the five indurating lines at Minntac. After proposing a revised FIP and responding to public comments, on March 2, 2021, the U.S. EPA promulgated a final revised FIP incorporating the conditions and limits for Minntac to which the parties agreed. U. S. Steel and the U.S. EPA reached a tentative settlement agreement to revise BART limits for Keetac. The proposed settlement agreement was subject to a 30-day public comment period as provided in the April 23, 2024 Federal Register. Per the terms of the proposed settlement agreement, the U.S. EPA will sign a proposed rule to revise the FIP consistent with the settlement agreement by April 23, 2025.

Mon Valley Works

On March 7, 2022, the Company received an enforcement order from the ACHD that includes a civil penalty demand for \$1.8 million. In the Order, the ACHD alleges that the Company's Clairton plant is solely and entirely culpable for 153 alleged exceedances of the Pennsylvania hydrogen sulfide ambient air standard that are reported to have occurred during January 1, 2020 through March 1, 2022. On April 5, 2022, the Company appealed the Order and is vigorously defending the matter. On December 29, 2023, the Company received an enforcement order from the ACHD that includes a civil penalty demand for \$2.2 million. In the Order, the ACHD alleges that the Company's Clairton plant was the cause for 159 alleged exceedances of the Pennsylvania hydrogen sulfide ambient air standard that are reported to have occurred from March 2, 2022 through November 30, 2023. The Company appealed the Order and consolidated the case with the Order from March 7, 2022. On September 27, 2024, the Company filed a Motion for Summary Judgment which is currently pending. Due to the ACHD not currently having a Hearing Officer, this matter is stayed.

On March 24, 2022, the Company received an enforcement order from the ACHD that includes a civil penalty demand for \$4.6 million for alleged air permit violations occurring between January 1, 2020 through March 15, 2022 regarding the Company's Clairton plant's coke oven pushing emission control systems. The Company has appealed the Order. On February 26, 2024, the Company received an enforcement order from the ACHD that includes a civil penalty demand for \$2.0 million for alleged air permit violations occurring from March 16, 2022 through December 31, 2023 regarding the Company's Clairton plant's coke oven pushing emission control systems. The Company has appealed the Order. The appeals of the 2022 and 2024 Orders have been consolidated. Due to the ACHD not currently having a Hearing Officer, this matter is stayed.

Item 4. MINE SAFETY DISCLOSURE

The information concerning mine safety violations and other regulatory matters required by Section 1503(a) of the Dodd-Frank Wall Street Reform and Consumer Protection Act and Item 104 of Regulation S-K is included in Exhibit 95 to this Form 10-K.

INFORMATION ABOUT OUR EXECUTIVE OFFICERS

The executive officers of U. S. Steel and their ages as of January 30, 2025, are as follows:

Name	Age	Title	Executive Officer Since
Daniel R. Brown	52	Senior Vice President - Advanced Technology Steelmaking & Chief Operating Officer, Big River Steel	February 1, 2022
James E. Bruno	59	Senior Vice President - Business Development and President, USSE	December 1, 2014
Scott D. Buckiso	57	Senior Vice President and Chief Manufacturing Officer North American Flat-Rolled	May 31, 2015
David B. Burritt	69	President & Chief Executive Officer	September 1, 2013
Jessica T. Graziano	51	Senior Vice President & Chief Financial Officer	August 8, 2022
Manpreet S. Grewal	45	Vice President, Controller & Chief Accounting Officer	March 30, 2020
Duane D. Holloway	52	Senior Vice President, General Counsel and Chief Ethics & Compliance Officer	April 16, 2018

Messrs. Brown, Bruno, Buckiso, Burritt, and Holloway have held responsible management or professional positions with U. S. Steel or its subsidiaries for more than the past five years. Prior to joining U. S. Steel in 2022, Ms. Graziano spent eight years with United Rentals, Inc., culminating in her position as Executive Vice President and Chief Financial Officer. Prior to her work with United Rentals, Ms. Graziano spent five years at Revlon, Inc. where she advanced through positions of increasing responsibility culminating in her being named Senior Vice President, Chief Accounting Officer and Corporate Controller. Prior to joining U. S. Steel in 2020, Mr. Grewal served as vice president, business finance, controller and chief accounting officer at Covanta since February 2017. Prior to Covanta, Mr. Grewal spent fourteen years at Johnson Controls Incorporated (formerly Tyco International) in increasingly responsible roles, including internal audit, accounting, controllership, and financial planning and analysis.

PART II

Item 5. MARKET FOR REGISTRANT'S COMMON EQUITY, RELATED STOCKHOLDER MATTERS AND ISSUER PURCHASES OF EQUITY SECURITIES

Common Stock Information

The principal market on which United States Steel Corporation (U. S. Steel) common stock is traded is the New York Stock Exchange, where the common stock trades under trading symbol "X". U. S. Steel common stock is also traded on the Chicago Stock Exchange under the symbol "X".

As of January 27, 2025, there were 9,505 registered holders of U. S. Steel common stock.

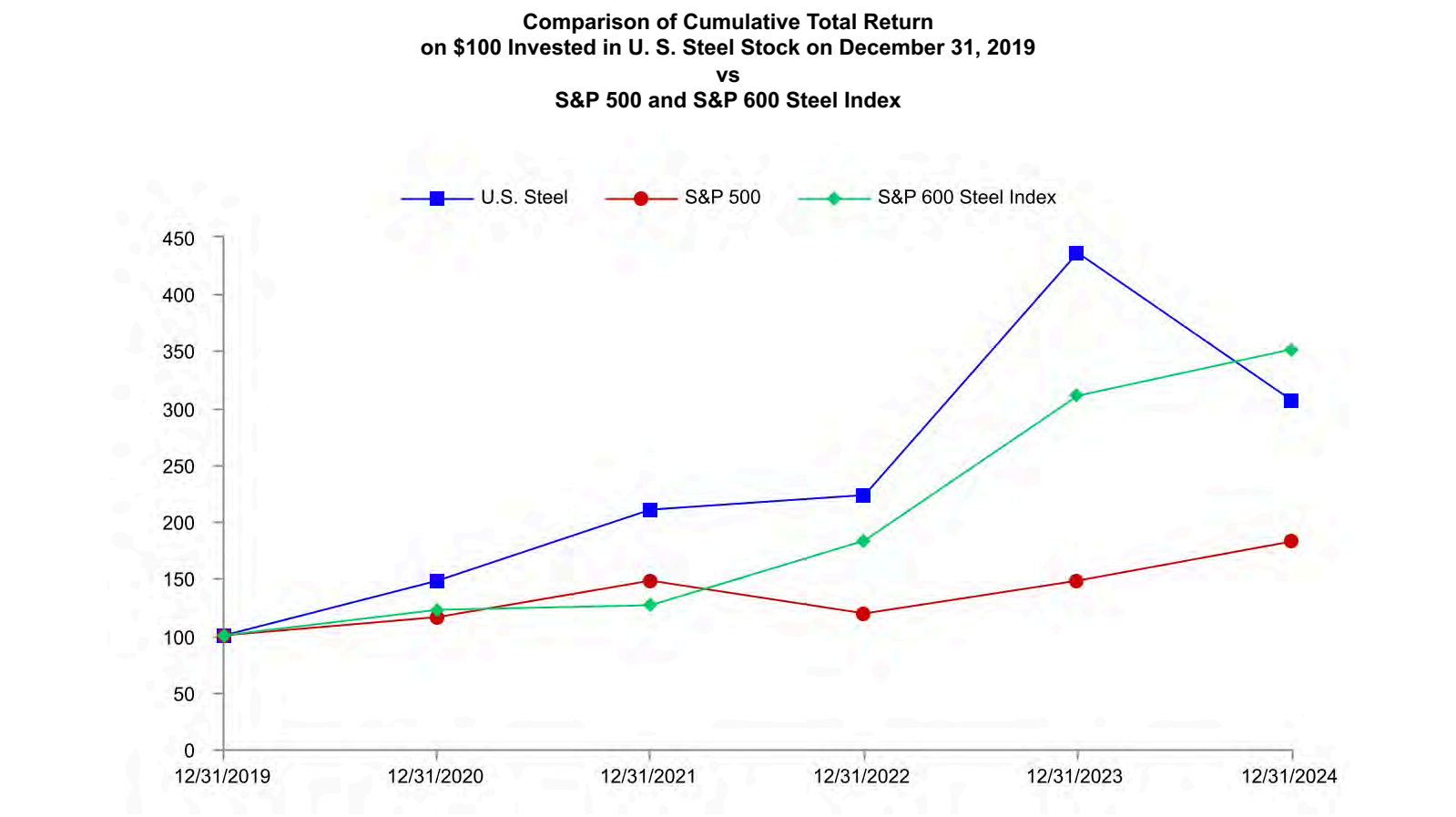
The Board of Directors currently intends to declare and pay dividends on shares of U. S. Steel common stock based on the financial condition and results of operations of U. S. Steel out of legally available funds and in accordance with the requirements set forth by applicable law. Quarterly dividends were declared by U. S. Steel in 2024 and 2023 in the amount of five cents per share.

Purchases of Equity Securities by the Issuer and the Affiliated Purchasers

There were no share repurchases in fiscal 2024.

Stockholder Return Performance

The graph below assumes \$100 invested on December 31, 2019, and compares the yearly change in cumulative total stockholder return of our common stock with the cumulative total return of the Standard & Poor's (S&P) 500 Stock Index and the S&P 600 Steel Index, and assumes that all dividends were reinvested. U. S. Steel is not included in either the S&P 500 Stock Index or S&P 600 Steel Index as to provide a clearer comparison to the selected indices.



For information on securities authorized for issuance under our equity compensation plans, see “Item 12. Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters.”

Unregistered Sales of Equity Securities

U. S. Steel had no sales of unregistered equity securities during the period covered by this report.

Item 6. RESERVED

Item 7. MANAGEMENT’S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS

The following discussion should be read in conjunction with the Consolidated Financial Statements and the related Notes that appear elsewhere in this document. Please refer to Item 7 of our 2023 Form 10-K for further discussion and analysis of our 2022 financial condition and results of operations.

Overview

Business Update

As previously disclosed, on December 18, 2023, the Company entered into the Merger Agreement by and among the Company, Purchaser, Merger Sub, and solely as provided in Section 9.13 therein, NSC. Pursuant to the Merger Agreement, and upon the

terms and subject to the conditions described therein, Merger Sub will merge with and into the Company, with the Company continuing as the surviving corporation and a wholly owned subsidiary of Purchaser (the “Merger”).

The parties have substantially complied with the Second Requests issued on April 3, 2024 and the statutory waiting period under the Hart-Scott-Rodino Antitrust Improvements Act of 1976 has now expired. In addition, all required regulatory approvals outside of the United States related to the Merger have been received. The closing conditions to the Merger include clearance by the Committee on Foreign Investment in the United States (“CFIUS”) under the Defense Production Act of 1950, as amended. Following referral of the transaction by CFIUS to the President of the United States, on January 3, 2025, the President of the United States issued an order prohibiting the Merger and requiring the parties to abandon the Merger Agreement within thirty days. On January 10, 2025, CFIUS granted an extension of that deadline to June 18, 2025.

On January 6, 2025, the Company, NSC and Purchaser jointly filed a lawsuit in the United States Court of Appeals for the District of Columbia Circuit alleging that the President’s order blocking the Merger was issued for purely political reasons, which are irrelevant to U.S. national security, challenging the decision by the President of the United States and the CFIUS process as violating the constitutional due process rights of the Company, NSC and Purchaser, as well as the applicable statute governing CFIUS and the Administrative Procedure Act, and as an exercise of power that exceeded the authority provided to the President of the United States under the applicable statute. On the same day, the Company, NSC and Purchaser also filed a lawsuit in the United States District Court for the Western District of Pennsylvania against Cleveland-Cliffs Inc. (“Cliffs”), Cliffs’ Chief Executive Officer Lourenco Goncalves, and the President of the United Steel, Paper and Forestry, Rubber, Manufacturing, Energy, Allied Industrial and Service Workers International Union (the “USW”), David McCall, for engaging in a coordinated series of anticompetitive and racketeering activities illegally designed to prevent any party other than Cliffs from acquiring the Company as part of an illegal campaign to monopolize critical domestic steel markets.

Segments Update

In 2024, the Company continued to execute on its strategy by investing in and completing its key strategic projects. U. S. Steel’s results in 2024 decreased compared to the previous year for the four reportable segments due to the following factors:

- **North American Flat-Rolled:** Flat-Rolled results decreased primarily due to lower sales volume across most products and lower sales price across most products.
- **Mini Mill:** Mini Mill results decreased primarily due to lower sales volume across most products and lower sales price across all products.
- **U. S. Steel Europe:** USSE results decreased primarily due to lower sales volume across most products and lower sales price across all products.
- **Tubular:** Tubular results decreased primarily due to lower sales price.

Fluctuations in the market price of raw materials and other inflationary impacts have affected the results of each of our reportable segments, and fluctuations going-forward are reasonably likely to have a material impact on future results. We anticipate inflation related headwinds for certain raw materials and other costs, and sales prices and sales volumes may continue to have an adverse effect on our results.

Critical Accounting Estimates

Management’s discussion and analysis of U. S. Steel’s financial condition and results of operations is based upon U. S. Steel’s financial statements, which have been prepared in accordance with accounting standards generally accepted in the United States (U.S. GAAP). The preparation of these financial statements requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities, the disclosure of contingent assets and liabilities at year-end and the reported amount of revenues and expenses during the year. Management regularly evaluates these estimates, including those related to employee benefits liabilities and assets held in trust relating to such liabilities; the carrying value of property, plant and equipment; intangible assets; valuation allowances for receivables, inventories and deferred income tax assets; liabilities for deferred income taxes; potential tax deficiencies; environmental obligations; potential litigation claims and settlements and put and call option assets and liabilities. Management’s estimates are based on historical experience, current business and market conditions, and various other assumptions that are believed to be reasonable under the circumstances, the results of which form the basis for making judgments about the carrying values of assets and liabilities that are not readily apparent from other sources. Actual results may differ materially from current expectations under different assumptions or conditions.

Management believes that the following are the more significant judgments and estimates used in the preparation of the financial statements.

Goodwill and intangible assets – Goodwill represents the excess of the cost over the fair value of acquired identifiable tangible and intangible assets and liabilities assumed from businesses acquired. Goodwill and intangible assets deemed to have indefinite lives are not amortized, but are subject to impairment testing annually, or more frequently if events or changes in

circumstances indicate the asset might be impaired. We perform our annual goodwill impairment test as of October 1 and monitor for interim triggering events on an ongoing basis. Application of the goodwill impairment test requires judgment.

We review goodwill for impairment utilizing either a qualitative assessment or a quantitative goodwill impairment test. If we choose to perform a qualitative assessment and we determine that the fair value of the reporting unit more likely than not exceeds the carrying value, no further evaluation is necessary. For reporting units where we perform the quantitative goodwill impairment test, we compare the fair value of each reporting unit, which we primarily determine using an income approach based on the present value of discounted cash flows, to the respective carrying value, which includes goodwill. If the fair value of the reporting unit exceeds its carrying value, we do not consider the goodwill impaired. If the carrying value is higher than the fair value, we recognize the difference as an impairment loss.

A quantitative goodwill impairment testing process requires valuation of the respective reporting unit, which we primarily determine using an income approach based on a discounted cash flow forecast covering discrete periods of time including a terminal value. We compute the terminal value using the constant growth method, which values the forecasted cash flows in perpetuity. The assumptions about future cash flows and growth rates are based on the respective reporting unit's long-term forecast and are subject to review and approval by senior management. A reporting unit's discount rate is a significant assumption and is a risk-adjusted weighted average cost of capital, which we believe approximates the rate from a market participant's perspective. The estimated fair value could be impacted by changes in market conditions, interest rates, growth rates, tax rates, costs, pricing and capital expenditures. We categorize the fair value determination as Level 3 in the fair value hierarchy due to its use of internal projections and unobservable measurement inputs.

Our Mini Mill reporting unit holds the goodwill recognized as a result of the Company's acquisition of Big River Steel and currently is our only reporting unit that has a significant amount of goodwill. This goodwill is primarily attributable to Big River Steel's operational abilities, workforce and the anticipated benefits from their recent expansion. U. S. Steel completed its annual goodwill impairment test using a qualitative assessment during the fourth quarter of 2024 and determined there was no impairment of goodwill.

Intangible assets with indefinite lives are also subject to at least annual impairment testing, which compares the fair value of the intangible assets with their carrying amounts. U. S. Steel has determined that certain of its acquired intangible assets have indefinite useful lives. These assets are also reviewed for impairment annually in the fourth quarter and whenever events or circumstances indicate the carrying value may not be recoverable. U. S. Steel completed its annual evaluation of its indefinite-lived water rights using a qualitative assessment and determined there was no indication of impairment. Key assumptions included in this test relate to the relevant market rate of an acre foot of water.

If business conditions deteriorate or other factors have an adverse effect on our qualitative and quantitative estimates, inclusive of discounted future cash flows or assumed growth rates, or if we experience a sustained decline in our market capitalization, future assessments of goodwill for impairment may result in impairment charges.

Finite-lived intangible assets are amortized on a straight-line basis over their estimated useful lives and are tested for impairment when events occur that indicate that the net book value will not be recovered over future cash flows.

Business combinations – We account for business combinations under the acquisition method of accounting in accordance with Accounting Standards Codification (ASC) Topic 805, *Business Combinations*, which requires an allocation of the consideration we paid to the identifiable assets, intangible assets and liabilities based on the estimated fair values as of the closing date of the acquisition. The excess of the fair value of the purchase price over the fair values of these identifiable assets, intangible assets and liabilities is recorded as goodwill.

Purchased intangibles are initially recognized at fair value and amortized over their useful lives unless those lives are determined to be indefinite. The valuation of acquired assets will impact future operating results. The fair value of identifiable intangible assets is determined using an income approach on an individual asset basis. Specifically, we use the multi-period excess earnings method to estimate the fair value of the customer relationships intangible asset. Determining the fair value of the customer relationships intangible asset involves significant judgments and assumptions, including expected realized price, base year metallic costs, contributory asset charges, and customer attrition rate.

Inventories – Inventories are carried at the lower of cost or market for last-in, first-out (LIFO), moving average and first-in, first-out (FIFO) method inventories. The predominant method of inventory costing for Flat-Rolled and Tubular is LIFO. The Mini Mill segment uses FIFO for raw materials and a moving average costing method to account for semi-finished and finished products. FIFO is the predominant inventory costing method used by the USSE segment. The LIFO method of inventory costing was used on 53 percent of consolidated inventories at both December 31, 2024, and December 31, 2023. Since the LIFO inventory valuation methodology is an annual calculation, interim estimates of the annual LIFO valuation are required. We recognize the effects of the LIFO inventory valuation method on an interim basis by estimating the year-end inventory amounts. The projections of annual LIFO inventory amounts are updated quarterly. Changes in U.S. GAAP rules or tax law, such as the elimination of the LIFO method of accounting for inventories, could negatively affect our profitability and cash flow.

Pensions and Other Benefits – The recording of net periodic benefit costs for defined benefit pensions and Other Benefits is based on, among other things, assumptions of the expected annual return on plan assets, discount rate, mortality, escalation or other changes in retiree health care costs and plan participation levels. Changes in the assumptions or differences between actual and expected changes in the present value of liabilities or assets of U. S. Steel's plans could cause net periodic benefit costs to increase or decrease materially from year to year as discussed below.

U. S. Steel's investment strategy for its U.S. pension and Other Benefits plan assets provides for a diversified mix of high-quality bonds, public equities and selected smaller investments in private equities and private credit. For its U.S. pension, U. S. Steel has a target allocation for plan assets of 68 percent in fixed income investments. The balance is invested in equity securities, private equity and real estate partnerships. U. S. Steel believes that returns on equities over the long term will be higher than returns from fixed-income securities as actual historical returns from U. S. Steel's trusts have shown. Returns on bonds tend to offset some of the short-term volatility of stocks. Both equity and fixed-income investments are made across a broad range of industries and companies (both domestic and foreign) to provide protection against the impact of volatility in any single industry as well as company specific developments. U. S. Steel will use a 6.90 percent assumed rate of return on assets for the development of net periodic cost for the main defined benefit pension plan in 2025. Actual returns since the inception of the plan have exceeded this 6.90 percent rate and while recent annual returns have been volatile, it is U. S. Steel's expectation that rates will achieve this level in future periods.

For its Other Benefits plan, U. S. Steel is employing a liability driven investment strategy. The plan assets are allocated to match the plan cash flows with maturing investments. To achieve this strategy, U. S. Steel has a target allocation for plan assets of 78 percent in fixed income and private credit. The balance is primarily invested in equity securities, private equity and real estate partnerships. U. S. Steel will use a 6.00 percent assumed rate of return on assets for the development of net periodic cost for its Other Benefits plan for 2025.

The expected long-term rate of return on plan assets is applied to the market value of assets as of the beginning of the period less expected benefit payments and considering any planned contributions.

To determine the discount rate used to measure our pension and Other Benefit obligations for U.S. plans we utilize a bond matching approach to select specific bonds that would satisfy our projected benefit payments. At December 31, 2024, the weighted average discount rate used for our pension and Other Benefit obligations was determined to be 5.90 percent and 5.90 percent, respectively, compared to the weighted average discount rate used of 5.49 percent and 5.58 percent, respectively, at December 31, 2023. The discount rate reflects the current rate at which we estimate the pension and Other Benefits liabilities could be effectively settled at the measurement date.

U. S. Steel reviews its actual historical rate experience and expectations of future health care cost trends to determine the escalation of per capita health care costs under U. S. Steel's benefit plans. Approximately 85 percent of our costs for the domestic United Steelworkers participants' retiree health benefits in the Company's main domestic benefit plan are limited to a per capita dollar maximum calculation based on 2006 base year actual costs incurred under the main U. S. Steel benefit plan for USW participants (cost cap). The full effect of the cost cap is expected to be realized around 2031. After 2031, the Company's costs for a majority of USW retirees and their dependents are expected to remain fixed and as a result, the cost impact of health care escalation for the Company is projected to be limited for this group (see Note 18 to the Consolidated Financial Statements). For measurement of its domestic retiree medical plans where health care cost escalation is applicable, U. S. Steel has assumed an initial escalation rate of 5.80 percent for 2025. This rate is assumed to decrease gradually to an ultimate rate of 4.50 percent in 2038 and remain at that level thereafter.

Net periodic pension benefit cost (credit), including multiemployer plans, is expected to total approximately \$139 million in 2025 compared to \$82 million in 2024. The increase in net periodic pension benefit cost in 2025 is primarily due to a decrease in expected asset return and an increase in amortized actuarial losses. Net periodic other benefit (credit) in 2025 is expected to be approximately \$(44) million, compared to \$(102) million in 2024. The expected decrease in the 2025 net periodic other benefit (credit) is primarily due to decreases in prior service credits and amortized actuarial gains. See Note 18 to the Consolidated Financial Statements, "Pensions and Other Benefits."

The table below projects the incremental effect of a hypothetical one percentage point change in significant assumptions used in determining the funded status and net periodic benefit cost for pension and other benefits:

	Hypothetical Rate Change Increase (Decrease)			
(In millions)	1%		(1)%	
Expected return on plan assets				
Incremental (decrease) increase in:				
Net periodic pension and other benefits costs for 2025	\$	(49)	\$	49
Discount rate				
Incremental (decrease) increase in:				
Net periodic pension and other benefits costs for 2025	\$	(24)	\$	(1)
Pension & other benefits obligations at December 31, 2024	\$	(344)	\$	400

Changes in the assumptions for expected annual return on plan assets and the discount rate used for accounting purposes do not impact the funding calculations used to derive minimum funding requirements for the pension plan. However, the discount rate required for minimum funding purposes is also based on corporate bond related indices and as such, the same general sensitivity concepts as above can be applied to increases or decreases to the funding obligations of the plans assuming the same hypothetical rate changes. See Note 18 to the Consolidated Financial Statements for a discussion regarding legislation enacted in March of 2021 that impacts the discount rate used for funding purposes. For further cash flow discussion see "Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations, Liquidity and Capital Resources."

Long-lived assets – U. S. Steel evaluates long-lived assets, primarily property, plant and equipment for impairment whenever changes in circumstances indicate that the carrying amounts of those productive assets exceed their recoverable amount as determined by the asset group's projected undiscounted cash flows. We evaluate long-lived assets for potential impairment at the asset group level. Our primary asset groups are flat-rolled, mini mill, USSE, welded tubular and seamless tubular.

In 2024, the Company recognized impairment charges of approximately \$19 million for certain indefinitely idled assets at Granite City Works and certain permanently idled assets at Clairton Works. In 2023, the Company recognized charges of approximately \$123 million for impairment of indefinitely idled iron and steel making assets at Granite City Works. Impairment charges of approximately \$151 million were recognized for the write-off of iron making and steel making assets at Great Lakes Works in 2022. The coil finishing processes at Granite City Works and Great Lakes Works continue to operate and remain components of the Company's operating plans. These impairment charges were the result of actions impacting specific, identifiable assets and were not significantly adverse to the flat-rolled long-lived asset group. No triggering events that required an impairment evaluation of our long-lived asset groups were identified during the years ended December 31, 2024, 2023 and 2022.

Taxes – U. S. Steel records a valuation allowance, related to certain state and foreign net operating losses, state and foreign tax credits and unused capital losses, to reduce deferred tax assets to the amount that is more likely than not to be realized. A valuation allowance is recorded if, based on the weight of all available positive and negative evidence, it is more likely than not that some portion, or all, of a deferred tax asset will not be realized. Each quarter U. S. Steel analyzes the likelihood that our deferred tax assets will be realized. In the future, if we determine that it is more likely than not that we will be able to realize all or a portion of our deferred tax assets, the valuation allowance will be reduced, and we will record a non-cash net benefit to earnings.

At the end of both 2024 and 2023, U. S. Steel did not have any undistributed foreign earnings and profits for which U.S. deferred taxes have not been provided.

For further information on income taxes see Note 11 to the Consolidated Financial Statements.

Environmental remediation – U. S. Steel has been identified as a PRP at four sites under the CERCLA as of December 31, 2024. Of these, there are three sites where information requests have been received or there are other indications that U. S. Steel may be a PRP under CERCLA, but where sufficient information is not presently available to confirm the existence of liability or to make a reasonable estimate with respect to any potential liabilities. There are also nine additional sites where U. S. Steel may be liable for remediation costs in excess of \$1 million under other environmental statutes, both federal and state, or where private parties are seeking to impose liability on U. S. Steel for remediation costs through discussions or litigation. At many of these sites, U. S. Steel is one of a number of parties involved and the total cost of remediation, as well as U. S. Steel's share, is frequently dependent upon the outcome of ongoing investigations and remedial studies. U. S. Steel accrues for environmental remediation activities when the responsibility to remediate is probable and the amount of associated costs is reasonably determinable. As environmental remediation matters proceed toward ultimate resolution or as remediation obligations arise, charges in excess of those previously accrued may be required.

U. S. Steel's accrual for environmental liabilities for U.S. and international facilities as of December 31, 2024, and 2023 was \$108 million and \$107 million, respectively. These amounts exclude liabilities related to asset retirement obligations, disclosed in Note 19 to the Consolidated Financial Statements.

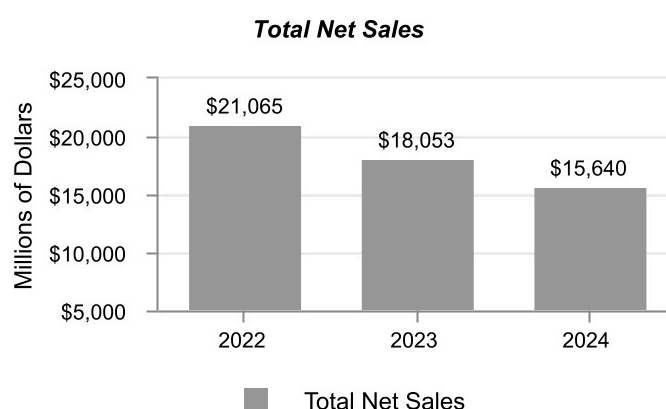
U. S. Steel is the subject of, or a party to, a number of pending or threatened legal actions, contingencies and commitments involving a variety of matters, including laws and regulations relating to the environment. The ultimate resolution of these contingencies could, individually or in the aggregate, be material to the Consolidated Financial Statements.

For discussion of relevant environmental items, see "Part I. Item 3. Legal Proceedings—Environmental Proceedings."

Segments

U. S. Steel has four reportable segments: North American Flat-Rolled, Mini Mill, USSE and Tubular Products. For further description of segment operations and information see Item 1. Business—Segments and Note 4 to the Consolidated Financial Statements, respectively.

Net Sales



Net Sales by Segment

Net sales by segment for the years ended December 31, 2024, and 2023 are set forth in the following table:

(Dollars in millions, excluding intersegment sales)	Years Ended December 31,		% Change
	2024	2023	
Flat-Rolled	\$ 9,604	\$ 10,744	(11)%
Mini Mill	2,070	2,223	(7)%
USSE	2,983	3,525	(15)%
Tubular	970	1,551	(37)%
Total sales from reportable segments	15,627	18,043	(13)%
Other	13	10	30 %
Net Sales	\$ 15,640	\$ 18,053	(13)%

Management's analysis of the percentage change in net sales for U. S. Steel's reportable business segments is set forth in the following table:

Year Ended December 31, 2024 versus Year Ended December 31, 2023	Steel Products ^(a)					Net Change
	Volume	Price	Mix	FX ^(b)	Other ^(c)	
Flat-Rolled	(8)%	(2)%	— %	— %	(1)%	(11)%
Mini Mill	(5)%	(3)%	1 %	— %	— %	(7)%
USSE	(8)%	(7)%	— %	— %	— %	(15)%
Tubular	— %	(30)%	(7)%	— %	— %	(37)%

^(a) Excludes intersegment sales.

^(b) Foreign currency translation effects.

^(c) Primarily consists of sales of raw material and coke making by-products.

Net sales for the year ended December 31, 2024, compared to the same period in 2023 were \$15,640 million and \$18,053 million, respectively.

- For the Flat-Rolled segment, the decrease in sales primarily resulted from decreased shipments (861 thousand tons) across most products and lower average realized prices (\$17 per ton) across most products.
- For the Mini Mill segment, the decrease in sales primarily resulted from decreased shipments (117 thousand tons) from lower value products and lower average realized prices (\$18 per ton) across all products.
- For the USSE segment, the decrease in sales primarily resulted from decreased shipments (321 thousand tons) across most products and lower average realized prices (\$69 per ton) across all products.
- For the Tubular segment, the decrease in sales primarily resulted from lower average realized prices (\$1,232 per ton) and mix changes to lower value products.

Operating Expenses

Union profit-sharing costs

(Dollars in millions)	Year Ended December 31,	
	2024	2023
Allocated to segment results	\$ 57	\$ 149

The amounts above represent profit-sharing amounts paid to active USW-represented employees and are included in cost of sales on the Consolidated Statements of Operations.

Profit-based amounts are calculated and paid on a quarterly basis as a percentage of consolidated earnings before interest and income taxes based on 7.5 percent of profit between \$10 and \$50 per ton and 15 percent of profit above \$50 per ton.

Net periodic pension and other benefits costs

Pension and other benefit costs (other than service cost) are reflected within net interest and other financial (benefits) costs and the service cost component is reflected within cost of sales in the Consolidated Statements of Operations.

Defined benefit and multiemployer pension plan costs included in cost of sales totaled \$108 million in 2024 and \$116 million in 2023.

Other benefit service cost included in cost of sales totaled \$4 million in 2024 and \$6 million in 2023.

Costs related to defined contribution plans totaled \$48 million in 2024 and \$50 million in 2023.

Selling, general and administrative expenses

Selling, general and administrative expenses were \$435 million and \$501 million for the years ended December 31, 2024, and December 31, 2023, respectively. The change between periods was primarily due to decreased costs related to pension and OPEB benefits and variable compensation.

Operating configuration adjustments

The Company adjusts its operating configuration in response to changes in market conditions, global overcapacity, import competition arising from unfair trade practices, and changes in customer demand. These operating configuration adjustments can include indefinitely and temporarily idling certain of its facilities as well as restarting production at certain of its facilities.

Idled Operations

In December 2024, the Company temporarily idled Blast Furnace #3 at USSE until demand improves. It is expected that Blast Furnace #3 will be restarted in the first quarter of 2025 based on market conditions.

In 2023, the Company indefinitely idled its subsidiary in Pittsburg, California, USS-UPI, LLC (UPI), resulting in restructuring and other charges of \$3 million and \$30 million in 2023 and 2022, respectively. Also, in 2023, the Company indefinitely idled the iron and steel making assets at Granite City Works which resulted in a non-cash asset impairment of \$123 million and additional charges of \$107 million primarily for take-or-pay commitments and employee-related costs. The hot-strip mill, cold mill and coating lines at Granite City Works continue to operate.

In 2023, the Company completed the previously announced permanent shutdown of coke batteries numbers 1 through 3 at the Mon Valley Works.

In 2022, U. S. Steel indefinitely idled the majority of the tin mill operations at Gary Works. This included the Tin Line #5 and the Tin Line #6. As of December 31, 2024, the carrying value of the indefinitely idled tin mill operations assets at Gary Works is \$65 million. Tin mill operations continue to operate at the Midwest plant.

At Great Lakes Works, the Company permanently idled the ironmaking operations in 2022, which resulted in non-cash impairment of \$151 million. The coil finishing process at Great Lakes Works continues to operate and remains a component of the Company's operating plans.

The Company's Lorain Tubular Operations, Lone Star Tubular Operations and the Wheeling Machine Products coupling production facility at Hughes Springs, Texas were initially idled in 2020 and remained indefinitely idled as of December 31, 2024. The carrying value of the Lorain Tubular Operations assets is \$50 million as of December 31, 2024.

Depreciation, depletion and amortization

Depreciation, depletion and amortization expenses were \$913 million in 2024 and \$916 million in 2023.

Earnings from investees

Earnings from investees were \$112 million in 2024 compared to \$115 million in 2023. The decrease in 2024 from the prior year is primarily due to decreased earnings from Hibbing Development Company and Patriot Premium Threading Services, partially offset by our PRO-TEC joint venture.

Restructuring and other charges

During 2024, the Company recorded restructuring and other charges of \$8 million, which related primarily to idling of certain coke-making facilities. Charges for restructuring and ongoing cost reduction initiatives are recorded in the period U. S. Steel commits to a restructuring or cost reduction plan, or executes specific actions contemplated by the plan and all criteria for liability recognition have been met. Charges related to restructuring and cost reductions are reported in Restructuring and other charges in the Consolidated Statements of Operations.

Earnings (loss) before interest, taxes, depreciation and amortization by segment

Segment performance is measured primarily on the basis of segment level earnings (loss) before interest, taxes, depreciation and amortization (EBITDA). EBITDA for reportable segments and the Other category does not include net interest and other financial costs (income), income taxes, and certain other items that management believes are not indicative of future results.

Earnings (loss) before interest, taxes, depreciation and amortization by segment ^(a) <i>(Dollars in Millions)</i>	Year Ended December 31,	
	2024	2023
Flat-Rolled	\$ 934	\$ 1,023
Mini Mill	233	383
USSE	71	98
Tubular	135	638
Other loss before interest, taxes, depreciation and amortization	(7)	(3)
Depreciation, depletion and amortization	(913)	(916)
Segment earnings before interest and income taxes	453	1,223
Other items not allocated to segments:		
Restructuring and other charges ^(b)	(8)	(36)
Stock-based compensation expense	(51)	(51)
Asset impairment charges ^(c)	(19)	(127)
Environmental remediation charges	(18)	(11)
Strategic alternatives review process costs	(90)	(79)
Granite City idling costs	(11)	(121)
Other charges, net	(16)	1
Total earnings before interest and income taxes	\$ 240	\$ 799

^(a) See Note 4 to the Consolidated Financial Statements for reconciliations and other details.

^(b) Included in restructuring and other charges on the Consolidated Statements of Operations. See Note 25 to the Consolidated Financial Statements for further details.

^(c) See Note 1 to the Consolidated Financial Statements for further details.

Segment results for Flat-Rolled

<i>(Dollars in Millions)</i>	Year Ended December 31,		% Change
	2024	2023	
Earnings before interest, taxes, depreciation and amortization (EBITDA)	\$ 934	\$ 1,023	(9)%
Depreciation, depletion and amortization	535	605	(12)%
Earnings before interest and income taxes	\$ 399	\$ 418	(5)%
Gross margin	11 %	11 %	— %
Raw steel production (mnt)	8,389	9,399	(11)%
Capability utilization	63 %	71 %	(8)%
Steel shipments (mnt)	7,845	8,706	(10)%
Average realized steel price per ton	1,013	1,030	(2)%

The decrease in Flat-Rolled EBITDA for 2024 compared to 2023 was primarily due to:

- lower average realized prices, including mix (approximately \$50 million)
- decreased shipments (approximately \$220 million)
- lower other sales (approximately \$70 million)
- higher operating costs (approximately \$110 million),

these changes were partially offset by:

- lower raw material costs, including inventory revaluations (approximately \$90 million)
- lower energy costs (approximately \$105 million)
- favorable equity affiliate income (approximately \$70 million)
- lower other costs, primarily profit-based payments (approximately \$95 million).

Gross margin for 2024 as compared to 2023 was unchanged.

Segment results for Mini Mill

	Year Ended December 31,		% Change
	2024	2023	
<i>(Dollars in Millions)</i>			
Earnings before interest, taxes, depreciation and amortization (EBITDA)	\$ 233	\$ 383	(39)%
Depreciation, depletion and amortization	203	168	21 %
Earnings before interest and income taxes	\$ 30	\$ 215	(86)%
Gross margin	17 %	19 %	(2)%
Raw steel production (mnt)	2,838	2,953	(4)%
Capability utilization	80 %	89 %	(9)%
Steel shipments (mnt)	2,307	2,424	(5)%
Average realized steel price per ton	857	875	(2)%

The decrease in Mini Mill EBITDA results for 2024 compared to 2023 was primarily due to:

- lower average realized prices, including mix (approximately \$55 million)
- decreased shipments (approximately \$140 million)
- higher other costs, primarily strategic projects startup costs (approximately \$105 million),

these changes were partially offset by:

- lower raw material costs (approximately \$150 million).

Gross margin for 2024 as compared to 2023 decreased primarily due to lower sales volume and price.

Segment results for USSE

	Year Ended December 31,		% Change
	2024	2023	
<i>(Dollars in Millions)</i>			
Earnings before interest, taxes, depreciation and amortization (EBITDA)	\$ 71	\$ 98	(28)%
Depreciation, depletion and amortization	125	94	33 %
(Loss) earnings before interest and income taxes	\$ (54)	\$ 4	(1,450)%
Gross margin	4 %	4 %	— %
Raw steel production (mnt)	3,832	4,395	(13)%
Capability utilization	77 %	88 %	(11)%
Steel shipments (mnt)	3,578	3,899	(8)%
Average realized steel price per ton	805	873	(8)%

The decrease in USSE EBITDA results for 2024 compared to 2023 was primarily due to:

- lower average realized prices, including mix (approximately \$220 million)
- decreased shipments, including volume inefficiencies (approximately \$70 million)
- lower other sales (approximately \$5 million)
- higher operating costs (approximately \$40 million),

these changes were partially offset by:

- lower raw material costs, including inventory revaluations and CO₂ accrual adjustments (approximately \$215 million)
- lower energy costs (approximately \$85 million)
- lower other costs (approximately \$5 million)
- strengthening of the U.S. dollar versus the Euro (approximately \$5 million).

Gross margin for 2024 as compared to 2023 was unchanged.

Segment results for Tubular

	Year ended December 31,		% Change
	2024	2023	
<i>(Dollars in Millions)</i>			
Earnings before interest, taxes, depreciation and amortization (EBITDA)	\$ 135	\$ 638	(79)%
Depreciation, depletion and amortization	50	49	2 %
Earnings before interest and income taxes	\$ 85	\$ 589	(86)%
Gross margin	14 %	40 %	(26)%
Raw steel production (mnt)	575	568	1 %
Capability utilization	64 %	63 %	1 %
Steel shipments (mnt)	476	478	— %
Average realized steel price per ton	1,905	3,137	(39)%

The decrease in Tubular EBITDA results for 2024 compared to 2023 was primarily due to:

- lower average realized prices (approximately \$520 million)
- decreased shipments (approximately \$35 million),

these changes were partially offset by:

- lower raw material costs (approximately \$20 million)
- lower other costs, primarily variable compensation (approximately \$30 million).

Gross margin for 2024 as compared to 2023 decreased primarily as a result of lower average realized prices.

Results for Other

The Other category had a loss before interest, taxes, depreciation and amortization of \$7 million for the year ended December 31, 2024, compared to a loss before interest, taxes, depreciation and amortization of \$3 million for the year ended December 31, 2023.

Net Interest and Other Financial Costs

<i>(Dollars in millions)</i>	Year Ended December 31,	
	2024	2023
Interest expense	24	72
Interest income	(96)	(141)
Loss on debt extinguishment	2	—
Other financial costs	29	18
Net periodic benefit income	(132)	(154)
Net gain from investments related to active employee benefits	(25)	(43)
Net interest and other financial benefits	\$ (198)	\$ (248)

Net interest and other financial benefits declined in 2024 compared to 2023 primarily due to reduced net periodic benefit income from increases in actuarial losses, reduced investment gains related to active employee benefits from lower 2024 asset performance, and decreased interest income from a lower cash balance. These were partially offset by lower interest expense as a result of increased capitalized interest. For additional information on U. S. Steel indebtedness see Note 17 to the Consolidated Financial Statements.

For additional information on U. S. Steel's foreign currency exchange activity see Note 16 to the Consolidated Financial Statements and Item 7A. "Quantitative and Qualitative Disclosures about Market Risk – Foreign Currency Exchange Rate Risk."

Income Tax

The income tax expense for the year ended December 31, 2024, was \$54 million compared to an income tax expense of \$152 million in 2023. The change from the prior year period was primarily due to a decrease in earnings before taxes. In addition, the current year period includes a benefit of \$59 million related to the 2023 federal and state income tax returns.

For further information on income taxes see Note 11 to the Consolidated Financial Statements.

Net earnings attributable to U. S. Steel

Net earnings attributable to U. S. Steel in 2024 were \$384 million compared to net earnings of \$895 million in 2023. The decrease was primarily attributable to the factors discussed above.

Liquidity and Capital Resources

Cash Flows and Capital Requirements

Net Cash Provided by Operating Activities

Net cash provided by operating activities was \$919 million in 2024 compared to \$2,100 million in 2023. The decrease in 2024 compared to 2023 was primarily due to lower net earnings and changes in working capital. Changes in working capital can vary significantly depending on factors such as the timing of inventory production and purchases, which is affected by the length of our business cycles as well as our captive raw materials position, customer payments of accounts receivable and payments to vendors in the regular course of business.

Our cash conversion cycle increased by 7 days in the fourth quarter of 2024 from the fourth quarter of 2023 as shown below:

Cash Conversion Cycle	2024		2023	
	<u>\$ millions</u>	<u>Days</u>	<u>\$ millions</u>	<u>Days</u>
Accounts receivable, net ^(a)	\$ 1,398	40	\$ 1,549	34
+ Inventories ^(b)	\$ 2,168	58	\$ 2,128	53
- Accounts Payable and Other Accrued Liabilities ^(c)	\$ 2,601	72	\$ 2,867	68
= Cash Conversion Cycle ^(d)		26		19

^(a) Calculated as Average Accounts Receivable, net divided by total Net Sales multiplied by the number of days in the period.

^(b) Calculated as Average Inventory divided by total Cost of Sales multiplied by the number of days in the period.

^(c) Calculated as Average Accounts Payable and Other Accrued Liabilities less bank checks outstanding and other current liabilities divided by total Cost of Sales multiplied by the number of days in the period.

^(d) Calculated as Accounts Receivable Days plus Inventory Days less Accounts Payable Days.

The cash conversion cycle is a non-GAAP financial measure. We believe the cash conversion cycle is a useful measure in providing investors with information regarding our cash management performance and is a widely accepted measure of working capital management efficiency. The cash conversion cycle should not be considered in isolation or as an alternative to other GAAP metrics as an indicator of performance.

The days in our cash conversion cycle in comparison to the prior year increased primarily from higher inventory levels in our Mini Mill segment due to the BR2 start-up and lower net sales in the fourth quarter of the current year compared to the same period in the prior year.

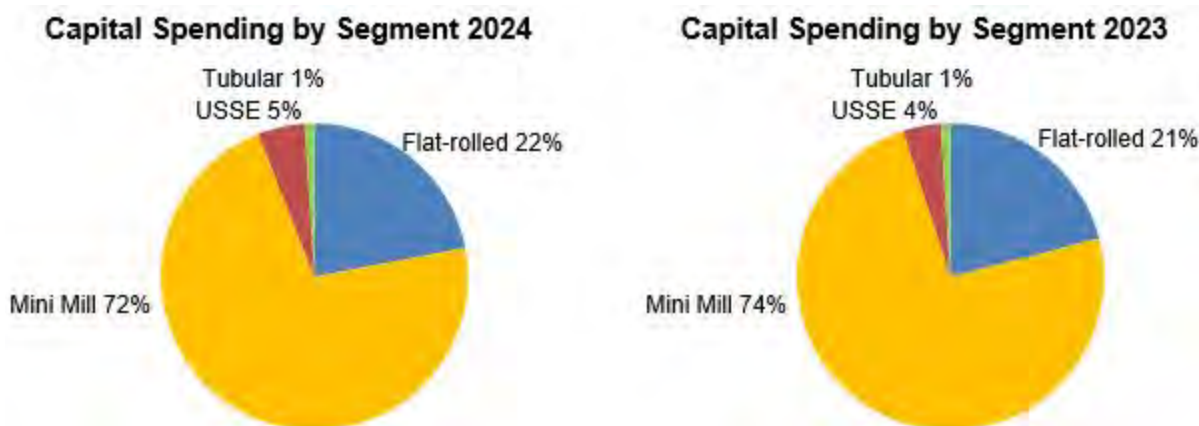
The LIFO inventory method is the predominant method of inventory costing for our Flat-Rolled and Tubular segments. The FIFO and moving average methods are the predominant inventory costing methods for our Mini Mill segment and the FIFO method is the predominant inventory costing method for our USSE segment. In the U.S., management monitors the inventory realizability by comparing the LIFO cost of inventory with the replacement cost of inventory. To the extent the replacement cost (i.e., market value) of inventory is lower than the LIFO cost of inventory, management will write the inventory down. As of December 31, 2024, and 2023, the replacement cost of the LIFO inventory was higher by approximately \$1,143 million and \$1,248 million, respectively.

Net cash provided by operating activities for 2024 and 2023 reflects employee benefits payments as shown in the following table.

Benefits Payments for Employees (Dollars in millions)	Year Ended December 31,	
	2024	2023
Other employee benefits payments not funded by trusts	32	40
Payments to a multiemployer pension plan	79	84
Pension related payments not funded by trusts	1	3
Reductions in cash flows from operating activities	\$ 112	\$ 127

Net Cash Used in Investing Activities

Net cash used in investing activities was \$2,276 million in 2024 compared to \$2,568 million in 2023. The decrease in net cash used in investing activities was primarily due to decreased capital expenditures (discussed in more detail below).



Capital expenditures in 2024 were \$2,287 million compared to \$2,576 million in 2023. Mini Mill capital expenditures were \$1,641 million and included \$1,368 million for BR2, exclusive of the air separation unit, which began operations during the fourth quarter, as well as spending for the dual Galvalume®/galvanized coating and color coating lines at the existing Big River Steel facility. Flat-Rolled capital expenditures were \$495 million which includes spending for the DR grade pellet facility at Keetac, as well as for mining equipment, blast furnace repairs and a stove rebuild at Gary Works, and other infrastructure and environmental projects across the Flat-Rolled footprint. USSE capital expenditures were \$118 million and included spending for the blast furnace stove repairs and upgrades, enterprise resource planning (ERP) project, 5-stand control system upgrades, and various other projects. Tubular capital expenditures were \$33 million and included spending to support steelmaking, infrastructure, and environmental projects within the Tubular footprint. Other businesses had no capital expenditures.

Net Cash used in Financing Activities

Net cash used in financing activities was \$199 million for the twelve months ended December 31, 2024, compared to net cash used in financing activities of \$98 million for the same period in 2023. The period over period change in financing activities was primarily due to the absence of proceeds received from the issuance of long-term debt in the current year period, partially offset by the absence of repurchases of common stock in the current year period.

In 2023, U. S. Steel received net proceeds of approximately \$238 million after closing on an aggregate principal amount of \$240 million unsecured Arkansas Development Finance Authority environmental improvement revenue bonds with a coupon rate of 5.700% and a final maturity of 2053.

Certain of our credit facilities, including the Credit Facility Agreement, the Big River Steel ABL Facility, the USSK Credit Agreement and the Export Credit Agreement, contain standard terms and conditions including customary material adverse change clauses. If a material adverse change was to occur, our ability to fund future operating and capital requirements could be negatively impacted. The €150 million (approximately \$156 million) USSK Credit Agreement contains certain USSK specific financial covenants. The USSK Credit Agreement requires USSK to maintain a net debt to EBITDA ratio of less than 3.50:1 (the "EBITDA Ratio Covenant"), as measured on a rolling twelve month basis on June 30th and December 31st of each year. As of December 31, 2024 USSK was in compliance with the EBITDA Ratio Covenant. There are currently no amounts outstanding under the facility.

We use surety bonds, trusts and letters of credit to provide financial assurance for certain transactions and business activities. The use of some forms of financial assurance and cash collateral have a negative impact on liquidity. U. S. Steel has committed \$192 million of liquidity sources for financial assurance purposes as of December 31, 2024. Increases in certain of these commitments which use collateral are reflected within cash, cash equivalents and restricted cash on the Consolidated Statement of Cash Flows.

The maximum guarantees of the indebtedness of unconsolidated entities of U. S. Steel totaled \$7 million at December 31, 2024. If any default related to the guaranteed indebtedness occurs, U. S. Steel has access to its interest in the assets of the investees to reduce its potential losses under the guarantees.

We may from time to time seek to retire or repurchase our outstanding long-term debt through open market purchases, privately negotiated transactions, exchange transactions, redemptions or otherwise. Such purchases or exchanges, if any, will depend on prevailing market conditions, our liquidity requirements and other factors and may be commenced or suspended at any time. The amounts involved may be material. See Note 17 to the Consolidated Financial Statements for further details regarding U. S. Steel's debt.

Share Repurchases

In the third quarter of 2022, the Board of Directors authorized a share repurchase program that allows for the repurchase of up to \$500 million of our outstanding common stock from time to time in the open market or privately negotiated transactions at the discretion of management. The Company's share repurchase program does not obligate it to acquire any specific number of shares. In the twelve months ended December 31, 2024 no common stock was repurchased under our share repurchase program. We do not expect to utilize the remainder of this authorization as the Merger Agreement contains a customary prohibition on our ability to engage in additional share repurchases without the consent of Purchaser. See Note 27 to the Consolidated Financial Statements, "Common Stock Repurchased" for further details.

Capital Requirements

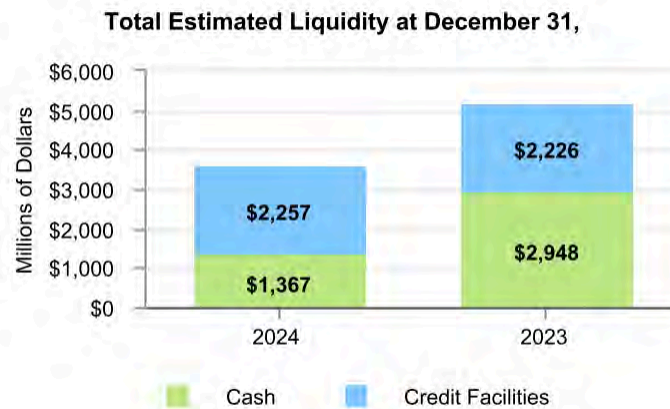
Capital expenditures for 2025 are expected to total approximately \$1.0 billion and are significantly lower than 2024 due to the on time completion of several strategic projects as well as the nearing completion and commissioning of the remaining strategic projects to expand our competitive advantages in low-cost iron ore, mini mill steelmaking and best-in-class finishing capabilities.

U. S. Steel's contractual commitments to acquire property, plant and equipment at December 31, 2024, totaled \$683 million.

Liquidity

The following table summarizes U. S. Steel's liquidity as of December 31, 2024:

(Dollars in millions)		
Cash and cash equivalents	\$	1,367
Amount available under Credit Facility Agreement		1,746
Amount available under Big River Steel - Revolving Line of Credit		340
Amounts available under USSK Credit Agreement and USSK Credit Facility		171
Total estimated liquidity	\$	3,624



As of December 31, 2024, \$171 million of the total cash and cash equivalents was held by our foreign subsidiaries. Substantially all of the liquidity attributable to our foreign subsidiaries can be accessed without the imposition of income taxes as a result of the election effective December 31, 2013, to liquidate for U.S. income tax purposes a foreign subsidiary that holds most of our international operations.

We expect that our estimated liquidity requirements will consist primarily of our 2025 planned strategic capital expenditures, working capital requirements, debt service, and operating costs and employee benefits for our operations. Our available liquidity at December 31, 2024, consists principally of our cash and cash equivalents and available borrowings under the Credit Facility Agreement, Big River Steel ABL Facility, USSK Credit Agreement and the USSK Credit Facility.

Management continues to evaluate market conditions in our industry and our global liquidity position, and may consider additional actions to further strengthen our balance sheet and optimize liquidity, including but not limited to the repayment or refinancing of outstanding debt and the incurrence of additional debt to opportunistically finance strategic projects.

U. S. Steel management believes that U. S. Steel's liquidity will be adequate to satisfy our cash requirements and obligations for the next twelve months and for the foreseeable future, including obligations to complete currently authorized capital spending programs. Future requirements for U. S. Steel's business needs, including the funding of capital expenditures, scheduled debt maturities, repurchase of debt, dividends, contributions to employee benefit plans and any amounts that may ultimately be paid

in connection with contingencies, are expected to be funded by a combination of internally generated funds (including asset sales), borrowings, refinancings and other external financing sources.

The Company has a supply chain finance (SCF) arrangement with a third-party administrator which allows participating suppliers, at their sole discretion, to make offers to sell payment obligations of the Company prior to their scheduled due dates at a discounted price to a participating financial institution. The third-party administrator entered into a separate agreement with the Export Import Bank of the United States to guarantee 90 percent of supplier obligations sold for up to \$95 million. No guarantees or collateral are provided by the Company or any of its subsidiaries under the SCF program.

The Company's goal is to capture overall supplier savings and improve working capital efficiency. The agreements facilitate the suppliers' ability to sell payment obligations, while providing them with greater working capital flexibility. The Company has no economic interest in the sale of the suppliers' receivables and no direct financial relationship with the financial institution concerning these services. The Company's obligations to its suppliers, including amounts due and scheduled payment dates, are not impacted by suppliers' decisions to sell amounts under the arrangements. The SCF program requires the Company to pay the third-party administrator the stated amount of the confirmed participating supplier invoices. The payment terms for confirmed invoices range from 45 to 90 days after the end of the month in which the invoice was issued.

The underlying costs from suppliers that elected to participate in the SCF program are generally recorded in cost of sales in the Company's Consolidated Statements of Operations. Amounts due to suppliers who participate in the SCF program are reflected in accounts payable and accrued expenses on the Company's Consolidated Balance Sheets and payments on the obligations by our suppliers are included in cash used in operating activities in the Consolidated Statements of Cash Flows. As of December 31, 2024, accounts payable and accrued expenses included \$62 million of outstanding payment obligations which suppliers elected to sell to participating financial institutions.

The following table summarizes the Company's contractual obligations at December 31, 2024, and the effect such obligations are expected to have on our liquidity and cash flows in future periods.

(Dollars in millions)

Contractual Obligations	Total	2025	Payments Due by Period		
			2026 through 2027	2028 through 2029	Beyond 2029
Debt (including interest) and finance leases ^(a)	\$ 7,077	\$ 338	\$ 1,133	\$ 1,573	\$ 4,033
Operating leases ^(b)	88	39	39	8	2
Contractual purchase commitments ^(c)	7,720	5,386	1,286	386	662
Capital commitments ^(d)	683	518	165	—	—
Environmental commitments ^(d)	108	26	—	—	82
Steelworkers Pension Trust ^(e)	411	79	163	169	—
Employee related benefits ^(f)	138	31	55	52	—
Total contractual obligations	\$ 16,225	\$ 6,417	\$ 2,841	\$ 2,188	\$ 4,779

(a) See Note 17 to the Consolidated Financial Statements.

(b) See Note 24 to the Consolidated Financial Statements.

(c) Reflects estimated contractual purchase commitments under purchase orders and "take or pay" arrangements. "Take or pay" arrangements are primarily for purchases of gases and certain energy and utility services.

(d) See Note 26 to the Consolidated Financial Statements.

(e) While it is difficult to make a prediction of cash requirements beyond the term of the 2022 Labor Agreements with the USW, which expire on September 1, 2026, projected amounts shown through 2028 assume the contribution rate per hour included in the 2022 Labor Agreements of \$4.00 per hour worked.

(f) The amounts reflect corporate cash outlays for expected benefit payments to be paid by the Company. (See Note 18 to the Consolidated Financial Statements.) The accuracy of this forecast of future cash flows depends on future medical health care escalation rates and restrictions related to our trusts for retiree healthcare and life insurance (VEBA) that impact the timing of the use of trust assets. Projected amounts have been reduced to reflect withdrawals from the USW VEBA trust available under its agreements with the USW. Due to these factors, it is not possible to reliably estimate cash requirements beyond five years and actual amounts experienced may differ significantly from those shown.

Other Commercial Commitments

The following table summarizes U. S. Steel's commercial commitments at December 31, 2024, and the effect such commitments could have on our liquidity and cash flows in future periods.

(Dollars in millions)

		Scheduled Reductions by Period			
		2025	2026 through 2027	2028 through 2029	Beyond 2029
Commercial Commitments	Total				
Standby letters of credit ^(a)	\$ 60	\$ 43	\$ —	\$ —	\$ 17 ^(b)
Surety bonds ^(a)	98	—	—	—	98 ^(b)
Funded Trusts ^(a)	35	—	—	—	35 ^(b)
Total commercial commitments	\$ 193	\$ 43	\$ —	\$ —	\$ 150

(a) Reflects a commitment or guarantee for which future cash outflow is not considered likely.

(b) Timing of potential cash outflows is not determinable.

Off-Balance Sheet Arrangements

U. S. Steel has invested in several joint ventures that are reported as equity investments. Several of these investments involved a transfer of assets in exchange for an equity interest. U. S. Steel has supply arrangements with several of these joint ventures.

U. S. Steel's other off-balance sheet arrangements include guarantees, indemnifications, unconditional purchase obligations, surety bonds, trusts and letters of credit disclosed in Note 26 to the Consolidated Financial Statements.

Derivative Instruments

See "Item 7A. Quantitative and Qualitative Disclosures About Market Risk" for discussion of derivative instruments and associated market risk for U. S. Steel.

Environmental Matters

U. S. Steel's environmental expenditures were as follows:

(Dollars in millions)

	2024	2023	2022
North America:			
Capital	\$ 80	\$ 60	\$ 38
Compliance			
Operating & maintenance	247	243	255
Remediation ^(a)	10	15	18
Total North America	\$ 337	\$ 318	\$ 311
USSE:			
Capital	\$ 3	\$ 10	\$ 6
Compliance			
Operating & maintenance	10	12	11
Remediation ^(a)	4	5	6
Total USSE	\$ 17	\$ 27	\$ 23
Total U. S. Steel	\$ 354	\$ 345	\$ 334

(a) These amounts include spending charged against remediation reserves, net of recoveries where permissible, but do not include non-cash provisions recorded for environmental remediation.

U. S. Steel's environmental capital expenditures accounted for 4 percent of total capital expenditures in 2024, 3 percent in 2023 and 2 percent in 2022.

Environmental compliance expenditures represented 2 percent of U. S. Steel's total costs and expenses in 2024, 2023, and 2022. Remediation spending during 2022 through 2024 was mainly related to remediation activities at former and present operating locations.

For discussion of other relevant environmental items see "Part I, Item 3. Legal Proceedings – Environmental Proceedings."

The following table shows activity with respect to environmental remediation liabilities for the years ended December 31, 2024, and December 31, 2023. These amounts exclude liabilities related to asset retirement obligations accounted for in accordance with ASC Topic 410. See Note 19 to the Consolidated Financial Statements.

<i>(Dollars in millions)</i>	2024	2023
Beginning Balance	\$ 107	\$ 126
Plus: Additions	18	15
Adjustments for changes in estimates	—	(11)
Less: Obligations settled	(17)	(23)
Ending Balance	\$ 108	\$ 107

New or expanded environmental requirements, which could increase U. S. Steel's environmental costs, may arise in the future. U. S. Steel intends to comply with all legal requirements regarding the environment, but since many of them are not fixed or presently determinable (even under existing legislation) and may be affected by future legislation, it is not possible to predict accurately the ultimate cost of compliance, including remediation costs which may be incurred and penalties which may be imposed. U. S. Steel's environmental capital expenditures are expected to be approximately \$156 million in 2025, \$6 million of which is related to projects at USSE. U. S. Steel's environmental expenditures for 2025 for operating and maintenance and for remediation projects are expected to be approximately \$273 million and \$65 million, respectively, of which approximately \$14 million and \$5 million for operating and maintenance and remediation, respectively, is related to USSE. Although the outcome of pending environmental matters is not estimable at this time, it is reasonably possible that U. S. Steel's environmental capital and operating and maintenance expenditures could materially increase as a result of the future resolution of these matters. Predictions of future environmental expenditures beyond 2025 can only be broad-based estimates, which have varied, and will continue to vary, due to the ongoing evolution of specific regulatory requirements, the possible imposition of more stringent requirements and the availability of new technologies to remediate sites, among other factors.

Accounting Standards

See Notes 2 and 3 to the Consolidated Financial Statements in Part II Item 8 of this Form 10-K.

Item 7A. QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK

U. S. Steel is exposed to certain risks related to its ongoing business operations, including financial, market, political, and economic risks. The following discussion provides information regarding U. S. Steel's exposure to the risks of changing foreign currency exchange rates, commodity prices and interest rates.

U. S. Steel may enter into derivative financial instrument transactions in order to manage or reduce these market risks. The use of derivative instruments is subject to our corporate governance policies. These instruments are used solely to mitigate market exposure and are not used for trading or speculative purposes.

U. S. Steel may elect to use hedge accounting for certain commodity or currency transactions. For those transactions, the impact of the hedging instrument will be recognized in other comprehensive income until the transaction is settled. Once the transaction is settled, the effect of the hedged item will be recognized in income. For further information regarding derivative instruments see Notes 1 and 16 to the Consolidated Financial Statements.

Foreign Currency Exchange Rate Risk

U. S. Steel is subject to the risk of price fluctuations due to the effects of exchange rates on revenues and operating costs, firm commitments for capital expenditures and existing assets or liabilities denominated in currencies other than the U.S. dollar, particularly the euro. U. S. Steel historically has made limited use of forward currency contracts to manage exposure to certain currency price fluctuations. U. S. Steel elected cash flow hedge accounting for foreign exchange forwards and had no material open forward exchange contracts that were subject to mark-to-market accounting as of December 31, 2024.

The fair value of our derivatives is determined using Level 2 inputs, which are defined as "significant other observable" inputs. The inputs used include quotes from counterparties that are corroborated with market sources.

Volatility in the foreign currency markets could have significant implications for U. S. Steel as a result of foreign currency transaction effects. Future foreign currency impacts will depend upon changes in currencies and the extent to which we engage in derivatives transactions. For additional information on U. S. Steel's foreign currency exchange activity, see Note 16 to the Consolidated Financial Statements.

Commodity Price Risk and Related Risks

In the normal course of our business, U. S. Steel is exposed to market risk or price fluctuations related to the purchase, production or sale of steel products. U. S. Steel is also exposed to price risk related to the purchase, production or sale of coal, coke, natural gas, steel scrap, iron ore and pellets, and zinc, tin and other nonferrous metals used as raw materials. U. S. Steel is also subject to market price risk for the purchase of a portion of its electricity at certain facilities. See Note 16 to the Consolidated Financial Statements for further details on U. S. Steel's derivatives.

U. S. Steel's market risk strategy has generally been to obtain competitive prices for our products and services and allow operating results to reflect market price movements dictated by supply and demand; however, from time to time U. S. Steel has made forward physical purchases to manage exposure to price risk related to the purchases of natural gas and certain non-ferrous metals used in the production process. As of December 31, 2024, U. S. Steel did not have forward buy contracts for natural gas or any of the other significant raw materials used in the domestic production process.

Interest Rate Risk

U. S. Steel is subject to the effects of interest rate fluctuations on the fair value of certain of our non-derivative financial instruments. A sensitivity analysis of the projected incremental effect of a hypothetical 10 percent increase/decrease in year-end 2024 and 2023 interest rates on the fair value of U. S. Steel's non-derivative financial instruments is provided in the following table:

(Dollars in millions)		2024		2023	
Non-Derivative Financial Instruments ^(a)	Fair Value ^(b)	Change in Fair Value ^(c)		Fair Value ^(b)	Change in Fair Value ^(c)
Financial liabilities:					
Debt ^{(d)(e)}	\$ 4,243	\$ 256	\$	4,797	\$ 325

(a) Fair values of cash and cash equivalents, current accounts and notes receivable, accounts payable, bank checks outstanding and accrued interest approximate carrying value and are relatively insensitive to changes in interest rates due to the short-term maturity of the instruments. Accordingly, these instruments are excluded from the table.

(b) See Note 20 to the Consolidated Financial Statements for carrying value of instruments.

(c) Reflects, by class of financial instrument, the estimated incremental effect of a hypothetical 10 percent change in interest rates at December 31, 2024, and 2023, on the fair value of U. S. Steel's non-derivative financial instruments. For financial liabilities, this assumes a 10 percent decrease in the weighted average yield to maturity of U. S. Steel's long-term debt at December 31, 2024, and December 31, 2023.

(d) Excludes finance lease obligations.

(e) Fair value was determined using Level 2 inputs which were derived from quoted market prices and is based on the yield on public debt where available or current borrowing rates available for financings with similar terms and maturities.

U. S. Steel's sensitivity to interest rate declines and corresponding increases in the fair value of our debt portfolio would unfavorably affect our results and cash flows only to the extent that we elected to repurchase or otherwise retire all or a portion of our fixed-rate debt portfolio at prices above carrying value.

Item 8. CONSOLIDATED FINANCIAL STATEMENTS AND SUPPLEMENTARY DATA

The information required by this item is set forth in our Consolidated Financial Statement contained in this Annual Report on Form 10-K. Specific financial statements can be found at the page listed below:

	PAGE
MANAGEMENT'S REPORT TO STOCKHOLDERS	65
REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM (PCAOB ID 238)	66
CONSOLIDATED STATEMENTS OF OPERATIONS FOR THE YEARS ENDED DECEMBER 31, 2024, 2023, AND 2022	68
CONSOLIDATED STATEMENTS OF COMPREHENSIVE INCOME (LOSS) FOR THE YEARS ENDED DECEMBER 31, 2024, 2023, AND 2022	69
CONSOLIDATED BALANCE SHEETS AS OF DECEMBER 31, 2024, AND 2023	70
CONSOLIDATED STATEMENTS OF CASH FLOWS FOR THE YEARS ENDED DECEMBER 31, 2024, 2023, AND 2022	71
CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY FOR THE YEARS ENDED DECEMBER 31, 2024, 2023, AND 2022	72
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS	74
SUPPLEMENTARY DATA (UNAUDITED)	116



MANAGEMENT'S REPORT TO STOCKHOLDERS

January 31, 2025

To the Stockholders of United States Steel Corporation:

Financial Statements and Practices

The accompanying consolidated financial statements of United States Steel Corporation are the responsibility of and have been prepared by United States Steel Corporation in conformity with accounting principles generally accepted in the United States of America. They necessarily include some amounts that are based on our best judgments and estimates. United States Steel Corporation's financial information displayed in other sections of this report is consistent with these financial statements.

United States Steel Corporation seeks to assure the objectivity and integrity of its financial records by careful selection of its managers, by organizational arrangements that provide an appropriate division of responsibility and by communication programs aimed at assuring that its policies, procedures and methods are understood throughout the organization.

United States Steel Corporation has a comprehensive, formalized system of internal controls designed to provide reasonable assurance that assets are safeguarded, that financial records are reliable and that information required to be disclosed in reports filed with or submitted to the Securities and Exchange Commission is recorded, processed, summarized and reported within the required time limits. Appropriate management monitors the system for compliance and evaluates it for effectiveness, and the independent registered public accounting firm measures its effectiveness and recommends possible improvements thereto.

The Board of Directors exercises its oversight role in the area of financial reporting and internal control over financial reporting through its Audit Committee. This committee, composed solely of independent directors, regularly meets (jointly and separately) with the independent registered public accounting firm, management, internal audit and other executives to monitor the proper discharge by each of their responsibilities relative to internal control over financial reporting and United States Steel Corporation's financial statements.

Internal Control Over Financial Reporting

United States Steel Corporation's management is responsible for establishing and maintaining adequate internal control over financial reporting, as defined in Exchange Act Rule 13a-15(f). Under the supervision and with the participation of United States Steel Corporation's management, including the Chief Executive Officer and Chief Financial Officer, United States Steel Corporation conducted an evaluation of the effectiveness of its internal control over financial reporting based on the framework in *Internal Control – Integrated Framework (2013)* issued by the Committee of Sponsoring Organizations of the Treadway Commission.

Based on this evaluation, United States Steel Corporation's management concluded that United States Steel Corporation's internal control over financial reporting was effective as of December 31, 2024.

The effectiveness of United States Steel Corporation's internal control over financial reporting as of December 31, 2024, has been audited by PricewaterhouseCoopers LLP, an independent registered public accounting firm, as stated in their report which is included herein.

/s/ David B. Burritt

David B. Burritt
President and
Chief Executive Officer

/s/ Jessica T. Graziano

Jessica T. Graziano
Senior Vice President and
Chief Financial Officer

/s/ Manpreet S. Grewal

Manpreet S. Grewal
Vice President, Controller
& Chief Accounting Officer

Report of Independent Registered Public Accounting Firm

To the Board of Directors and Stockholders of United States Steel Corporation

Opinions on the Financial Statements and Internal Control over Financial Reporting

We have audited the accompanying consolidated balance sheets of United States Steel Corporation and its subsidiaries (the “Company”) as of December 31, 2024 and 2023, and the related consolidated statements of operations, of comprehensive income (loss), of stockholders’ equity and of cash flows for each of the three years in the period ended December 31, 2024, including the related notes and financial statement schedule listed in the index appearing under Item 15(a)(2) (collectively referred to as the “consolidated financial statements”). We also have audited the Company’s internal control over financial reporting as of December 31, 2024, based on criteria established in *Internal Control - Integrated Framework* (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the financial position of the Company as of December 31, 2024 and 2023, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2024 in conformity with accounting principles generally accepted in the United States of America. Also in our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 31, 2024, based on criteria established in *Internal Control - Integrated Framework* (2013) issued by the COSO.

Basis for Opinions

The Company’s management is responsible for these consolidated financial statements, for maintaining effective internal control over financial reporting, and for its assessment of the effectiveness of internal control over financial reporting, included in the accompanying Management’s Report to Stockholders on Internal Control Over Financial Reporting. Our responsibility is to express opinions on the Company’s consolidated financial statements and on the Company’s internal control over financial reporting based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) (PCAOB) and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audits to obtain reasonable assurance about whether the consolidated financial statements are free of material misstatement, whether due to error or fraud, and whether effective internal control over financial reporting was maintained in all material respects.

Our audits of the consolidated financial statements included performing procedures to assess the risks of material misstatement of the consolidated financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the consolidated financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements. Our audit of internal control over financial reporting included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, and testing and evaluating the design and operating effectiveness of internal control based on the assessed risk. Our audits also included performing such other procedures as we considered necessary in the circumstances. We believe that our audits provide a reasonable basis for our opinions.

Definition and Limitations of Internal Control over Financial Reporting

A company’s internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company’s internal control over financial reporting includes those policies and procedures that (i) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (ii) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (iii) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company’s assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

Critical Audit Matters

The critical audit matter communicated below is a matter arising from the current period audit of the consolidated financial statements that was communicated or required to be communicated to the audit committee and that (i) relates to accounts or

disclosures that are material to the consolidated financial statements and (ii) involved our especially challenging, subjective, or complex judgments. The communication of critical audit matters does not alter in any way our opinion on the consolidated financial statements, taken as a whole, and we are not, by communicating the critical audit matter below, providing a separate opinion on the critical audit matter or on the accounts or disclosures to which it relates.

Sales Recognition

As described in Notes 1 and 6 to the consolidated financial statements, revenue is generated primarily from contracts to produce, ship and deliver steel products, and to a lesser extent, raw materials such as iron ore pellets and coke by-products. Sales are recognized when the Company's performance obligations are satisfied. Generally, the Company's performance obligations are satisfied, control of products is transferred, and revenue is recognized at a single point in time, when title transfers to customers for products shipped. For the year ended December 31, 2024, the Company's net sales were \$15.6 billion.

The principal consideration for our determination that performing procedures relating to sales recognition is a critical audit matter is a high degree of auditor effort in performing procedures related to the Company's sales recognition.

Addressing the matter involved performing procedures and evaluating audit evidence in connection with forming our overall opinion on the consolidated financial statements. These procedures included testing the effectiveness of controls relating to the sales recognition process. These procedures also included, among others, for certain components (i) evaluating revenue transactions by testing the issuance and settlement of invoices and credit memos (ii) tracing transactions not settled to a detailed listing of accounts receivable, (iii) testing the completeness and accuracy of data provided by management, and (iv) confirming a sample of outstanding customer invoice balances as of December 31, 2024 and, for confirmations not returned, obtaining and inspecting source documents, such as invoices, delivery documents, and subsequent cash receipts. For other components, these procedures included testing the revenue recognized for a sample of revenue transactions by obtaining and inspecting source documents, such as evidence of customer arrangement, invoices, proof of shipment, and subsequent cash receipts.

/s/ PricewaterhouseCoopers LLP
Pittsburgh, Pennsylvania
January 31, 2025

We have served as the Company's auditor since 1903.

UNITED STATES STEEL CORPORATION
CONSOLIDATED STATEMENTS OF OPERATIONS

(Dollars in millions, except per share amounts)	Year Ended December 31,		
	2024	2023	2022
Net sales:			
Net sales	\$ 13,135	\$ 16,038	\$ 19,123
Net sales to related parties (Note 23)	2,505	2,015	1,942
Total (Note 6)	15,640	18,053	21,065
Operating expenses (income):			
Cost of sales (excludes items shown below)	14,060	15,803	16,777
Selling, general and administrative expenses	435	501	422
Depreciation, depletion and amortization (Notes 13 and 14)	913	916	791
Earnings from investees (Note 12)	(112)	(115)	(243)
Asset impairment charges (Note 1)	19	129	163
Restructuring and other charges (Note 25)	8	36	48
Gain on equity investee transactions (Note 12)	—	—	(6)
Other losses (gains), net	77	(16)	(47)
Total	15,400	17,254	17,905
Earnings before interest and income taxes	240	799	3,160
Interest expense	24	72	159
Interest income	(96)	(141)	(44)
Loss on debt extinguishment (Note 7)	2	—	—
Other financial costs	29	18	32
Net periodic benefit income	(132)	(154)	(246)
Net gain from investments related to active employee benefits (Note 20)	(25)	(43)	—
Net interest and other financial (benefits) costs (Note 7)	(198)	(248)	(99)
Earnings before income taxes	438	1,047	3,259
Income tax expense (Note 11)	54	152	735
Net earnings	384	895	2,524
Less: Net earnings attributable to noncontrolling interests	—	—	—
Net earnings attributable to United States Steel Corporation	\$ 384	\$ 895	\$ 2,524
Earnings per common share (Note 8)			
Earnings per share attributable to United States Steel Corporation stockholders:			
— Basic	\$ 1.71	\$ 3.98	\$ 10.22
— Diluted	\$ 1.57	\$ 3.56	\$ 9.16

The accompanying notes are an integral part of these Consolidated Financial Statements.

UNITED STATES STEEL CORPORATION
CONSOLIDATED STATEMENTS OF COMPREHENSIVE INCOME (LOSS)

(Dollars in millions)	Year Ended December 31,		
	2024	2023	2022
Net earnings	\$ 384	\$ 895	\$ 2,524
Other comprehensive income (loss), net of tax:			
Changes in foreign currency translation adjustments ^(a)	(70)	54	(91)
Changes in pension and other employee benefit accounts ^(a)	(77)	81	(297)
Changes in derivative financial instruments ^(a)	80	(9)	(28)
Changes in fair value of active employee benefit investments ^(a)	—	5	—
Total other comprehensive income (loss), net of tax	(67)	131	(416)
Comprehensive income including noncontrolling interest	317	1,026	2,108
Comprehensive income attributable to noncontrolling interest	—	—	—
Comprehensive income attributable to United States Steel Corporation	\$ 317	\$ 1,026	\$ 2,108
^(a) Related income tax (provision) benefit:			
Foreign currency translation adjustments	\$ 28	\$ (3)	\$ 24
Pension and other benefits adjustments	23	(24)	95
Derivative adjustments	(26)	3	9
Active employee benefit investments	—	(2)	—

The accompanying notes are an integral part of these Consolidated Financial Statements.

UNITED STATES STEEL CORPORATION
CONSOLIDATED BALANCE SHEETS

(Dollars in millions)	December 31,	
	2024	2023
Assets		
Current assets:		
Cash and cash equivalents (Note 9)	\$ 1,367	\$ 2,948
Receivables, less allowance of \$26 and \$38	1,236	1,390
Receivables from related parties (Note 23)	162	158
Inventories (Note 10)	2,168	2,128
Other current assets	299	319
Total current assets	5,232	6,943
Long-term restricted cash (Note 9)	35	32
Investments and long-term receivables, less allowance of \$3 in both periods (Note 12)	757	761
Operating lease assets (Note 24)	72	109
Property, plant and equipment, net (Note 13)	11,973	10,393
Intangibles, net (Note 14)	416	436
Deferred income tax benefits (Note 11)	—	19
Goodwill (Note 14)	920	920
Other noncurrent assets	830	838
Total assets	\$ 20,235	\$ 20,451
Liabilities		
Current liabilities:		
Accounts payable and other accrued liabilities	\$ 2,601	\$ 2,889
Accounts payable to related parties (Note 23)	146	139
Payroll and benefits payable	295	442
Accrued taxes	131	222
Accrued interest	70	70
Current operating lease liabilities (Note 24)	35	44
Short-term debt and current maturities of long-term debt (Note 17)	95	142
Total current liabilities	3,373	3,948
Noncurrent operating lease liabilities (Note 24)	44	73
Long-term debt, less unamortized discount and debt issuance costs (Note 17)	4,078	4,080
Employee benefits (Note 18)	117	126
Deferred income tax liabilities (Note 11)	657	587
Deferred credits and other noncurrent liabilities	526	497
Total liabilities	8,795	9,311
Contingencies and commitments (Note 26)		
Stockholders' Equity		
Common stock issued — 288,088,141 and 285,959,739 shares issued (par value \$1 per share, authorized 400,000,000 shares) (Note 8)	288	286
Treasury stock, at cost (62,907,930 shares and 62,288,523 shares)	(1,446)	(1,418)
Additional paid-in capital	5,307	5,253
Retained earnings	7,219	6,880
Accumulated other comprehensive (loss) income (Note 21)	(21)	46
Total United States Steel Corporation stockholders' equity	11,347	11,047
Noncontrolling interests	93	93
Total liabilities and stockholders' equity	\$ 20,235	\$ 20,451

The accompanying notes are an integral part of these Consolidated Financial Statements.

UNITED STATES STEEL CORPORATION
CONSOLIDATED STATEMENTS OF CASH FLOWS

(Dollars in millions)	Year Ended December 31,		
	2024	2023	2022
Increase (decrease) in cash and cash equivalents			
Operating activities:			
Net earnings	\$ 384	\$ 895	\$ 2,524
Adjustments to reconcile net cash provided by operating activities:			
Depreciation, depletion and amortization (Notes 13 and 14)	913	916	791
Asset impairment charges (Note 1)	19	129	163
Gain on equity investee transactions (Note 12)	—	—	(6)
Restructuring and other charges (Note 25)	8	36	48
Loss on debt extinguishment (Note 7)	2	—	—
Pensions and other post-employment benefits	(133)	(157)	(213)
Active employee benefit investments	65	32	—
Deferred income taxes (Note 11)	113	97	501
Net gain on sale of assets	(5)	(6)	(12)
Equity investees earnings, net of distributions received	(3)	(1)	(215)
Changes in:			
Current receivables	174	103	370
Inventories	(71)	257	(222)
Current accounts payable and accrued expenses	(285)	25	(180)
Income taxes receivable/payable	(126)	(27)	(15)
All other, net	(136)	(199)	(29)
Net cash provided by operating activities	919	2,100	3,505
Investing activities:			
Capital expenditures	(2,287)	(2,576)	(1,769)
Proceeds from cost reimbursement government grants (Note 26)	—	—	54
Proceeds from sale of assets	5	8	32
Proceeds from sale of ownership interests in equity investees (Note 12)	—	—	12
Other investing activities	6	—	(8)
Net cash used in investing activities	(2,276)	(2,568)	(1,679)
Financing activities:			
Issuance of long-term debt, net of financing costs (Note 17)	—	241	343
Repayment of long-term debt (Note 17)	(128)	(89)	(382)
Common stock repurchased (Note 27)	—	(175)	(849)
Proceeds from government incentives (Note 26)	—	—	82
Other financing activities	(71)	(75)	(62)
Net cash used in financing activities	(199)	(98)	(868)
Effect of exchange rate changes on cash	(19)	15	(19)
Net (decrease) increase in cash, cash equivalents and restricted cash	(1,575)	(551)	939
Cash, cash equivalents and restricted cash at beginning of year (Note 9)	2,988	3,539	2,600
Cash, cash equivalents and restricted cash at end of year (Note 9)	\$ 1,413	\$ 2,988	\$ 3,539

See Note 22 for supplemental cash flow information.

The accompanying notes are an integral part of these Consolidated Financial Statements.

UNITED STATES STEEL CORPORATION
CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY

	Dollars in Millions			Shares in Thousands		
	2024	2023	2022	2024	2023	2022
Common stock:						
Balance at beginning of year	\$ 286	\$ 283	\$ 280	285,960	282,487	279,522
Common stock issued	2	3	3	2,128	3,473	2,965
Balance at end of year	\$ 288	\$ 286	\$ 283	288,088	285,960	282,487
Treasury stock:						
Balance at beginning of year	\$ (1,418)	\$ (1,204)	\$ (334)	(62,289)	(54,090)	(15,709)
Common stock repurchased	—	(175)	(849)	—	(7,092)	(37,559)
Excise tax on common stock repurchased	—	(1)	—	—	—	—
Common stock repurchased for employee/non-employee director stock plans	(28)	(38)	(21)	(619)	(1,107)	(822)
Balance at end of year	\$ (1,446)	\$ (1,418)	\$ (1,204)	(62,908)	(62,289)	(54,090)
Additional paid-in capital:						
Balance at beginning of year	\$ 5,253	\$ 5,194	\$ 5,199			
Employee stock plans	54	59	72			
Cumulative effect upon adoption of Accounting Standards Update 2020-06	—	—	(77)			
Balance at end of year	\$ 5,307	\$ 5,253	\$ 5,194			

The accompanying notes are an integral part of these Consolidated Financial Statements.

UNITED STATES STEEL CORPORATION
CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY

(Dollars in millions)	(Continued)			Comprehensive Income (Loss)		
	2024	2023	2022	2024	2023	2022
Retained earnings:						
Balance at beginning of year	\$ 6,880	\$ 6,030	\$ 3,534			
Net earnings attributable to United States Steel Corporation	384	895	2,524	\$ 384	\$ 895	\$ 2,524
Dividends on common stock	(46)	(45)	(50)			
Cumulative effect upon adoption of Accounting Standards Update 2020-06	—	—	22			
Other	1	—	—			
Balance at end of year	\$ 7,219	\$ 6,880	\$ 6,030			
Accumulated other comprehensive (loss) income:						
Pension and other benefit adjustments (Note 18):						
Balance at beginning of year	\$ (241)	\$ (322)	\$ (25)			
Changes during year, net of taxes ^(a)	(77)	79	(304)	(77)	79	(304)
Changes during year, equity investee net of taxes ^(a)	—	2	7	—	2	7
Balance at end of year	\$ (318)	\$ (241)	\$ (322)			
Foreign currency translation adjustments:						
Balance at beginning of year	\$ 334	\$ 280	\$ 371			
Changes during year, net of taxes ^(a)	(70)	54	(91)	(70)	54	(91)
Balance at end of year	\$ 264	\$ 334	\$ 280			
Derivative financial instruments:						
Balance at beginning of year	\$ (52)	\$ (43)	\$ (15)			
Changes during year, net of taxes ^(a)	80	(9)	(28)	80	(9)	(28)
Balance at end of year	\$ 28	\$ (52)	\$ (43)			
Fair value of active employee benefit investments						
Balance at beginning of year	\$ 5	\$ —	\$ —			
Changes during year, net of taxes ^(a)	—	5	—	—	5	—
Balance at end of year	\$ 5	\$ 5	\$ —			
Total balances at end of year	\$ (21)	\$ 46	\$ (85)			
Total stockholders' equity	\$ 11,347	\$ 11,047	\$ 10,218			
Noncontrolling interests:						
Balance at beginning of year	\$ 93	\$ 93	\$ 93			
Net loss	—	—	—	—	—	—
Balance at end of year	\$ 93	\$ 93	\$ 93			
Total comprehensive income				\$ 317	\$ 1,026	\$ 2,108
^(a) Related income tax (provision) benefit:						
Foreign currency translation adjustments	\$ 28	\$ (3)	\$ 24			
Pension and other benefits adjustments	23	(24)	95			
Derivative adjustments	(26)	3	9			
Active employee benefit investments	—	(2)	—			

The accompanying notes are an integral part of these Consolidated Financial Statements.

1. Nature of Business and Significant Accounting Policies

Nature of Business

U. S. Steel produces and sells steel products, including flat-rolled and tubular products, in North America and Europe. Operations in the United States also include iron ore and coke production facilities and real estate operations. Operations in Europe also include coke production facilities.

Agreement and Plan of Merger with Nippon Steel Corporation

On December 18, 2023, the Company entered into an Agreement and Plan of Merger (such agreement, as it may be amended, modified or supplemented from time to time, the “Merger Agreement”) by and among the Company, Nippon Steel North America, Inc., a New York corporation (“Purchaser”), 2023 Merger Subsidiary, Inc., a Delaware corporation and a wholly owned subsidiary of Purchaser (“Merger Sub”), and solely as provided in Section 9.13 therein, Nippon Steel Corporation, a Japanese corporation (“NSC”). Pursuant to the Merger Agreement, and upon the terms and subject to the conditions described therein, Merger Sub will merge with and into the Company, with the Company continuing as the surviving corporation and a wholly owned subsidiary of Purchaser (the “Merger”). On April 12, 2024, the Company obtained the approval of its stockholders required to adopt the Merger Agreement. U. S. Steel stockholders approved the Merger with 98.8% approval of shares voted, satisfying a condition to closing. Subject to the terms and conditions set forth in the Merger Agreement, each share of the Company’s common stock, par value \$1.00 per share, outstanding immediately prior to the effective time of the Merger (the “Effective Time”) will, at the Effective Time, automatically be converted into the right to receive \$55.00 per share in cash, without interest, subject to any required tax withholding. The parties have substantially complied with the Second Requests issued on April 3, 2024 and the statutory waiting period under the Hart-Scott-Rodino Antitrust Improvements Act of 1976 has now expired. In addition, all required regulatory approvals outside of the United States related to the Merger have been received. The closing conditions to the Merger include clearance by the Committee on Foreign Investment in the United States (“CFIUS”) under the Defense Production Act of 1950, as amended. Following referral of the transaction by CFIUS to the President of the United States, on January 3, 2025, the President of the United States issued an order prohibiting the Merger and requiring the parties to abandon the Merger Agreement within thirty days. On January 10, 2025, CFIUS granted an extension of that deadline to June 18, 2025.

On January 6, 2025, the Company, NSC and Purchaser jointly filed a lawsuit in the United States Court of Appeals for the District of Columbia Circuit alleging that the President’s order blocking the Merger was issued for purely political reasons, which are irrelevant to U.S. national security, challenging the decision by the President of the United States and the CFIUS process as violating the constitutional due process rights of the Company, NSC and Purchaser, as well as the applicable statute governing CFIUS and the Administrative Procedure Act, and as an exercise of power that exceeded the authority provided to the President of the United States under the applicable statute. The Company, NSC and Purchaser also filed a lawsuit in the United States District Court for the Western District of Pennsylvania against Cleveland-Cliffs Inc. (“Cliffs”), Cliffs’ Chief Executive Officer Lourenco Goncalves, and the President of the United Steel, Paper and Forestry, Rubber, Manufacturing, Energy, Allied Industrial and Service Workers International Union (the “USW”), David McCall, for engaging in a coordinated series of anticompetitive and racketeering activities illegally designed to prevent any party other than Cliffs from acquiring the Company as part of an illegal campaign to monopolize critical domestic steel markets.

The Merger Agreement requires us to operate in the ordinary course of business and restricts us, without the consent of Purchaser, from taking certain specified actions agreed by the parties to be outside the ordinary course of business until the pending Merger occurs or the Merger Agreement terminates.

Significant Accounting Policies

Principles applied in consolidation

These financial statements include the accounts of U. S. Steel and its majority-owned subsidiaries. Additionally, variable interest entities for which U. S. Steel is the primary beneficiary are included in the Consolidated Financial Statements, and their impacts are either partially or completely offset by noncontrolling interests. Intercompany accounts, transactions and profits have been eliminated in consolidation.

Investments in entities over which U. S. Steel has significant influence are accounted for using the equity method of accounting and are carried at U. S. Steel’s share of net assets plus loans, advances and our share of earnings less distributions.

Earnings or loss from investees includes U. S. Steel’s share of earnings or loss from equity method investments (and any amortization of basis differences), which are generally recorded a month in arrears.

Use of estimates

Generally accepted accounting principles require management to make estimates and assumptions that affect the reported amounts of assets and liabilities, the disclosure of contingent assets and liabilities at year-end and the reported amounts of revenues and expenses during the year. Significant items subject to such estimates and assumptions include the carrying value of property, plant and equipment; intangible assets; the fair value of assets or liabilities acquired in a business combination; valuation allowances for receivables, inventories and deferred income tax assets and liabilities;

environmental liabilities; liabilities for potential tax deficiencies; potential litigation claims and settlements; assets and obligations related to employee benefits; and restructuring and other charges. Actual results could differ materially from the estimates and assumptions used.

The preparation of the financial statements includes an assessment of certain accounting matters using all available information including consideration of forecasted financial information in context with other information reasonably available to us. However, our future assessment of current expectations could result in material impacts to our consolidated financial statements in future reporting periods. All such adjustments are of a normal recurring nature unless disclosed otherwise.

Sales recognition

Sales are recognized when U. S. Steel's performance obligations are satisfied. Generally, U. S. Steel's performance obligations are satisfied, control of our products is transferred, and revenue is recognized at a single point in time, when title transfers to our customer for product shipped or when services are provided. Revenues are recorded net of any sales incentives. Shipping and other transportation costs charged to customers are treated as fulfillment activities and are recorded as additional net sales and cost of sales at the time control is transferred to the customer. See Note 6 for further details on U. S. Steel's revenue.

Inventories

Inventories are carried at the lower of cost or net realizable value. Fixed costs related to abnormal production capacity are expensed in the period incurred rather than capitalized into inventory.

LIFO is the predominant method of inventory costing for inventories held by the Flat-Rolled and Tubular segments. The Mini Mill segment uses a moving average costing method to account for semi-finished and finished products and FIFO to account for raw materials. FIFO is the predominant method used by the USSE segment. The LIFO method of inventory costing was used on 53 percent of consolidated inventories at both December 31, 2024, and December 31, 2023.

Derivative instruments

From time to time, U. S. Steel may use fixed price forward physical purchase contracts to partially manage our exposure to price risk. Generally, forward physical purchase contracts qualify for the normal purchase normal sales exclusion in Accounting Standards Codification (ASC) 815, *Derivatives and Hedging*, and are not subject to mark-to-market accounting. U. S. Steel also uses derivatives such as commodity-based financial swaps and foreign currency exchange forward contracts to manage its exposure to purchase and sale price fluctuations and foreign currency exchange rate risk. The USSE and Flat-Rolled segments elect hedge accounting for some of their derivatives. Under hedge accounting, fluctuations in the value of the derivative are recognized in Accumulated other comprehensive (loss) income (AOCI) until the associated underlying is recognized in earnings. When the associated underlying is recognized in earnings, the value of the derivative is reclassified to earnings from AOCI. The Mini Mill segment has not elected hedge accounting. Therefore, the changes in fair value of the Mini Mill segment's foreign exchange forwards, as well as fair value changes for other derivatives where hedge accounting has not been elected, are recognized immediately in earnings. In accordance with the guidance in ASC Topic 820 on fair value measurements and disclosures, the fair value of our foreign exchange forwards, commodity purchase swaps and sales swaps was determined using Level 2 inputs, which are defined as "significant other observable" inputs. The inputs used are from market sources that aggregate data based upon market transactions. See Note 16 for further details on U. S. Steel's derivatives.

Property, plant and equipment

Property, plant and equipment is carried at cost less accumulated depreciation and is depreciated on a straight-line basis over the estimated useful lives of the assets.

Depletion of mineral properties is based on rates which are expected to amortize cost over the estimated tonnage of minerals to be removed.

When property, plant and equipment is sold or otherwise disposed of, any gains or losses are reflected in income. If a loss on disposal is expected, such losses are recognized when the assets are reclassified as assets held for sale or when impaired as part of an asset group's impairment.

Asset Impairment

U. S. Steel evaluates impairment of its property, plant and equipment whenever circumstances indicate that the carrying value may not be recoverable. We evaluate the impairment of long-lived assets at the asset group level. Our asset groups are flat-rolled, mini mill, USSE, welded tubular and seamless tubular. Asset impairments are recognized when the carrying value of an asset group exceeds its recoverable amount as determined by the asset group's aggregate projected undiscounted cash flows.

In 2024, the Company recognized impairment charges of approximately \$19 million for certain indefinitely idled assets at Granite City Works and certain permanently idled assets at Clairton Works. In 2023, the Company recognized charges of approximately \$123 million for impairment of indefinitely idled iron and steel making assets at Granite City Works. In 2022,

impairment charges of approximately \$151 million were recognized for the write-off of iron making and steel making assets at Great Lakes Works. The coil finishing processes at Granite City Works and Great Lakes Works continue to operate and remain components of the Company's operating plans. These impairment charges were the result of actions impacting specific, identifiable assets and were not significantly adverse to the flat-rolled long-lived asset group.

No triggering events that required an impairment evaluation of our long-lived asset groups were identified during the years ended December 31, 2024, 2023, and 2022.

Goodwill and identifiable intangible assets

Goodwill represents the excess of the cost over the fair value of acquired identifiable tangible and intangible assets and liabilities assumed from businesses acquired. Goodwill and intangible assets deemed to have indefinite lives are not amortized, but are subject to impairment testing annually, or more frequently if events or changes in circumstances indicate the asset might be impaired. We perform our annual goodwill impairment test as of October 1 and monitor for interim triggering events on an ongoing basis.

We review goodwill for impairment utilizing either a qualitative assessment or a quantitative goodwill impairment test. If we choose to perform a qualitative assessment and we determine that the fair value of the reporting unit more likely than not exceeds the carrying value, no further evaluation is necessary. For reporting units where we perform the quantitative goodwill impairment test, we compare the fair value of each reporting unit, which we primarily determine using an income approach based on the present value of discounted cash flows, to the respective carrying value, which includes goodwill. If the fair value of the reporting unit exceeds its carrying value, we do not consider the goodwill impaired. If the carrying value is higher than the fair value, we recognize the difference as an impairment loss.

A quantitative goodwill impairment testing process requires valuation of the respective reporting unit, which we primarily determine using an income approach based on a discounted cash flow forecast covering discrete periods of time including a terminal value. We compute the terminal value using the constant growth method, which values the forecasted cash flows in perpetuity. The assumptions about future cash flows and growth rates are based on the respective reporting unit's long-term forecast and are subject to review and approval by senior management. A reporting unit's discount rate is a significant assumption and is a risk-adjusted weighted average cost of capital, which we believe approximates the rate from a market participant's perspective. The estimated fair value could be impacted by changes in market conditions, interest rates, growth rates, tax rates, costs, pricing and capital expenditures. We categorize the fair value determination as Level 3 in the fair value hierarchy due to its use of internal projections and unobservable measurement inputs.

Our Mini Mill reporting unit holds the goodwill recognized as a result of the Company's acquisition of Big River Steel and currently is our only reporting unit that has a significant amount of goodwill. This goodwill is primarily attributable to Big River Steel's operational abilities, workforce and the anticipated benefits from their recent expansion. U. S. Steel completed its annual goodwill impairment test using a qualitative assessment during the fourth quarter of 2024 and determined there was no impairment of goodwill.

Intangible assets with indefinite lives are also subject to at least annual impairment testing, which compares the fair value of the intangible assets with their carrying amounts. U. S. Steel has determined that certain of its acquired intangible assets have indefinite useful lives. These assets are also reviewed for impairment annually in the fourth quarter and whenever events or circumstances indicate the carrying value may not be recoverable. U. S. Steel completed its annual evaluation of its indefinite-lived water rights using a qualitative assessment and determined there was no indication of impairment.

Finite-lived intangible assets are amortized on a straight-line basis over their estimated useful lives and are tested for impairment when events occur that indicate that the net book value will not be recovered over future cash flows.

Environmental remediation

Environmental expenditures are capitalized if the costs mitigate or prevent future contamination or if the costs improve existing assets' environmental safety or efficiency. U. S. Steel provides for remediation costs and penalties when the responsibility to remediate is probable and the amount of associated costs is reasonably estimable. The timing of remediation accruals typically coincides with completion of studies defining the scope of work to be undertaken or when it is probable that a formal plan of action will be approved by the oversight agency. Remediation liabilities are accrued based on estimates of believed environmental exposure and are discounted if the amount and timing of the cash disbursements are readily determinable.

Asset retirement obligations

Asset retirement obligations (AROs) are initially recorded at fair value and are capitalized as part of the cost of the related long-lived asset and depreciated in accordance with U. S. Steel's depreciation policies for property, plant and equipment. The fair value of the obligation is determined as the discounted value of expected future cash flows. Accretion expense is recorded each month to increase this discounted obligation over time. Certain AROs related to disposal costs of the majority of assets at our integrated steel facilities are not recorded because they have an indeterminate settlement date.

These AROs will be initially recognized in the period in which sufficient information exists to estimate their fair value. See Note 19 for further details on U. S. Steel's AROs.

Pensions and other post-employment benefits

U. S. Steel has defined contribution plans or multiemployer arrangements for pension benefits for more than 85 percent of its employees in the United States and defined benefit pension plans covering the remaining employees. For hires before January 1, 2016, U. S. Steel has defined benefit retiree health care and life insurance plans (Other Benefits) that cover its represented employees in North America upon their retirement. Government-sponsored programs into which U. S. Steel makes required contributions cover U. S. Steel's European employees. For more details regarding pension and other post-employment benefits see Note 18 of the Consolidated Financial Statements.

The pension and Other Benefits obligations and the related net periodic benefit costs are based on, among other things, assumptions regarding the discount rate, estimated return on plan assets, salary increases, the projected mortality of participants and the current level and future escalation of health care costs. Additionally, U. S. Steel recognizes an obligation to provide post-employment benefits for disability-related claims covering indemnity and medical payments for certain employees in North America. The obligation for these claims and the related periodic costs are measured using actuarial techniques and assumptions. Actuarial gains and losses occur when actual experience differs from any of the many assumptions used to value the benefit plans, or when assumptions change. For pension and Other Benefits, the Company recognizes into income on an annual basis a portion of unrecognized actuarial net gains or losses that exceed 10 percent of the larger of projected benefit obligations or plan assets (the corridor). These unrecognized amounts in excess of the corridor are amortized over the plan participants' average life expectancy or average future service, depending on the demographics of the plan. Unrecognized actuarial net gains and losses for disability-related claims are immediately recognized into income.

Deferred taxes

Deferred tax assets and liabilities are recognized for the estimated future tax consequences attributable to differences between the financial statement carrying amounts of existing assets and liabilities and their respective tax basis. The realization of deferred tax assets is assessed quarterly based on several interrelated factors. These factors include U. S. Steel's expectation to generate sufficient future taxable income and the projected time period over which these deferred tax assets will be realized. U. S. Steel records a valuation allowance when necessary to reduce deferred tax assets to the amount that will more likely than not be realized. See Note 11 for further details of deferred taxes.

2. New Accounting Standards

During the year ended December 31, 2024, there were no new accounting standards and interpretations issued which are expected to have a material impact on the Company's financial position, operations or cash flows.

In November 2024, the Financial Accounting Standards Board (FASB) issued Accounting Standards Update 2024-03, *Disaggregation of Income Statement Expenses* (ASU 2024-03). ASU 2024-03 includes requirements that an entity disclose in the notes to the financial statements specified information about certain costs and expenses, including the amounts of (a) purchases of inventory, (b) employee compensation, (c) depreciation, (d) intangible asset amortization, and (e) other amounts of depletion expense included in each relevant expense caption presented on the statement of operations. The standard also requires disclosure of a qualitative description of the amounts remaining in relevant expense captions that are not separately disaggregated quantitatively, as well as the total amount of selling expenses and an entity's definition of selling expenses. ASU 2024-03 is effective for annual periods beginning after December 15, 2026, and interim periods beginning after December 15, 2027. U. S. Steel is currently assessing the impact of ASU 2024-03 on its disclosures.

In March 2024, the SEC adopted final rules that would require certain climate related disclosures. Certain disclosures would be required in the notes to the financial statements beginning in fiscal year 2025. The audited financial statement disclosures include capitalized costs and expenses related to severe weather events and other natural conditions subject to certain materiality thresholds. Beginning in annual disclosures for fiscal year 2026, certain greenhouse gas emission disclosures would also be required. In April 2024, the SEC issued a stay on the rules until legal challenges to the rule are addressed. U. S. Steel is monitoring the legal challenges and assessing the impact of the rules on its disclosures.

In December 2023, the FASB issued Accounting Standards Update 2023-09, *Improvements to Income Tax Disclosures* (ASU 2023-09). ASU 2023-09 includes requirements that an entity disclose specific categories in the rate reconciliation and provide additional information for reconciling items that are greater than five percent of the amount computed by multiplying pretax income (or loss) by the applicable statutory income tax rate. The standard also requires that entities disclose income (or loss) from continuing operations before income tax expense (or benefit) and income tax expense (or benefit) each disaggregated between domestic and foreign. In addition, the standard also requires disclosure of payment amounts disaggregated by federal, state, and foreign, as well as by major jurisdiction. ASU 2023-09 is effective for annual periods beginning after December 15, 2024. U. S. Steel is currently assessing the impact of ASU 2023-09 on its disclosures.

3. Recently Adopted Accounting Standards

In November 2023, the FASB issued Accounting Standards Update 2023-07, *Improvements to Reportable Segment Disclosures* (ASU 2023-07). ASU 2023-07 includes requirements that an entity disclose the title of the chief operating decision maker (CODM) and on an interim and annual basis, significant segment expenses and the composition of other segment items for each segment's reported profit. The standard also permits disclosure of additional measures of segment profit. ASU 2023-07 is effective for fiscal years beginning after December 15, 2023, and interim periods within fiscal years beginning after December 15, 2024. U. S. Steel adopted this guidance effective January 1, 2024 for annual reporting and applied the amendments retrospectively to all prior periods presented in the Consolidated Financial Statements. The amendments for interim periods will be adopted in our fiscal year beginning on January 1, 2025. See Note 4 for further details on segment information.

In September 2022, the FASB issued Accounting Standards Update 2022-04, *Disclosure of Supplier Finance Program Obligations* (ASU 2022-04). ASU 2022-04 requires that an entity disclose certain information about supplier finance programs used in connection with the purchase of goods and services. ASU 2022-04 is effective for all entities with fiscal years beginning after December 15, 2022, and interim periods within those fiscal years, except for the amendment on roll-forward information, which is effective for fiscal years beginning after December 15, 2023. U. S. Steel adopted this guidance effective January 1, 2023, with the exception of the amendment on roll-forward information, which was adopted in our fiscal year beginning on January 1, 2024 and applied prospectively.

The Company has a SCF arrangement with a third-party administrator which allows participating suppliers, at their sole discretion, to make offers to sell payment obligations of the Company prior to their scheduled due dates at a discounted price to a participating financial institution. The third-party administrator entered into a separate agreement with the Export Import Bank of the United States to guarantee 90 percent of supplier obligations sold for up to \$95 million. No guarantees or collateral are provided by the Company or any of its subsidiaries under the SCF program, and the Company does not benefit from any preferential payment terms or discounts as a result of supplier participation.

The Company's goal is to capture overall supplier savings and improve working capital efficiency. The agreements facilitate the suppliers' ability to sell payment obligations, while providing them with greater working capital flexibility. The Company has no economic interest in the sale of the suppliers' receivables and no direct financial relationship with the financial institution concerning these services. The Company's obligations to its suppliers, including amounts due and scheduled payment dates, are not impacted by suppliers' decisions to sell amounts under the arrangements. The SCF program requires the Company to pay the third-party administrator the stated amount of the confirmed participating supplier invoices. The payment terms for confirmed invoices range from 45 to 90 days after the end of the month in which the invoice was issued.

The underlying costs from suppliers that elected to participate in the SCF program are generally recorded in cost of sales in the Company's Consolidated Statements of Operations. Amounts due to suppliers who participate in the SCF program are reflected in accounts payable and accrued expenses on the Company's Consolidated Balance Sheets and payments on the obligations by our suppliers are included in cash used in operating activities in the Consolidated Statements of Cash Flows. As of December 31, 2024 and 2023, accounts payable and accrued expenses included \$62 million and \$84 million, respectively, of outstanding payment obligations which suppliers elected to sell to participating financial institutions.

The roll-forward of the Company's outstanding obligations confirmed as valid under its SCF program for the year ended December 31, 2024 is as follows:

<i>(in millions)</i>	2024
Confirmed obligations outstanding at beginning of year	\$197
Invoices confirmed	936
Invoices paid	(935)
Confirmed obligations outstanding at end of year	\$198

4. Segment Information

U. S. Steel has four reportable segments: North American Flat-Rolled, Mini Mill, USSE and Tubular Products. The results of our real estate business are disclosed in the Other category. The majority of U. S. Steel's customers are located in North America and Europe. During 2024, sales to one customer of the Flat-Rolled segment were approximately \$2.0 billion which exceeded 10 percent of U. S. Steel's total consolidated net sales. During 2023 and 2022, no single customer accounted for more than 10 percent of U. S. Steel's total consolidated net sales.

The Flat-Rolled segment includes the operating results of U. S. Steel's integrated steel plants and equity investees in the United States involved in the production of slabs, strip mill plates, sheets and tin mill products, as well as all pig iron, iron

ore and coke production facilities in the United States. These operations primarily serve North American customers in the service center, conversion, transportation (including automotive), construction, container and appliance and electrical markets.

The Mini Mill segment includes the operating results of Big River Steel and BR2 steel plants in Osceola, Arkansas involved in the production of sheets and electrical products. These operations primarily serve North American customers in the service center, conversion, transportation (including automotive), construction, container and appliance and electrical markets.

The USSE segment includes the operating results of USSK, U. S. Steel's integrated steel plant and coke production facilities in Slovakia, and its subsidiaries. USSE conducts its business mainly in Central and Western Europe and primarily serves customers in the European transportation (including automotive), construction, container, appliance, electrical, service center, conversion and oil, gas and petrochemical markets. USSE produces and sells slabs, hot-rolled, cold-rolled, hot-dip galvanized, and color-coated coils, electrical steel, strip mill plate, sheet, tin mill products and spiral welded pipe.

The Tubular segment includes the operating results of U. S. Steel's tubular production facilities and an equity investee in the United States. These operations produce and sell rounds, seamless and electric resistance welded (welded) steel casing and tubing (commonly known as oil country tubular goods or OCTG), standard and line pipe and mechanical tubing and primarily serve customers in the oil, gas and petrochemical markets. The Tubular segment includes the electric arc furnace at our Fairfield Tubular Operations in Fairfield, Alabama.

The chief operating decision maker (CODM), which is the chief executive officer, evaluates segment performance and determines resource allocations based on a number of factors, the primary measure being earnings (loss) before interest, taxes, depreciation and amortization (EBITDA). EBITDA for reportable segments and the Other category does not include net interest and other financial costs (income), income taxes, and certain other items that management believes are not indicative of future results. For all of the segments, the CODM uses segment EBITDA in the Annual Operating Plan (AOP) and monthly performance review processes. The CODM considers AOP-to-actual EBITDA variances on a monthly, quarter-to-date, and year-to-date basis for evaluating performance of each segment and making decisions about resource allocations to each segment.

The accounting principles applied at the operating segment level in determining earnings (loss) before interest, taxes, depreciation and amortization are generally the same as those applied at the consolidated financial statement level. Intersegment sales and transfers are accounted for at market-based prices and are eliminated at the corporate consolidation level. Corporate-level selling, general and administrative expenses and costs related to certain former businesses are allocated to the reportable segments and Other based on measures of activity that management believes are reasonable.

The results of segment operations are as follows:

(In millions)	Flat-Rolled	Mini Mill	USSE	Tubular	Total
2024					
Customer sales	\$ 9,604	\$ 2,070	\$ 2,983	\$ 970	\$ 15,627
Intersegment sales	211	347	24	7	589
Net sales	9,815	2,417	3,007	977	16,216
Other net sales ^(a)					13
Elimination of intersegment sales					(589)
Total net sales					\$ 15,640
Less: ^(b)					
Cost of sales	8,775	2,063	2,898	843	14,579
Earnings from investees	(90)	—	—	(22)	(112)
Other segment items ^(c)	196	121	38	21	376
Segment earnings before interest, taxes, depreciation and amortization	934	233	71	135	\$ 1,373
Other loss before interest, taxes, depreciation and amortization ^(a)					(7)
Depreciation, depletion and amortization					(913)
Items not allocated to segments:					
Restructuring and other charges (Note 25)					(8)
Stock-based compensation expense (Note 15)					(51)
Asset impairment charges					(19)
Environmental remediation charges					(18)
Strategic alternatives review process costs					(90)
Granite City idling costs					(11)
Other charges, net					(16)
Earnings before interest and income taxes					\$ 240
Net interest and other financial benefits					(198)
Earnings before income taxes					\$ 438
Capital expenditures ^(d)	495	1,641	118	33	2,287
Segment depreciation, depletion and amortization	(535)	(203)	(125)	(50)	(913)
Other depreciation, depletion and amortization ^(a)					—
Total depreciation, depletion and amortization					\$ (913)
Assets ^(d)	7,266	9,339	1,904	975	19,484
Other assets ^(a)					127
Corporate, reconciling items, and eliminations ^(e)					624
Total assets					\$ 20,235

^(a) The results of our real estate business are disclosed in the Other category.

^(b) The significant expense (income) categories and amounts align with the segment-level information that is regularly provided to the CODM. Intersegment expenses are included within the amounts shown.

^(c) Other segment items primarily include selling, general and administrative expenses, BRS recycling tax credit revenue and BR2 startup costs.

^(d) Mini Mill includes capital expenditures and assets related to BR2 of \$1.4 billion and \$4.7 billion, respectively.

^(e) The majority of Corporate, reconciling items, and eliminations total assets is comprised of cash and the elimination of intersegment amounts.

(In millions)	Flat-Rolled	Mini Mill	USSE	Tubular	Total
2023					
Customer sales	\$ 10,744	\$ 2,223	\$ 3,525	\$ 1,551	\$ 18,043
Intersegment sales	365	455	25	1	846
Net sales	11,109	2,678	3,550	1,552	18,889
Other net sales ^(a)					10
Elimination of intersegment sales					(846)
Total net sales					\$ 18,053
Less: ^(b)					
Cost of sales	9,899	2,259	3,413	931	16,502
Earnings from investees	(72)	—	—	(43)	(115)
Other segment items ^(c)	259	36	39	26	360
Segment earnings before interest, taxes, depreciation and amortization	1,023	383	98	638	\$ 2,142
Other loss before interest, taxes, depreciation and amortization ^(a)					(3)
Depreciation, depletion and amortization					(916)
Items not allocated to segments:					
Restructuring and other charges (Note 25)					(36)
Stock-based compensation expense (Note 15)					(51)
Asset impairment charges					(127)
Environmental remediation charges					(11)
Strategic alternatives review process costs					(79)
Granite City idling costs					(121)
Other charges, net					1
Earnings before interest and income taxes					\$ 799
Net interest and other financial benefits					(248)
Earnings before income taxes					\$ 1,047
Capital expenditures ^(d)	536	1,899	109	32	2,576
Segment depreciation, depletion and amortization	(605)	(168)	(94)	(49)	(916)
Other depreciation, depletion and amortization ^(a)					—
Total depreciation, depletion and amortization					\$ (916)
Assets ^(d)	7,546	7,569	2,229	1,002	18,346
Other assets ^(a)					140
Corporate, reconciling items, and eliminations ^(e)					1,965
Total assets					\$ 20,451

^(a) The results of our real estate business are disclosed in the Other category.

^(b) The significant expense (income) categories and amounts align with the segment-level information that is regularly provided to the CODM. Intersegment expenses are included within the amounts shown.

^(c) Other segment items primarily include selling, general and administrative expenses, BRS recycling tax credit revenue and BR2 startup costs.

^(d) Mini Mill includes capital expenditures and assets related to BR2 of \$1.5 billion and \$3.0 billion, respectively.

^(e) The majority of Corporate, reconciling items, and eliminations total assets is comprised of cash and the elimination of intersegment amounts.

(In millions)	Flat-Rolled	Mini Mill	USSE	Tubular	Total
2022					
Customer sales	\$ 12,522	\$ 2,681	\$ 4,243	\$ 1,611	\$ 21,057
Intersegment sales	350	366	13	5	734
Net sales	12,872	3,047	4,256	1,616	21,791
Other net sales ^(a)					9
Elimination of intersegment sales					(735)
Total net sales					\$ 21,065
Less: ^(b)					
Cost of sales	10,357	2,381	3,696	1,024	17,458
Earnings from investees	(220)	—	—	(23)	(243)
Other segment items ^(c)	228	27	31	23	309
Segment earnings before interest, taxes, depreciation and amortization	2,507	639	529	592	\$ 4,267
Other earnings before interest, taxes, depreciation and amortization ^(a)					23
Depreciation, depletion and amortization					(791)
Items not allocated to segments:					
Restructuring and other charges (Note 25)					(48)
Stock-based compensation expense (Note 15)					(57)
Asset impairment charges					(163)
Environmental remediation charges					(13)
United Steelworkers labor agreement signing bonus and related costs					(64)
Gains on assets sold & previously held investments					6
Earnings before interest and income taxes					\$ 3,160
Net interest and other financial benefits					(99)
Earnings before income taxes					\$ 3,259
Capital expenditures ^(d)	503	1,159	90	17	1,769
Segment depreciation, depletion and amortization	(499)	(158)	(85)	(48)	(790)
Other depreciation, depletion and amortization ^(a)					(1)
Total depreciation, depletion and amortization					\$ (791)
Assets ^(d)	7,936	5,787	2,175	1,140	17,038
Other assets ^(a)					141
Corporate, reconciling items, and eliminations ^(e)					2,279
Total assets					\$ 19,458

^(a) The results of our real estate business are disclosed in the Other category.

^(b) The significant expense (income) categories and amounts align with the segment-level information that is regularly provided to the CODM. Intersegment expenses are included within the amounts shown.

^(c) Other segment items primarily include selling, general and administrative expenses, BRS recycling tax credit revenue and adjustments in electricity purchase agreements.

^(d) Mini Mill includes capital expenditures and assets related to BR2 of \$0.8 billion and \$1.4 billion, respectively.

^(e) The majority of Corporate, reconciling items, and eliminations total assets is comprised of cash and the elimination of intersegment amounts.

Geographic Area:

The information below summarizes external sales, property, plant and equipment and equity method investments based on the location of the operating segment to which they relate.

(In millions)	Year	External Sales	Assets
North America	2024	\$ 12,657	\$ 11,853 ^(a)
	2023	14,528	10,223 ^(a)
	2022	16,822	8,459 ^(a)
Europe	2024	2,983	854
	2023	3,525	910
	2022	4,243	843
Total	2024	15,640	12,707
	2023	18,053	11,133
	2022	21,065	9,302

^(a) Assets with a book value of \$11,853 million, \$10,223 million, and \$8,459 million were located in the United States at December 31, 2024, 2023, and 2022, respectively.

5. Dispositions

Real Property, South Works Disposition

In July 2024, the Company entered into a purchase and sale agreement with a third party for the sale of substantially all of the Company's former South Works real property. The Company will convey title of the property to the buyer for expected proceeds of approximately \$70 million. This transaction is expected to close within the next 12 months.

USS-UPI, LLC Disposition

In December 2023, production at USS-UPI, LLC (UPI) was indefinitely idled. The Company has accrued a total of \$44 million and \$108 million for severance, exit costs and employee benefits as of December 31, 2024 and 2023, respectively. Payments of \$59 million for these items were made during the year ended December 31, 2024. The Company has previously committed to, and continues to intend to, pursue the disposition of certain assets related to the UPI facility.

As of December 31, 2024, the South Works property and the UPI facility are recorded as assets held-for-sale which are recorded in Other current assets on the Consolidated Balance Sheet.

6. Revenue

Revenue is generated primarily from contracts to produce, ship and deliver steel products, and to a lesser extent, raw materials sales such as iron ore pellets and coke by-products and real estate sales. Generally, U. S. Steel's performance obligations are satisfied and revenue is recognized when title transfers to our customer for product shipped or services are provided. Revenues are recorded net of any sales incentives. Shipping and other transportation costs charged to customers are treated as fulfillment activities and are recorded in both revenue and cost of sales at the time control to the related good being shipped is transferred to the customer. Costs related to obtaining sales contracts are incidental and are expensed when incurred. Because customers are invoiced at the time title transfers and U. S. Steel's right to consideration is unconditional at that time, U. S. Steel does not maintain contract asset balances. Additionally, U. S. Steel does not maintain contract liability balances, as performance obligations are satisfied prior to customer payment for product. U. S. Steel offers industry standard payment terms.

The following tables disaggregate our revenue by product for each of our reportable business segments for the years ended December 31, 2024, 2023, and 2022, respectively (Net Sales by Product, excluding intersegment sales, in millions):

Year Ended December 31, 2024	Flat-Rolled	Mini Mill	USSE	Tubular	Other	Total
Semi-finished	\$ 84	\$ —	\$ 78	\$ 35	\$ —	\$ 197
Hot-rolled sheets	1,566	1,039	1,468	—	—	4,073
Cold-rolled sheets	3,665	325	229	—	—	4,219
Coated sheets	2,899	701	1,052	—	—	4,652
Tubular products	—	—	51	913	—	964
All other ^(a)	1,390	5	105	22	13	1,535
Total	\$ 9,604	\$ 2,070	\$ 2,983	\$ 970	\$ 13	\$ 15,640

^(a) Consists primarily of sales of raw materials and coke making by-products

Year Ended December 31, 2023	Flat-Rolled	Mini Mill	USSE	Tubular	Other	Total
Semi-finished	\$ 242	\$ —	\$ 168	\$ —	\$ —	\$ 410
Hot-rolled sheets	1,926	1,215	1,637	—	—	4,778
Cold-rolled sheets	3,568	365	269	—	—	4,202
Coated sheets	3,484	639	1,278	—	—	5,401
Tubular products	—	—	52	1,528	—	1,580
All other ^(a)	1,524	4	121	23	10	1,682
Total	\$ 10,744	\$ 2,223	\$ 3,525	\$ 1,551	\$ 10	\$ 18,053

^(a) Consists primarily of sales of raw materials and coke making by-products.

Year Ended December 31, 2022	Flat-Rolled	Mini Mill	USSE	Tubular	Other	Total
Semi-finished	\$ 193	\$ —	\$ 103	\$ —	\$ —	\$ 296
Hot-rolled sheets	2,338	1,570	1,919	—	—	5,827
Cold-rolled sheets	3,898	356	385	—	—	4,639
Coated sheets	4,461	745	1,622	—	—	6,828
Tubular products	—	—	68	1,594	—	1,662
All other ^(a)	1,632	10	146	17	8	1,813
Total	\$ 12,522	\$ 2,681	\$ 4,243	\$ 1,611	\$ 8	\$ 21,065

^(a) Consists primarily of sales of raw materials and coke making by-products.

7. Net Interest and Other Financial Costs

(In millions)	2024	2023	2022
Interest income:			
Interest income	\$ (96)	\$ (141)	\$ (44)
Interest expense and other financial costs:			
Interest incurred	237	234	218
Less interest capitalized	213	162	59
Total interest expense	24	72	159
Loss on debt extinguishment ^(a)	2	—	—
Net periodic benefit income	(132)	(154)	(246)
Net gain from investments related to active employee benefits	(25)	(43)	—
Foreign currency net loss (gain) ^(b)	6	(5)	11
Financial costs on:			
Amended Credit Agreement	5	5	5
USSK Credit Facility	2	4	3
Other	7	5	4
Amortization of discounts and deferred financing costs	9	9	9
Total other financial costs	29	18	32
Net interest and other financial (benefits) costs	\$ (198)	\$ (248)	\$ (99)

^(a) Represents a net pretax charge of \$2 million during 2024 related to the repayments of the 2026 Senior Convertible Notes.

^(b) The functional currency for USSE is the euro. Foreign currency net loss (gain) is a result of transactions denominated in currencies other than the euro.

8. Earnings and Dividends Per Common Share

Earnings per Share Attributable to United States Steel Corporation Stockholders

Basic earnings per common share is based on the weighted average number of common shares outstanding during the period.

Diluted earnings per common share assumes the exercise of stock options, the vesting of restricted stock units and performance awards, provided in each case the effect is dilutive. The "if-converted" method is used to calculate the dilutive effect of the Senior Convertible Notes due in 2026 as a result of ASU 2020-06.

The computations for basic and diluted earnings per common share from continuing operations are as follows:

(Dollars in millions, except per share amounts)	2024	2023	2022
Net earnings attributable to United States Steel Corporation stockholders			
Basic	\$ 384	\$ 895	\$ 2,524
Interest expense on Senior Convertible Notes, net of tax	13	13	13
Diluted	\$ 397	\$ 908	\$ 2,537
Weighted-average shares outstanding (in thousands):			
Basic	224,817	224,761	246,986
Effect of Senior Convertible notes	26,159	26,194	26,194
Effect of stock options, restricted stock units and performance awards	3,028	4,405	3,783
Diluted	254,004	255,360	276,963
Net earnings per share attributable to United States Steel Corporation stockholders:			
Basic	\$ 1.71	\$ 3.98	\$ 10.22
Diluted	\$ 1.57	\$ 3.56	\$ 9.16

The following table summarizes the securities that were antidilutive, and therefore, were not included in the computation of diluted earnings per common share:

(In thousands)	2024	2023	2022
Securities granted under the 2016 Omnibus Incentive Compensation Plan, as amended and restated	125	475	960

Dividends Paid per Share

Quarterly dividends on common stock were five cents per share for each quarter in 2024, 2023, and 2022.

9. Cash, Cash Equivalents and Restricted Cash

The following table provides a reconciliation of cash, cash equivalents and restricted cash reported within U. S. Steel's Consolidated Balance Sheets that sum to the total of the same amounts shown in the Consolidated Statements of Cash Flows:

(In millions)	December 31,		
	2024	2023	2022
Cash and cash equivalents	\$ 1,367	\$ 2,948	\$ 3,504
Restricted cash in other current assets	11	8	4
Long-term restricted cash	35	32	31
Total cash, cash equivalents and restricted cash	\$ 1,413	\$ 2,988	\$ 3,539

Amounts included in restricted cash represent cash balances which are legally or contractually restricted, primarily for insurance purposes, environmental liabilities and other capital projects.

10. Inventories

(In millions)	December 31, 2024	December 31, 2023
Raw materials	\$ 959	\$ 773
Semi-finished products	828	877
Finished products	331	428
Supplies and sundry items	50	50
Total	\$ 2,168	\$ 2,128

Current acquisition costs for LIFO inventories were estimated to exceed the above inventory values at December 31 by \$1.1 billion in 2024 and \$1.2 billion in 2023. As a result of the liquidation of LIFO inventories, cost of sales increased and earnings before interest and income taxes decreased by \$3 million in 2024. Cost of sales decreased and earnings before interest and income taxes increased by \$43 million and \$44 million in 2023 and 2022, respectively.

11. Income Taxes

Components of earnings before income taxes:

(In millions)	2024	2023	2022
United States	\$ 499	\$ 1,041	\$ 2,847
Foreign	(61)	6	412
Earnings before income taxes	\$ 438	\$ 1,047	\$ 3,259

At the end of 2024, 2023, and 2022, U. S. Steel does not have any undistributed foreign earnings and profits for which U.S. deferred taxes have not been provided.

Income tax provision (benefit):

(In millions)	2024			2023			2022		
	Current	Deferred	Total	Current	Deferred	Total	Current	Deferred	Total
Federal	\$ (53)	\$ 60	\$ 7	\$ 56	\$ 116	\$ 172	\$ 101	\$ 451	\$ 552
State and local	(6)	24	18	(3)	(14)	(17)	54	43	97
Foreign	—	29	29	2	(5)	(3)	79	7	86
Total	\$ (59)	\$ 113	\$ 54	\$ 55	\$ 97	\$ 152	\$ 234	\$ 501	\$ 735

A reconciliation of the federal statutory tax rate of 21 percent to total provision follows:

(In millions)	2024	2023	2022
Statutory rate applied to earnings before income taxes	\$ 92	\$ 220	\$ 684
Valuation allowance	47	(14)	(38)
Excess percentage depletion	(23)	(18)	(48)
Capitalized transaction costs	13	10	—
State and local income taxes after federal income tax effects	8	(1)	97
Effects of foreign operations	(12)	(3)	85
U.S. impact of foreign operations	(29)	(19)	6
Impact of tax credits	(11)	(7)	(83)
Adjustment of prior years' federal income taxes	(42)	(34)	40
Unrecognized tax benefits	12	2	—
Stock compensation	(7)	(5)	(3)
Nondeductible executive compensation	5	16	6
Other	1	5	(11)
Total provision	\$ 54	\$ 152	\$ 735

Included in the 2024 provision is a benefit of \$59 million related to the 2023 federal and state income tax returns.

In March 2022, the Company and the Arkansas Economic Development Commission entered into the Recycling Tax Credit Incentive Agreement, whereby the Company may earn state income tax credits in an amount equal to 30 percent of the cost of waste reduction, reuse, or recycling equipment, subject to meeting the requirements of the Arkansas Code Ann. Section 26-51-506, for the Company's BR2 facility near Osceola, Arkansas. Documentation supporting the Company's investment in qualifying equipment must be submitted as part of an application for certification expected to be completed in 2025. In March 2022, the Company received a lump-sum payment of approximately \$82 million as proceeds from the sale of a portion of expected future tax credits to be earned by the Company (see Note 26 for additional information). The Company estimates that it could earn tax credits in excess of \$700 million, exclusive of the amount sold in March 2022, which the Company will recognize in the year it meets the requirements of Arkansas Code Ann. Section 26-51-506. Any unused tax credit that cannot be claimed in a tax year may be carried forward indefinitely by the Company and applied to its future state tax liability.

On August 16, 2022, H.R. 5376 (commonly called the Inflation Reduction Act of 2022) was signed into law, which, among other things, implemented a corporate alternative minimum tax (CAMT) of 15 percent on net book income of certain large corporations adjusted for certain items prescribed by the legislation.

The Organization for Economic Co-operation and Development (the "OECD"), an international association of 38 countries including the U.S., has proposed changes to numerous long-standing tax principles, including a global minimum tax initiative. On December 12, 2022, the European Union member states agreed to implement the OECD's Pillar 2 global

corporate minimum tax rate of 15 percent on companies with revenues of at least €750 million, which went into effect in 2024. The law on minimum top-up tax for multinational enterprise groups and large-scale domestic groups in Slovakia was approved by the parliament on December 8, 2023 and signed by the President on December 21, 2023, with an effective date of December 31, 2023.

The Company analyzed the 2024 tax effects of CAMT and Pillar 2, which were not material to the Consolidated Financial Statements.

Included in the 2023 provision is a benefit of \$43 million related to the 2022 federal and state income tax returns, as well as an additional benefit of \$12 million related to the adjustment of prior years' federal income taxes. Also included in the 2023 provision is a benefit of \$23 million related to the recognition of a deferred tax asset on unrecognized currency losses in branch operations pursuant to proposed regulations under Internal Revenue Code Section 987.

Deferred taxes

Deferred tax assets and liabilities resulted from the following:

(In millions)	December 31,	
	2024	2023
Deferred tax assets:		
Federal tax loss carryforwards (no expiration)	\$ 213	\$ 1
Federal capital loss carryforwards (expiring in 2026)	69	69
State tax credit carryforwards (expiring in 2027 through 2038)	17	14
State tax loss carryforwards (expiring in 2026 through 2044)	91	80
State capital loss carryforwards (expiring in 2026 through 2036)	21	23
General business credit carryforwards (expiring in 2044)	9	—
Foreign tax loss and credit carryforwards (expiring in 2027 through 2034)	26	8
Operating lease liabilities	19	28
Capitalized research and development	76	69
Receivables, payables and debt	149	140
Inventory	48	57
Other temporary differences	71	41
Valuation allowance	(149)	(101)
Total deferred tax assets	\$ 660	\$ 429
Deferred tax liabilities:		
Property, plant and equipment	\$ 589	\$ 642
Operating right-of-use assets	17	26
Investments in subsidiaries and equity investees	557	184
Employee benefits	109	72
Contingencies and accrued liabilities	45	73
Total deferred tax liabilities	\$ 1,317	\$ 997
Net deferred tax liability	\$ (657)	\$ (568)

U. S. Steel recognizes deferred tax assets and liabilities for the estimated future tax consequences attributable to differences between the financial statement carrying amounts of existing assets and liabilities and their respective tax basis. The realization of deferred tax assets is assessed quarterly based on several interrelated factors. These factors include U. S. Steel's expectation to generate sufficient future taxable income and the projected time period over which these deferred tax assets will be realized.

Each quarter U. S. Steel analyzes the likelihood that our deferred tax assets will be realized. A valuation allowance is recorded if, based on the weight of all available positive and negative evidence, it is more likely than not that some portion, or all, of a deferred tax asset will not be realized.

At December 31, 2024, the net domestic deferred tax liability was \$619 million, net of an established valuation allowance of \$103 million. At December 31, 2023, the net domestic deferred tax liability was \$566 million, net of an established valuation allowance of \$98 million.

At December 31, 2024, the net foreign deferred tax liability was \$38 million, net of an established valuation allowance of \$46 million. At December 31, 2023, the net foreign deferred tax liability was \$2 million, net of an established valuation allowance of \$3 million. The net foreign deferred tax asset will fluctuate as the value of the U.S. dollar changes with respect to the euro.

U. S. Steel will continue to monitor the realizability of its deferred tax assets on a quarterly basis. In the future, if we determine that realization is more likely than not for a deferred tax asset with a valuation allowance, the related valuation allowance will be reduced, and we will record a non-cash benefit to earnings.

Unrecognized tax benefits

Unrecognized tax benefits are the differences between a tax position taken, or expected to be taken, in a tax return and the benefit recognized for accounting purposes pursuant to the guidance in ASC Topic 740 on income taxes. The total amount of gross unrecognized tax benefits was \$18 million, \$4 million, and \$2 million as of December 31, 2024, 2023, and 2022, respectively.

The total amount of net unrecognized tax benefits that, if recognized, would affect the effective tax rate was \$18 million and \$4 million as of December 31, 2024, and 2023, respectively.

U. S. Steel records interest related to uncertain tax positions as a part of net interest and other financial costs in the Consolidated Statements of Operations. Any penalties are recognized as part of selling, general and administrative expenses. U. S. Steel had accrued liabilities for interest and penalties related to uncertain tax positions of less than \$1 million and \$2 million as of December 31, 2024, and 2023, respectively.

A tabular reconciliation of unrecognized tax benefits follows:

(In millions)	2024		2023		2022	
Unrecognized tax benefits, beginning of year	\$	4	\$	2	\$	3
Increases – tax positions taken in prior years		16		—		—
Increases – current tax positions		—		2		—
Lapse of statute of limitations		(2)		—		(1)
Unrecognized tax benefits, end of year	\$	18	\$	4	\$	2

Tax years subject to examination

Below is a summary of the tax years open to examination by major tax jurisdiction:

U.S. Federal – 2021 and forward

U.S. States – 2017 and forward

Slovakia – 2013 and forward

Status of Internal Revenue Service (IRS) examinations

The IRS completed its audit of the Company's 2017-2018 federal consolidated tax returns in 2023.

12. Investments, Long-Term Receivables and Equity Investee Transactions

(In millions)	December 31,	
	2024	2023
Equity method investments	\$ 734	\$ 740
Receivables due after one year, less allowance of \$3 in both periods	21	19
Other	2	2
Total	\$ 757	\$ 761

Summarized financial information of all investees accounted for by the equity method of accounting is as follows (amounts represent 100% of investee financial information):

(In millions)	2024		2023		2022	
Income data – year ended December 31:						
Net Sales	\$	3,184	\$	3,335	\$	3,222
Operating income		245		342		492
Net earnings		220		319		462
Balance sheet date – December 31:						
Current Assets	\$	847	\$	876	\$	1,085
Noncurrent Assets		788		844		974
Current liabilities		226		255		314
Noncurrent Liabilities		392		398		513

U. S. Steel's portion of the income (loss) from investees reflected on the Consolidated Statements of Operations was \$112 million, \$115 million, and \$243 million for the years ended December 31, 2024, 2023, and 2022, respectively.

All of our significant investees are located in the U.S. Investees accounted for using the equity method include:

Investee	December 31, 2024 Interest
Chrome Deposit Corporation	50 %
Double G Coatings Company, Inc.	50 %
Hibbing Development Company	24.1 %
Hibbing Taconite Company ^(a)	14.7 %
Patriot Premium Threading Services, LLC	50 %
PRO-TEC Coating Company, LLC	50 %

^(a) Hibbing Taconite Company (Hibbing) is an unincorporated joint venture that is owned, in part, by Hibbing Development Company (HDC), which is accounted for using the equity method. Through HDC we are able to influence the activities of Hibbing, and as such, its activities are accounted for using the equity method.

In 2022, the Company recognized pre-tax gains on equity investee transactions of approximately \$6 million from Worthington Specialty Processing pertaining to the sale of the former joint venture's facilities and subsequent distribution to the investors. The joint venture is expected to be dissolved in the future and is expected to result in an immaterial distribution to the Company.

Dividends or partnership distributions received from equity investees were \$109 million, \$114 million and \$28 million in 2024, 2023 and 2022, respectively.

U. S. Steel evaluates impairment of its equity method investments whenever circumstances indicate that a decline in value below carrying value is other than temporary. Under these circumstances, we would adjust the investment down to its estimated fair value, which then becomes its new carrying value.

We supply substrate to certain of our equity method investees and from time to time will extend the payment terms for their trade receivables. For discussion of transactions and related receivable and payable balances between U. S. Steel and its investees, see Note 23.

13. Property, Plant and Equipment

(In millions)	Useful Lives	December 31,	
		2024	2023
Land and depletable property	—	\$ 257	\$ 216
Buildings	35-40 years	2,883	1,854
Machinery and equipment			
Steel producing	2-30 years	19,790	16,806
Other	5-30 years	102	97
Information technology	5-15 years	857	829
Assets under finance lease	5-15 years	379	302
Construction in process	—	1,971	3,871
Total		26,239	23,975
Less accumulated depreciation and depletion		14,266	13,582
Net		\$ 11,973	\$ 10,393

Amounts in accumulated depreciation and depletion for assets acquired under finance leases were \$182 million and \$126 million at December 31, 2024, and 2023, respectively.

14. Goodwill and Intangible Assets

Intangible assets are being amortized on a straight-line basis over their estimated useful lives and are detailed below:

(In millions)	Useful Lives	As of December 31, 2024			As of December 31, 2023		
		Gross Carrying Amount	Accumulated Amortization	Net Amount	Gross Carrying Amount	Accumulated Amortization	Net Amount
Customer relationships	22 Years	\$ 413	\$ 75	\$ 338	\$ 413	\$ 56	\$ 357
Patents	5-15 Years	17	14	3	17	13	4
Energy Contract	2 Years	—	—	—	54	54	—
Total amortizable intangible assets		\$ 430	\$ 89	\$ 341	\$ 484	\$ 123	\$ 361

Amortization expense was \$20 million and \$42 million for years ended December 31, 2024, and December 31, 2023, respectively. We expect approximately \$97 million in total amortization expense from 2025 through 2029 and approximately \$244 million in remaining amortization expense thereafter.

The carrying amount of acquired water rights with indefinite lives as of December 31, 2024, and December 31, 2023, totaled \$75 million.

Below is a summary of goodwill by segment for the twelve months ended December 31, 2024:

(In millions)	Flat-Rolled	Mini Mill	USSE	Tubular	Total
Balance at December 31, 2023	\$ —	\$ 916	\$ 4	\$ —	\$ 920
Additions	—	—	—	—	—
Balance at December 31, 2024	\$ —	\$ 916	\$ 4	\$ —	\$ 920

15. Stock-Based Compensation Plans

U. S. Steel has outstanding stock-based compensation awards that were granted by the Compensation & Organization Committee of the Board of Directors (the Committee), or its designee, under the 2005 Stock Incentive Plan (the 2005 Plan) and the 2016 Omnibus Incentive Compensation Plan, as amended and restated (the Omnibus Plan) (collectively the Plans). On April 26, 2016, the Company's stockholders approved the Omnibus Plan and authorized the Company to issue up to 7,200,000 shares of U. S. Steel common stock under the Omnibus Plan. The Company's stockholders authorized the issuance of an additional 6,300,000 shares under the Omnibus Plan on April 25, 2017, an additional 4,700,000 shares under the Omnibus Plan on April 28, 2020, and an additional 14,500,000 shares under the Omnibus Plan on April 27, 2021. While awards that were previously granted under the 2005 Plan remain outstanding, all future awards will be granted under the Omnibus Plan. As of December 31, 2024, there were 4,084,130 shares available for future grants under the Omnibus Plan.

Generally, a share issued under the Omnibus Plan pursuant to an award other than a stock option will reduce the number of shares available under the Stock Plan by 1.78 shares. Shares related to awards under either plan (i) that are forfeited, (ii) that terminate without shares having been issued or (iii) for which payment is made in cash or property other than shares, are again available for awards under the Omnibus Plan. Shares delivered to U. S. Steel or withheld for purposes of satisfying the exercise price or tax withholding obligations are not available for future awards. The purpose of the Plans is to attract, reward and retain employees and non-employee directors who create long-term value for our stockholders by delivering on objectives that support our long-term strategy. The Committee administers the Plans, and under the Omnibus Plan may make grants of stock options, restricted stock units (RSUs), performance awards, and other stock-based awards.

The following table summarizes the total stock-based compensation awards granted during the years 2024, 2023, and 2022:

	Restricted Stock Units	TSR Performance Awards	ROCE Performance Awards	Performance-Based Restricted Stock Units
2024	801,540	—	230,350	—
2023	2,126,020	185,120	357,020	—
2022	1,249,830	236,520	408,870	83,951

Stock-based compensation expense

The following table summarizes the total compensation expense recognized for stock-based compensation awards:

	Year Ended December 31, 2024	Year Ended December 31, 2023	Year Ended December 31, 2022
(In millions, except per share amounts)			
Stock-based compensation expense recognized:			
Cost of sales	\$ 20	\$ 16	\$ 15
Selling, general and administrative expenses	32	35	42
Total	52	51	57
Related deferred income tax benefit	12	12	14
Decrease in net income	40	39	43
Decrease in basic earnings per share	0.18	0.17	0.18
Decrease in diluted earnings per share	0.16	0.15	0.16

As of December 31, 2024, total future compensation cost related to nonvested stock-based compensation arrangements was \$43 million and the average period over which this cost is expected to be recognized is approximately 21 months.

Stock options

Compensation expense for stock options is recorded over the vesting period based on the fair value on the date of grant, as calculated by U. S. Steel using the Black-Scholes model and the assumptions listed below. Awards generally vest ratably over a three-year service period and have a term of ten years. Stock options are generally issued at the average market price of the underlying stock on the date of the grant. Upon exercise of stock options, shares of U. S. Steel stock are issued from treasury stock or from authorized, but unissued common stock. There were 171,000 performance-based stock options granted in 2021. There were no stock options granted in 2024, 2023, and 2022.

The 171,000 performance-based stock options granted in December 2021 do not become vested and exercisable until the Company's 20-trading day average closing stock price meets or exceeds the following stock price hurdles during the seven-year period beginning on the grant date, as follows:

20-trading day Average Closing Stock Price Achievement During 7-Year Period Beginning on Grant Date ^(a)	Percentage of Performance-Based Stock Options Exercisable
\$ 35.00	33.33 %
\$ 45.00	33.33 %
\$ 55.00	33.34 %

^(a) The \$35.00 tranche vested in April 2022 and the \$45.00 tranche vested in January 2024.

The following table shows a summary of the status and activity of stock options for the year ended December 31, 2024:

	Shares	Weighted-Average Exercise Price (per share)	Weighted-Average Remaining Contractual Term (in years)	Aggregate Intrinsic Value (in millions)
Outstanding at January 1, 2024	760,238	\$ 27.98		
Granted	—	\$ —		
Exercised	(158,908)	\$ 24.90		
Forfeited or expired	(13,057)	\$ 37.33		
Outstanding at December 31, 2024	588,273	\$ 28.60	2.11	\$ 4
Exercisable at December 31, 2024	531,273	\$ 29.15	1.91	\$ 4
Exercisable and expected to vest at December 31, 2024	588,273	\$ 28.60	2.11	\$ 4

The aggregate intrinsic value in the table above represents the total pretax intrinsic value (difference between our closing stock price on the last trading day of 2024 and the exercise price, multiplied by the number of in-the-money options). Intrinsic value changes are a function of the fair market value of our stock.

The total intrinsic value of stock options exercised (i.e., the difference between the market price at exercise and the price paid by the employee to exercise the option) was \$3 million, \$4 million, and \$5 million during the years ended December 31, 2024, December 31, 2023, and December 31, 2022, respectively. The total amount of cash received by U. S. Steel from the exercise of options was \$4 million and \$10 million during the years ended December 31, 2024, and

December 31, 2023, respectively. The related net tax benefit realized from the exercise of these options was immaterial in 2024 and 2023.

Stock awards

Compensation expense for nonvested stock awards is recorded over the vesting period based on the fair value at the date of grant.

RSUs awarded as part of annual grants generally vest ratably over three years. Their fair value is the average market price of the underlying common stock on the date of grant. RSUs granted in connection with new-hire or retention awards generally cliff vest three years from the date of the grant.

Total shareholder return (TSR) performance awards may vest at varying levels at the end of a three-year performance period if U. S. Steel's total shareholder return compared to the total shareholder return of a peer group of companies meets performance criteria during the three-year performance period. TSR is calculated as follows: 20 percent for each year in the three-year performance period and 40 percent for the full three-year period. TSR performance awards may vest and pay out 50 percent at the threshold level, 100 percent at the target level and 200 percent at the maximum level. Payment for performance in between the threshold percentages will be interpolated. The fair value of the performance awards is calculated using a Monte-Carlo simulation.

Performance awards based on the return on capital employed (ROCE) metric will be measured based on the Company's consolidated worldwide earnings (loss) before interest and income taxes, as adjusted, divided by consolidated worldwide capital employed, as adjusted, over a three year period.

ROCE is calculated based on the ROCE achieved in the first, second and third years of the performance period, weighted at 20 percent for each year in the three-year performance period and 40 percent for the full three-year period. The ROCE awards will pay out 50 percent at the threshold level, 100 percent at the target level and 200 percent at the maximum level. Payment for performance in between the threshold percentages will be interpolated.

Compensation expense associated with the ROCE awards will be contingent based upon the achievement of the specified ROCE performance goals and will be adjusted on a quarterly basis to reflect the probability of achieving the ROCE metric.

ROCE performance awards may vest at the end of a three-year performance period contingent upon meeting ROCE performance goals approved by the Committee. The fair value of the ROCE performance awards is the average market price of the underlying common stock on the date of grant.

In December 2021 and August 2022, special performance-based restricted stock unit awards (PSUs) were granted to members of the Company's executive leadership team. Shares are earned based on the achievement of certain pre-set quantitative performance criteria during the four-year performance period, January 1, 2022, through December 31, 2025. Shares may vest following the expiration of the Performance Period if the Company satisfies the performance criteria.

The Chief Executive Officer was granted PSUs that vest with the following, equally weighted, performance metrics: (i) EBITDA margin expansion, (ii) greenhouse gas emissions intensity reduction, (iii) asset portfolio optimization, (iv) leverage metrics and (v) corporate relative valuation. Other members of the executive leadership team were granted PSUs that vest with performance criteria related to: (i) on time and on budget completion of the second mini mill (30% of the grant), (ii) EBITDA margin expansion (40% of the grant) and (iii) greenhouse gas emissions intensity reduction (30% of the grant).

For the PSU awards, a payout is achievable at threshold (50% of target), target (100% of target) or maximum (200% of target) performance achievement. Pay out amounts will be interpolated between the threshold, target and maximum amounts.

The following table shows a summary of the performance awards outstanding as of December 31, 2024, and their fair market value on the respective grant date:

Performance Period	Fair Value (in millions)	Minimum Shares	Target Shares	Maximum Shares
2024 - 2026	\$ 10	—	219,770	439,540
2023 - 2025	\$ 16	—	495,852	991,704
2022 - 2024	\$ 15	—	595,662	1,191,324
2021 - 2025	\$ 13	—	574,168	1,148,336

The following table shows a summary of the status and activity of nonvested stock awards for the year ended December 31, 2024:

	Restricted Stock Units	TSR Performance Awards ^(a)	ROCE Performance Awards ^(a)	Performance-Based Restricted Stock Units ^(a)	Total	Weighted-Average Grant-Date Fair Value
Nonvested at January 1, 2024	3,432,338	728,570	952,969	697,485	5,811,362	\$ 26.95
Granted	801,540	—	230,350	—	1,031,890	47.22
Vested	(1,332,529)	(192,040)	(404,952)	—	(1,929,521)	23.00
Performance adjustment factor ^(b)	—	(114,890)	202,476	—	87,586	15.89
Forfeited or expired	(139,826)	(32,612)	(58,587)	(123,317)	(354,342)	29.60
Nonvested at December 31, 2024	2,761,523	389,028	922,256	574,168	4,646,975	\$ 32.68

^(a) The number of shares shown for the performance awards is based on the target number of share awards.

^(b) Consists of adjustments to vested performance awards to reflect actual performance.

The following table presents information on RSUs and performance awards granted:

	2024	2023	2022
Number of awards granted	1,031,890	2,668,160	1,979,171
Weighted-average grant-date fair value per share	\$ 47.22	\$ 31.68	\$ 24.52

During the years ended December 31, 2024, 2023, and 2022, the total fair value of shares vested was \$44 million, \$45 million, and \$45 million, respectively.

16. Derivative Instruments

U. S. Steel is exposed to foreign currency exchange rate risks in our European operations. USSE's revenues are primarily in euros and costs are primarily in euros and U.S. dollars. U. S. Steel uses foreign exchange forward sales contracts (foreign exchange forwards) with maturities up to 12 months to manage our currency requirements and exposure to foreign currency exchange rate fluctuations. Derivative instruments are required to be recognized at fair value in the Consolidated Balance Sheet. The USSE and Flat-Rolled segments use hedge accounting for their foreign exchange forwards.

U. S. Steel also uses financial swaps to mitigate commodity price risks related to the procurement of natural gas, zinc, tin, electricity, and iron ore (commodity purchase swaps). We have elected cash flow hedge accounting for these commodity purchase swaps, which have maturities of up to 15 months.

U. S. Steel has entered into financial swaps that are used to partially manage the sales price risk of certain hot-rolled coil sales and iron ore sales (sales swaps). The sales swaps are accounted for using hedge accounting and have maturities of up to 12 months.

Generally, forward physical purchase contracts qualify for the normal purchase and normal sales exceptions described in ASC Topic 815 and are not subject to mark-to-market accounting. In accordance with the guidance in ASC Topic 820 on fair value measurements and disclosures, the fair value of our foreign exchange forwards, commodity purchase swaps and sales swaps was determined using Level 2 inputs, which are defined as "significant other observable" inputs. The inputs used are from market sources that aggregate data based upon market transactions.

The table below shows the outstanding swap quantities used to hedge forecasted purchases and sales as of December 31, 2024, and December 31, 2023:

Hedge Contracts	Classification	December 31, 2024	December 31, 2023
Natural gas (in mmbtus)	Commodity purchase swaps	20,706,000	20,625,000
Tin (in metric tons)	Commodity purchase swaps	—	5
Zinc (in metric tons)	Commodity purchase swaps	9,300	26,148
Electricity (in megawatt hours)	Commodity purchase swaps	16,400	183,288
Iron ore pellets (in metric tons)	Commodity purchase swaps	2,880,000	0
Iron ore pellets (in metric tons)	Sales swaps	300,900	120,834
Hot-rolled coils (in tons)	Sales swaps	236,000	261,000
Foreign currency (in millions of euros)	Foreign exchange forwards	€ 368	€ 452
Foreign currency (in millions of dollars)	Foreign exchange forwards	\$ —	\$ 37

The following summarizes the fair value amounts included in our Consolidated Balance Sheets as of December 31, 2024, and December 31, 2023:

Balance Sheet Location (in millions)	December 31, 2024	December 31, 2023
Designated as Hedging Instruments		
Accounts receivable	\$ 41	\$ 4
Accounts payable	8	81
Investments and long-term receivables	1	—
Other long-term liabilities	1	2

The table below summarizes the effect of hedge accounting on AOCI and amounts reclassified from AOCI into earnings for 2024, 2023, and 2022:

(In millions)	Gain (Loss) on Derivatives in AOCI			Location of Reclassification from AOCI	Amount of Gain (Loss) Recognized in Income		
	2024	2023	2022		2024	2023	2022
Sales swaps	\$ 58	\$ (41)	\$ 14	Net sales	\$ 8	\$ (15)	\$ (18)
Commodity purchase swaps	20	34	(35)	Cost of sales ^(a)	(40)	(105)	103
Foreign exchange forwards	28	(5)	(16)	Cost of sales	7	(1)	44

^(a) Costs for commodity purchase swaps are recognized in cost of sales as products are sold.

The table below summarizes the impact of derivative activity where hedge accounting has not been elected on our Consolidated Statements of Operations for 2024, 2023, and 2022:

(In millions)	Consolidated Statements of Operations Location	Amount of Gain (Loss) Recognized in Income		
		2024	2023	2022
Commodity purchase swaps	Cost of sales	\$ —	\$ (13)	\$ 18
Foreign exchange forwards	Other financial costs	(1)	1	(7)

At current contract values, \$22 million in AOCI as of December 31, 2024, will be recognized as a decrease in cost of sales over the next year, and \$12 million in AOCI as of December 31, 2024, will be recognized as an increase in net sales over the next year.

17. Debt

(In millions)	Issuer/Borrower	Interest Rates %	Maturity	December 31,	
				2024	2023
2037 Senior Notes	U. S. Steel	6.650	2037	\$ 274	\$ 274
2026 Senior Convertible Notes	U. S. Steel	5.000	2026	349	350
2029 Senior Notes	U. S. Steel	6.875	2029	475	475
2029 Senior Secured Notes	Big River Steel	6.625	2029	720	720
Environmental Revenue Bonds	U. S. Steel	4.125 - 6.750	2026 - 2053	1,104	1,164
Environmental Revenue Bonds	Big River Steel	4.500 - 4.750	2049	752	752
Finance leases and all other obligations	U. S. Steel	Various	2025 - 2029	189	157
Finance leases and all other obligations	Big River Steel	Various	2025 - 2027	162	167
ECA Credit Agreement	U. S. Steel	Variable	2031	84	97
Credit Facility Agreement	U. S. Steel	Variable	2027	—	—
Big River Steel ABL Facility	Big River Steel	Variable	2026	—	—
USSK Credit Agreement	U. S. Steel Kosice	Variable	2026	—	—
USSK Credit Facility	U. S. Steel Kosice	Variable	2027	—	—
Total debt				4,109	4,156
Less unamortized discount, premium and debt issuance costs				(64)	(66)
Less short-term debt, long-term debt due within one year, and short-term issuance costs				95	142
Long-term debt				\$ 4,078	\$ 4,080

Arkansas Development Finance Authority Environmental Improvement Revenue Bonds, Series 2023 (United States Steel Corporation Project) (Green Bonds)

On May 18, 2023, U. S. Steel closed on an offering consisting of an aggregate principal amount of \$240 million unsecured Arkansas Development Finance Authority environmental improvement revenue bonds, which carry a green bond designation. The bonds, issued through Arkansas Development Finance Authority, have a coupon rate of 5.700% and a final maturity of 2053 (2053 ADFA Green Bonds). U. S. Steel received net proceeds of approximately \$238 million after fees of approximately \$2 million related to the underwriting and third-party expenses, and will pay semiannual interest. The net proceeds from the issuance of the 2053 ADFA Green Bonds were used to partially fund work related to the BR2 facility near Osceola, Arkansas.

On and after May 1, 2026, the Company may redeem the 2053 ADFA Green Bonds at its option, at any time in whole or from time to time in part at the redemption prices (expressed in percentages of principal amount) listed below, plus accrued and unpaid interest on the 2053 ADFA Green Bonds, if any, to, but excluding, the applicable redemption date, if redeemed during the twelve-month period beginning on May 1 of each of the years indicated below.

Year	Redemption Price
2026	105.000 %
2027	104.000 %
2028	103.000 %
2029	102.000 %
2030	101.000 %
2031 and thereafter	100.000 %

At any time prior to May 1, 2026, U. S. Steel may also redeem the 2053 ADFA Green Bonds, at our option, in whole or in part, or from time to time, at a price equal to the greater of 100 percent of the principal amount of the 2053 ADFA Green Bonds plus accrued and unpaid interest, if any, or the sum of the present value of the redemption price of the 2053 ADFA Green Bonds if they were redeemed on May 1, 2026, plus interest payments due through May 1, 2026, discounted to the date of redemption on a semi-annual basis at the applicable tax-exempt municipal bond rate, plus accrued and unpaid interest, if any.

2026 Senior Convertible Notes

In October 2019, U. S. Steel issued \$350 million of 5.00% Senior Convertible Notes due November 1, 2026 (2026 Senior Convertible Notes). Interest on the 2026 Senior Convertible Notes is payable semi-annually on May 1 and November 1 of each year. The initial conversion rate for the 2026 Senior Convertible Notes is 74.8391 shares of U. S. Steel common stock per \$1,000 principal amount, equivalent to an initial conversion price of approximately \$13.36 per share of common stock, subject to adjustment pursuant to the 2026 Senior Convertible Notes indenture. Based on the initial conversion rate, the 2026 Senior Convertible Notes are convertible into 26,155,592 shares of U. S. Steel common stock and we reserved for the possible issuance of 33,348,361 shares, which is the maximum amount that could be issued upon conversion. Prior to August 1, 2026, holders of notes may convert all or a portion of their notes at their option only upon the satisfaction of specified conditions and during certain periods. On or after August 1, 2026, holders may convert all or a portion of their notes prior to the maturity date. Upon conversion, we will satisfy the obligation with cash, common stock, or a combination thereof, at our election. Anytime prior to August 1, 2026, if the price per share of U. S. Steel's common stock has been at least 130% of the conversion price for specified periods, U. S. Steel may redeem all or a portion of the 2026 Senior Convertible Notes at a cash redemption price of 100% of the principal amount, plus accrued and unpaid interest.

If U. S. Steel undergoes a fundamental change, as defined in the 2026 Senior Convertible Notes, holders may require us to repurchase the 2026 Senior Convertible Notes in whole or in part for cash at a price equal to 100% of the principal amount of the 2026 Senior Convertible Notes to be purchased plus any accrued and unpaid interest up to, but excluding the repurchase date.

Big River Steel — Sustainability Linked ABL Facility

Big River Steel's amended senior secured asset-based revolving credit facility (Big River Steel ABL Facility) matures on July 23, 2026. The facility is secured by first-priority liens on accounts receivable and inventory and certain other assets and second priority liens on most tangible and intangible assets of Big River Steel in each case subject to permitted liens. Additionally, the amendment includes sustainability targets related to greenhouse gas emissions intensity reduction, safety performance and facility certification by ResponsibleSteel™.

The Big River Steel ABL Facility provides for borrowings for working capital and general corporate purposes in an amount equal up to the lesser of (a) \$350 million and (b) a borrowing base calculated based on specified percentages of eligible accounts receivables and inventory, subject to certain adjustments and reserves.

Big River Steel LLC must maintain a fixed charge coverage ratio of at least 1.00 to 1.00 for the most recent twelve consecutive months when availability under the Big River Steel ABL Facility is less than the greater of ten percent of the borrowing base availability and \$13 million. Based on the most recent four quarters as of December 31, 2024, Big River Steel would have met the fixed charge coverage ratio test. The facility includes affirmative and negative covenants and events of default that are customary for facilities of this type.

There were no loans outstanding under the Big River Steel ABL Facility at December 31, 2024. Availability under the Big River Steel ABL Facility, pursuant to the available borrowing base, was \$340 million at December 31, 2024.

U. S. Steel — Sustainability Linked Credit Facility Agreement

On May 27, 2022, U. S. Steel entered into the Sixth Amended and Restated Credit Facility Agreement (Credit Facility Agreement) to replace the existing Fifth Amended and Restated Credit Facility Agreement (Fifth Credit Facility Agreement). The Credit Facility Agreement has substantially the same terms as the Fifth Credit Facility Agreement, except the Credit Facility Agreement references the Secured Overnight Financing Rate instead of the London Interbank Offered Rate, adjusts the individual lenders' commitments, and renews the five-year maturity to May 27, 2027. The Credit Facility Agreement also adjusts the threshold for the fixed charge coverage ratio. The total availability under the facility remained the same at \$1,750 million, and the financial impact from replacing the Fifth Credit Facility Agreement was immaterial. Consistent with the Fifth Credit Facility Agreement, the Credit Facility Agreement is secured by first-priority liens on certain accounts receivable and inventory and includes targets related to greenhouse gas emissions intensity reduction, safety performance and facility certification by ResponsibleSteel™.

The Credit Facility Agreement provides for borrowings for working capital and general corporate purchases in an amount equal to the lesser of (a) \$1,750 million or (b) a borrowing base calculated based on specified percentages of eligible accounts receivable and inventory, subject to certain adjustments and reserves. As of December 31, 2024, there were approximately \$4 million of letters of credit issued and no loans drawn under the Credit Facility Agreement. U. S. Steel must maintain a fixed charge coverage ratio of at least 1.00 to 1.00 for the most recent four consecutive quarters when availability under the Credit Facility Agreement is less than the greater of ten percent of the maximum facility availability and \$140 million. Based on the most recent four quarters as of December 31, 2024, the Company would have met the fixed charge coverage ratio test.

USSK Credit Facilities

On September 28, 2023, the Company elected to reduce the size of the USSK Credit Agreement from €300 million to €150 million (approximately \$156 million). The reduced credit facility size supports USSK's liquidity needs and is consistent with efforts to optimize costs and the global liquidity position. The USSK Credit Agreement matures in 2026 and contains sustainability targets related to greenhouse gas emissions intensity reduction, safety performance and facility certification by ResponsibleSteel™.

Under the USSK Credit Agreement, USSK is required to maintain a net debt to EBITDA ratio of less than 3.50:1.00 (the “EBITDA Ratio Covenant”), as measured on a rolling twelve month basis on June 30th and December 31st of each year. As of December 31, 2024, USSK met the EBITDA Ratio Covenant, and the USSK Credit Agreement was undrawn and fully available.

During the first quarter of 2023, USSK increased the size of its €20 million credit facility to €30 million (approximately \$31 million) (the USSK Credit Facility). On September 13th, 2024, the Company amended the USSK Credit Facility to extend the term by three years, maturing in 2027. At December 31, 2024, USSK had no borrowings under the USSK Credit Facility, and the availability was approximately \$15 million due to approximately \$16 million of customs and other guarantees outstanding.

Debt Maturities – Aggregate maturities of debt are as follows (in millions):

2025	2026	2027	2028	2029	Later Years	Total
\$ 99	\$ 562	\$ 130	\$ 41	\$ 1,216	\$ 2,061	\$ 4,109

18. Pensions and Other Benefits

U. S. Steel has defined contribution plans or multiemployer retirement benefits for more than 85 percent of its employees in the United States and non-contributory defined benefit pension plans covering the remaining employees. Benefits under the defined benefit pension plans are based upon years of service and final average pensionable earnings, with a minimum benefit based upon years of service. In addition, pension benefits for most non-represented employees under these plans are based upon a percent of total career pensionable earnings. Effective December 31, 2015, non-represented participants in the defined benefit plan no longer accrue additional benefits under the plan. For most non-represented employees without defined benefit coverage (the defined benefit pension plan was closed to new participants in 2003) and those for which the defined benefit plan was frozen, the Company also provides in the defined contribution plans (401(k) plans) a retirement account benefit based on salary and attained age. Most non-represented employees also participate in the 401(k) plans whereby the Company matches a certain percentage of salary based on the amount contributed by the participant. As of December 31, 2024, approximately 80 percent of U. S. Steel’s represented employees in the United States are covered by the SPT, a multiemployer pension plan, to which U. S. Steel contributes on the basis of a fixed dollar amount for each hour worked.

Certain hourly employees of U. S. Steel’s flat-rolled, tubular, cokemaking and iron ore operations in the United States are covered by collective bargaining agreements with the USW entered into effective September 1, 2022 (the 2022 Labor Agreements) that expire on September 1, 2026. The 2022 Labor Agreements include a signing bonus for each eligible USW-represented employee and annual 5% wage increases effective September 1, 2022, 2023, 2024, and 2025. Additionally, the 2022 Labor Agreements provide for increases to our pension and retirement benefits, including increases to our defined benefit pension plan, and to the contribution rate to the SPT from \$3.50 to \$4.00 per hour effective January 1, 2023. During the fourth quarter of 2022, U. S. Steel recorded a charge of approximately \$67 million for the 2022 Labor Agreements signing bonus and related costs which was recognized primarily as a component of Cost of sales on the Consolidated Statements of Operations.

In addition, as part of the collective bargaining process, U. S. Steel and the USW agreed to leverage the overfunded OPEB plans to support the benefits provided to active represented employees. Beginning January 1, 2023, this agreement allows the Company to use a certain amount of surplus VEBA assets (the surplus amount) to pay for legally permissible benefits under Section 501(c)(9) of the Internal Revenue Code for active employees and retirees of the USW. The surplus amount represented a one-time transfer of VEBA assets to a subaccount to be used for these employees and retirees, which took place in the first quarter of 2023. The surplus amount of \$595 million was determined as of December 31, 2022, (after merger of the UPI VEBA) and is the balance of VEBA assets in excess of 135% of the retiree obligation. The Company is permitted to withdraw a target of \$75 million annually, with a guaranteed annual minimum of \$50 million, and which may be in excess of \$75 million in certain circumstances, on a quarterly pro rata basis, from the subaccount to cover the cost of the permissible benefits for active USW employees and USW retirees. As a result of its designation for this purpose, the surplus amount is presented as \$75 million in Other current assets and \$430 million in Other noncurrent assets on the Consolidated Balance Sheet as of December 31, 2024. Pursuant to the agreement with the USW, the Company merged the United States Steel Corporation Plan for Active Employee Insurance Benefits with and into the United States Steel Corporation Plan for Retiree Insurance Benefits effective January 1, 2023. Upon the one-time transfer from the VEBA to the subaccount, the surplus assets were no longer accounted for under ASC 715, *Compensation-Retirement Benefits*, and are instead accounted for primarily under the provisions of ASC 825 *Financial Instruments*, resulting in the portfolio being accounted for on a fair value basis, with gains and losses recognized in earnings, and reported as activity in Other financial costs (benefits) on the Company’s Consolidated Statements of Operations.

On November 8, 2021, U. S. Steel entered into a commitment agreement with Banner Life Insurance Company and William Penn Life Insurance Company of New York (the “Insurers”) and State Street Global Advisors Trust Company, as

independent fiduciary to the United States Steel Corporation Plan for Employee Pension Benefits (Revision of 2003), for the plan to purchase group annuity contracts and transfer approximately \$284 million of its pension plan obligations to the Insurers. The purchase of the group annuity contracts was funded directly by the assets of the pension plan. The purchase resulted in the transfer of administrative and benefit-paying responsibilities for approximately 17,800 U.S. retirees and beneficiaries to the Insurers. The Insurers began paying benefits for certain retirees and beneficiaries in the Plan on January 1, 2022. There was no change to the pension benefits for any retirees and beneficiaries as a result of the transaction.

On October 26, 2022, U. S. Steel entered into an agreement with Pacific Life Insurance Company (the Insurer) and State Street Global Advisors Trust Company, as independent fiduciary to the UPI Pension Plan, for the plan to purchase group annuity contracts and transfer approximately \$115 million of its pension plan obligations to the Insurer. The purchase of the group annuity contracts was completed on November 1, 2022, and funded directly by the assets of the pension plan. The purchase resulted in the transfer of the administrative and benefit-paying responsibilities for approximately 850 U.S. retirees and beneficiaries to the Insurer. The Insurer began paying benefits for certain retirees and beneficiaries in the Plan on January 1, 2023. There was no change to the pension benefits for any retirees and beneficiaries as a result of the transaction. As a result of the transaction, the Corporation recognized a non-cash pension settlement credit of approximately \$3 million. This amount was reclassified to earnings through Net interest and other financial costs from accumulated other comprehensive loss.

Effective as of December 15, 2022, the UPI Pension Plan was merged into the U. S. Steel pension plan.

U. S. Steel's defined benefit retiree health care and life insurance plans (Other Benefits) cover the majority of its represented employees in the United States upon their retirement. Health care benefits are provided for Medicare and pre-Medicare retirees, with Medicare retirees largely enrolled in Medicare Advantage Plans. Both are subject to various cost sharing features, and in most cases domestically, an employer cap on total costs. The Other Benefits plan was closed to represented employees hired or rehired under certain conditions on or after January 1, 2016.

The retiree medical and retiree life insurance plans, for non-represented employees were amended to eliminate retiree medical benefits effective December 31, 2017, and to eliminate retiree life insurance benefits for employees who retired after December 31, 2017.

The majority of U. S. Steel's European employees are covered by government-sponsored programs into which U. S. Steel makes required contributions. Also, U. S. Steel sponsors defined benefit plans for most European employees covering benefit payments due to employees upon their retirement, some of which are government mandated. These same employees receive service awards throughout their careers based on stipulated service and, in some cases, age and service.

U. S. Steel uses a December 31 measurement date for its plans and may have an interim measurement date if significant events occur. Details relating to pension benefits and Other Benefits are below.

(In millions)	Pension Benefits		Other Benefits	
	2024	2023	2024	2023
Change in benefit obligations				
Benefit obligations at January 1	\$ 4,071	\$ 4,186	\$ 1,119	\$ 1,236
Service cost	29	33	4	6
Interest cost	212	220	60	67
Actuarial losses (gains)	(118)	24	(18)	(77)
Exchange rate gain	(1)	(1)	—	—
Settlements, curtailments and termination benefits	—	12	—	—
Benefits paid	(411)	(403)	(103)	(113)
Benefit obligations at December 31	\$ 3,782	\$ 4,071	\$ 1,062	\$ 1,119
Change in plan assets				
Fair value of plan at January 1	\$ 4,174	\$ 4,170	\$ 1,172	\$ 1,151
Actual return on plan assets	148	406	18	98
Asset reversion	—	—	(10)	(2)
Benefits paid from plan assets	(410)	(402)	(71)	(75)
Fair value of plan assets at December 31	\$ 3,912	\$ 4,174	\$ 1,109	\$ 1,172
Funded status of plans at December 31	130	103	47	53

For pension benefits, the largest contributor to the actuarial gain in 2024 was the increase in the discount rate from 5.49% at December 31, 2023, to 5.90% at December 31, 2024. In 2023, the largest contributor of actuarial loss was the decrease in the discount rate from 5.55% at December 31, 2022, to 5.49% at December 31, 2023.

For Other Benefits, the largest contributor to the actuarial gain in 2024 was the increase in the discount rate from 5.58% at December 31, 2023, to 5.90% at December 31, 2024. In 2023, the largest contributor to the actuarial gain was attributable to reductions in future health care costs.

Amounts recognized in accumulated other comprehensive loss:

	2024			
(In millions)	12/31/2023	Amortization	Activity	12/31/2024
Pensions				
Prior Service Cost	\$ 113	\$ (17)	\$ —	\$ 96
Actuarial Losses	1,409	(43)	31	1,397
Other Benefits				
Prior Service Credit	(18)	27	—	9
Actuarial Gains	(664)	65	38	(561)

As of December 31, 2024, and 2023, the following amounts were recognized in the Consolidated Balance Sheets:

(In millions)	Pension Benefits		Other Benefits	
	2024	2023	2024	2023
Noncurrent assets	\$ 154	\$ 131	\$ 51	\$ 57
Current liabilities	(2)	(2)	(1)	(1)
Noncurrent liabilities	(22)	(26)	(3)	(3)
Accumulated other comprehensive loss ^(a)	1,493	1,522	(552)	(682)
Net amount recognized	\$ 1,623	\$ 1,625	\$ (505)	\$ (629)

^(a) Accumulated other comprehensive loss effects associated with accounting for pensions and other benefits in accordance with ASC Topic 715 at December 31, 2024, and December 31, 2023, respectively, are reflected net of tax of \$626 million and \$602 million respectively, on the Consolidated Statements of Stockholders' Equity.

The Accumulated Benefit Obligation (ABO) for all defined benefit pension plans was \$3,679 million and \$3,956 million at December 31, 2024, and 2023, respectively.

(In millions)	December 31,	
	2024	2023
Information for pension plans with an accumulated benefit obligation in excess of plan assets:		
Aggregate accumulated benefit obligations (ABO)	\$ (18)	\$ (21)
Aggregate projected benefit obligations (PBO)	(24)	(28)
Aggregate fair value of plan assets	—	—

The aggregate PBO in excess of plan assets reflected above is included in the payroll and benefits payable and employee benefits lines on the Consolidated Balance Sheets.

Following are the details of net periodic benefit costs (credits) related to Pension and Other Benefits:

(In millions)	Pension Benefits			Other Benefits		
	2024	2023	2022	2024	2023	2022
Components of net periodic benefit cost (credits):						
Service cost	\$ 29	\$ 33	\$ 45	\$ 4	\$ 6	\$ 9
Interest cost	212	220	157	60	67	49
Expected return on plan assets	(298)	(328)	(357)	(74)	(61)	(91)
Amortization - prior service costs (credits)	17	17	2	(27)	(23)	(24)
- actuarial losses (gains)	43	13	73	(65)	(72)	(53)
Net periodic benefit cost (credits), excluding below	3	(45)	(80)	(102)	(83)	(110)
Multiemployer plans ^(a)	79	83	74	—	—	—
Settlement, termination and curtailment losses	—	13	12	—	—	2
Net periodic benefit cost (credits)	\$ 82	\$ 51	\$ 6	\$ (102)	\$ (83)	\$ (108)

(a) Primarily represents pension expense for the SPT covering USW employees hired from National Steel Corporation and new USW employees hired after May 21, 2003.

Net periodic benefit expense (credits) for pensions and Other Benefits is projected to be approximately \$139 million and approximately \$(44) million, respectively, in 2025. The pension cost projection includes approximately \$79 million of contributions to the SPT.

Weighted average assumptions used to determine the benefit obligation at December 31 and net periodic benefit cost for the year ended December 31 are detailed below.

	Pension Benefits		Other Benefits	
	2024	2023	2024	2023
	U.S. and Europe	U.S. and Europe	U.S.	U.S.
Actuarial assumptions used to determine benefit obligations at December 31:				
Discount rate	5.90 %	5.49 %	5.90 %	5.58 %
Increase in compensation rate	3.15 %	3.15 %	N/A	N/A

	Pension Benefits			Other Benefits		
	2024	2023	2022	2024	2023	2022
	U.S. and Europe	U.S. and Europe	U.S. and Europe	U.S.	U.S.	U.S.
Actuarial assumptions used to determine net periodic benefit cost for the year ended December 31:						
Discount rate	5.49 %	5.55 %	3.01 %	5.58 %	5.66 %	3.11 %
Expected annual return on plan assets	6.90 %	6.90 %	6.82 %	6.00 %	4.50 %	4.50 %
Increase in compensation rate	3.15 %	3.15 %	2.60 %	N/A	N/A	N/A

The discount rate reflects the current rate at which the pension and Other Benefit liabilities could be effectively settled at the measurement date. In 2017, we refined our discount rate determination process for our U.S. plans by using a bond matching approach to select specific bonds that would satisfy our projected benefit payments. We believe the bond matching approach more closely reflects the process we would employ to settle our pension and other benefits obligations. For our European pension plan, the discount rate is determined using data published by European Central Bank and underlying data provided by EuroMTS Ltd. The discount rate assumptions are updated annually.

Assumed health care cost trend rates at December 31:	2024	2023
	U.S.	U.S.
Health care cost trend rate assumed for next year	5.80%	5.90%
Rate to which the cost trend rate is assumed to decline (the ultimate trend rate)	4.50%	4.50%
Year that the rate reaches the ultimate trend rate	2038	2038

U. S. Steel reviews its actual historical rate experience and expectations of future health care cost trends to determine the escalation of per capita health care costs under U. S. Steel's benefit plans. About 85 percent of our costs for the domestic USW participants' retiree health benefits in the Company's main domestic benefit plan are limited to a per capita dollar maximum calculation based on 2006 base year actual costs incurred under the main U. S. Steel benefit plan for USW participants (cost cap). The full effect of the cost cap is expected to be realized around 2031. After 2031, the Company's costs for a majority of USW retirees and their dependents are expected to remain fixed and as a result, the cost impact of health care escalation for the Company is projected to be limited for this group.

Plan Assets

ASC Topic 820 establishes a single definition of fair value, creates a three-tier hierarchy as a framework for measuring fair value based on inputs used to value the Plan's investments, and requires additional disclosure about fair value. The hierarchy gives the highest priority to unadjusted quoted prices in active markets for identical assets or liabilities (level 1) and the lowest priority to unobservable inputs (level 3). The three levels of the fair value hierarchy are summarized below:

- Level 1 – Inputs to the valuation methodology are unadjusted quoted prices for identical assets or liabilities in active markets that the Plan has the ability to access.
- Level 2 – Inputs to the valuation methodology include:
 - Quoted prices for similar assets or liabilities in active markets;
 - Quoted prices for identical or similar assets or liabilities in inactive markets;
 - Inputs other than quoted prices that are observable for the asset or liability;
 - Inputs that are derived principally from or corroborated by observable market data by correlation or other means

If the asset or liability has a specified (contractual) term, the level 2 input must be observable for substantially the full term of the asset or liability.

- Level 3 – Inputs to the valuation methodology are unobservable and significant to the fair value measurement.

An instrument's level is based on the lowest level of any input that is significant to the fair value measurement. Valuation techniques maximize the use of relevant observable inputs and minimize the use of unobservable inputs. The following is a description of the valuation methodologies used for assets measured at fair value. There have been no changes in the methodologies used at December 31, 2024, and 2023.

Short-term investments are valued at amortized cost which approximates fair value due to the short-term maturity of the instruments. Equity securities - U.S. & International are valued at the closing price reported on the active exchange on which the individual securities are traded. U.S. and Non U.S. government bonds are valued using pricing models maximizing the use of observable inputs for similar securities. Corporate U.S. & Non U.S. bonds are also valued using pricing models maximizing the use of observable inputs for similar securities, which includes basing value on yields currently available on comparable securities of issuers with similar credit ratings. When quoted prices are not available for identical or similar bonds, the bond is valued under a discounted cash flow approach that maximizes observable inputs, such as current yields of similar instruments, but includes adjustments for certain risks that may not be observable, such as credit and liquidity risks. Mortgage and asset-backed securities are valued using quotes from a broker dealer. Private equities and real estate are valued using information provided by external managers for each individual investment held in the fund or using NAV (net asset value) as a practical expedient. Timberland investments are valued at their appraised value. Mineral Interests and other alternatives are valued at the present value of estimated future cash flows discounted at estimated market rates for assets of similar quality and duration.

The fair value of U. S. Steel's pension plan assets by asset category at December 31 was as follows (in millions):

Asset Category	2024					2023				
	Level 1	Level 2	Level 3	measured at NAV ^(a)	Total	Level 1	Level 2	Level 3	measured at NAV ^(a)	Total
Equity										
U. S. companies	\$ 295	\$ —	\$ —	\$ —	\$ 295	\$ 332	\$ —	\$ —	\$ —	\$ 332
International companies	419	—	—	—	419	433	—	—	—	433
Derivative financial instruments	38	—	—	—	38	—	7	—	—	7
Total equity	752	—	—	—	752	765	7	—	—	772
Fixed Income										
Corporate Bonds - U.S.	—	706	—	—	706	—	654	—	—	654
Corporate Bonds - Non-U.S.	—	116	—	—	116	—	129	—	—	129
U.S. government and agencies	—	178	—	—	178	—	197	—	—	197
Non-U.S. government	—	66	—	—	66	—	43	—	—	43
Mortgage and asset-backed securities	—	6	—	—	6	—	9	—	—	9
Derivative financial instruments	2	2	—	—	4	—	6	—	—	6
Total fixed income	2	1,074	—	—	1,076	—	1,038	—	—	1,038
Alternatives										
Timberlands	—	—	—	1	1	—	—	—	21	21
Mineral Interests and other alternatives	—	—	—	348	348	—	—	—	239	239
Private equity	—	—	—	210	210	—	—	—	235	235
Real estate	—	—	—	251	251	—	—	—	245	245
Total alternatives	—	—	—	810	810	—	—	—	740	740
Commingled Funds	—	—	—	1,154	1,154	—	—	—	1,499	1,499
Short-Term Investments	55	36	—	—	91	106	5	—	—	111
Other ^(b)	29	—	—	—	29	14	—	—	—	14
Total assets at fair value	\$ 838	\$ 1,110	\$ —	\$ 1,964	\$ 3,912	\$ 885	\$ 1,050	\$ —	\$ 2,239	\$ 4,174

^(a) In accordance with ASC Topic 820, certain investments that were measured at net asset value per share (or its equivalent) have not been classified in the fair value hierarchy.

^(b) Includes cash, accrued income, and miscellaneous payables.

The following table sets forth a summary of changes in the fair value of U. S. Steel's Pension plan Level 3 assets for the years ended December 31, 2024, and 2023:

(In millions)	Level 3 assets only	
	2024	2023
Balance at beginning of period	\$ —	\$ 89
Transfers in and/or out of Level 3	—	(89)
Actual return on plan assets:		
Realized gain	—	—
Net unrealized gain	—	—
Purchases, sales, issuances and settlements:		
Purchases	—	—
Sales	—	—
Balance at end of period	\$ —	\$ —

The fair value of U. S. Steel's Other Benefits plan assets by asset category at December 31 was as follows (in millions):

Asset Category	2024					2023				
	Level 1	Level 2	Level 3	measured at NAV ^(a)	Total	Level 1	Level 2	Level 3	measured at NAV ^(a)	Total
Equity										
U. S. companies	\$ 64	\$ —	\$ —	\$ —	64	\$ 65	\$ —	\$ —	\$ —	65
International companies	24	—	—	—	24	31	—	—	—	31
Total equity	88	—	—	—	88	96	—	—	—	96
Fixed Income										
Corporate Bonds - U.S.	—	435	—	—	435	—	476	—	—	476
Corporate Bonds - Non-U.S.	—	78	—	—	78	—	108	—	—	108
U.S. government and agencies	—	89	—	—	89	—	105	—	—	105
Non-U.S. government	—	15	—	—	15	—	14	—	—	14
Mortgage and asset-backed securities	—	11	—	—	11	—	11	—	—	11
Total fixed income	—	628	—	—	628	—	714	—	—	714
Alternatives										
Timberlands	—	—	—	—	—	—	—	—	3	3
Other alternatives	—	—	29	70	99	—	—	—	41	41
Private equity	—	—	—	50	50	—	—	—	54	54
Real estate	—	—	—	20	20	—	—	—	30	30
Total alternatives	—	—	29	140	169	—	—	—	128	128
Commingled Funds	—	—	—	177	177	—	—	—	190	190
Short-Term Investments	19	10	—	—	29	13	1	—	—	14
Other ^(b)	18	—	—	—	18	30	—	—	—	30
Total assets at fair value	\$ 125	\$ 638	\$ 29	\$ 317	\$ 1,109	\$ 139	\$ 715	\$ —	\$ 318	\$ 1,172

^(a) In accordance with ASC Topic 820, certain investments that were measured at net asset value per share (or its equivalent) have not been classified in the fair value hierarchy.

^(b) Includes cash, accrued income, and miscellaneous payables.

The following table sets forth a summary of changes in the fair value of U. S. Steel's Other Benefits plan Level 3 assets for the years ended December 31, 2024, and 2023:

(In millions)	Level 3 assets only	
	2024	2023
Balance at beginning of period	\$ —	\$ 47
Transfers in and/or out of Level 3	—	(47)
Actual return on plan assets:		
Realized gain	—	—
Net unrealized loss	—	—
Purchases, sales, issuances and settlements:		
Purchases	29	—
Sales	—	—
Balance at end of period	\$ 29	\$ —

U. S. Steel's investment strategy for its U.S. pension and Other Benefits plan assets provides for a diversified mix of high quality bonds, public equities and selected smaller investments in private equities and private credit. For its U.S. pension, U. S. Steel has a target allocation for plan assets of 68 percent in corporate bonds, government bonds and mortgage, private credit, and asset-backed securities. The balance is invested in equity securities, timber, private equity and real estate partnerships. U. S. Steel believes that returns on equities over the long term will be higher than returns from fixed-income securities as actual historical returns from U. S. Steel's trusts have shown. Returns on bonds tend to offset some of the short-term volatility of stocks. Both equity and fixed-income investments are made across a broad range of industries and companies (both domestic and foreign) to provide protection against the impact of volatility in any single industry as well as company specific developments. U. S. Steel will use a 6.90 percent assumed rate of return on assets for the development of net periodic cost for the main defined benefit pension plan in 2025. Actual returns since the inception of the plan have exceeded this 6.90 percent rate and while recent annual returns have been volatile, it is U. S. Steel's expectation that rates will achieve this level in future periods.

For its Other Benefits plan, U. S. Steel is employing a liability driven investment strategy. The plan assets are allocated to match the plan cash flows with maturing investments. To achieve this strategy, U. S. Steel has a target allocation for plan assets of 78 percent in fixed income and private credit. The balance is primarily invested in equity securities, private equity and real estate partnerships. U. S. Steel will use a 6.00 percent assumed rate of return on assets for the development of net periodic cost for its Other Benefit plans for 2025.

Steelworkers Pension Trust

For most bargaining unit employees participating in the SPT, U. S. Steel contributed to the SPT a fixed dollar amount for each hour worked of \$4.00 through December 31, 2024. SPT contributions increased from \$3.50 to \$4.00 per hour effective January 1, 2023. U. S. Steel's contributions to the SPT represented greater than 30% of the total combined contributions of all employers participating in the plan for the years ended December 31, 2024, 2023, and 2022.

Participation in a multiemployer pension plan agreed to under the terms of a collective bargaining agreement differ from a traditional qualified single employer defined benefit pension plan. The SPT shares risks associated with the plan in the following respects:

- a. Contributions to the SPT by U. S. Steel may be used to provide benefits to employees of other participating employers;
- b. If a participating employer stops contributing to the SPT, the unfunded obligations of the plan may be borne by the remaining participating employers; and
- c. If U. S. Steel chooses to stop participating in the SPT, U. S. Steel may be required to pay an amount based on the underfunded status of the plan, referred to as a withdrawal liability.

On March 21, 2011, the Board of Trustees of the SPT elected funding relief which has the effect of decreasing the amount of required minimum contributions in near-term years, but will increase the minimum funding requirements during later plan years. As a result of the election of funding relief, the SPT's zone funding under the Pension Protection Act may be impacted.

In addition to the funding relief election, the Board of Trustees also elected a special amortization rule, which allows the SPT to separately amortize investment losses incurred during the SPT's December 31, 2008 plan year-end over a 29 year period, whereas they were previously required to be amortized over a 15 year period.

U. S. Steel's participation in the SPT for the annual periods ended December 31, 2024, 2023, and 2022 is outlined in the table below.

Pension Fund	Employer Identification Number/ Pension Plan Number	Pension Protection Act Zone Status as of December 31 ^(a)		FIP/RP Status Pending/Implemented ^(b)	U. S. Steel Contributions (in millions)			Surcharge Imposed ^(c)		Expiration Date of Collective Bargaining Agreement
		2024	2023		2024	2023	2022	2024	2023	
Steelworkers Pension Trust	23-6648508/499	Green	Green	No	\$ 83	\$ 82	\$ 74	No	No	September 1, 2026

^(a) The zone status is based on information that U. S. Steel received from the plan and is certified by the plan's actuary. Among other factors, plans in the green zone are at least 80 percent funded, while plans in the yellow zone are less than 80 percent funded and plans in the red zone are less than 65 percent funded.

^(b) Indicates if a financial improvement plan (FIP) or a rehabilitation plan (RP) is either pending or has been implemented.

^(c) Indicates whether there were charges to U. S. Steel from the plan.

Cash Flows

The following information is in addition to the contributions to the SPT noted in the table above.

Employer Contributions – U. S. Steel did not make any voluntary or mandatory contributions to the U. S. Steel Retirement Plan Trust in 2024 or 2023. The U. S. Steel Retirement Plan Trust is the funding vehicle for the Company's main defined benefit pension plan.

For pension plans not funded by trusts, U. S. Steel made \$1 million, \$3 million, and \$2 million of pension payments in 2024, 2023, and 2022, respectively.

Cash payments totaling \$32 million, \$40 million, and \$32 million were made for other post-employment benefit payments not funded by trusts in 2024, 2023, and 2022, respectively. In 2024, 2023, and 2022, U. S. Steel continued to use assets from our VEBA trust for represented retiree health care and life insurance benefits to pay USW post-employment benefit claims.

Estimated Future Benefit Payments – The following benefit payments, which reflect expected future service as appropriate, are expected to be paid from U. S. Steel's defined benefit plans:

(In millions)	Pension Benefits	Other Benefits
2025	\$ 1,043	\$ 102
2026	1,043	109
2027	1,154	111
2028	1,182	114
2029	1,451	117
Years 2030 - 2034	9,904	437

Defined contribution plans

U. S. Steel also contributes to two defined contribution plans for its salaried employees. Most non-represented salaried employees in North America receive pension benefits in the form of a separate retirement account through a defined contribution plan with contribution percentages based upon age, for which company contributions totaled \$19 million, \$21 million, and \$21 million in 2024, 2023, and 2022, respectively. U. S. Steel's matching contributions to the salaried employees' defined contribution plans, which for most non-represented salaried employees are 100 percent of the employees' contributions up to six percent of their eligible salary, totaled \$20 million, \$20 million, and \$19 million in 2024, 2023, and 2022, respectively. U. S. Steel also maintains non-qualified defined contribution plans to provide benefits which are otherwise limited by the terms of the qualified plan or the Internal Revenue Code. U. S. Steel's contributions under these defined contribution plans were less than \$1 million in 2024, \$2 million in 2023, and less than \$1 million in 2022.

Most represented employees are eligible to participate in a defined contribution plan where there is no company match on savings or separate retirement account except for certain Tubular hourly employees. Effective with the 2015 Labor Agreement, represented employees hired on or after January 1, 2016, are eligible for a \$0.50 per hour savings account contribution. As a result of the 2018 Labor Agreements, the retiree healthcare account contribution for each hour worked increased to \$0.55 effective January 1, 2019, \$0.60 effective January 1, 2020, and \$0.65 effective January 1, 2021. As a result of the 2022 Labor Agreements, the retiree healthcare account contribution for each hour worked increased to \$0.75 effective January 1, 2023. These Company contributions for represented employees totaled \$7 million, \$7 million, and \$5 million in 2024, 2023, and 2022, respectively.

Other post-employment benefits

The Company provides benefits to former or inactive employees after employment but before retirement. Certain benefits including workers' compensation and black lung benefits represent material obligations to the Company and under the guidance for nonretirement post-employment benefits, have historically been treated as accrued benefit obligations. Liabilities for these benefits recorded at December 31, 2024, totaled \$81 million as compared to \$91 million at December 31, 2023. Liability amounts were developed assuming a discount rate of 5.76% and 5.66% at December 31, 2024, and 2023. Net periodic benefit cost for these benefits is projected to be \$15 million in 2025 compared to \$9 million in 2024 and \$24 million in 2023.

Pension Funding

In March 2021, the American Rescue Plan Act (ARPA - H.R. 1319) further extended the pension relief interest rate corridor used to measure defined benefit pension obligations for calculating minimum annual contributions. The new interest rate formula results in higher interest rates for minimum funding calculations as compared to prior law over the next few years, which will improve the funded status of our main defined benefit pension plan and reduce minimum required contributions.

U. S. Steel will monitor the funded status of the plan to determine when voluntary contributions may be prudent in order to mitigate potentially larger mandatory contributions in later years.

19. Asset Retirement Obligations

U. S. Steel's asset retirement obligations (AROs) primarily relate to mine, landfill closure and post-closure costs. The following table reflects changes in the carrying values of AROs for the years ended December 31, 2024, and 2023:

(In millions)	December 31,	
	2024	2023
Balance at beginning of year	\$ 79	\$ 66
Additional obligations incurred	—	12
Obligations settled	(4)	(1)
Change in estimate of obligations	(1)	—
Foreign currency translation effects	(1)	—
Accretion expense	4	2
Balance at end of period	\$ 77	\$ 79

Certain AROs related to disposal costs of the majority of fixed assets at our integrated steel facilities have not been recorded because they have an indeterminate settlement date. These AROs will be initially recognized in the period in which sufficient information exists to estimate their fair value.

20. Fair Value of Financial Instruments

The carrying value of cash and cash equivalents, current accounts and notes receivable, accounts payable and accrued interest included in the Consolidated Balance Sheets approximate fair value. See Note 16 for disclosure of U. S. Steel's derivative instruments, which are accounted for at fair value on a recurring basis.

Stelco Option for Minntac Mine Interest

On April 30, 2020, the Company entered into an Option Agreement with Stelco, a subsidiary of Cleveland-Cliffs Inc., that grants Stelco the option to purchase a 25 percent interest (the Option Interest) in a to-be-formed entity (the Joint Venture) that will own the Company's current iron ore mine located in Mt. Iron, Minnesota (the Minntac Mine). As consideration for the option, Stelco paid the Company an aggregate amount of \$100 million in five \$20 million installments during the year ended December 31, 2020, which are recorded net of transaction costs in the Consolidated Balance Sheet. The option can be exercised any time before January 31, 2027, and in the event Stelco exercises the option, Stelco will contribute an additional \$500 million to the Joint Venture, which amount shall be remitted solely to U. S. Steel in the form of a one-time special distribution, and the parties will engage in good faith negotiations to finalize the master agreement (pursuant to which Stelco will acquire the Option Interest) and the limited liability company agreement of the Joint Venture.

Surplus VEBA assets

During the fourth quarter 2022, U. S. Steel and the USW agreed to utilize the overfunded OPEB plans to support the benefits provided to active represented employees. Beginning January 1, 2023, this agreement allows the Company to use a certain amount of surplus VEBA assets (the surplus amount) to pay for legally permissible benefits under Section 501(c)(9) of the Internal Revenue Code for active employees and retirees of the USW. The surplus amount of \$595 million was determined as of December 31, 2022, and was the balance of VEBA assets in excess of 135% of the retiree obligation at that time. On January 1, 2023, a subaccount was created and consisted of a pro-rata share of the existing trust. On February 1, 2023, using January 31, 2023 asset values, a new investment strategy was implemented and comprised of existing investments from the VEBA trust and cash. On February 1, 2023, certain assets were transferred from the VEBA to the subaccount. The Company is permitted to withdraw a target of \$75 million annually, with a guaranteed annual minimum of \$50 million, on a quarterly pro rata basis, from the subaccount to cover the cost of the permissible benefits for active USW employees and USW retirees. If after the annual withdrawal of \$75 million, the subaccount value decreases by less than \$40 million annually (defined as the "Threshold Surplus"), the Company may withdraw the excess above the Threshold Surplus. Based on the value of the subaccount as of December 31, 2023, approximately \$15 million was withdrawn from the subaccount in January 2024 to pay for permissible benefits. The surplus VEBA assets subaccount portfolio consists of fixed income securities including corporate bonds, U.S. government bonds, and U.S. Treasury notes, in addition to alternatives including investments in private credit partnerships and real estate funds. A portion of the corporate bonds are classified as available-for-sale debt securities, with unrealized gains and losses reported in Accumulated other comprehensive (loss) income. Upon sale, realized gains and losses are reported in earnings. All other investments in the subaccount are financial instruments measured at fair value or net asset value, with gains and losses recognized through net earnings and are reported as Net gain from investments related to active employee benefits on the Company's Consolidated Statements of Operations

As of December 31, 2024, the fair value of the surplus VEBA assets subaccount portfolio was \$505 million, with \$75 million in Other current assets and \$430 million in Other noncurrent assets on the Consolidated Balance Sheet.

As of December 31, 2023, the fair value of the surplus VEBA assets subaccount portfolio was \$570 million, with \$89 million in Other current assets and \$481 million in Other noncurrent assets on the Consolidated Balance Sheet.

The value of corporate bonds classified as available-for-sale debt securities was \$131 million and \$208 million as of December 31, 2024, and 2023, respectively. A total pretax net gain related to available-for-sale securities of \$7 million was included in Accumulated other comprehensive (loss) income as of both December 31, 2024, and 2023.

During 2024, pretax net gains of \$25 million were recognized in Net gain from investments related to active employee benefits. During 2024, immaterial pretax net gains were recognized in Accumulated other comprehensive (loss) income.

During 2023, pretax net gains of \$43 million and \$7 million were recognized in Net gain from investments related to active employee benefits and in Accumulated other comprehensive (loss) income, respectively.

The fair value of the subaccount portfolio by asset category as of December 31, 2024 and 2023 was as follows (in millions):

Asset Category	December 31, 2024					December 31, 2023				
	Level 1	Level 2	Level 3	measured at NAV ^(a)	Total	Level 1	Level 2	Level 3	measured at NAV ^(a)	Total
Fixed Income										
Corporate bonds - U.S.	—	129	—	—	129	—	191	—	—	191
Corporate bonds - Non-U.S.	—	46	—	—	46	—	56	—	—	56
U.S. government bonds	—	43	—	—	43	—	86	—	—	86
Mortgage and asset-backed securities	—	14	—	—	14	—	12	—	—	12
Total fixed income	\$ —	\$ 232	\$ —	\$ —	\$ 232	\$ —	\$ 345	\$ —	\$ —	\$ 345
Alternatives										
Private credit partnerships	—	—	29	157	186	—	—	58	64	122
Other alternatives	—	—	—	19	19	—	—	—	18	18
Total alternatives	\$ —	\$ —	\$ 29	\$ 176	\$ 205	\$ —	\$ —	\$ 58	\$ 82	\$ 140
Commingled Funds	—	—	—	5	5	—	—	—	61	61
Other ^(b)	63	—	—	—	63	25	—	(1)	—	24
Total assets at fair value	\$ 63	\$ 232	\$ 29	\$ 181	\$ 505	\$ 25	\$ 345	\$ 57	\$ 143	\$ 570

^(a) In accordance with ASC Topic 820, certain investments that were measured at net asset value per share (or its equivalent) have not been classified in the fair value hierarchy.

^(b) Includes cash, accrued income, and miscellaneous payables.

The following table summarizes U. S. Steel's financial assets and liabilities that were not carried at fair value at December 31, 2024, and 2023.

(In millions)	December 31, 2024		December 31, 2023	
	Fair Value	Carrying Amount	Fair Value	Carrying Amount
Financial liabilities:				
Long-term debt ^(a)	\$ 4,243	\$ 3,822	\$ 4,797	\$ 3,899

^(a) Excludes finance lease obligations.

The fair value of long-term debt was determined using Level 2 inputs which were derived from quoted market prices.

Fair value of the financial assets and liabilities disclosed herein is not necessarily representative of the amount that could be realized or settled, nor does the fair value amount consider the tax consequences of realization or settlement.

Financial guarantees are U. S. Steel's only unrecognized financial instrument. For details relating to financial guarantees see Note 26.

21. Reclassifications from Accumulated Other Comprehensive Income (AOCI)

(In millions)	Pension and Other Benefit Items	Foreign Currency Items	Unrealized (Loss) Gain on Derivatives	Active Employee Benefit Investments	Total
Balance at December 31, 2022	\$ (322)	\$ 280	\$ (43)	\$ —	\$ (85)
Other comprehensive income (loss) before reclassifications	131	54	(77)	6	114
Amounts reclassified from AOCI ^(a)	(50)	—	68	(1)	17
Net current-period other comprehensive income (loss)	81	54	(9)	5	131
Balance at December 31, 2023	\$ (241)	\$ 334	\$ (52)	\$ 5	\$ 46
Other comprehensive (loss) income before reclassifications	(52)	(70)	72	3	(47)
Amounts reclassified from AOCI ^(a)	(25)	—	8	(3)	(20)
Net current-period other comprehensive (loss) income	(77)	(70)	80	—	(67)
Balance at December 31, 2024	\$ (318)	\$ 264	\$ 28	\$ 5	\$ (21)

^(a) See table below for further details.

Details about AOCI components ^(a) (In millions)	Amount reclassified from AOCI		
	2024	2023	2022
Amortization of pension and other benefit items			
Prior service credits ^(a)	\$ (10)	\$ (6)	\$ (23)
Actuarial (gains) losses ^(a)	(22)	(60)	20
Settlements, termination and curtailment losses (gains) ^(a)	—	1	(3)
Total pensions and other benefits items	(32)	(65)	(6)
Derivative reclassifications to Consolidated Statements of Operations	12	143	(133)
Active employee benefit investment reclassifications to Consolidated Statements of Operations	(4)	(1)	—
Total before tax	(24)	77	(139)
Tax provision (benefit)	4	(60)	32
Net of tax	\$ (20)	\$ 17	\$ (107)

^(a) These AOCI components are included in the computation of net periodic benefit cost (see Note 18 for additional details).

22. Supplemental Cash Flow Information

(In millions)	Year Ended December 31,		
	2024	2023	2022
Net cash used in operating activities included:			
Interest and other financial costs paid (net of amount capitalized)	\$ (35)	\$ (68)	\$ (161)
Income taxes paid	\$ (53)	\$ (86)	\$ (242)
Non-cash investing and financing activities:			
Change in accrued capital expenditures	\$ (109)	\$ (2)	\$ 351
U. S. Steel common stock issued for employee/non-employee director stock plans	\$ 45	\$ 45	\$ 46
Capital expenditures funded by finance lease borrowings	\$ 78	\$ 90	\$ 52
Export Credit Agreement (ECA) financing	\$ —	\$ 5	\$ —

In January 2025, the Company received a refund of approximately \$44 million for the 2023 federal income tax return, which included approximately \$1 million of interest.

23. Transactions with Related Parties

Related party sales and service transactions are primarily related to equity investees and were \$2,505 million, \$2,015 million, and \$1,942 million in 2024, 2023, and 2022, respectively.

Accounts payable to related parties include balances due to PRO-TEC Coating Company (PRO-TEC) of \$144 million and \$137 million at December 31, 2024, and 2023, respectively for invoicing and receivables collection services provided by U. S. Steel on PRO-TEC's behalf. U. S. Steel, as PRO-TEC's exclusive sales agent, is responsible for credit risk related to those receivables. U. S. Steel also provides PRO-TEC marketing, selling and customer service functions. Payables to other related parties totaled \$2 million for both the period ending December 31, 2024 and the period ending December 31, 2023.

Purchases from related parties for outside processing services provided by equity investees amounted to \$19 million, \$26 million, and \$27 million during 2024, 2023, and 2022, respectively. Purchases of iron ore pellets from related parties amounted to \$87 million, \$157 million, and \$131 million for the years ended December 31, 2024, 2023, and 2022, respectively.

On December 18, 2023, the Company entered into the Merger Agreement by and among the Company, Purchaser, Merger Sub, and solely as provided in Section 9.13 therein, NSC. Pursuant to the Merger Agreement, and upon the terms and subject to the conditions described therein, Merger Sub will merge with and into the Company, with the Company continuing as the surviving corporation and a wholly owned subsidiary of Purchaser.

Wheeling-Nippon Steel, Inc., ("WNS") a wholly owned subsidiary of NSC (party to the Merger Agreement described above), currently is a customer of the Company. Net sales to related parties pertaining to business with WNS amounted to \$322 million for the year ended December 31, 2024. Receivables from related parties as of December 31, 2024 include \$6 million due from WNS.

24. Leases

Operating lease assets consist primarily of office space, heavy mobile equipment used in our mining operations and facilities and equipment under operating service agreements for electricity generation and scrap processing. We also have operating lease assets for light mobile equipment and information technology assets. The Company also has short-term leases related to transportation services for which we apply the short-term lease exception. Significant finance leases primarily consist of heavy mobile equipment used in our mining operations. Variable lease payments are primarily related to operating service agreements where payment is solely dependent on consumption of certain services, such as raw material and by-product processing. Most long-term leases include renewal options and, in certain leases, purchase options. Generally, we are not reasonably certain that these options will be exercised. We have residual value guarantees under certain light mobile equipment leases. There is no impact to our leased assets for residual value guarantees as the potential loss is not probable (see "Other Contingencies" in Note 26 for further details). We do not have material restrictive covenants associated with our leases or material amounts of sublease income. From time to time, U. S. Steel may enter into arrangements for the construction or purchase of an asset and then enter into a financing arrangement to lease the asset. U. S. Steel recognizes leased assets and liabilities under these arrangements when it obtains control of the asset.

The following table summarizes the lease amounts included in our Consolidated Balance Sheets as of December 31, 2024 and 2023.

(In millions)	Balance Sheet Location	December 31, 2024	December 31, 2023
Assets			
Operating	Operating lease assets ^(a)	\$ 72	\$ 109
Finance	Property, plant and equipment ^(b)	198	176
Total Lease Assets		\$ 270	\$ 285
Liabilities			
Current			
Operating	Current operating lease liabilities	\$ 35	\$ 44
Finance	Current portion of long-term debt	58	43
Non-Current			
Operating	Noncurrent operating lease liabilities	44	73
Finance	Long-term debt less unamortized discount and issue costs	151	137
Total Lease Liabilities		\$ 288	\$ 297

^(a) Operating lease assets are recorded net of accumulated amortization of \$129 million and \$138 million as of December 31, 2024, and December 31, 2023, respectively.

^(b) Finance lease assets are recorded net of accumulated depreciation of \$182 million and \$126 million as of December 31, 2024, and December 31, 2023, respectively.

The following table summarizes lease costs included in our Consolidated Statements of Operations for the years ended December 31, 2024, December 31, 2023, and December 31, 2022.

(In millions)	Classification	Year Ended December 31, 2024	Year Ended December 31, 2023	Year Ended December 31, 2022
Operating Lease Cost ^(a)	Cost of sales	\$ 48	\$ 54	\$ 65
Operating Lease Cost	Selling, general and administrative expenses	14	15	14
Finance Lease Cost				
Amortization	Depreciation, depletion and amortization	56	42	26
Interest	Interest expense	14	11	9
Total Lease Cost		\$ 132	\$ 122	\$ 114

^(a) Operating lease cost recorded in cost of sales includes \$13 million of variable lease cost for the year ended December 31, 2024. Operating lease cost recorded in cost of sales includes \$12 million of variable lease cost for both the years ended December 31, 2023, and December 31, 2022. Operating lease cost recorded in selling, general and administrative expenses includes \$1 million of variable lease cost for the years ended December 31, 2024, December 31, 2023, and December 31, 2022. \$1 million of short-term lease cost is included in cost of sales and selling, general and administrative expenses for the years ended December 31, 2024, December 31, 2023, and December 31, 2022.

Lease liability maturities as of December 31, 2024, are shown below.

(In millions)	Operating	Finance	Total
2025	\$ 39	\$ 78	\$ 117
2026	24	70	94
2027	15	50	65
2028	7	29	36
2029	1	7	8
After 2029	2	—	2
Total Lease Payments	\$ 88	\$ 234	\$ 322
Less: Interest	9	25	34
Present value of lease liabilities	\$ 79	\$ 209	\$ 288

Lease terms and discount rates are shown below.

	December 31, 2024
Weighted average lease term	
Finance	3 years
Operating	3 years
Weighted average discount rate	
Finance	6.05 %
Operating	7.14 %

Supplemental cash flow information related to leases is as follows:

(In millions)	Year Ended December 31, 2024	Year Ended December 31, 2023	Year Ended December 31, 2022
Cash paid for amounts included in the measurement of lease liabilities:			
Operating cash flows from operating leases	\$ 47	\$ 55	66
Operating cash flows from finance leases	14	11	9
Financing cash flows from finance leases	49	34	20
Right-of-use assets exchanged for lease liabilities:			
Operating leases	4	14	20
Finance leases	78	90	52

25. Restructuring and Other Charges

During 2024, the Company recorded restructuring and other charges of \$8 million, which related primarily to the idling of certain coke-making facilities. Cash payments related to previously accrued restructuring programs made during the year ended December 31, 2024 were approximately \$89 million.

During 2023, the Company recorded restructuring and other charges of \$36 million, which relate primarily to Company-wide headcount reductions. Cash payments were made related to severance and exit costs of approximately \$75 million.

During 2022, the Company recorded restructuring and other charges of \$48 million, which consists of charges of \$30 million related to the planned disposition of a component within the Flat-Rolled segment, \$23 million related to headcount reductions under a voluntary early retirement program (VERP) offered at USSK, a \$9 million favorable adjustment to the expected exit costs of indefinitely idled facilities, and \$4 million of severance-related charges at other facilities. Cash payments were made related to severance and exit costs of approximately \$95 million.

Charges for restructuring and ongoing cost reduction initiatives are recorded in the period U. S. Steel commits to a restructuring or cost reduction plan, or executes specific actions contemplated by the plan and all criteria for liability recognition have been met. Charges related to the restructuring and cost reductions are reported in restructuring and other charges in the Consolidated Statements of Operations.

The activity in the accrued balances incurred in relation to restructuring during the years ended December 31, 2023, and December 31, 2024, were as follows:

(in millions)	Employee Related Costs	Exit Costs	Non-cash Charges	Total
Balance at December 31, 2022	\$ 132	\$ 50	\$ —	\$ 182
Additional charges	25	11	—	36
Release of prior accruals and other adjustments ^(a)	(2)	(1)	—	(3)
Cash payments/utilization ^(b)	(45)	(30)	—	(75)
Balance at December 31, 2023	\$ 110	\$ 30	\$ —	\$ 140
Additional charges	(3)	11	—	8
Cash payments/utilization ^(b)	(62)	(27)	—	(89)
Balance at December 31, 2024	\$ 45	\$ 14	\$ —	\$ 59

^(a) Includes releases of accruals to reflect the current estimate of costs to complete approved restructuring programs.

^(b) \$4 million and \$10 million of payments were made from the pension fund trust assets in the Employee Related Cost column during the years ended December 31, 2023, and 2024, respectively.

26. Contingencies and Commitments

U. S. Steel is the subject of, or party to, a number of pending or threatened legal actions, contingencies and commitments involving a variety of matters, including laws and regulations relating to the environment. Certain of these matters are discussed below. The ultimate resolution of these contingencies could, individually or in the aggregate, be material to the Consolidated Financial Statements. However, management believes that U. S. Steel will remain a viable and competitive enterprise even though it is possible that these contingencies could be resolved unfavorably.

U. S. Steel accrues for estimated costs related to existing lawsuits, claims and proceedings when it is probable that it will incur these costs in the future and the costs are reasonably estimable.

Asbestos matters – As of December 31, 2024, U. S. Steel was a defendant in approximately 990 active cases involving approximately 2,575 plaintiffs. The vast majority of these cases involve multiple defendants. About 1,600, or approximately 62 percent, of these plaintiff claims are currently pending in jurisdictions which permit filings with massive numbers of plaintiffs. At December 31, 2023, U. S. Steel was a defendant in approximately 915 cases involving approximately 2,505 plaintiffs. Based upon U. S. Steel's experience in such cases, it believes that the actual number of plaintiffs who ultimately assert claims against U. S. Steel will likely be a small fraction of the total number of plaintiffs.

The following table shows the number of asbestos claims in the current year and the prior two years:

Period ended	Opening Number of Claims	Claims Dismissed, Settled and Resolved	New Claims	Closing Number of Claims
December 31, 2022	2,505	230	235	2,510
December 31, 2023	2,510	235	230	2,505
December 31, 2024	2,505	240	310	2,575

The amount U. S. Steel accrues for pending asbestos claims is not material to U. S. Steel's financial condition. However, U. S. Steel is unable to estimate the ultimate outcome of asbestos-related claims due to a number of uncertainties, including: (1) the rates at which new claims are filed, (2) the number of and effect of bankruptcies of other companies traditionally defending asbestos claims, (3) uncertainties associated with the variations in the litigation process from jurisdiction to jurisdiction, (4) uncertainties regarding the facts, circumstances and disease process with each claim, and (5) any new legislation enacted to address asbestos-related claims.

Further, U. S. Steel does not believe that an accrual for unasserted claims is required. At any given reporting date, it is probable that there are unasserted claims that will be filed against the Company in the future. The Company engages an outside valuation consultant to assist in assessing its ability to estimate an accrual for unasserted claims. This assessment is based on the Company's settlement experience, including recent claims trends. This analysis focuses on settlements made over the last several years as these claims are likely to best represent future claim characteristics. After review by the valuation consultant and U. S. Steel management, it was determined that the Company could not estimate an accrual for unasserted claims.

Despite these uncertainties, management believes that the ultimate resolution of these matters will not have a material adverse effect on U. S. Steel's financial condition.

Environmental Matters – U. S. Steel is subject to federal, state, local and foreign laws and regulations relating to the environment. These laws generally provide for control of pollutants released into the environment and require responsible parties to undertake remediation of hazardous waste disposal sites. Penalties may be imposed for noncompliance. Changes in accrued liabilities for remediation activities where U. S. Steel is identified as a named party are summarized in the following table:

(In millions)	Year Ended December 31,	
	2024	2023
Beginning of period	\$ 107	\$ 126
Accruals for environmental remediation deemed probable and reasonably estimable	18	15
Adjustments for changes in estimates	—	(11)
Obligations settled	(17)	(23)
End of period	\$ 108	\$ 107

Accrued liabilities for remediation activities are included in the following Consolidated Balance Sheet lines:

(In millions)	December 31, 2024	December 31, 2023
Accounts payable	\$ 26	\$ 27
Deferred credits and other noncurrent liabilities	82	80
Total	\$ 108	\$ 107

Expenses related to remediation are recorded in cost of sales and were \$18 million and \$13 million for the years ended December 31, 2024, and December 31, 2023, respectively. It is not currently possible to estimate the ultimate amount of all remediation costs that might be incurred or the penalties that may be imposed. Due to uncertainties inherent in remediation projects and the associated liabilities, it is reasonably possible that total remediation costs for active matters may exceed the accrued liabilities by as much as 30 to 50 percent.

Remediation Projects

U. S. Steel is involved in environmental remediation projects at or adjacent to several current and former U. S. Steel facilities and other locations that are in various stages of completion ranging from initial characterization through post-closure monitoring. Based on the anticipated scope and degree of uncertainty of projects, we categorize projects as follows:

- (1) *Projects with Ongoing Study and Scope Development* – Projects which are still in the development phase. For these projects, the extent of remediation that may be required is not yet known, the remediation methods and plans are not yet developed, and/or cost estimates cannot be determined. Therefore, significant costs, in addition to the accrued liabilities for these projects, are reasonably possible. There are three environmental remediation projects where additional costs for completion are not currently estimable, but could be material. These projects are at South Works, UPI and the former steelmaking plant at Joliet, Illinois. As of December 31, 2024, accrued liabilities for these projects totaled \$7 million for the costs of studies, investigations, interim measures, design and/or remediation. It is reasonably possible that additional liabilities associated with future requirements regarding studies, investigations, design and remediation for these projects could be as much as \$33 million to \$46 million.
- (2) *Significant Projects with Defined Scope* – Projects with significant accrued liabilities with a defined scope. As of December 31, 2024, there are four significant projects with defined scope greater than or equal to \$5 million each, with a total accrued liability of \$54 million. These projects are: Gary Resource Conservation and Recovery Act (RCRA) (accrued liability of \$23 million), Duluth Works (accrued liability of \$6 million), Fairfield Works (accrued liability of \$8 million) and the former Geneva facility (accrued liability of \$17 million).
- (3) *Other Projects with a Defined Scope* – Projects with relatively small accrued liabilities for which we believe that, while additional costs are possible, they are not likely to be significant, and also include those projects for which we do not yet possess sufficient information to estimate potential costs to U. S. Steel. There are three other environmental remediation projects which each had an accrued liability of between \$1 million and \$5 million. The total accrued liability for these projects at December 31, 2024, was \$5 million. These projects have progressed through a significant portion of the design phase and material additional costs are not expected.

The remaining environmental remediation projects each have an accrued liability of less than \$1 million each. The total accrued liability for these projects at December 31, 2024, was approximately \$4 million. The Company does not foresee material additional liabilities for any of these sites.

Post-Closure Costs – Accrued liabilities for post-closure site monitoring and other costs at various closed landfills totaled \$27 million at December 31, 2024, and were based on known scopes of work.

Administrative and Legal Costs – As of December 31, 2024, U. S. Steel had an accrued liability of \$11 million for administrative and legal costs related to environmental remediation projects. These accrued liabilities were based on projected administrative and legal costs for the next three years and do not change significantly from year to year.

Capital Expenditures – For a number of years, U. S. Steel has made substantial capital expenditures to comply with various regulations, laws, and other requirements relating to the environment. Such capital expenditures totaled \$83 million and \$70 million in 2024 and 2023, respectively. U. S. Steel anticipates making additional such expenditures in the future, which may be material; however, the exact amounts and timing of such expenditures are uncertain because of the continuing evolution of specific regulatory requirements.

European Union (the EU) Environmental Requirements - Phase IV of the EU Emissions Trading System (the EU ETS) commenced on January 1, 2021, and will finish on December 31, 2030. The European Commission issued final approval of the updated 2021-2025 Slovak National Allocation table in February 2022. The Slovak Ministry of Environment allocated 6.2 million metric tons of European Union Emission Allowances (EUA) at no charge (free allowances or free allocation) to USSE in March 2024. As of December 31, 2024, we have pre-purchased approximately 2.22 million EUA totaling €161 million (approximately \$167 million) via spot purchases or settled forwards to cover the 2024 shortfall of emission allowances and expected shortfall in subsequent years.

The EU's Industrial Emissions Directive requires implementation of EU-determined best available techniques (BAT) for Iron and Steel production to reduce environmental impacts as well as compliance with BAT associated emission levels. Total capital expenditures for projects to go beyond BAT requirements were €138 million (approximately \$143 million). These costs were partially offset by the EU funding received and may be mitigated over the next measurement periods if USSK complies with certain financial covenants, which are assessed annually. If we are unable to meet these covenants in the future, USSK might be required to provide additional collateral (e.g., bank guarantee) to secure 50 percent of the EU funding received. USSK complied with these covenants as of December 31, 2024, and no additional collateral will be required by the end of June 30, 2025. By this next assessment date, we expect that nine of the total fifteen projects will pass the sustainability monitoring and will be excluded from further assessment to provide additional collateral if the covenants are not met. The last assessment of financial covenants will be performed as of June 30, 2026.

Environmental indemnifications – Throughout its history, U. S. Steel has sold numerous properties and businesses and many of these sales included indemnifications and cost sharing agreements related to the assets that were divested. The amount of potential environmental liability associated with these transactions and properties is not estimable due to the nature and extent of the unknown conditions related to the properties divested and deconsolidated. Aside from the environmental liabilities already recorded as a result of these transactions due to specific environmental remediation activities and cases (included in the \$108 million of accrued liabilities for remediation discussed above), there are no other known probable and estimable environmental liabilities related to these transactions.

Guarantees – The maximum guarantees of the indebtedness of unconsolidated entities of U. S. Steel totaled \$7 million at December 31, 2024.

Other contingencies – Under certain finance lease agreements covering various equipment, U. S. Steel has the option to renew the lease or to purchase the equipment at the end of the lease term. If U. S. Steel does not exercise the purchase option by the end of the lease term, U. S. Steel guarantees a residual value of the equipment as determined at the lease inception date (totaling approximately \$14 million at December 31, 2024). No liability has been recorded for these guarantees as the potential loss is not probable.

The Company's BR2 facility in Osceola, Arkansas qualifies for financing and related economic incentives associated with the acquisition, development, construction and operation of the facility. These incentives consist of advance lump-sum payments which are included in deferred credits and other noncurrent liabilities on the Consolidated Balance Sheets. In March 2022, the Company received a lump-sum payment of approximately \$82 million as proceeds from the sale of a portion of expected future tax credits to be earned by the Company under the State of Arkansas's Recycling Tax Credit program. These funds are to be used primarily for the acquisition of project related equipment, however they may also be used for the training and development of new employees hired for the facility. The Company is contingently liable for certain repayment penalties if the Company fails to meet certain employment requirements in any given period. In April 2022, the Company received a \$3 million grant from Mississippi County, Arkansas, and in May 2022, the Company received a \$50 million grant from the State of Arkansas Quick Action Closing Fund. Both grants pertain to the reimbursement of qualifying project costs. For each of these incentives and grants, the balance of deferred income will be recognized into other gains, net in the accompanying Consolidated Statements of Operations on a systematic basis over the periods in which the Company earns the granted funds by complying with the investment and employment requirements of the grant programs.

In July 2024, the Company also received a lump-sum payment of approximately \$75 million as proceeds from the sale of a portion of future tax credits to be earned by the Company under the State of Arkansas's Recycling Tax Credit program for the Phase II portion of the Big River Steel facilities. The Company is contingently liable for certain repayment penalties if the Company fails to meet certain employment requirements, and as such a deferred liability was recognized for this grant and will be amortized into other gains, net in the statement of operations on a systematic basis over the periods in which the Company earns the granted funds by complying with the employment requirements of the grant program.

We have incurred and expect to continue to incur significant expenses in connection with the pending Merger, including legal and investment banking fees.

Insurance – U. S. Steel maintains insurance for certain property damage, equipment, business interruption and general liability exposures; however, insurance is applicable only after certain deductibles and retainages. U. S. Steel is self-insured for certain other exposures including workers' compensation (where permitted by law) and auto liability. Liabilities are recorded for workers' compensation and personal injury obligations. Other costs resulting from losses under deductible or retainage amounts or not otherwise covered by insurance are charged against income upon occurrence.

U. S. Steel uses surety bonds, trusts and letters of credit to provide whole or partial financial assurance for certain obligations such as workers' compensation. The total amount of active surety bonds, trusts and letters of credit being used for financial assurance purposes was approximately \$192 million as of December 31, 2024, which reflects U. S. Steel's maximum exposure under these financial guarantees, but not its total exposure for the underlying obligations. A significant portion of our trust arrangements and letters of credit are collateralized by the Credit Facility Agreement. The remaining trust arrangements and letters of credit are collateralized by restricted cash. Restricted cash, which is recorded in other current and noncurrent assets, totaled \$46 million and \$40 million at December 31, 2024, and December 31, 2023, respectively.

Capital Commitments – At December 31, 2024, U. S. Steel's contractual commitments to acquire property, plant and equipment totaled \$683 million.

Contractual Purchase Commitments – U. S. Steel is obligated to make payments under contractual purchase commitments, including unconditional purchase obligations. Payments for contracts with remaining terms in excess of one year are summarized below (in millions):

2025	2026	2027	2028	2029	Later years	Total
\$1,260	\$1,033	\$253	\$218	\$167	\$661	\$3,592

The majority of U. S. Steel's unconditional purchase obligations relate to the supply of industrial gases, and certain energy and utility services with terms ranging from 13 months to 19 years. Unconditional purchase obligations also include coke and steam purchase commitments related to a coke supply agreement with Gateway Energy & Coke Company LLC (Gateway) under which Gateway is obligated to supply a minimum volume of the expected targeted annual production of the heat recovery coke plant, and U. S. Steel is obligated to purchase the coke from Gateway at the contract price. As of December 31, 2024, if U. S. Steel were to terminate the agreement, it may be obligated to pay in excess of \$26 million.

As a result of the indefinite idling of the iron and steel making processes at Granite City Works, there were \$60 million and \$86 million of liabilities for unconditional purchase obligations as of December 31, 2024, and December 31, 2023, respectively.

Total payments relating to unconditional purchase obligations were approximately \$815 million in 2024, \$787 million in 2023, and \$850 million in 2022.

27. Common Stock Repurchased

On October 25, 2021, the Board of Directors authorized a share repurchase program that allowed for the repurchase of up to \$300 million of its outstanding common stock from time to time in the open market or privately negotiated transactions. On January 24, 2022, the Board of Directors authorized an additional \$500 million under the share repurchase program.

On July 25, 2022, following the completion of the previously authorized \$800 million share repurchase programs, the Board of Directors authorized a share repurchase program that allows for the repurchase of up to \$500 million of its outstanding common stock from time to time in the open market or privately negotiated transactions at the discretion of management. The Company's share repurchase program does not obligate it to acquire any specific number of shares.

U. S. Steel repurchased 7.1 million and 37.6 million shares of common stock for approximately \$175 million and \$849 million under these programs during 2023 and 2022, respectively. We do not expect to utilize the remainder of this authorization. No share repurchases were completed during 2024 as the Merger Agreement prohibits us from engaging in additional share repurchases without the consent of Purchaser.

FIVE-YEAR OPERATING SUMMARY (Unaudited)

(Thousands of tons, unless otherwise noted)	2024	2023	2022	2021	2020
Raw Steel Production					
Gary, IN	5,665	5,587	5,326	5,664	4,675
Great Lakes, MI	—	—	—	—	328
Mon Valley, PA	2,724	2,650	2,161	2,668	2,552
Granite City, IL	—	1,162	1,359	1,549	1,758
Total Flat-Rolled facilities	8,389	9,399	8,846	9,881	9,313
Mini Mill facility	2,838	2,953	2,650	2,688	—
U. S. Steel Košice	3,832	4,395	3,839	4,931	3,366
Tubular facility	575	568	634	464	16
Total	15,634	17,315	15,969	17,964	12,695
Raw Steel Capability					
Flat-Rolled	13,200	13,200	13,200	13,200	17,000
Mini Mill ^(c)	6,300	3,300	3,300	3,300	—
USSE	5,000	5,000	5,000	5,000	5,000
Tubular ^(d)	900	900	900	900	900
Total	25,400	22,400	22,400	22,400	22,900
Production as % of total capability:					
Flat-Rolled	63 %	71 %	67 %	58 %	55 %
Mini Mill ^(c)	80 %	89 %	80 %	81 %	— %
USSE	77 %	88 %	77 %	99 %	67 %
Tubular ^(d)	64 %	63 %	70 %	52 %	7 %
Coke Production					
Flat-Rolled	3,164	3,295	3,627	3,848	2,557
USSE	1,336	1,485	1,407	1,548	1,116
Total	4,500	4,780	5,034	5,396	3,673
Iron Ore Pellet Production ^(a)					
Total	22,247	22,134	22,059	23,369	16,981
Steel Shipments by Segment ^(b)					
Flat-Rolled	7,845	8,706	8,373	9,018	8,711
Mini Mill	2,307	2,424	2,287	2,230	—
USSE	3,578	3,899	3,759	4,302	3,041
Tubular	476	478	523	444	464
Total steel shipments	14,206	15,507	14,942	15,994	12,216
Average Realized Price (dollars per net ton)					
Flat-Rolled	\$ 1,013	\$ 1,030	\$ 1,261	\$ 1,172	\$ 718
Mini Mill	\$ 857	\$ 875	\$ 1,134	\$ 1,314	\$ —
USSE	\$ 805	\$ 873	\$ 1,090	\$ 966	\$ 626
Tubular	\$ 1,905	\$ 3,137	\$ 2,978	\$ 1,696	\$ 1,271

^(a) Includes our share of production from Hibbing.

^(b) Does not include intersegment shipments or shipments by joint ventures and other equity investees of U. S. Steel. Includes shipments from U. S. Steel to joint ventures and equity investees of substrate materials, primarily hot-rolled and cold-rolled sheets.

^(c) The 2024 production as a % of total capability amount is based on Mini Mill's aggregate annual raw steel production capability of 3.3 million tons through the third quarter of 2024 and 6.3 million tons during the fourth quarter of 2024.

^(d) The Fairfield Electric Arc Furnace commenced operation in October 2020. The 2020 production as a % of total capability amount is based on an October 1, 2020, start date.

FIVE-YEAR OPERATING SUMMARY (Unaudited) (Continued)

(Thousands of net tons)	2024	2023	2022	2021	2020
Steel Shipments by Market - North American Facilities ^(a)					
Steel service centers	1,980	2,622	2,208	2,660	1,450
Further conversion:					
Trade customers	2,382	2,669	2,935	2,385	2,063
Joint ventures ^(b)	193	211	256	490	415
Transportation and automotive ^(b)	3,403	2,893	2,631	2,372	2,012
Construction and construction products	1,186	1,422	1,261	1,524	1,295
Containers and packaging	364	571	706	959	913
Appliances and electrical equipment	523	507	509	679	497
Oil, gas and petrochemicals	465	447	494	426	430
All other	132	266	183	197	100
Total	<u>10,628</u>	<u>11,608</u>	<u>11,183</u>	<u>11,692</u>	<u>9,175</u>
Steel Shipments by Market - USSE					
Steel service centers	877	848	839	995	690
Further conversion:					
Trade customers	245	293	289	314	202
Transportation and automotive	559	636	619	590	517
Construction and construction products	1,224	1,319	1,052	1,346	775
Containers and packaging	223	312	423	449	435
Appliances and electrical equipment	176	172	225	266	194
Oil, gas and petrochemicals	1	—	3	8	5
All other	273	319	309	334	223
Total	<u>3,578</u>	<u>3,899</u>	<u>3,759</u>	<u>4,302</u>	<u>3,041</u>

- ^(a) Does not include shipments by joint ventures and other equity investees of U. S. Steel, but instead reflects the shipments of substrate materials, primarily hot-rolled and cold-rolled sheets, to those entities.
- ^(b) PRO-TEC automotive substrate shipments are included in the Transportation and Automotive category.

Item 9. CHANGES IN AND DISAGREEMENTS WITH ACCOUNTANTS ON ACCOUNTING AND FINANCIAL DISCLOSURE

None.

Item 9A. CONTROLS AND PROCEDURES

Conclusions Regarding the Effectiveness of Disclosure Controls and Procedures

Under the supervision and with the participation of U. S. Steel's management, including the chief executive officer and chief financial officer, U. S. Steel conducted an evaluation of our disclosure controls and procedures, as such term is defined under Rule 13a-15(e) promulgated under the Securities Exchange Act of 1934, as amended (the Exchange Act). Based on this evaluation, U. S. Steel's chief executive officer and chief financial officer concluded that U. S. Steel's disclosure controls and procedures were effective as of the end of the period covered by this annual report.

Management's Report on Internal Control Over Financial Reporting

See "Item 8. Financial Statements and Supplementary Data – Management's Report to Stockholders – Internal Control Over Financial Reporting."

Attestation Report of Independent Registered Public Accounting Firm

See "Item 8. Financial Statements and Supplementary Data – Report of Independent Registered Public Accounting Firm."

Changes in Internal Control Over Financial Reporting

There have not been any changes in U. S. Steel's internal control over financial reporting that occurred during the fourth quarter of 2024 which have materially affected, or are reasonably likely to materially affect, U. S. Steel's internal control over financial reporting.

Item 9B. OTHER INFORMATION

During the quarter ended December 31, 2024, none of our directors or officers adopted or terminated a "Rule 10b5-1 trading arrangement" or a "non-Rule 10b5-1 trading arrangement," as those terms are defined in Item 408 of Regulation S-K.

Item 9C. DISCLOSURE REGARDING FOREIGN JURISDICTIONS THAT PREVENT INSPECTIONS

Not Applicable.

PART III

Item 10. DIRECTORS, EXECUTIVE OFFICERS AND CORPORATE GOVERNANCE

Information concerning the directors of U. S. Steel required by this item is incorporated and made part hereof by reference to the material appearing under the heading "Election of Directors" in U. S. Steel's Proxy Statement for the 2025 Annual Meeting of Stockholders, which will be filed with the Securities and Exchange Commission, pursuant to Regulation 14A, no later than 120 days after the end of the fiscal year. Information concerning the Audit Committee, and its financial expert required by this item is incorporated and made part hereof by reference to the material appearing under the heading "Corporate Governance – Board Committees – Audit" in U. S. Steel's Proxy Statement for the 2025 Annual Meeting of Stockholders. Information regarding the Nominating Committee required by this item is incorporated and made part hereof by reference to the material appearing under the heading "Corporate Governance – Board Committees – Corporate Governance & Sustainability" in U. S. Steel's Proxy Statement for the 2025 Annual Meeting of Stockholders. Information regarding the ability of stockholders to communicate with the Board of Directors is incorporated and made part hereof by reference to the material appearing under the heading "Corporate Governance – Commitment to Stockholder Engagement – Communications from Stockholders and Interested Parties" in U. S. Steel's Proxy Statement for the 2025 Annual Meeting of Stockholders. Information regarding compliance with Section 16(a) of the Exchange Act required by this item is incorporated and made part hereof by reference to the material appearing under the heading "Delinquent Section 16(a) Reports" in U. S. Steel's Proxy Statement for the 2025 Annual Meeting of Stockholders. Information concerning the executive officers of U. S. Steel is contained in Part I of this Form 10-K under the caption "Information about our Executive Officers."

U. S. Steel has adopted a Code of Ethical Business Conduct that applies to all of our directors and officers, including our principal executive officer, principal financial officer, principal accounting officer or controller, or persons performing similar functions. U. S. Steel will provide a copy of this code free of charge upon request. To obtain a copy, contact the Office of the Corporate Secretary, United States Steel Corporation, 600 Grant Street, Pittsburgh, Pennsylvania, 15219-2800 (telephone: 412-433-1121). The Code of Ethical Business Conduct is also available through the Company's website at www.ussteel.com.

We intend to post all required disclosures concerning any amendments to or waivers from, our Code of Ethical Business Conduct on our website. U. S. Steel does not intend to incorporate the contents of our website into this Annual Report on Form 10-K.

U. S. Steel has an Insider Trading Policy governing the purchase, sale and other dispositions of its securities by directors, officers and employees that is reasonably designed to promote compliance with insider trading laws, rules and regulations and NYSE listing standards. The Insider Trading Policy is filed with this Form 10-K as Exhibit 19.

Item 11. EXECUTIVE COMPENSATION

Information required by this item is incorporated and made part hereof by reference to the material appearing under the headings “Director Compensation,” “Compensation & Organization Committee Report,” “Compensation Discussion and Analysis,” “Executive Compensation Tables,” “Potential Payments Upon Termination or Change in Control” and “CEO Pay Ratio” in U. S. Steel’s Proxy Statement for the 2025 Annual Meeting of Stockholders.

Item 12. SECURITY OWNERSHIP OF CERTAIN BENEFICIAL OWNERS AND MANAGEMENT AND RELATED STOCKHOLDER MATTERS

Equity Compensation Plan Information

Plan Category	(1) Number of securities to be issued upon exercise of outstanding options, warrants and rights	(2) Weighted-average exercise price of outstanding options, warrants and rights	(3) Number of securities remaining available for future issuance under equity compensation plans excluding securities reflected in Column (1) ^(b)
Equity compensation plans approved by security holders ^(a)	7,872,563	\$28.60	4,084,130
Equity compensation plans not approved by security holders ^(c)	—	(one for one)	—
Total	7,872,563	—	4,084,130

^(a) The numbers in columns (1) and (2) of this row contemplate all shares that could potentially be issued as a result of outstanding grants under the 2005 Stock Incentive Plan and the 2016 Omnibus Incentive Compensation Plan, as amended and restated as of December 31, 2024. (For more information, see Note 15 to the Consolidated Financial Statements). Column (1) includes (i) 751,863 shares of common stock that could be issued for the Common Stock Units outstanding under the Deferred Compensation Program for Non-Employee Directors and (ii) 3,770,904 shares that could be issued for the 1,885,452 performance awards outstanding under the Long-Term Incentive Compensation Program (a program under the 2016 Omnibus Incentive Compensation Plan, as amended and restated). The calculation in column (2) does not include the Common Stock Units since the weighted average exercise price for Common Stock Units is one for one; that is, one share of common stock will be given in exchange for each unit of such phantom stock accumulated through the date of the director’s retirement. Also, the calculation in column (2) does not include the performance awards since the shares issued for performance awards can range from zero for one to two for one; that is, performance awards may result in up to 3,770,904 of common stock being issued (two for one), or some lesser number of shares (including zero shares of common stock issued), depending upon the Corporation’s common stock performance versus that of a peer group of companies or the Corporation’s return on capital employed performance over a performance period.

^(b) Represents shares available under the 2016 Omnibus Incentive Compensation Plan, as amended and restated.

^(c) At December 31, 2024, U. S. Steel had no securities remaining for future issuance under equity compensation plans that had not been approved by security holders. Column (1) represents Common Stock Units that were issued pursuant to the Deferred Compensation Plan for Non-Employee Directors prior to its being amended to make it a program under the 2005 Stock Incentive Plan and 2016 Omnibus Incentive Compensation Plan, as amended and restated. The weighted average exercise price for Common Stock Units in column (2) is one for one; that is, one share of common stock will be given in exchange for each unit of phantom stock upon the director’s retirement from the Board of Directors. All future grants under this amended plan/program will count as shares issued under the 2016 Omnibus Incentive Compensation Plan, as amended and restated, a stockholder approved plan.

Other information required by this item is incorporated and made part hereof by reference to the material appearing under the headings “Stock Ownership of Directors and Executive Officers” and “Stock Ownership of Certain Beneficial Owners” in U. S. Steel’s Proxy Statement for the 2025 Annual Meeting of Stockholders.

Item 13. CERTAIN RELATIONSHIPS AND RELATED TRANSACTIONS, AND DIRECTOR INDEPENDENCE

Information required by this item is incorporated and made part hereof by reference to the material appearing under the headings “Corporate Governance – Related Person Transactions Policy” and “Corporate Governance – Director Independence” in U. S. Steel’s Proxy Statement for the 2025 Annual Meeting of Stockholders.

Item 14. PRINCIPAL ACCOUNTANT FEES AND SERVICES

Information required by this item is incorporated and made part hereof by reference to the material appearing under the heading “Audit Fees” in U. S. Steel’s Proxy Statement for the 2025 Annual Meeting of Stockholders.

PART IV**Item 15. EXHIBITS AND FINANCIAL STATEMENT SCHEDULE****A. Documents Filed as Part of the Report****1. Financial Statements and Supplementary Data**

Financial Statements filed as part of this report are included in “Item 8 – Financial Statements and Supplementary Data”.

2. Financial Statement Schedules

See “Schedule II – Valuation and Qualifying Accounts and Reserves” for years ended December 31, 2024, 2023, and 2022. All other schedules are omitted because they are not applicable or the required information is contained in the applicable financial statements or notes thereto.

B. Exhibits

Exhibit No.

2. Plan of acquisition, reorganization, arrangement, liquidation or succession

(a)	<u>Agreement and Plan of Merger, dated as of December 18, 2023, by and among the Company, Parent, Merger Sub and NSC (solely as provided in Section 9.13 therein).</u>**	Incorporated by reference to Exhibit 2.1 to United States Steel Corporation's Form 8-K filed on December 18, 2023, Commission File Number 1-16811.

3. Articles of Incorporation and By-Laws

(a)	<u>Amended and Restated Certificate of Incorporation of United States Steel Corporation, dated April 25, 2017</u>	Incorporated by reference to Exhibit 3.1 to United States Steel Corporation's Form 8-K filed on April 28, 2017, Commission File Number 1-16811.
(b)	<u>Amended and Restated By-Laws of United States Steel Corporation, dated as of January 31, 2023.</u>	Incorporated by reference to Exhibit 3.1 to United States Steel Corporation's Form 8-K filed on February 2, 2023, Commission File Number 1-16811.

4. Instruments Defining the Rights of Security Holders, Including Indentures

(a)	<u>Indenture between United States Steel Corporation and The Bank of New York Mellon (f/k/a The Bank of New York), dated as of May 21, 2007.</u>	Incorporated by reference to Exhibit 4.1 to United States Steel Corporation's Form 8-K filed on May 22, 2007, Commission File Number 1-16811.
(b)	<u>First Supplemental Indenture between United States Steel Corporation and The Bank of New York Mellon (f/k/a The Bank of New York), dated as of May 21, 2007.</u>	Incorporated by reference to Exhibit 4.2 to United States Steel Corporation's Form 8-K filed on May 22, 2007, Commission File Number 1-16811.
(c)	<u>Tenth Supplemental Indenture between United States Steel Corporation and The Bank of New York Mellon, dated as of February 11, 2021.</u>	Incorporated by reference to Exhibit 4.1 to United States Steel Corporation's Form 8-K filed on February 11, 2021, Commission File Number 1-16811.
(d)	<u>Indenture by and between United States Steel Corporation and The Bank of New York Mellon, dated as of October 21, 2019.</u>	Incorporated by reference to Exhibit 4.1 to United States Steel Corporation's Form 8-K filed on October 21, 2019, Commission File Number 1-16811.
(e)	<u>Indenture among Big River Steel LLC, BRS Finance Corp., BRS Intermediate Holdings LLC, each Guarantor that may become party thereto and U.S. Bank National Association, dated as of September 18, 2020.</u>	Incorporated by reference to Exhibit 4.1 to United States Steel Corporation's Form 8-K filed on January 19, 2021, Commission File Number 1-16811.
(f)	<u>Description of Securities.</u>	Incorporated by reference to Exhibit 4.1 to United States Steel Corporation's Form 10-K filed on February 14, 2020, Commission File Number 1-16811.

Certain long-term debt instruments are omitted pursuant to Item 601(b)(4)(iii) of Regulation S-K. U. S. Steel agrees to furnish to the Commission on request a copy of any instrument defining the rights of holders of long-term debt of U. S. Steel and of any subsidiary for which consolidated or unconsolidated financial statements are required to be filed.

10. Material Contracts

(a)	<u>Option Agreement by and between United States Steel Corporation and Stelco Inc., dated as of April 30, 2020.</u>	Incorporated by reference to Exhibit 10.1 to United States Steel Corporation's Form 8-K filed on April 30, 2020, Commission File Number 1-16811.
(b)	<u>Commitment Agreement by and among United States Steel Corporation, Banner Life Insurance Company, William Penn Life Insurance Company of New York and State Street Global Advisors Trust Company, dated November 8, 2021.**</u>	Incorporated by reference to Exhibit 10.1 to United States Steel Corporation's Form 10-K filed on February 11, 2022, Commission File Number 1-16811.
(c)	<u>Sixth Amended and Restated Credit Agreement, dated as of May 27, 2022, among United States Steel Corporation, the Subsidiary Guarantors from time to time party thereto, the Lenders party thereto, the LC Issuing Banks party thereto, and JPMorgan Chase Bank, N.A., as Administrative and Collateral Agent.</u>	Incorporated by reference to Exhibit 10.1 to United States Steel Corporation's Form 8-K filed on June 3, 2022, Commission File Number 1-16811.
(d)	<u>Amendment No. 1 to Sixth Amended and Restated Credit Agreement, dated as of December 19, 2022, among United States Steel Corporation, the Subsidiary Guarantors from time to time party thereto, the Lenders party thereto, the LC Issuing Banks party thereto, and JPMorgan Chase Bank, N.A., as Administrative and Collateral Agent.**</u>	Incorporated by reference to Exhibit 10.1 to United States Steel Corporation's Form 10-K filed on February 3, 2023, Commission File Number 1-16811.
(e)	<u>Third Amended and Restated Borrower Security Agreement, dated as of May 27, 2022, between United States Steel Corporation and JPMorgan Chase Bank, N.A., as Collateral Agent.</u>	Incorporated by reference to Exhibit 10.2 to United States Steel Corporation's Form 8-K filed on June 3, 2022, Commission File Number 1-16811.
(f)	<u>Third Amended and Restated Subsidiary Security Agreement, dated as of May 27, 2022, between the Subsidiary Guarantors and JPMorgan Chase Bank, N.A., as Collateral Agent.</u>	Incorporated by reference to Exhibit 10.3 to United States Steel Corporation's Form 8-K filed on June 3, 2022, Commission File Number 1-16811.
(g)	<u>Second Amended and Restated Borrower Canadian Security Agreement, dated as of May 27, 2022, between United States Steel Corporation and JPMorgan Chase Bank, N.A., as Collateral Agent.</u>	Incorporated by reference to Exhibit 10.4 to United States Steel Corporation's Form 8-K filed on June 3, 2022, Commission File Number 1-16811.
(h)	<u>Agreement of Sale between United States Steel Corporation and The Industrial Development Board of the City of Hoover, dated as of October 1, 2019.</u>	Incorporated by reference to Exhibit 10.4 to United States Steel Corporation's Form 8-K filed on October 28, 2019, Commission File Number 1-16811.
(i)	<u>Loan Agreement between United States Steel Corporation and the Allegheny County Industrial Development Authority, dated as of October 1, 2019.</u>	Incorporated by reference to Exhibit 10.5 to United States Steel Corporation's Form 8-K filed on October 28, 2019, Commission File Number 1-16811.
(j)	<u>Amended and Restated Credit Agreement, dated December 22, 2022, among Exploratory Ventures, LLC, as Borrower, United States Steel Corporation, as Parent Guarantor, KFW IPEX-Bank GMBH, as Mandated Lead Arranger and ECA Structuring Bank, KFW IPEX-Bank GMBH, as Facility Agent and ECA Agent, and lenders party thereto from time to time.**</u>	Incorporated by reference to Exhibit 10.1 to United States Steel Corporation's Form 10-Q filed on October 27, 2023, Commission File Number 1-16811.
(k)	<u>Agreement of Sale between United States Steel Corporation and The Industrial Development Board of the City of Hoover regarding \$63,400,000 million 6.375% Environmental Improvement Revenue Bonds, Series 2020 (United States Steel Corporation Project), dated as of November 1, 2020.</u>	Incorporated by reference to Exhibit 10.1 to United States Steel Corporation's Form 8-K filed on November 24, 2020, Commission File Number 1-16811.
(l)	<u>Loan Agreement dated between United States Steel Corporation and the Indiana Finance Authority regarding \$33,300,000 Indiana Finance Authority Environmental Improvement Revenue Bonds, Series 2020A (United States Steel Corporation Project) and Indiana Finance Authority Environmental Improvement Revenue Refunding Bonds, Series 2020B (United States Steel Corporation Project), dated as of November 1, 2020.</u>	Incorporated by reference to Exhibit 10.2 to United States Steel Corporation's Form 8-K filed on November 24, 2020, Commission File Number 1-16811.
(m)	<u>ABL Credit Agreement by and among Big River Steel LLC, BRS Intermediate Holdings LLC, Goldman Sachs Bank USA and each lender party thereto, dated as of August 23, 2017.**</u>	Incorporated by reference to Exhibit 10.2 to United States Steel Corporation's Form 10-K filed on February 11, 2022, Commission File Number 1-16811.

(n)	<u>First Amendment to ABL Credit Agreement by and among Big River Steel LLC, BRS Intermediate Holdings LLC, Goldman Sachs Bank USA and each lender party thereto, dated as of September 10, 2020.</u>	Incorporated by reference to Exhibit 10.1 to United States Steel Corporation's Form 8-K filed on January 19, 2021, Commission File Number 1-16811.
(o)	<u>Second Amendment to ABL Credit Agreement by and among Big River Steel LLC, BRS Intermediate Holdings LLC, Goldman Sachs Bank USA and each lender party thereto, dated as of July 23, 2021.</u>	Incorporated by reference to Exhibit 10.4 to United States Steel Corporation's Form 10-Q filed on July 30, 2021, Commission File Number 1-16811.
(p)	<u>Third Amendment to ABL Credit Agreement by and among Big River Steel LLC, BRS Intermediate Holdings LLC, Goldman Sachs Bank USA and each lender party thereto, dated as of December 19, 2022.**</u>	Incorporated by reference to Exhibit 10.2 to United States Steel Corporation's Form 10-K filed on February 3, 2023, Commission File Number 1-16811.
(q)	<u>Fourth Amendment to ABL Credit Agreement by and among BRS Intermediate Holdings LLC, Big River Steel LLC, BRS Finance Corp. and Goldman Sachs Bank USA and each lender party thereto, dated as of June 16, 2023.</u>	Incorporated by reference to Exhibit 10.1 to United States Steel Corporation's Form 10-Q filed on July 28, 2023, Commission File Number 1-16811.
(r)	<u>Bond Financing Agreement between Arkansas Development Finance Authority and each of Big River Steel LLC, BRS Finance Corp. and BRS Intermediate Holdings LLC relating to \$265 million Arkansas Development Finance Authority Industrial Development Revenue Bonds (Big River Steel Project), Tax-Exempt Series 2020 (Green Bonds), dated as of September 10, 2020.</u>	Incorporated by reference to Exhibit 10.2.1 to United States Steel Corporation's Form 8-K filed on January 19, 2021, Commission File Number 1-16811.
(s)	<u>Definitions Annex relating to Arkansas Development Finance Authority Industrial Development Revenue Bonds (Big River Steel Project), Tax-Exempt Series 2020 (Green Bonds), dated as of September 10, 2020.</u>	Incorporated by reference to Exhibit 10.2.2 to United States Steel Corporation's Form 8-K filed on January 19, 2021, Commission File Number 1-16811.
(t)	<u>Bond Financing Agreement between Arkansas Development Finance Authority and each of Big River Steel LLC, BRS Finance Corp. and BRS Intermediate Holdings LLC relating to \$487 million Arkansas Development Finance Authority Industrial Development Revenue Bonds (Big River Steel Project), Series 2019, dated as of May 31, 2019.</u>	Incorporated by reference to Exhibit 10.3.1 to United States Steel Corporation's Form 8-K filed on January 19, 2021, Commission File Number 1-16811.
(u)	<u>Definitions Annex relating to Arkansas Development Finance Authority Industrial Development Revenue Bonds (Big River Steel Project), Series 2019, dated as of May 31, 2019.</u>	Incorporated by reference to Exhibit 10.3.2 to United States Steel Corporation's Form 8-K filed on January 19, 2021, Commission File Number 1-16811.
(v)	<u>Loan Agreement between Arkansas Development Finance Authority and each of United States Steel Corporation and Exploratory Ventures, LLC relating to \$290,000,000 Arkansas Development Finance Authority Environmental Improvement Revenue Bonds, Series 2022 (United States Steel Corporation Project) (Green Bonds), dated as of September 1, 2022.</u>	Incorporated by reference to Exhibit 10.1 to United States Steel Corporation's Form 10-Q filed on October 28, 2022, Commission File Number 1-16811.
(w)	<u>EUR 300,000,000 Unsecured Sustainability Linked Revolving Credit Facility Agreement among U. S. Steel Košice, s.r.o., and ING Bank N.V., Komerční banka, a.s., Slovenská sporiteľňa, a.s., UniCredit Bank Czech Republic and Slovakia, a.s., Československá Obchodná banka, a.s., and Citibank Europe plc, dated September 29, 2021.</u>	Incorporated by reference to Exhibit 10.1 to United States Steel Corporation's Form 8-K filed on October 1, 2021, Commission File Number 1-16811.
(x)	<u>Supplemental Agreement No. 9 between U. S. Steel Košice, s.r.o. and ING Bank N.V., dated December 3, 2021.</u>	Incorporated by reference to Exhibit 10.3 to United States Steel Corporation's Form 10-K filed on February 11, 2022, Commission File Number 1-16811.
(y)	<u>First Supplemental Agreement, dated December 15, 2022, between U. S. Steel Košice, s.r.o., and ING Bank N.V., as Facility Agent, relating to an up to EUR 300,000,000 credit agreement dated September 29, 2021.**</u>	Incorporated by reference to Exhibit 10.3 to United States Steel Corporation's Form 10-K filed on February 3, 2023, Commission File Number 1-16811.
(z)	<u>United States Steel Corporation 2005 Stock Incentive Plan, Amended and Restated Effective April 29, 2014.*</u>	Incorporated by reference to Appendix A to United States Steel Corporation's Definitive Proxy Statement on Schedule 14A filed on March 14, 2014, Commission File Number 1-16811.

(aa)	Form of Stock Option Grant under the Long-Term Incentive Compensation Program, a program under the United States Steel Corporation 2005 Stock Incentive Plan.*	Incorporated by reference to Exhibit 10(x) to United States Steel Corporation's Form 10-K filed on February 27, 2007, Commission File Number 1-16811.
(bb)	Form of Stock Option Grant Agreement under the Long-Term Incentive Compensation Program, a program under the United States Steel Corporation 2005 Stock Incentive Plan.*	Incorporated by reference to Exhibit 10.2 to United States Steel Corporation's Form 10-Q filed on April 26, 2011, Commission File Number 1-16811.
(cc)	Form of Non-Qualified Stock Option Grant Agreement under the Long-Term Incentive Compensation Program, a program under the United States Steel Corporation 2005 Stock Incentive Plan.*	Incorporated by reference to Exhibit 10.1 to United States Steel Corporation's Form 10-Q filed on April 29, 2015, Commission File Number 1-16811.
(dd)	Administrative Procedures for the Long-Term Incentive Compensation Program under the United States Steel Corporation 2005 Stock Incentive Plan, as Amended and Restated, and under the United States Steel Corporation Annual Incentive Compensation Plan, Effective February 22, 2016.*	Incorporated by reference to Exhibit 10(kk) to United States Steel Corporation's Form 10-K filed on February 29, 2016, Commission File Number 1-16811.
(ee)	United States Steel Corporation Deferred Compensation Program for Non-Employee Directors, a program under the 2005 Stock Incentive Plan, effective as of November 29, 2005.*	Incorporated by reference to Exhibit 10(d) to United States Steel Corporation's Form 10-K filed on February 28, 2012, Commission File Number 1-16811.
(ff)	United States Steel Corporation 2010 Annual Incentive Compensation Plan, Effective April 27, 2010.*	Incorporated by reference to Appendix B to United States Steel Corporation's Definitive Proxy Statement on Schedule 14A filed on March 12, 2010, Commission File Number 1-16811.
(gg)	Administrative Procedures for the Executive Management Annual Incentive Compensation Program under the United States Steel Corporation 2010 Annual Incentive Compensation Plan, as amended November 1, 2016.*	Incorporated by reference to Exhibit 10.1 to United States Steel Corporation's Form 10-Q filed on November 2, 2016, Commission File Number 1-16811.
(hh)	United States Steel Corporation Supplemental Thrift Program, Amended and Restated Effective July 31, 2013.*	Incorporated by reference to Exhibit 10.7 to United States Steel Corporation's Form 10-Q filed on October 29, 2013, Commission File Number 1-16811.
(ii)	United States Steel Corporation Supplemental Thrift Program, Amended and Restated Effective November 1, 2016.*	Incorporated by reference to Exhibit 10.3 to United States Steel Corporation's Form 10-Q filed on November 2, 2016, Commission File Number 1-16811.
(jj)	United States Steel Corporation Supplemental Thrift Program, Amended and Restated Effective January 1, 2019.*	Incorporated by reference to Exhibit 10.4 to United States Steel Corporation's Form 10-Q filed on May 3, 2019, Commission File Number 1-16811.
(kk)	United States Steel Corporation Non Tax-Qualified Retirement Account Program, Amended and Restated Effective November 13, 2013.	Incorporated by reference to Exhibit 10(dd) to United States Steel Corporation's Form 10-K filed on February 25, 2014, Commission File Number 1-16811.
(ll)	United States Steel Corporation Non Tax-Qualified Retirement Account Program, Amended and Restated Effective January 1, 2016.*	Incorporated by reference to Exhibit 10.2 to United States Steel Corporation's Form 10-Q filed on November 2, 2016, Commission File Number 1-16811.
(mm)	United States Steel Corporation Non Tax-Qualified Retirement Account Program, Amended and Restated Effective January 1, 2019.*	Incorporated by reference to Exhibit 10.3 to United States Steel Corporation's Form 10-Q filed on May 3, 2019, Commission File Number 1-16811.
(nn)	United States Steel Corporation Non Tax-Qualified Pension Plan, Amended and Restated Effective December 31, 2015.*	Incorporated by reference to Exhibit 10.1 to United States Steel Corporation's Form 8-K filed on August 21, 2015, Commission File Number 1-16811.
(oo)	United States Steel Corporation Executive Management Supplemental Pension Program, Amended and Restated Effective December 31, 2015.*	Incorporated by reference to Exhibit 10.2 to United States Steel Corporation's Form 8-K filed on August 21, 2015, Commission File Number 1-16811.
(pp)	United States Steel Corporation Supplemental Retirement Account Program, Amended and Restated Effective January 1, 2016.*	Incorporated by reference to Exhibit 10.1 to United States Steel Corporation's Form 10-Q filed on November 4, 2015, Commission File Number 1-16811.
(qq)	United States Steel Corporation Supplemental Retirement Account Program, Amended and Restated Effective January 1, 2019.*	Incorporated by reference to Exhibit 10.5 to United States Steel Corporation's Form 10-Q filed on May 3, 2019, Commission File Number 1-16811.
(rr)	United States Steel Corporation Change in Control Severance Plan, Amended and Restated Effective July 28, 2020.*	Incorporated by reference to Exhibit 10.1 to United States Steel Corporation's Form 8-K filed on July 30, 2020, Commission File Number 1-16811.

(ss)	United States Steel Corporation Executive Severance Plan, Effective December 14, 2021.*	Incorporated by reference to Exhibit 10.1 to United States Steel Corporation's Form 8-K filed on December 20, 2021, Commission File Number 1-16811.
(tt)	United States Steel Corporation 2016 Omnibus Incentive Compensation Plan, Effective April 26, 2016.*	Incorporated by reference to Exhibit 10.1 to United States Steel Corporation's Form 10-Q filed on April 27, 2016, Commission File Number 1-16811.
(uu)	First Amendment to United States Steel Corporation 2016 Omnibus Incentive Compensation Plan, Effective February 28, 2017.*	Incorporated by reference to Exhibit 10.1 to United States Steel Corporation's Form 10-Q filed on April 26, 2017, Commission File Number 1-16811.
(vv)	United States Steel Corporation 2016 Omnibus Incentive Compensation Plan, Amended and Restated Effective April 28, 2020*	Incorporated by reference to Exhibit 10.1 to United States Steel Corporation's Form 8-K filed on May 1, 2020, Commission File Number 1-16811.
(ww)	United States Steel Corporation 2016 Omnibus Incentive Compensation Plan, Amended and Restated Effective April 27, 2021.*	Incorporated by reference to Exhibit 10.2 to United States Steel Corporation's Form 10-Q filed on April 30, 2021, Commission File Number 1-16811.
(xx)	Form of United States Steel Corporation 2016 Omnibus Incentive Compensation Plan (Stock Option Grant)*	Incorporated by reference to Exhibit 10.3 to United States Steel Corporation's Form 10-Q filed on July 27, 2016, Commission File Number 1-16811.
(yy)	Form of United States Steel Corporation 2016 Omnibus Incentive Compensation Plan Performance Share Award Grant Agreement (2021 Grants)*	Incorporated by reference to Exhibit 10.3 to United States Steel Corporation's Form 10-Q filed on April 30, 2021, Commission File Number 1-16811.
(zz)	Form of United States Steel Corporation 2016 Omnibus Incentive Compensation Plan Performance Cash Award Grant Agreement (2021 Grants)*	Incorporated by reference to Exhibit 10.5 to United States Steel Corporation's Form 10-Q filed on April 30, 2021, Commission File Number 1-16811.
(aaa)	Form of United States Steel Corporation 2016 Omnibus Incentive Compensation Plan Restricted Stock Unit Grant Agreement (2021 Grants)*	Incorporated by reference to Exhibit 10.6 to United States Steel Corporation's Form 10-Q filed on April 30, 2021, Commission File Number 1-16811.
(bbb)	Form of United States Steel Corporation 2016 Omnibus Incentive Compensation Plan Retention Restricted Stock Unit Grant Agreement (2021 Grants)*	Incorporated by reference to Exhibit 10.7 to United States Steel Corporation's Form 10-Q filed on April 30, 2021, Commission File Number 1-16811.
(ccc)	Form of United States Steel Corporation 2016 Omnibus Incentive Compensation Plan TSR Performance Share Award Grant Agreement (2021 Grants)*	Incorporated by reference to Exhibit 10.8 to United States Steel Corporation's Form 10-Q filed on April 30, 2021, Commission File Number 1-16811.
(ddd)	Form of United States Steel Corporation 2016 Omnibus Incentive Compensation Plan Performance Share Award Grant Agreement (2021 SVP Performance Awards)* **	Incorporated by reference to Exhibit 10.4 to United States Steel Corporation's Form 10-K filed on February 11, 2022, Commission File Number 1-16811.
(eee)	Form of United States Steel Corporation 2016 Omnibus Incentive Compensation Plan Performance Share Award Grant Agreement (2021 CEO Performance Award)* **	Incorporated by reference to Exhibit 10.5 to United States Steel Corporation's Form 10-K filed on February 11, 2022, Commission File Number 1-16811.
(fff)	Form of United States Steel Corporation 2016 Omnibus Incentive Compensation Plan Performance Non-Qualified Stock Option Grant Agreement (2021 CEO PSO)* **	Incorporated by reference to Exhibit 10.6 to United States Steel Corporation's Form 10-K filed on February 11, 2022, Commission File Number 1-16811.
(ggg)	Form of United States Steel Corporation 2016 Omnibus Incentive Plan Performance Share Award Grant Agreement (ROCE Grant)*	Incorporated by reference to Exhibit 10.2 to United States Steel Corporation's Form 10-Q filed on April 29, 2022, Commission File Number 1-16811.
(hhh)	Form of United States Steel Corporation 2016 Omnibus Incentive Plan Performance Share Award Grant Agreement (TSR Grant)*	Incorporated by reference to Exhibit 10.3 to United States Steel Corporation's Form 10-Q filed on April 29, 2022, Commission File Number 1-16811.
(iii)	Form of United States Steel Corporation 2016 Omnibus Incentive Compensation Plan Performance Share Award Grant Agreement (2023 ROCE Grants)*	Incorporated by reference to Exhibit 10.2 to United States Steel Corporation's Form 10-Q filed on April 28, 2023, Commission File Number 1-16811.
(jjj)	Form of United States Steel Corporation 2016 Omnibus Incentive Compensation Plan Performance Share Award Grant Agreement (2023 TSR Grants)*	Incorporated by reference to Exhibit 10.3 to United States Steel Corporation's Form 10-Q filed on April 28, 2023, Commission File Number 1-16811.
(kkk)	Form of United States Steel Corporation 2016 Omnibus Incentive Compensation Plan Restricted Stock Unit Grant Agreement (2023 Annual Grants)*	Incorporated by reference to Exhibit 10.4 to United States Steel Corporation's Form 10-Q filed on April 28, 2023, Commission File Number 1-16811.
(lll)	Form of United States Steel Corporation 2016 Omnibus Incentive Compensation Plan Restricted Stock Unit Grant Agreement (2023 Retention Grants)*	Incorporated by reference to Exhibit 10.5 to United States Steel Corporation's Form 10-Q filed on April 28, 2023, Commission File Number 1-16811.

(mmm)	Administrative Procedures for the Executive Management Annual Incentive Compensation Plan under the United States Steel Corporation 2016 Omnibus Incentive Compensation Plan, Effective February 28, 2023.*	Incorporated by reference to Exhibit 10.6 to United States Steel Corporation's Form 10-Q filed on April 28, 2023, Commission File Number 1-16811.
(nnn)	United States Steel Corporation Deferred Compensation Program for Non-Employee Directors, a program under the United States Steel Corporation 2016 Omnibus Incentive Plan, effective as of July 26, 2016, as amended on October 30, 2018.*	Incorporated by reference to Exhibit 10.4 to United States Steel Corporation's Form 10-K filed on February 15, 2019, Commission File Number 1-16811.
(ooo)	United States Steel Corporation Deferred Compensation Program for Non-Employee Directors, a program under the United States Steel Corporation 2016 Omnibus Incentive Plan, effective as of July 26, 2016, as amended on October 28, 2019.*	Incorporated by reference to Exhibit 10.1 to United States Steel Corporation's Form 10-K filed on February 14, 2020, Commission File Number 1-16811.
(ppp)	United States Steel Corporation Deferred Compensation Program for Non-Employee Directors, a program under the United States Steel Corporation 2016 Omnibus Incentive Compensation Plan, Effective January 1, 2022.*	Incorporated by reference to Exhibit 10.7 to United States Steel Corporation's Form 10-K filed on February 11, 2022, Commission File Number 1-16811.
(qqq)	United States Steel Corporation Non-Employee Director Stock Program of the 2016 Omnibus Incentive Compensation Plan, Effective November 1, 2019.*	Incorporated by reference to Exhibit 10.2 to United States Steel Corporation's Form 10-K filed on February 14, 2020, Commission File Number 1-16811.
(rrr)	United States Steel Corporation Non-Employee Director Compensation Policy, Effective as of January 1, 2022.*	Incorporated by reference to Exhibit 10.8 to United States Steel Corporation's Form 10-K filed on February 11, 2022, Commission File Number 1-16811.
(sss)	United States Steel Corporation Non-Employee Director Compensation Policy, Adopted as of December 14, 2021, Amended as of December 15, 2022.*	Incorporated by reference to Exhibit 10.1 to United States Steel Corporation's Form 10-Q filed on April 28, 2023, Commission File Number 1-16811.
(ttt)	Letter Agreement between Scott D. Buckiso and United States Steel Corporation, dated July 30, 2020.*	Incorporated by reference to Exhibit 10.4 to United States Steel Corporation's Form 10-K filed on February 12, 2021, Commission File Number 1-16811.
(uuu)	Separation Agreement and Release by and between Douglas R. Matthews and United States Steel Corporation, dated December 24, 2020.*	Incorporated by reference to Exhibit 10.1 to United States Steel Corporation's Form 10-K filed on February 12, 2021, Commission File Number 1-16811.
(vvv)	Special Transition Agreement and Release by and between Christine S. Breves and United States Steel Corporation, dated February 15, 2022.	Incorporated by reference to Exhibit 10.1 to United States Steel Corporation's Form 10-Q filed on April 29, 2022, Commission File Number 1-16811.
(www)	Form of Offer Letter to Jessica T. Graziano, dated June 6, 2022.**	Incorporated by reference to Exhibit 10.5 to United States Steel Corporation's Form 10-Q filed on July 29, 2022, Commission File Number 1-16811.
(xxx)	United States Steel Corporation 2016 Omnibus Incentive Compensation Plan Restricted Stock Unit Grant Agreement (Non-Employee Directors – Base Retainer)*	Incorporated by reference to Exhibit 10.1 to United States Steel Corporation's Form 10-K filed on February 2, 2024, Commission File Number 1-16811.
(yyy)	United States Steel Corporation 2016 Omnibus Incentive Compensation Plan Restricted Stock Unit Grant Agreement (Non-Employee Directors – Chair Retainer)*	Incorporated by reference to Exhibit 10.2 to United States Steel Corporation's Form 10-K filed on February 2, 2024, Commission File Number 1-16811.
(zzz)	United States Steel Corporation 2016 Omnibus Incentive Compensation Plan Deferred Stock Unit Grant Agreement (Non-Employee Directors – Base Retainer)*	Incorporated by reference to Exhibit 10.3 to United States Steel Corporation's Form 10-K filed on February 2, 2024, Commission File Number 1-16811.
(aaaa)	United States Steel Corporation 2016 Omnibus Incentive Compensation Plan Deferred Stock Unit Grant Agreement (Non-Employee Directors – Chair Retainer)*	Incorporated by reference to Exhibit 10.4 to United States Steel Corporation's Form 10-K filed on February 2, 2024, Commission File Number 1-16811.
(bbbb)	Administrative Procedures for the Executive Management Annual Incentive Compensation Plan under the United States Steel Corporation 2016 Omnibus Incentive Compensation Plan, Effective February 27, 2024.*	Incorporated by reference to Exhibit 10.1 to United States Steel Corporation's Form 10-Q filed on May 3, 2024, Commission File Number 1-16811.
(cccc)	Form of United States Steel Corporation 2016 Omnibus Incentive Compensation Plan Performance Share Award Grant Agreement (2024 ROCE Grants).*	Incorporated by reference to Exhibit 10.2 to United States Steel Corporation's Form 10-Q filed on May 3, 2024, Commission File Number 1-16811.

(dddd)	Form of United States Steel Corporation 2016 Omnibus Incentive Compensation Plan Restricted Stock Unit Grant Agreement (2024 Retention Grants).*	Incorporated by reference to Exhibit 10.3 to United States Steel Corporation's Form 10-Q filed on May 3, 2024, Commission File Number 1-16811.
(eeee)	Form of United States Steel Corporation 2016 Omnibus Incentive Compensation Plan Restricted Stock Unit Grant Agreement (2024 Annual Grants).*	Incorporated by reference to Exhibit 10.4 to United States Steel Corporation's Form 10-Q filed on May 3, 2024, Commission File Number 1-16811.
(ffff)	Amendment No. 2 to the Sixth Amended and Restated Credit Agreement, dated May 3, 2024, by and among United States Steel Corporation, JPMorgan Chase Bank, N.A. and the other lenders party thereto.	Incorporated by reference to Exhibit 10.1 to United States Steel Corporation's Form 10-Q filed on August 2, 2024, Commission File Number 1-16811.
(gggg)	Second Supplement Agreement between U. S. Steel Kosice, S.R.O. and ING Bank N.V., dated May 3, 2024.	Incorporated by reference to Exhibit 10.2 to United States Steel Corporation's Form 10-Q filed on August 2, 2024, Commission File Number 1-16811.
(hhhh)	Supplemental Agreement No. 11 between U. S. Steel Kosice, S.R.O. and ING Bank N.V., dated May 3, 2024.	Incorporated by reference to Exhibit 10.3 to United States Steel Corporation's Form 10-Q filed on August 2, 2024, Commission File Number 1-16811.
(iiii)	First Amendment and Consent to Amended and Restated Credit Agreement, dated June 7, 2024, by and among Exploratory Ventures, LLC, United States Steel Corporation, KFW IPEX-Bank GMBH, and other lenders and parties thereto.	Incorporated by reference to Exhibit 10.4 to United States Steel Corporation's Form 10-Q filed on August 2, 2024, Commission File Number 1-16811.
(jjjj)	Supplemental Agreement No. 12 between U. S. Steel Košice, s.r.o. and ING Bank N.V., dated September 13, 2024.	Incorporated by reference to Exhibit 10.1 to United States Steel Corporation's Form 10-Q filed on November 11, 2024, Commission File Number 1-16811.

19	United States Steel Corporation Insider Trading Policy, effective February 27, 2023.
21	List of Subsidiaries
23	Consent of PricewaterhouseCoopers LLP
24	Powers of Attorney
31.1	Certification of Chief Executive Officer required by Rules 13a-14(a) or 15d-14(a) of the Securities Exchange Act of 1934, as promulgated by the Securities and Exchange Commission pursuant to Section 302 of the Sarbanes-Oxley Act of 2002
31.2	Certification of Chief Financial Officer required by Rules 13a-14(a) or 15d-14(a) of the Securities Exchange Act of 1934, as promulgated by the Securities and Exchange Commission pursuant to Section 302 of the Sarbanes-Oxley Act of 2002
32.1	Certification of Chief Executive Officer Pursuant to 18 U.S.C. Section 1350, as Adopted Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002
32.2	Certification of Chief Financial Officer Pursuant to 18 U.S.C. Section 1350, as Adopted Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002
95	Mine Safety Disclosure required under Section 1503 of the Dodd-Frank Wall Street Reform and Consumer Protection Act
97	United States Steel Corporation Executive Officer Recoupment (Clawback) Policy, effective July 25, 2023.
101	The following financial information from United States Steel Corporation's Annual Report on Form 10-K for the year ended December 31, 2024, formatted in Inline XBRL (Extensible Business Reporting Language) includes: (i) the Consolidated Statements of Operations, (ii) the Consolidated Statements of Comprehensive Income (Loss), (iii) the Consolidated Balance Sheets, (iv) the Consolidated Statements of Cash Flows, and (v) Notes to the Consolidated Financial Statements.
104	Cover Page Interactive Data File (formatted as Inline XBRL and contained in Exhibit 101)

* Indicates management contract or compensatory plan or arrangement.

** Schedules and exhibits have been omitted pursuant to Item 601(b)(2) of Regulation S-K. The Corporation hereby undertakes to furnish supplemental copies of the omitted schedules and exhibits upon request by the U.S. Securities and Exchange Commission; provided, however, that the parties may request confidential treatment pursuant to Rule 24b-2 of the Exchange Act for any document so furnished.

SCHEDULE II – VALUATION AND QUALIFYING ACCOUNTS AND RESERVES

YEARS ENDED DECEMBER 31, 2024, 2023, AND 2022

(millions of dollars)

Description	Balance at Beginning of Period	Additions		Deductions		Balance at End of Period
		Charged to Costs and Expenses	Charged to Other Accounts	Charged to Costs and Expenses	Charged to Other Accounts	
Year ended December 31, 2024:						
Reserves deducted in the balance sheet from the assets to which they apply:						
Allowance for doubtful accounts	\$ 38	\$ 8	\$ —	\$ —	\$ 20	\$ 26
Investments and long-term receivables reserve	3	—	—	—	—	3
Deferred tax valuation allowance:						
Domestic	98	5	—	—	—	103
Foreign	3	43	—	—	—	46
Year ended December 31, 2023:						
Reserves deducted in the balance sheet from the assets to which they apply:						
Allowance for doubtful accounts	\$ 38	\$ 14	\$ —	\$ —	\$ 14	\$ 38
Investments and long-term receivables reserve	4	—	—	—	1	3
Deferred tax valuation allowance:						
Domestic	116	—	—	18	—	98
Foreign	3	—	—	—	—	3
Year ended December 31, 2022:						
Reserves deducted in the balance sheet from the assets to which they apply:						
Allowance for doubtful accounts	\$ 44	\$ 17	\$ —	\$ —	\$ 23	\$ 38
Investments and long-term receivables reserve	4	—	—	—	—	4
Deferred tax valuation allowance:						
Domestic	159	18	—	61	—	116
Foreign	3	—	—	—	—	3

Item 16. FORM 10-K SUMMARY

None.

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, the Registrant has duly caused this report to be signed on its behalf by the undersigned, thereunto duly authorized.

Date: January 31, 2025

UNITED STATES STEEL CORPORATION

By: /s/ Manpreet S. Grewal

Manpreet S. Grewal
Vice President, Controller & Chief Accounting Officer

<u>Signature</u>	<u>Title</u>
<u>/s/ David B. Burritt</u> David B. Burritt	President & Chief Executive Officer & Director (Principal Executive Officer)
<u>/s/ Jessica T. Graziano</u> Jessica T. Graziano	Senior Vice President & Chief Financial Officer (Principal Financial Officer)
<u>/s/ Manpreet S. Grewal</u> Manpreet S. Grewal	Vice President, Controller & Chief Accounting Officer (Principal Accounting Officer)
<u>*</u> Tracy A. Atkinson	Director
<u>*</u> Andrea J. Ayers	Director
<u>*</u> Alicia J. Davis	Director
<u>*</u> Terry L. Dunlap	Director
<u>*</u> John J. Engel	Director
<u>*</u> John V. Faraci	Director
<u>*</u> Murry S. Gerber	Director
<u>*</u> Paul A. Mascarenas	Director
<u>*</u> Michael H. McGarry	Director
<u>*</u> David S. Sutherland	Board Chair
<u>*</u> Patricia A. Tracey	Director

* BY: /s/ Manpreet S. Grewal
Manpreet S. Grewal
Attorney-in-Fact

GLOSSARY OF CERTAIN DEFINED TERMS

The following definitions apply to terms used in this document:

2026 Senior Convertible Notes	Senior Convertible Notes due November 1, 2026
2053 ADFA Green Bonds	Arkansas Development Finance Authority Environmental Improvement Revenue Bonds due 2053
401(k) plans	defined contribution plans
ABL	Asset-Based Loan
ACCCI	American Coke and Coal Chemicals Institute
ACHD	Allegheny County Health Department
AD	antidumping
AD/CVD	antidumping and countervailing duty
ADEM	Alabama Department of Environmental Management
AHSS	advanced high-strength steel
AI	Artificial Intelligence
AISI	American Iron and Steel Institute
AOCI	Accumulated Other Comprehensive Income
AOP	Annual Operating Plan
ARO	Asset Retirement Obligation
ARPA	American Rescue Plan Act
ASC	Accounting Standards Codification
ASU	Accounting Standards Update
BART	Best Available Retrofit Technology
BAT	Best Available Technique
Big River Steel ABL Facility	Big River Steel amended senior secured asset-based revolving credit facility
BOF	Basic Oxygen Furnace Steelmaking
Big River 2 or BR2	Big River Steel 2
BRS	Big River Steel
CAA	Clean Air Act
CAFC	U.S. Court of Appeals for the Federal Circuit
CAFE	Corporate Average Fuel Economy
CAMT	corporate alternative minimum tax
CAMU	Corrective Action Management Unit
CBAM	carbon border adjustment mechanism
CDC	Chrome Deposit Corporation
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFIUS	the Committee on Foreign Investment in the United States
CIO	Chief Information Officer
CISO	the Chief Information Security Officer
CISSP	Certified Information Systems Security Professional
CIT	U.S. Court of International Trade
Cliffs	Cleveland-Cliffs Inc.
CMIP	Corrective Measure Implementation Plan
CO ₂	carbon dioxide
CODM	chief operating decision maker
COETF	Coke Environmental Task Force
commodity purchase swaps	financial swaps associated with purchases of natural gas, zinc, tin and electricity
CORE	corrosion-resistant steel
COSO	Committee of Sponsoring Organizations of the Treadway Commission
cost cap	per capita dollar maximum the company is expected to pay per participant under the main U. S. Steel benefit plan
Credit Facility Agreement	Sixth Amended and Restated Credit Facility Agreement
CSIRP	Cybersecurity Incident Response Plan
CVD	countervailing duties
CWA	Clean Water Act
DAFW	OSHA Days Away From Work
D.C. Circuit	the United States Court of Appeals for the D.C. Circuit
DEI	diversity equity and inclusion
DOC	U.S. Department of Commerce

Double G	Double G Coatings Company LLC
DR	direct reduced
DRA	DRA Global and Barr Engineering Co.
EAF	Electric Arc Furnace
EBITDA	earnings before interest, taxes, depreciation and amortization
EC	European Commission
ECA	Export Credit Agreement
the “Effective Time”	effective time of the Merger
EGU	electric generating unit
EPS	earnings per share
ERGs	employee resource groups
ERISA	Employee Retirement Income Security Act of 1974
ERM	Enterprise Risk Management
ERP	enterprise resource planning
ERW	electric resistance welded
ESG	environmental, social and governance
ETS	Emissions Trading System
EU	European Union
EU ETS	EU Emissions Trading System
EUA	European Union Emission Allowances
EWPM	electric-weld pipe mill
FASB	Financial Accounting Standards Board
FIFO	first in, first out
FIP	Federal Implementation Plan
Fifth Credit Facility Agreement	Fifth Amended and Restated Credit Facility Agreement
Flat-Rolled	North American Flat-Rolled segment
foreign exchange forwards	foreign exchange forward sales contracts
FX	foreign exchange
GAAP	Generally Accepted Accounting Principles
Gateway	Gateway Energy and Coke Company LLC
GEN3	generation 3
GHG	greenhouse gas
GLNPO	Great Lakes National Program Office
Green Steels	steels made with low greenhouse gas emissions intensity
HDC	Hibbing Development Company
Hibbing	Hibbing Taconite Company
IEPA	Illinois Environmental Protection Agency
IRS	Internal Revenue Service
ISO	International Organization for Standardization
ITC	U.S. International Trade Commission
JSW	JSW Steel (USA) Inc. and JSW Steel USA Ohio, Inc.
JSW Defendants	Nucor, U. S. Steel, AK Steel Holding Group and Cleveland-Cliffs Inc.
Keetac	U. S. Steel's iron ore operations at Keewatin, Minnesota
LIFO	last in, first out
MACT	Maximum Achievable Control Technology
Merger Sub	2023 Merger Subsidiary, Inc., a Delaware corp. and a wholly owned subsidiary of Purchaser
Midwest	Midwest Plant
Minntac	U. S. Steel's iron ore operations at Mt. Iron, Minnesota
mmbtus	One Million British Thermal Units
mnt	thousand net tons
MPCA	Minnesota Pollution Control Agency
NAAQS	National Ambient Air Quality Standards
NAV	net asset value
NESHAP	National Emission Standards for Hazardous Air Pollutants
NGO	non-grain oriented
NIST	the National Institute of Standards and Technology
non-GAAP	Non-Generally Accepted Accounting Principles

NOV	Notice of Violation
NOx	nitrogen oxide
NPDES	National Pollutant Discharge Elimination System
NSC	Nippon Steel Corporation, a Japanese corporation
OCTG	oil country tubular goods
OECD	The Organization for Economic Co-operation and Development
OEM	original equipment manufacturer
OPEB	Other Post-Employment Benefit
Order	Administrative Order on Consent
Other Benefits	defined benefit retiree health care and life insurance plans
Patriot	Patriot Premium Threading Services, LLC
PBO	Projected Benefit Obligation
PCAOB	Public Company Accounting Oversight Board (United States)
PFAS	Per- and Polyfluoroalkyl Substances
PII	Personally Identifiable Information
PM	Particulate Matter
PPA	Pension Protection Act of 2006
ppb	parts per billion
PRO-TEC	PRO-TEC Coating Company, U. S. Steel and Kobe Steel Ltd. joint venture
PRP	potentially responsible party
PSU	Performance-based restricted Stock Unit
Purchaser	Nippon Steel North America, Inc., a New York corporation
RCRA	Resource Conservation and Recovery Act
RICO	Racketeer Influenced and Corrupt Organizations
ROCE	Return On Capital Employed
RP	Rehabilitation plan
RSU	Restricted Stock Unit
S&P	Standard & Poor's
sales swaps	financial swaps hot-rolled coil and iron ore pellet sales
SCF	supply chain finance
SEC	Securities and Exchange Commission
SIP	State Implementation Plan
SO ₂	Sulfur dioxide
SPT	Steelworkers Pension Trust
SSS	site-specific standard
Stelco	Stelco Inc., a subsidiary of Cleveland-Cliffs Inc.
sustainable steels	steels made with low greenhouse gas emissions
SWMU	Solid Waste Management Units
the 2005 Plan	2005 Stock Incentive Plan
the 2022 Labor Agreements	collective bargaining agreements with United Steelworkers effective September 1, 2022
the Committee	the Compensation & Organization Committee of the Board of Directors
the "Company"	United States Steel Corporation and its subsidiaries
the Exchange Act	the Securities Exchange Act of 1934, as amended
the "Insurers"	Banner Life Insurance Company and William Penn Life Insurance Company of New York
the insurer	Pacific Life Insurance Company
the "Merger"	pursuant to which Merger Sub will merge with and into the Company
	On December 18, 2023, the Company entered into an Agreement and Plan of Merger with Nippon Steel North America, Inc.
the "Merger Agreement"	
the Minntac Mine	iron ore mine located in Mt. Iron, Minnesota
the Omnibus Plan	2016 Omnibus Incentive Compensation Plan, as amended and restated
USSK Credit Agreement	USSK €150 million unsecured sustainability linked credit agreement
TRQ	tariff rate quotas
Transtar	Transtar LLC and its direct and indirect subsidiaries
TSR	Total Shareholder Return
Tubular	Tubular Products segment

U. S. Steel	United States Steel Corporation
U.S. EPA	United States Environmental Protection Agency
U.S. GAAP	accounting standards generally accepted in the United States
U.S. Supreme Court	the Supreme Court of the United States
UDEQ	Utah Department of Environmental Quality
ug/m3	micrograms per cubic meter
UK	United Kingdom
UPI	USS-POSCO Industries
USSE	U. S. Steel Europe segment
USSK	U. S. Steel Košice
USSTP	U. S. Steel Tubular Products LLC
USTR	United States Trade Representative
USW	United Steel, Paper and Forestry, Rubber, Manufacturing, Energy, Allied Industrial and Service Workers International Union or United Steelworkers
USX	United States Steel Corporation
VEBA	trusts for retiree healthcare and life insurance
VERP	voluntary early retirement program
welded	seamless and electric resistance welded
WTO	World Trade Organization
WQS	water quality standard

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 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.

UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
WASHINGTON, DC 20549

FORM 8-K

CURRENT REPORT

Pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934
Date of report (Date of earliest event reported): June 18, 2025

United States Steel Corporation
(Exact Name of Registrant as Specified in Charter)

Delaware
(State or Other Jurisdiction
of Incorporation)

1-16811
(Commission
File Number)

25-1897152
(I.R.S. Employer
Identification No.)

600 Grant Street,
Pittsburgh, PA 15219-2800
(Address of Principal Executive Offices, and Zip Code)

(412) 433-1121
Registrant's Telephone Number, Including Area Code

(Former Name or Former Address, if Changed Since Last Report)

Check the appropriate box below if the Form 8-K filing is intended to simultaneously satisfy the filing obligation of the registrant under any of the following provisions *see* General Instruction A.2. below):

- ☐ Written communication pursuant to Rule 425 under the Securities Act (17 CFR 230.425)
- ☐ Soliciting material pursuant to Rule 14a-12 under the Exchange Act (17 CFR 240.14a-12)
- ☐ Pre-commencement communication pursuant to Rule 14d-2(b) under the Exchange Act (17 CFR 240.14d-2(b))
- ☐ Pre-commencement communication pursuant to Rule 13e-4(c) under the Exchange Act (17 CFR 240.13e-4(c))

Securities registered pursuant to Section 12(b) of the Act:

Title of each class	Trading Symbol(s)	Name of each exchange on which registered
Common Stock	X	New York Stock Exchange
Common Stock	X	Chicago Stock Exchange

Indicate by check mark whether the registrant is an emerging growth company as defined in Rule 405 of the Securities Act of 1933 (17 CFR §230.405) or Rule 12b-2 of the Securities Exchange Act of 1934 (17 CFR §240.12b-2).

Emerging growth company ☐

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act. ☐

Introductory Note

On June 18, 2025, United States Steel Corporation, a Delaware corporation (the “Company”), completed the transaction contemplated by the terms of the previously announced Agreement and Plan of Merger, dated December 18, 2023 (the “Agreement”), by and among the Company, Nippon Steel North America, Inc., a New York corporation (“Parent”), 2023 Merger Subsidiary, Inc., a Delaware corporation and a wholly owned subsidiary of Parent (“2023 Sub”), and, solely as provided in Section 9.13 thereof, Nippon Steel Corporation, a Japanese corporation (“Guarantor”).

Pursuant to the Agreement, 2023 Sub merged with and into the Company (the “Transaction”), with the Company surviving the merger as the surviving corporation and a subsidiary of Parent. At the effective time of the Transaction (the “Effective Time”), on the terms and subject to the conditions of the Agreement, each share of common stock, par value \$1.00 per share, of the Company (the “Common Stock”) issued and outstanding immediately prior to the Effective Time (other than (a) shares of Common Stock owned by the Company or any wholly owned subsidiary of the Company as treasury stock or otherwise (other than shares of Common Stock reserved for issuance under any of the Company Equity Plans (as defined in the Agreement)) or held directly or indirectly by Parent, 2023 Sub or any wholly owned subsidiary of Parent immediately prior to the Effective Time and (b) shares of Common Stock that were held by holders who did not vote in favor of the adoption of the Agreement and properly demanded, exercised and perfected appraisal of such shares pursuant to Section 262 of the General Corporation Law of the State of Delaware (the “DGCL”)) was automatically converted into the right to receive \$55.00 in cash (the “Transaction Consideration”). Additionally, at the Effective Time, each share of common stock, par value \$1.00 per share, of 2023 Sub outstanding

immediately prior to the Effective Time was converted into and became one validly issued, fully paid and nonassessable share of common stock, par value \$1.00 per share, of the surviving corporation and constituted the only outstanding shares of capital stock of the surviving corporation.

Pursuant to the Agreement, each time-vested restricted stock unit award in respect of shares of Common Stock (a “Company RSU Award”), or portion thereof, that was outstanding immediately prior to the Effective Time, to the extent not vested, automatically became fully vested and was cancelled and converted into the right of the holder of the Company RSU Award (or portion thereof) to receive an amount in cash equal to (i) the Transaction Consideration *multiplied by* (ii) the number of shares underlying such Company RSU Award (or portion thereof) immediately prior to the Effective Time, together with any accrued and unpaid dividends corresponding to such vested Company RSU Award (or portion thereof).

Pursuant to the Agreement, each performance-based restricted stock unit award in respect of shares of Common Stock (a “Company PSU Award”), or portion thereof, that was outstanding immediately prior to the Effective Time, to the extent not vested, automatically became fully vested to the extent described in the following sentence and was cancelled and converted into the right of the holder of the Company PSU Award (or portion thereof) to receive an amount in cash equal to (i) the Transaction Consideration *multiplied by* (ii) the total number of shares subject to such Company PSU Award (or portion thereof) immediately prior to the Effective Time, together with any accrued and unpaid dividends corresponding to such vested Company PSU Award (or portion thereof). The total number of shares subject to a Company PSU Award were based on deemed achievement of the greater of (i) actual performance and (ii) target performance through the Effective Time. Notwithstanding the foregoing, if any portion of the Company PSU Award had been earned by its terms as of the Effective Time, but had not yet become vested, the total number of shares subject to such Company PSU Award was based on the number of shares actually earned.

Pursuant to the Agreement, each option to acquire shares of Common Stock (a “Company Option Award”), or portion thereof, that was outstanding immediately prior to the Effective Time, to the extent not vested, automatically became fully vested and was cancelled and converted into the right of the holder of each such Company Option Award to receive an amount in cash equal to (i) the excess, if any, of the Transaction Consideration over the applicable exercise price of such Company Option Award, *multiplied by* (ii) the number of shares of Common Stock subject to such Company Option Award immediately prior to the Effective Time (assuming full vesting for any Company Option Award (or portion thereof) that was subject to performance-based vesting). Any out-of-the-money Company Option Awards were cancelled without consideration therefor.

Pursuant to the Agreement, each share of Common Stock underlying a deferred restricted stock unit (“Company DSU Award”) was converted into the right to receive an amount in cash equal to the Transaction Consideration or such other amount contemplated by the Company DSU Award to be settled in accordance with the terms thereof.

Item 1.01. Entry into a Material Definitive Agreement.

National Security Agreement

On June 13, 2025, the Company entered into a National Security Agreement (the “NSA”), among Guarantor, Parent, the Company and the U.S. Government, represented by the U.S. Department of the Treasury and the U.S. Department of Commerce. The NSA provides that, subject to receipt of certain regulatory approvals, the Company will issue one share of Class G Preferred Stock (the “Golden Share”) to the U.S. Government. Pursuant to the NSA, and through its ownership of the Golden Share, the U.S. Government will have certain rights with respect to non-ordinary course matters with respect to U. S. Steel, including relating to governance, domestic production and trade matters.

Supplemental Indentures

Under that certain Indenture, dated as of October 21, 2019 (the “Convertible Notes Indenture”), between the Company and The Bank of New York Mellon, as trustee (the “Trustee”), relating to the Company’s 5.00% Senior Convertible Notes due 2026 (the “Convertible Notes”), the consummation of the Transaction constitutes a Share Exchange Event (as defined in the Convertible Notes Indenture). In connection with the consummation of the Transaction and the occurrence of a Share Exchange Event, the Company and the Trustee entered into a First Supplemental Indenture to the Convertible Notes Indenture, dated as of June 18, 2025 (the “First Supplemental Indenture”), relating to the Convertible Notes. The First Supplemental Indenture provides that, from and after the Effective Time, each \$1,000 principal amount of Convertible Notes shall be convertible solely into cash (as opposed to shares of Common Stock) in an amount equal to the product of (a) the Transaction Consideration *multiplied by* (b) the number of shares of Common Stock that a holder of Convertible Notes would have received under the conversion rate in effect immediately prior to the Transaction.

The foregoing descriptions of the Convertible Notes Indenture and the First Supplemental Indenture and the transactions contemplated thereby are subject to and qualified in their entirety by reference to (i) the full text of the Convertible Notes Indenture, which was filed as Exhibit 4.1 to the Company’s Current Report on Form 8-K with the U.S. Securities and Exchange Commission (the “SEC”) on October 21, 2019 and which is incorporated herein by reference, and (ii) the full text of the First Supplemental Indenture, which is filed as Exhibit 4.1 to this Current Report on Form 8-K and incorporated herein by reference.

In connection with the consummation of the Transaction, the Company and the Trustee entered into an Eleventh Supplemental Indenture, dated as of June 18, 2025 (the “Eleventh Supplemental Indenture”), to that certain Indenture, dated as of May 21, 2007 (the “Base Indenture”), as supplemented by a First Supplemental Indenture, dated as of May 21, 2007 (the “Senior Notes First Supplemental Indenture”), among the Company and the Trustee, relating to the Company’s 6.65% Senior Notes due June 1, 2037 (the “2037 Notes”), and as further supplemented by a Tenth Supplemental Indenture, dated as of February 11, 2021 (the “Tenth Supplemental Indenture”), among the Company and the Trustee, relating to the Company’s 6.875% Senior Notes due March 1, 2029 (the “2029 Notes” and, collectively with the 2037 Notes, the “Senior Notes”). The Eleventh Supplemental Indenture provides that, from and after the Effective Time, the definition of “Consolidated Net Tangible Assets” in Section 1.03 of the Senior Notes First Supplemental Indenture and Section 1.03 of the Tenth Supplemental Indenture is amended and restated to reference, for purpose of determining “Consolidated Net Tangible Assets”, financial statements provided by the Company to holders within such time periods as would have been required by the Securities Exchange Act of 1934, as amended (the “Exchange Act”), if the Company were a “non-accelerated filer,” and provide that financial statements may be deemed to be provided to holders if the Company (x) posts such financial statements on a website (which may be nonpublic and may be maintained by the Company or a third party) to which access will be given to holders that certify their status as such to the reasonable satisfaction of the Company or (y) otherwise makes the information publicly available (including by posting such information on EDGAR).

The foregoing descriptions of the Base Indenture, the Senior Notes First Supplemental Indenture, the Tenth Supplemental Indenture and the Eleventh Supplemental Indenture and the transactions contemplated thereby are subject to and qualified in their entirety by reference to (i) the full text of the Base Indenture, which was filed as Exhibit 4.1 to the Company’s Current Report on Form 8-K with the SEC on May 22, 2007, and which is incorporated herein by reference, (ii) the full text of the Senior Notes First Supplemental Indenture, which was filed as Exhibit 4.2 to the Company’s Current Report on Form 8-K with the SEC on May 22, 2007, and which is incorporated herein by reference, (iii) the full text of the Tenth Supplemental Indenture, which was filed as Exhibit 4.1 to the Company’s Current Report on Form 8-K with the SEC on February 11, 2021, and which is incorporated herein by reference, and (iv) the full text of the Eleventh Supplemental Indenture, which is filed as Exhibit 4.2 to this Current Report on Form 8-K and incorporated herein by reference.

Item 2.01. Completion of Acquisition or Disposition of Assets.

The description contained under the Introductory Note above is hereby incorporated by reference into this Item 2.01.

The description of the effects of the Agreement and the transactions contemplated by the Agreement does not purport to be complete and is subject to, and qualified in its entirety by reference to, the full text of the Agreement, which was filed as Exhibit 2.1 to the Company's Current Report on Form 8-K filed with the SEC on December 18, 2023 and which is incorporated herein by reference.

Item 2.04. Triggering Events that Accelerate or Increase a Direct Financial Obligation or an Obligation under an Off-Balance Sheet Arrangement.

Under the Convertible Notes Indenture, the consummation of the Transaction constitutes a Fundamental Change and a Make-Whole Fundamental Change (each as defined in the Convertible Notes Indenture).

As a result of the Fundamental Change, holders of the Convertible Notes have the right (the "Fundamental Change Purchase Right") to require the Company to purchase for cash (a) all of such holder's Convertible Notes or (b) any portion of the principal amount thereof that is equal to \$1,000 or an integral multiple of \$1,000 in excess thereof, in each case, on July 18, 2025 (the "Fundamental Change Purchase Date"), at a purchase price equal to 100% of the principal amount of the Convertible Notes to be purchased, *plus* accrued and unpaid interest thereon, if any, to, but excluding, the Fundamental Change Purchase Date.

Notwithstanding the Fundamental Change Purchase Right, the Convertible Notes are convertible, at the option of the holder, at any time until 5:00 p.m., New York City time, on July 17, 2025. Pursuant to the terms of the Convertible Notes Indenture, as supplemented by the First Supplemental Indenture, the consideration due upon conversion of each \$1,000 principal amount of Convertible Notes shall be solely an amount of cash equal to the product of (a) the Transaction Consideration *multiplied by* (b) the number of shares of Common Stock that a holder of the Convertible Notes would have received under the conversion rate in effect immediately prior to the Share Exchange Event. The conversion rate in effect immediately prior to the Share Exchange Event, taking into account all adjustments, was 74.8391 shares of Common Stock per \$1,000 principal amount of Convertible Notes. As a result, holders of the Convertible Notes will be entitled to receive \$4,116.15 in cash per \$1,000 principal amount of Convertible Notes validly surrendered for conversion.

Item 3.01. Notice of Delisting or Failure to Satisfy a Continued Listing Rule or Standard; Transfer of Listing.

The descriptions contained under the Introductory Note, Item 2.01, and Item 5.01 of this Current Report on Form 8-K are incorporated by reference into this Item 3.01.

In connection with the consummation of the Transaction, on June 18, 2025, the Company notified the New York Stock Exchange LLC ("NYSE") and the Chicago Stock Exchange ("CSE") that the Transaction had been consummated and requested that the NYSE and the CSE (a) suspend trading of the Common Stock, (b) remove the Common Stock from listing on the NYSE and the CSE prior to the open of trading on June 18, 2025, and (c) file with the SEC a notification of delisting of Common Stock under Section 12(b) of the Exchange Act. As a result, the Common Stock will no longer be listed on the NYSE and the CSE.

Additionally, the Company intends to file with the SEC a Form 15 under the Exchange Act to terminate the registration of the Common Stock under Section 12(g) of the Exchange Act and suspend the Company's reporting obligations under Sections 13 and 15(d) of the Exchange Act.

Item 3.03. Material Modification to Rights of Security Holders.

The descriptions contained under the Introductory Note, Item 2.01, Item 3.01, Item 5.01 and Item 5.03 of this Current Report on Form 8-K are incorporated by reference into this Item 3.03.

In connection with the Transaction and at the Effective Time, holders of Common Stock immediately prior to such time ceased to have any rights as stockholders in the Company (other than their right to receive the Transaction Consideration pursuant to the Agreement).

Item 5.01. Changes in Control of Registrant.

The descriptions contained under the Introductory Note, Item 2.01 and Item 5.02 of this Current Report on Form 8-K are incorporated by reference into this Item 5.01.

As a result of the consummation of the Transaction, a change in control of the Company occurred. Pursuant to the Agreement, at the Effective Time, 2023 Sub was merged with and into the Company, with the Company continuing as the surviving corporation and becoming a subsidiary of Parent. The total equity value of the transaction was approximately \$14.2 billion. The funds used by Parent to consummate the Transaction and complete the related transactions were provided by third-party debt financing.

Item 5.03. Amendments to Articles of Incorporation or Bylaws; Change in Fiscal Year.

The description contained under the Introductory Note of this Current Report on Form 8-K is incorporated by reference into this Item 5.03.

At the Effective Time, (a) the Company's certificate of incorporation was amended and restated until thereafter amended in accordance with such certificate and the DGCL and (b) the bylaws of 2023 Sub as in effect immediately prior to the Effective Time, reflecting certain amendments, became the bylaws of the surviving corporation until thereafter amended in accordance with such bylaws, the certificate of incorporation of the surviving corporation and DGCL. Following the Effective Time, the certificate of incorporation and the bylaws of the surviving corporation were further amended and restated. The Company will further amend and restate its certificate of incorporation in order to issue the Golden Share following receipt of regulatory approvals required for the issuance of the Golden Share. The Fifth Amended and Restated Certificate of Incorporation and Second Amended and Restated Bylaws of the Company are attached hereto as Exhibit 3.1 and Exhibit 3.2, respectively, and are incorporated herein by reference.

Item 9.01. Financial Statements and Exhibits.**(d) Exhibits**

<u>Exhibit No.</u>	<u>Exhibit</u>

2.1*	Agreement and Plan of Merger, dated as of December 18, 2023, by and among the Company, Parent, 2023 Sub and Guarantor (solely as provided in Section 9.13 therein) (incorporated by reference to Exhibit 2.1 to the Company's Current Report on Form 8-K, filed with the U.S. Securities and Exchange Commission on December 18, 2023)
3.1	Fifth Amended and Restated Certificate of Incorporation of the Company
3.2	Second Amended and Restated Bylaws of the Company
4.1	First Supplemental Indenture, dated as of June 18, 2025, between the Company and the Bank of New York Mellon, as Trustee
4.2	Eleventh Supplemental Indenture, dated as of June 18, 2025, between the Company and The Bank of New York Mellon, as Trustee
104	Cover Page Interactive Data File (embedded within the Inline XBRL document)

* Schedules have been omitted pursuant to Item 601(b)(2) of Regulation S-K. The registrant hereby undertakes to furnish supplementally copies of any of the omitted schedules upon request by the SEC; provided, however, that the parties may request confidential treatment pursuant to Rule 24b-2 of the Exchange Act for any document so furnished.

SIGNATURES

Pursuant to the requirements of the Securities Exchange Act of 1934, as amended, the registrant has duly caused this report to be signed on its behalf by the undersigned hereunto duly authorized.

Date: June 18, 2025

UNITED STATES STEEL CORPORATION

By: /s/ Scotland M. Duncan
Name: Scotland M. Duncan
Title: Senior Vice President, General Counsel and Secretary

**FIFTH AMENDED AND RESTATED
CERTIFICATE OF INCORPORATION
OF
UNITED STATES STEEL CORPORATION**

United States Steel Corporation, a Delaware corporation (the “**Corporation**”), hereby certifies that this Fifth Amended and Restated Certificate of Incorporation has been duly adopted in accordance with Sections 242 and 245 of the General Corporation Law of the State of Delaware (the “**DGCL**”), and that:

A. The name of the Corporation is: United States Steel Corporation. The Corporation was originally formed as a Delaware limited liability company under the name “United States Steel LLC” on May 25, 2001 and converted to a Delaware corporation, pursuant to Section 265 of the Delaware General Corporation Law and Section 18-216 of the Delaware Limited Liability Company Act, on December 31, 2001 under the name United States Steel Corporation.

B. The original Certificate of Incorporation of the Corporation was amended and restated on September 30, 2003, further amended and restated on April 25, 2017 and further amended and restated on June 18, 2025 upon the filing of a Certificate of Merger, pursuant to which 2023 Merger Subsidiary, Inc., a Delaware corporation, merged with and into the Corporation, with the Corporation surviving the merger under the name “United States Steel Corporation”.

C. This Fifth Amended and Restated Certificate of Incorporation amends and restates the Corporation’s Certificate of Incorporation.

D. The Certificate of Incorporation upon the filing of this Fifth Amended and Restated Certificate of Incorporation, shall read as follows:

ARTICLE I

The name of the corporation shall be United States Steel Corporation (the “**Corporation**”).

ARTICLE II

The address of its registered office in the State of Delaware is: The Corporation Trust Company, 1209 Orange Street, Corporation Trust Center, Wilmington, County of New Castle, Delaware 19801. The name of its registered agent at such address is The Corporation Trust Company.

ARTICLE III

The nature of the business or purposes to be conducted or promoted by the corporation is to engage in any lawful act or activity for which corporations may be organized under the General Corporation Law of the State of Delaware (“**DGCL**”).

ARTICLE IV

The total number of shares of all classes of stock that the Corporation has authority to issue is 1,000 consisting of 1,000 shares of Common Stock, \$1.00 par value per share (“**Common Stock**”).

ARTICLE V

Elections of directors need not be by written ballot unless the by-laws of the Corporation shall so provide.

Meetings of stockholders may be held within or without of the State of Delaware, as the by-laws may provide. The books of the Corporation may be kept (subject to any provision contained in the statutes) outside the State of Delaware at such place or places as may be designated from time to time by the board of directors or in the by-laws of the Corporation.

ARTICLE VI

1. The Corporation shall not, either directly or indirectly by amendment, merger, consolidation or otherwise, without (in addition to any other vote required by law or this Certificate of Incorporation) (i) at any time when Donald J. Trump is serving as President of the United States of America, the written consent of Donald J. Trump or President Trump’s Designee, or (ii) at any other time, the written consent of the CMAs (as parties to the NSA) (and any such act or transaction entered into without such consent or vote shall be null and void *ab initio*, *ultra vires* and of no force or effect):

- (a) alter, amend, repeal or waive any provision of this Certificate of Incorporation, except as contemplated by Article XII of the NSA;
- (b) change the Corporation’s name from “United States Steel Corporation”, change the Corporation’s headquarters from Pittsburgh, Pennsylvania, or change the Corporation’s domicile to a jurisdiction other than a state, commonwealth, district or territory of the United States;
- (c) reduce, waive or delay any Capital Investment (as defined in Schedule 2 to this Certificate of Incorporation), subject to receipt of necessary approvals and permits on an expedited basis;
- (d) (A) prior to June 18, 2027, close, idle or sell the Corporation’s Granite City Works or (B) prior to June 18, 2035, close, idle or sell any other Production Location, except, in each case of (A) and (B), any Temporary Idling or in response to, or as a result of, a Force Majeure Event;
- (e) fail to follow the recommendation of the CMAs (as parties to the NSA) with respect to Trade Actions;
- (f) effect any material acquisition of a business that is domiciled in the United States that competes with the Corporation or its suppliers;

- (g) implement pricing of the Corporation’s average spot sales price during any rolling six (6)-month period below eighty-five percent (85%) of the corresponding six (6)-month average for that applicable steel product as publicly published by the U.S. Midwest Domestic Hot-Rolled Coil Steel Index

(i.e., Hot-rolled, Cold-rolled, and Coated steel); provided, that, for the avoidance of doubt, the average spot sales price will be calculated monthly and will be based on the average spot price for the applicable steel product for each individual customer transaction in the United States;

(h) accept direct financial assistance from the Japanese government, excluding (a) financing obtained from Japan Bank for International Cooperation (JBIC), Nippon Export and Investment Insurance (NEXI) or other equivalent Japanese government related financial institutions on commercially reasonable terms and (b) financial assistance for research and development in Japan;

(i) prior to June 18, 2030, reduce the base salary of employees of the Corporation; and

(j) make material changes to the Corporation's existing raw materials and steel sourcing strategy in the United States, unless such changes are intended to benefit the Corporation, its operations or customers, which changes, among others, include: to the extent steel making raw materials or inputs are or become inadequate in quantity or quality; and initial imports to the Corporation to accelerate the transfer of technology or commissioning or qualification of facilities committed to being built in the United States (e.g., grain oriented electrical steel).

2. For purposes of this Article VI:

(a) **"Disqualified Individual"** is defined on Schedule 1 to this Certificate of Incorporation.

(b) **"Force Majeure Event"** means acts of God, natural disaster or the elements, explosion, insurrection, riot, strikes, lockouts, boycotts, picketing, labor disturbances, acts of public enemy, war (declared or undeclared), acts of terrorism, epidemics or pandemics, but in each case only to the extent that such act or event prevents, impedes, or reduces Production Capacity.

(c) **"NSA"** means the National Security Agreement, effective as of June 13, 2025, by and among Nippon Steel Corporation, a publicly traded company incorporated in Japan ("NSC"), Nippon Steel North America, Inc., a New York corporation, the Corporation, and the U.S. Government, represented by the U.S. Department of the Treasury and the U.S. Department of Commerce as the CFIUS Monitoring Agencies (the **"CMAs"**).

(d) **"Production Capacity"** means the name plate capacity to produce and supply steel and steel-related products from the following facilities of the Corporation in the United States involved in the production, including support for production, of steel products as of the effective date of this Certificate of Incorporation: Automotive Center (Troy, Michigan); Big River Steel; Big River 2; Fairfield Tubular Operations; Fairfield Works; Gary Works; Granite City Works; Great Lakes Works; Midwest Plant; Minnesota Ore Operations (including Keetac and Minntac); Mon Valley Works (including Clairton Plant, Edgar Thomson Plant, Fairless Plant, and Irvin Plant); Research and Technology Center (Munhall, Pennsylvania); U. S. Steel Tubular Products Innovation and Offshore Operations (Houston, Texas); and Wheeling Machine Products (Pine Bluff, Arkansas) (each such facility, a **"Production Location"**).

3

(e) **"Temporary Idling"** means the idling of a Production Location in connection with, or to address, issues related to safety and environmental issues, maintenance and repairs, upgrades made to the equipment, or related assets, labor and logistical disruptions, weather events, or natural disasters.

(f) **"President Trump's Designee"** means such individual who Donald J. Trump, in his capacity as President of the United States of America, designates to provide the consent required pursuant to this Article VI, and upon such designation, such individual will serve as President Trump's Designee until (i) he or she is removed as President Trump's Designee or (ii) such time as Donald J. Trump is no longer serving as President of the United States of America; provided that in no event shall a Disqualified Individual be President Trump's Designee.

(g) **"Trade Actions"** means trade measures under U.S. law such as antidumping/countervailing duty orders, safeguard measures, Section 232 national security actions, or any other legal action, including filing a petition or otherwise initiating a case, or policy advocacy related to U.S. trade or imports.

ARTICLE VII

Subject to Article VI of this Certification of Incorporation, the Corporation reserves the right to amend, alter, change or repeal any provision contained in this Certificate of Incorporation, in the manner now or hereafter prescribed by statute, and all rights conferred upon stockholders herein are granted subject to this reservation.

ARTICLE VIII

The Corporation is to have perpetual existence.

ARTICLE VIX

Section 203 of the DGCL shall not apply to the Corporation.

ARTICLE X

No director or officer shall be personally liable to the Corporation or its stockholders for monetary damages for any breach of fiduciary duty by such director or officer as a director or officer, except (i) in the case of directors or officers, for breach of the director's or officer's duty of loyalty to the Corporation or its stockholders, (ii) in the case of directors or officers, for acts or omissions not in good faith or which involve intentional misconduct or a knowing violation of law, (iii) in the case of directors, liability pursuant to Section 174 of the DGCL, (iv) in the case of directors or officers, for any transaction from which the director or officer derived an improper personal benefit and (v) in the case of officers, any action by or in the right of the Corporation. No amendment to or repeal of this Article X shall apply to or have any effect on the liability or alleged liability of any director or officer of the Corporation for or with respect to any acts or omissions of such director or officer occurring prior to such amendment or repeal.

* * *

4

IN WITNESS WHEREOF, this Fifth Amended and Restated Certificate of Incorporation has been executed by the Corporation's duly authorized officer this 18th day of June, 2025.

UNITED STATES STEEL CORPORATION

By: /s/ Scotland M. Duncan

Name: Scotland M. Duncan

Title: Senior Vice President, General Counsel and Secretary

Schedule 1

Disqualified Individuals

“**Disqualified Individual**” means an individual who is, or was within the five (5) years prior to election as a Class G Director, (i) a director, manager, officer, partner, owner, investor, agent or consultant of, or otherwise affiliated with or acting in concert or on behalf of, a Competitor of the Corporation, Nippon Steel North America, Inc. or their affiliates, (ii) a member of the United Steel, Paper and Forestry, Rubber, Manufacturing, Energy, Allied Industrial and Service Workers International Union (the “**USW**”), (iii) listed below in this Schedule 1, or (iv) an immediate family member of any individual described in clause (i), (ii) or (iii).

“**Competitor**” means any person engaged in the same or similar line of business as the Corporation.

Disqualified Individuals

- James Chadwick
- Fred DiSanto
- Alan Kestenbaum
- Any other individual affiliated with, or acting in concert or on behalf of, Ancora Holdings Group, LLC

Schedule 2

Capital Investments

“**Capital Investments**” means, collectively, the investments by Nippon Steel Corporation (“**NSC**”) or its affiliates set forth below in this Schedule 2. The specific investment amounts in each year and each facility may change, while the total investment amounts from 2025 through 2028 will not change:

State	Facility	2025 ¹	2026	2027	2028	Total 2025-2028
Arkansas	Big River Steel	\$0.1	\$0.9	\$0.9	\$1.3	\$3.0
Indiana	Gary Works	\$0.4	\$0.9	\$0.8	\$1.1	\$3.1
Pennsylvania	Mon Valley	\$0.1	\$0.7	\$0.7	\$0.9	\$2.4
Minnesota	Keetac/Minntac	\$0.2	\$0.2	\$0.3	\$0.3	\$0.8
Alabama	Fairfield Works	\$0.2	\$0.2	\$0.1	\$0.1	\$0.5
TBD	New Mini Mill	-	-	-	\$1.0	\$1.0
Total	--	\$0.9	\$2.7	\$2.6	\$4.6	\$10.8

(\$ in Billions)

“**Incurred**” means, with respect to a Capital Investment, that the amount has been paid or, in respect of a capital project relating to a facility listed in this Schedule 2, become committed to be paid. In the event that an investment cannot be made for a key project listed in this Schedule 2 as a result of the delay or rejection of the necessary approvals and permits on an expedited basis, the amount of such investment will be deemed “incurred”.

¹ Inclusive of all amounts incurred at any time in 2025.

SECOND AMENDED & RESTATED
BYLAWS OF
UNITED STATES STEEL CORPORATION
ARTICLE I OFFICES

SECTION 1.1. REGISTERED OFFICE. The registered office of the corporation shall be established and maintained at the office of The Corporation Trust Company, 1209 Orange Street, Corporation Trust Center, Wilmington, Delaware 19801, and said corporation shall be the registered agent of this corporation in charge thereof.

SECTION 1.2. OTHER OFFICES. The corporation shall have its principal office in Pittsburgh, Pennsylvania and may have other offices, either within or without the State of Delaware, at such place or places as the Board of Directors may from time to time appoint or the business of the corporation may require.

ARTICLE II MEETING OF STOCKHOLDERS

SECTION 2.1. ANNUAL MEETINGS. Annual meetings of stockholders for the election of directors and for such other business as may be stated in the notice of the meeting, shall be held in person or by remote communication at such place, either within or without the State of Delaware, and at such time and date as the Board of Directors, by resolution, shall determine and as set forth in the notice of the meeting.

If the date of the annual meeting shall fall upon a legal holiday, the meeting shall be held on the next business day. At each annual meeting, the stockholders entitled to vote shall elect a Board of Directors and they may transact such other corporate business as shall be stated in the notice of the meeting.

SECTION 2.2. OTHER MEETINGS. Meetings of stockholders for any purpose other than the election of directors may be held in person or by remote communication at such time and place, within or without the State of Delaware, as shall be stated in the notice of meeting.

SECTION 2.3. VOTING. Each stockholder entitled to vote in accordance with the terms of the Certificate of Incorporation and in accordance with the provisions of these Bylaws shall be entitled to one vote, in person or by proxy, for each share of stock entitled to vote held by such stockholder, but no proxy shall be voted after three years from its date unless such proxy provides for a longer period. Upon the demand of any stockholder, the vote for directors and the vote upon any question before the meeting, shall be by ballot. All elections for directors shall be decided by plurality vote; all questions shall be decided by majority vote except as otherwise provided by the Certificate of Incorporation or the laws of the State of Delaware.

A complete list of the stockholders entitled to vote at the ensuing election, arranged in alphabetical order, with the address of each, and the number of shares held by each, shall be open to the examination of any stockholder, for any purpose germane to the meeting, during ordinary business hours, for a period of at least ten days prior to the meeting, either at a place within the city where the meeting is to be held, which place shall be specified in the notice of the meeting, or, if not so specified, at the place where the meeting is to be held. The list shall also be produced and kept at the meeting and place of the meeting during the whole time thereof, and may be inspected by any stockholder who is entitled to be present.

SECTION 2.4. QUORUM. Except as otherwise required by law, by the Certificate of Incorporation or by these Bylaws, the presence, in person or by proxy, of stockholders holding shares constituting a majority of the voting power entitled to vote shall constitute a quorum at all meetings of the stockholders. In case a quorum shall not be present at any meeting, a majority in interest of the stockholders entitled to vote thereat, present in person or by proxy, shall have the power to adjourn the meeting from time to time, without notice other than announcement at the meeting, until the requisite amount of stock entitled to vote shall be present. At any such adjourned meeting at which the requisite amount of stock entitled to vote shall be represented, any business may be transacted which might have been transacted at the meeting as originally noticed; but only those stockholders entitled to vote at the meeting as originally noticed shall be entitled to vote at any adjournment or adjournments thereof.

SECTION 2.5. SPECIAL MEETINGS. Special meetings of the stockholders for any purpose or purposes may be called by the Board of Directors, President or Secretary, or upon the written request of the stockholders holding shares constituting a majority of the voting power entitled to vote at the meeting requested to be called.

SECTION 2.6. NOTICE OF MEETINGS. Written notice stating the place, date and time of the meeting, and the general nature of the business to be considered, shall be given to each stockholder entitled to vote thereat at his address as it appears on the records of the corporation, not less than ten nor more than sixty days before the date of the meeting. No business other than that stated in the notice shall be transacted at any meeting without the unanimous consent of all the stockholders entitled to vote thereat. The attendance of any stockholder at a meeting, in person or by proxy, without protesting the lack of notice of such meeting prior to the conclusion of the meeting, shall constitute a waiver of notice by such stockholder.

SECTION 2.7. ACTION WITHOUT MEETING. Unless otherwise provided by the Certificate of Incorporation, any action required or permitted to be taken at any annual or special meeting of stockholders, or any action which may be taken at any annual or special meeting, may be taken without a meeting, without prior notice and without a vote, if a consent in writing, setting forth the action so taken, shall be signed by the holders of outstanding stock having not less than the minimum number of votes that would be necessary to authorize or take such action at a meeting at which all shares entitled to vote thereon were present and voted. Prompt notice of the taking of the corporate action without a meeting by less than unanimous written consent shall be given to those stockholders who have not consented in writing.

ARTICLE III DIRECTORS

SECTION 3.1. NUMBER AND TERM. The Board of Directors shall consist of one or more members and shall not exceed nine members. At each annual meeting, the stockholders shall determine the number of directors; provided, that between annual meetings the authorized number of directors may be increased or decreased by the stockholders or pursuant to Section 3.6 of these Bylaws. From and after the election of the Independent U.S. Directors, a majority of the Board of Directors shall be comprised of members who are U.S. citizens. A director shall hold office until a successor is elected and qualified, or until the earlier death, resignation, disqualification, or removal of the director.

SECTION 3.2. INDEPENDENT U.S. DIRECTORS. As soon as practicable after the adoption of these Bylaws, three members of the Board of Directors shall be elected and shall be "Independent U.S. Directors," each of whom shall: (i) be a U.S. citizen and (ii) have a background in the steel industry, U.S. national security, trade matters, manufacturing and/or labor.

SECTION 3.3. RESIGNATIONS. Any director, member of a committee or other officer may resign at any time. Such resignation shall be made in writing, and shall take effect at the time specified therein, and if no time be specified, at the time of its receipt by the President or Secretary. The acceptance of a resignation shall not be necessary to make it effective.

SECTION 3.4. VACANCIES. If the office of any director, member of a committee or other officer becomes vacant, the remaining directors in office, though less than a quorum, by a majority vote, may appoint any qualified person to fill such vacancy, who shall hold office for the unexpired term and until his or her successor shall be duly chosen. If the office of any director becomes vacant and there are no remaining directors, the stockholders, by the affirmative vote of the holders of shares constituting a majority of the voting power of the corporation, at a special meeting called for such purpose, may appoint any qualified person to fill such vacancy.

SECTION 3.5. REMOVAL. Any director or directors may be removed either for or without cause at any time by the affirmative vote of the holders of a majority of all the shares of stock outstanding and entitled to vote, at a special meeting of the stockholders called for the purpose and the vacancies thus created may be filled, at the meeting held for the purpose of removal, by the affirmative vote of a majority in interest of the stockholders entitled to vote.

SECTION 3.6. INCREASE OF NUMBER. Subject to Section 3.1 of these Bylaws, the number of directors may be increased by the affirmative vote of a majority interest of the stockholders, at the annual meeting or at a special meeting called for that purpose, and by like vote the additional directors may be chosen at such meeting to hold office until the next annual election and until their successors are elected and qualify.

SECTION 3.7. POWERS. The Board of Directors shall exercise all of the powers of the corporation except such as are by (a)(i) law, (ii) the Certificate of Incorporation of the corporation or (iii) these Bylaws or (b) resolution of the stockholders conferred upon or reserved to the stockholders.

SECTION 3.8. COMMITTEES. The Board of Directors may, by resolution or resolutions passed by a majority of the whole Board of Directors, designate one or more committees, each committee to consist of two or more directors of the corporation or dissolve any such committee. The Board of Directors may designate one or more directors as alternate members of any committee, who may replace any absent or disqualified member at any meeting of the committee. In the absence or disqualification of any member of such committee or committees, the member or members thereof present at any meeting and not disqualified from voting, whether or not he/she or they constitute a quorum, may unanimously appoint another member of the Board of Directors to act at the meeting in the place of any such absent or disqualified member. Any such committee, to the extent provided in the resolution of the Board of Directors, or in these Bylaws, shall have and may exercise all the powers and authority of the Board of Directors in the management of the business and affairs of the corporation, and the Board of Directors may, by resolution or resolutions passed by a majority of the whole Board of Directors, revoke or amend any such powers and authority; but no such committee shall have the power or authority in reference to amending the Certificate of Incorporation, adopting an agreement of merger or consolidation, recommending to the stockholders the sale, lease or exchange of all or substantially all of the corporation's property and assets, recommending to the stockholders a dissolution of the corporation or a revocation of a dissolution, or amending the Bylaws of the corporation; and, unless the resolution, these Bylaws, or the Certificate of Incorporation expressly so provide, no such committee shall have the power or authority to declare a dividend or to authorize the issuance of stock.

SECTION 3.9. MEETINGS. Regular meetings of the directors may be held without notice at such places and times as shall be determined from time to time by resolution of the directors.

Special meetings of the Board of Directors may be called by the President or by the Secretary on the written request of any director, on at least one day notice to each director and shall be held at such place or places as may be determined by the directors, or shall be stated in the call of the meeting.

Unless otherwise restricted by the Certificate of Incorporation or by these Bylaws, members of the Board of Directors, or any committee designated by the Board of Directors, may participate in a meeting of the Board of Directors, or any committee, by means of conference telephone or similar communications equipment by means of which all persons participating in the meeting can hear each other, and such participation in a meeting shall constitute presence in person at the meeting.

SECTION 3.10. QUORUM. A majority of the directors shall constitute a quorum for the transaction of business. If at any meeting of the Board of Directors there shall be less than a quorum present, a majority of those present may adjourn the meeting from time to time until a quorum is obtained, and no further notice thereof need be given other than by announcement at the meeting which shall be so adjourned. The vote of the majority of all the directors then in office shall be the act of the Board of Directors unless otherwise permitted under the Certificate of Incorporation of the corporation or these Bylaws.

SECTION 3.11. COMPENSATION. Each director of the corporation who is not a salaried officer or employee of the corporation, or of a parent or affiliate of the corporation, shall receive such compensation for serving as a director and such fees for attendance at meetings of the Board of Directors or any committee of the Board of Directors as the Board of Directors may from time to time determine. By resolution of the Board of Directors a fixed fee and reimbursement of expenses related to attendance may be allowed for attendance by directors at each meeting. Nothing herein contained shall be construed to preclude any director from serving the corporation in any other capacity as an officer, agent or otherwise, and receiving compensation therefor.

SECTION 3.12. CHAIRMAN OF THE BOARD. At the first regular meeting of the Board of Directors in each year (at which a quorum shall be present) held next after the annual meeting, the Board of Directors shall proceed to the election of the Chairman of the Board of Directors from among its members.

SECTION 3.13. ACTION WITHOUT MEETING. Any action required or permitted to be taken at any meeting of the Board of Directors, or of any committee thereof, may be taken without a meeting, if prior to such action a written consent thereto is signed by all members of the Board of Directors, or of such committee as the case may be, and such written consent is filed with the minutes of proceedings of the Board of Directors or committee.

ARTICLE IV OFFICERS

SECTION 4.1. GENERALLY. The Board of Directors, at its first meeting after each annual meeting of stockholders, shall elect at least the following officers: a Chief Executive Officer, a President, a Chief Financial Officer, one or more Vice Presidents and a Secretary. The Board of Directors may also elect, appoint, or provide for the appointment of such other officers and agents as may from time to time appear necessary or advisable in the conduct of the affairs of the corporation. The Chief Executive Officer is empowered to appoint officers from time to time, other than a President, Chief Financial Officer, Executive Vice President and Secretary. The Corporate Secretary or any officer elected by the Board of Directors acting in conjunction with the Corporate Secretary may appoint such assistant officers (including one or more Assistant Secretaries) as may be necessary or desirable for the conduct of the business of the corporation. Officers of the corporation shall hold office until their successors are chosen and qualified or until their earlier death, resignation or removal, and shall perform such duties as from time to time shall be prescribed by these Bylaws and by the Board of Directors and, to the extent not so provided, as generally pertain to their respective offices. The Board of Directors may fill any vacancy occurring in any office of the corporation. Two or more offices may be held by the same person.

SECTION 4.2. CHIEF EXECUTIVE OFFICER. The Chief Executive Officer, subject to the overall direction and supervision of the Board of Directors and

committees thereof, shall be in general charge of the affairs of the corporation and its officers, and shall consult and advise with the Board of Directors and committees thereof on the business and the affairs of the corporation. The Chief Executive Officer shall have the power to make and execute contracts and other instruments, including powers of attorney, on behalf of the corporation and to delegate such power to others. The Chief Executive Officer shall perform all duties incident to the office of the Chief Executive Officer, and any other duties as may be from time to time assigned to the Chief Executive Officer by the Board of Directors, in each case subject to the control of the Board of Directors.

SECTION 4.3. PRESIDENT. The President shall report and be responsible to the Chief Executive Officer. The President shall have such powers and perform such duties as from time to time may be assigned or delegated to the President by the Board of Directors or the Chief Executive Officer or that are incident to the office of President. The President shall also have the power to make and execute contracts on the corporation's behalf and to delegate such power to others.

SECTION 4.4. CHIEF FINANCIAL OFFICER. The Chief Financial Officer shall be the principal financial officer of the corporation and shall have such powers and perform such duties as may be assigned by the Board of Directors or the Chief Executive Officer. The Chief Financial Officer shall also have the power to make and execute contracts on the corporation's behalf and to delegate such power to others.

SECTION 4.5. VICE PRESIDENTS. Each Executive Vice President, Senior Vice President and Vice President shall have such powers and perform such duties as may be assigned to the officer by the Board of Directors or by the Chief Executive Officer. Each Executive Vice President, Senior Vice President and Vice President shall have all the powers and duties as are commonly incident to the office of Vice President, or that are delegated to him or her by the Board of Directors, the Chief Executive Officer or his or her superior officer. A Vice President may be designated by the Board of Directors to perform the duties and exercise the powers of the President in the event of the President's absence or disability. Each Executive Vice President, Senior Vice President and Vice President shall also have the power to make and execute contracts on the corporation's behalf and to delegate such power to others.

SECTION 4.6. SECRETARY. The powers and duties of the Secretary are: (i) to act as Secretary at all meetings of the Board of Directors, of the committees of the Board of Directors and of the stockholders, and to record the proceedings of those meetings in a book or books to be kept for that purpose; (ii) to see that all notices required to be given by the corporation are duly given and served; (iii) to have charge of the books, records and papers of the corporation and see that the reports, statements and other documents required by law to be kept and filed are properly kept and filed; and (iv) to have any other powers and perform all of the duties as are commonly incident to the office of Secretary, or as the Board of Directors or the Chief Executive Officer may from time to time prescribe. The Secretary shall have the responsibility for authenticating records of the corporation, and shall also have the power to make and execute contracts on the corporation's behalf and to delegate such power to others.

SECTION 4.7. ASSISTANT SECRETARIES. The Assistant Secretary, if there is one, or if there shall be more than one, the Assistant Secretaries in the order determined by the Board of Directors (or if there shall have been no determination, then in the order of their election) shall, in the absence of the Secretary or in the event of the Secretary's inability or refusal to act, perform the duties and exercise the powers of the Secretary.

5

SECTION 4.8. DELEGATION OF AUTHORITY. Such other officers as the Board of Directors may choose shall perform such duties and have such powers as from time to time may be assigned to them by the Board of Directors. The Board of Directors may delegate to any other officer of the corporation the power to choose such other officers and to prescribe their respective duties and powers. All powers and authority conferred to officers of the corporation in these bylaws shall be subject to (a) any limitations on authority as the Board of Directors may adopt, amend or repeal and (b) any requirement that stockholders approve an action or matter.

SECTION 4.9. REMOVAL. Any officer of the corporation shall serve at the pleasure of the Board of Directors (or, in the case of an officer appointed by the Chief Executive Officer, at the pleasure of the Chief Executive Officer) and shall hold office until the officer's successor is chosen and qualified or until the officer's earlier death, resignation or removal. Any officer may be removed at any time, with or without cause, by the Board of Directors (and, in the case of an officer appointed by the Chief Executive Officer, by the Chief Executive Officer). The removal shall be without prejudice to the contractual rights of the officer, if any, with the corporation.

SECTION 4.10. COMPENSATION. The compensation of officers of the corporation shall be fixed by the Board of Directors or by any officer(s) authorized by the Board of Directors to prescribe compensation for other officers.

SECTION 4.11. VOTING UPON INTERESTS IN OTHER BUSINESS ENTITIES. Unless otherwise ordered by the Board of Directors, any Officer or any person or persons appointed in writing by any of them, shall have full power and authority on behalf of the corporation to attend and to act and to vote at any meetings of stockholders of any corporation in which the corporation may hold stock, or at meetings of partnerships in which the corporation may hold partnership interests, or at any other meetings of holders of interests in business entities in which the corporation may hold interests, including limited liability companies, and at any such meeting shall possess and may exercise any and all rights and powers incident to the ownership of such stock, partnership interest or other interest, and which, as the owner thereof, the corporation might have possessed and exercised if present. The Board of Directors, by resolution, from time to time, may confer like powers upon any other person or persons.

ARTICLE V MISCELLANEOUS

SECTION 5.1. CERTIFICATES OF STOCK. Certificates of stock, signed by the President, Vice-President, Secretary or Assistant Secretary, may be issued or shares of stock may remain uncertificated. Any of or all the signatures may be facsimiles.

SECTION 5.2. LOST CERTIFICATES. A new certificate of stock may be issued in the place of any certificate theretofore issued by the corporation, alleged to have been lost or destroyed, and the directors may, in their discretion, require the owner of the lost or destroyed certificate, or such owner's legal representatives, to give the corporation a bond, in such sum as they may direct, not exceeding double the value of the stock, to indemnify the corporation against any claim that may be made against it on account of the alleged loss of any such certificate, or the issuance of any such new certificate.

SECTION 5.3. TRANSFER OF SHARES. The shares of stock of the corporation shall be transferable only upon its books by the holders thereof in person or by their duly authorized attorneys or legal representatives, and upon such transfer the old certificates shall be surrendered to the corporation by the delivery thereof to the person in charge of the stock and transfer books and ledgers, or to such other person as the directors may designate, by whom they shall be cancelled, and new certificates shall thereupon be issued. A record shall be made of each transfer and whenever a transfer shall be made for collateral security, and not absolutely, it shall be so expressed in the entry of the transfer.

6

SECTION 5.4. STOCKHOLDERS RECORD DATE. In order that the corporation may determine the stockholders entitled to notice of or to vote at any meeting of stockholders or any adjournment thereof, or to express consent to corporate action in writing without a meeting, or entitled to receive payment of any dividend or other distribution or allotment of any rights, or entitled to exercise any rights in respect of any change, conversion or exchange of stock or for the purpose of any other lawful action, the Board of Directors may fix, in advance, a record date, which shall not be more than sixty nor less than ten days before the date of such meeting, nor more than sixty days prior to any other action. A determination of stockholders of record entitled to notice of or to vote at a meeting of stockholders shall apply to any adjournment of the meeting;

provided, however, that the Board of Directors may fix a new record date for the adjourned meeting.

SECTION 5.5. DIVIDENDS. The Board of Directors may from time to time declare such dividends as they shall deem advisable and proper, subject to such restrictions as may be imposed by law and the Certificate of Incorporation.

SECTION 5.6. NO CORPORATE SEAL. There shall be no corporate seal.

SECTION 5.7. FISCAL YEAR. The fiscal year of the corporation shall be determined by resolution of the Board of Directors.

SECTION 5.8. CHECKS. All checks, drafts or other orders for the payment of money, notes or other evidences of indebtedness issued in the name of the corporation shall be signed by such officer or officers, agent or agents of the corporation, and in such manner as shall be determined from time to time by resolutions of the Board of Directors.

SECTION 5.9. NOTICE AND WAIVER OF NOTICE. Whenever any notice is required by these Bylaws to be given, personal notice is not meant unless expressly so stated, and any notice so required shall be deemed to be sufficient if given by depositing the same in the United States mail, postage prepaid, addressed to the person entitled thereto at his address as it appears on the records of the corporation, and such notice shall be deemed to have been given on the day of such mailing. Stockholders not entitled to vote shall not be entitled to receive notice of any meetings except as otherwise provided by law.

Whenever any notice whatever is required to be given under the provisions of any law, or under the provisions of the Certificate of Incorporation of the corporation or these Bylaws, a waiver thereof in writing, signed by the person or persons entitled to said notice, whether before or after the time stated therein, shall be deemed equivalent thereto.

ARTICLE VI INDEMNIFICATION

SECTION 6.1. RIGHT TO INDEMNIFICATION. The corporation shall indemnify and hold harmless to the fullest extent permitted by law any person who was or is made or is threatened to be made a party or is involved in any action, suit, or proceeding whether civil, criminal, administrative or investigative ("proceeding") by reason of the fact that he or she, or a person for whom he or she is the legal representative, is or was a director, officer or employee of the corporation or is or was serving at the request of the corporation as a director, officer or employee of another corporation or of a partnership, joint venture, trust, enterprise or non-profit entity, including service with respect to employee benefit plans, against all expenses, liability, and loss reasonably incurred or suffered by such person. The corporation shall indemnify any person seeking indemnity in connection with a proceeding initiated by such person only if the proceeding was authorized by the Board of Directors.

7

SECTION 6.2. PREPAYMENT OF EXPENSES. The corporation shall pay the expenses reasonably incurred in defending any such proceeding in advance of its final disposition; provided, however, the payment of expenses incurred by a director, officer or employee in his or her capacity as a director, officer or employee (except with regard to service to an employee benefit plan or nonprofit entity) in advance of the final disposition of the proceeding shall be made only upon the agreement by the director, officer or employee to repay all amounts advanced if it should be determined that the director, officer or employee is not entitled to be indemnified under this Article VI or otherwise, and provided, further, that the corporation shall have no obligation to pay any expenses in advance pursuant to this Section 6.2 to any person who is or was an employee of the corporation (other than a director or an officer) or is or was serving at the request of the corporation as an employee of another corporation or of a partnership, joint venture, trust, enterprise or non-profit entity, with respect to any proceeding by or in the right of the corporation to procure a judgment in its favor.

SECTION 6.3. CLAIMS. If a claim under this Article VI is not paid in full within ninety days after a written claim has been received by the corporation, the claimant may file suit to recover the unpaid amount of such claim and, if successful in whole or in part, shall be entitled to be paid in addition the expense of prosecuting such claim. In any such action the corporation shall have the burden of proving that the claimant was not eligible for indemnification under applicable law.

SECTION 6.4. NON-EXCLUSIVITY OF RIGHTS. The rights conferred on any person by this Article VI shall not be exclusive of any other right which such person may have or hereafter acquire under any statute, provision of the Certificate of Incorporation, these Bylaws, agreement, vote of stockholders or disinterested directors or otherwise.

SECTION 6.5. EFFECT OF AMENDMENT OR REPEAL. The foregoing provisions of this Article VI shall be deemed to be a contract between the corporation and any person described in Section 6.1 above. Any repeal or modification of this Article VI shall not affect any rights or obligations then existing with respect to any acts or omissions occurring prior to such amendment or repeal, regardless of whether any action, suit or proceeding based in whole or in part on any such acts or omissions is commenced before or after any such repeal or modification.

ARTICLE VII AMENDMENTS

These Bylaws may be altered or repealed and Bylaws may be made at any annual meeting of the stockholders or at any special meeting thereof if notice of the proposed alteration or repeal or Bylaw or Bylaws to be made be contained in the notice of such special meeting, by the affirmative vote of a majority of the stock issued and outstanding and entitled to vote thereat.

Effective: June 18, 2025

FIRST SUPPLEMENTAL INDENTURE

FIRST SUPPLEMENTAL INDENTURE, dated as of June 18, 2025 (this “Supplemental Indenture”), between United States Steel Corporation, a Delaware corporation (the “Company”) and The Bank of New York Mellon, as trustee (the “Trustee”), to the Indenture, dated as of October 21, 2019 (the “Base Indenture”, as supplemented by this Supplemental Indenture and as further amended and supplemented from time to time, the “Indenture”), between the Company and the Trustee.

WITNESSETH

WHEREAS, the Company previously issued its 5.00% Senior Convertible Notes due 2026 (the “Notes”) under the Base Indenture;

WHEREAS, in connection with that certain Agreement and Plan of Merger, dated as of December 18, 2023 (as amended, restated, amended and restated, supplemented or otherwise modified from time to time, the “Agreement”), among, *inter alios*, the Company, Nippon Steel North America, Inc., a New York corporation (“Parent”), and 2023 Merger Subsidiary, Inc., a Delaware corporation and a wholly owned subsidiary of Parent (“Purchaser”), pursuant to which, effective as of June 18, 2025 (the “Effective Date”), (A) Purchaser merged with and into the Company (the “Merger”), with the Company surviving the Merger as a wholly owned subsidiary of Parent and (B) at the Effective Date, each outstanding share of common stock of the Company, par value \$1.00 per share (the “Shares”) (excluding (x) Shares owned by the Company or any wholly owned subsidiary of the Company as treasury stock or otherwise, but including, for the avoidance of doubt, any Shares held by any Company Employee Plan (as defined in the Agreement) or trust related thereto (other than, for the avoidance of doubt, Shares reserved for issuance under any of the Company Equity Plans (as defined in the Agreement)) or held, directly or indirectly, by Parent, Purchaser or any wholly owned subsidiary of Parent immediately prior to the Effective Date and (y) Shares that are issued and outstanding immediately prior to the Effective Date (other than the shares described in the foregoing clause (x)) and that are held by holders that did not vote in favor of the adoption of the Agreement or consented thereto in writing and are entitled to demand and properly demand, exercise and perfect appraisal of such shares pursuant to Section 262 of the General Corporation Law of the State of Delaware) were automatically converted into the right to receive \$55.00 per share (the “Merger Consideration”) in cash, without interest, subject to any required tax withholding;

WHEREAS, in connection with the foregoing, Section 14.07(a) of the Base Indenture provides that, at the Effective Date, the right to convert each \$1,000 principal amount of Notes into a number of shares of the Common Stock equal to the Conversion Rate in effect immediately prior to the Merger will, without the consent of the Holders, be changed into a right to convert each \$1,000 principal amount of Notes into or based on a number of Units of Reference Property equal to the Conversion Rate in effect immediately prior to the Merger, and provides that the Company shall execute a supplemental indenture with the Trustee to provide for such change in the right to convert each \$1,000 principal amount of Notes;

WHEREAS, pursuant to Section 10.01 of the Base Indenture, the Trustee is authorized to sign any amendment, supplement or waiver to the Base Indenture without the consent of any Holder if such amendment, supplement or waiver does not adversely affect the rights, duties or immunities of the Trustee under the Indenture.

NOW, THEREFORE, in consideration of the foregoing and for other good and valuable consideration, the receipt of which is hereby acknowledged, the Company and the Trustee mutually covenant and agree for the equal and ratable benefit of the Holders as follows:

(1) Definition of Terms.

- (a) Capitalized terms used herein without definition shall have the meanings assigned to them in the Indenture.
- (b) All references herein to Articles and Sections, unless otherwise specified, refer to the corresponding Articles and Sections of the Indenture.
- (c) The terms “herein”, “hereof”, “hereunder” and other words of similar import refer to this Supplemental Indenture.
- (d) In the event of a conflict between any definition set forth in the Indenture and any definition set forth in this Supplemental Indenture, the definitions set forth in this Supplemental Indenture shall control.

(2) Settlement upon Conversion. In accordance with Section 14.07(a) of the Indenture, in connection with the consummation of the Merger and the occurrence of a Share Exchange Event, from and after the Effective Date, each \$1,000 principal amount of Notes shall be convertible solely into an amount of cash equal to (i) the Merger Consideration *multiplied* by (ii) the number of shares of Common Stock that a Holder would have received under the Conversion Rate in effect immediately prior to the Merger, which is the amount of cash that Holders of the Notes would have been entitled to receive upon the consummation of the Merger had each \$1,000 principal amount of the Notes been converted into a number of shares of Common Stock equal to the Conversion Rate immediately prior to the Merger. The procedures for settlement upon conversion set forth in the Indenture shall continue to apply *mutatis mutandis* to the Holders’ right to convert the Notes into the cash amount described in this Supplemental Indenture, and any reference in the Indenture to Holders’ right to convert the Notes into any Settlement Amount shall be deemed to be a reference to Holders’ right to convert the Notes into the cash amount described in this Supplemental Indenture.

(3) Ratification of Indenture: Supplemental Indenture Part of Indenture Except as expressly provided for herein, the Indenture is in all respects ratified and confirmed and all the terms, conditions and provisions thereof shall remain in full force and effect. This Supplemental Indenture shall form a part of the Indenture for all purposes, and every Holder of Notes heretofore or hereafter authenticated and delivered shall be bound hereby.

(4) No Recourse Against Others. No director, officer, employee, incorporator or stockholder of the Company shall have any liability for any obligations of the Company under the Notes, the Indenture, the Supplemental Indenture or any claim based on, in respect of, or by reason of, such obligations or their creation. Each Holder, by accepting a Note, waives and releases all such liability. The waiver and release are part of the consideration for issuance of the Notes.

(5) Governing Law. This Supplemental Indenture, and any claim, controversy or dispute arising under or related to this Supplemental Indenture shall be governed by, and construed in accordance with, the laws of the State of New York.

(6) Execution in Counterparts. The parties may sign any number of copies of this Supplemental Indenture. Each signed copy shall be an original, but all of them together shall represent the same agreement. Delivery of an executed counterpart of a signature page to this Supplemental Indenture by telecopier, facsimile or other electronic transmission (e.g. a “pdf” or “tif”) (including any electronic signature complying with the New York Electronic Signatures and Records Act (N.Y. State Tech. §§ 301-309), as amended from time to time, or other applicable law) shall be effective as delivery of a manually executed counterpart thereof.

(7) Effect of Headings. The section headings herein are for convenience only and shall not affect the construction hereof.

(8) Effect on Successors and Assigns. All covenants and agreements in this Supplemental Indenture given by the parties hereto shall bind their successors and assigns, whether so expressed or not.

[Remainder of Page Intentionally Left Blank; Signature Pages Follow]

IN WITNESS WHEREOF, the parties hereto have caused this Supplemental Indenture to be duly executed, all as of the date first above written.

UNITED STATES STEEL CORPORATION

By: /s/ Arne Jahn

Name: Arne Jahn

Title: Vice President – Treasurer & Chief Risk Officer

[Signature Page to First Supplemental Indenture]

THE BANK OF NEW YORK MELLON,
as Trustee

By: /s/ Glenn McKeever

Name: Glenn McKeever

Title: Vice President

[Signature Page to First Supplemental Indenture]

ELEVENTH SUPPLEMENTAL INDENTURE

ELEVENTH SUPPLEMENTAL INDENTURE, dated as of June 18, 2025 (this “Supplemental Indenture”), between United States Steel Corporation, a Delaware corporation (the “Company”) and The Bank of New York Mellon (formerly known as The Bank of New York), as trustee (the “Trustee”).

WITNESSETH

WHEREAS, the Company and the Trustee executed and delivered an Indenture, dated as of May 21, 2007 (the “Base Indenture”), as supplemented by the First Supplemental Indenture, dated as of May 21, 2007 (the “First Supplemental Indenture”), among the Company and the Trustee, relating to the Company’s 6.65% Senior Notes due June 1, 2037 (the “2037 Notes”), and as further supplemented by the Tenth Supplemental Indenture, dated as of February 11, 2021 (the “Tenth Supplemental Indenture”) and, collectively with the Base Indenture and the First Supplemental Indenture, the “Indenture”), among the Company and the Trustee, relating to the Company’s 6.875% Senior Notes due March 1, 2029 (the “2029 Notes”) and, collectively with the 2037 Notes, the “Notes”);

WHEREAS, in connection with that certain Agreement and Plan of Merger, dated as of December 18, 2023 (as amended, restated, amended and restated, supplemented or otherwise modified from time to time), among the Company, Nippon Steel North America, Inc., a New York corporation (“Parent”), and 2023 Merger Subsidiary, Inc., a Delaware corporation and a wholly owned subsidiary of Parent (“Purchaser”), pursuant to which Purchaser will merge with and into the Company (the “Merger”), with the Company surviving the Merger as a wholly owned subsidiary of Parent;

WHEREAS, in connection with the Merger, the Company shall cease to prepare annual and quarterly reports on Form 10-K and Form 10-Q;

WHEREAS, pursuant to Section 9.01(9) of the Base Indenture, the Company, when authorized by an Establishment Action, and the Trustee, may from time to time enter into a supplemental indenture without the consent of the Holders for the purpose of curing any ambiguity or correcting or supplementing any provision of the Indenture which may be defective or inconsistent with any other provision of the Indenture;

WHEREAS, all things necessary to make this Supplemental Indenture a legal and binding supplement to the Indenture in accordance with its terms and the terms of the Indenture have been done; and

WHEREAS, the Company (i) has complied with all conditions precedent provided for in the Indenture relating to this Supplemental Indenture and (ii) desires and has requested the Trustee to join with it in entering into this Supplemental Indenture for the purpose of amending the Indenture in certain respects as permitted by Section 9.01(9) of the Base Indenture.

NOW, THEREFORE, in consideration of the foregoing and for other good and valuable consideration, the receipt of which is hereby acknowledged, the Company and the Trustee mutually covenant and agree for the equal and ratable benefit of the Holders as follows:

(1) Scope of Supplemental Indenture. This Supplemental Indenture constitutes a supplement to the Indenture and an integral part of the Indenture and shall be read together with the Base Indenture and each of the First Supplemental Indenture and Tenth Supplemental Indenture, as applicable, as though all the provisions thereof are contained in one instrument. Except as expressly amended by this Supplemental Indenture, the terms and provisions of the Indenture shall remain in full force and effect. Notwithstanding the foregoing, this Supplemental Indenture shall only apply to the Notes.

(2) Definition of Terms.

- (a) Capitalized terms used herein without definition shall have the meanings assigned to them in the Indenture.
- (b) All references herein to Articles and Sections, unless otherwise specified, refer to the corresponding Articles and Sections of the Indenture.
- (c) The terms “herein”, “hereof”, “hereunder” and other words of similar import refer to this Supplemental Indenture.

(d) In the event of a conflict between any definition set forth in the Indenture and any definition set forth in this Supplemental Indenture, the definitions set forth in this Supplemental Indenture shall control.

(3) Amendments to Indenture. With respect to the Notes, each of the First Supplemental Indenture and the Tenth Supplemental Indenture is hereby corrected and supplemented pursuant to Section 9.01(9) of the Base Indenture to amend and restate, in its entirety, the definition of “Consolidated Net Tangible Assets” in Section 1.03 of the First Supplemental Indenture and Section 1.03 of the Tenth Supplemental Indenture as follows:

“Consolidated Net Tangible Assets” means, as of the time of determination, the aggregate amount of the assets of the Company and the assets of its consolidated Subsidiaries after deducting (1) all goodwill, trade names, trademarks, service marks, patents, unamortized debt discount and expense and other intangible assets and (2) all current liabilities, as reflected on the consolidated balance sheet contained in financial statements for the most recently completed fiscal quarter and prepared by the Company in accordance with GAAP and provided to the Holders within such time periods as would have been required by the Exchange Act if the Company were a “non-accelerated filer” (and which financial statements have not been subsequently disclaimed as being not reliable by the Company) prior to the time as of which “Consolidated Net Tangible Assets” is being determined. Financial statements may be deemed to be provided to holders if the Company (x) posts such financial statements on a website (which may be nonpublic and may be maintained by the Company or a third party) to which access will be given to Holders that certify their status as such to the reasonable satisfaction of the Company or (y) otherwise makes the information publicly available (including by posting such information on EDGAR).

(4) No Recourse Against Others. No director, officer, employee, incorporator or stockholder of the Company shall have any liability for any obligations of the Company under the Notes, the Indenture, the Supplemental Indenture or any claim based on, in respect of, or by reason of, such obligations or their creation. Each Holder, by accepting a Note, waives and releases all such liability. The waiver and release are part of the consideration for issuance of the Notes.

(5) Trust Indenture Act Controls. If any provision hereof limits, qualifies or conflicts with the duties imposed by Section 310 through 317 of the Trust Indenture Act, the imposed duties shall control.

(6) Governing Law. This Supplemental Indenture shall be governed by, and construed in accordance with, the laws of the State of New York.

(7) Execution in Counterparts. The parties may sign any number of copies of this Supplemental Indenture. Each signed copy shall be an original, but all of them together shall represent the same agreement. Delivery of an executed counterpart of a signature page to this Supplemental Indenture by telecopier, facsimile or other electronic transmission (e.g. a “pdf” or “tif”) (including any electronic signature complying with the New York Electronic Signatures and Records Act (N.Y. State Tech. §§ 301-309), as amended from time to time, or other applicable law) shall be effective as delivery of a manually executed counterpart thereof.

(8) Effect of Headings. The section headings herein are for convenience only and shall not affect the construction hereof.

(9) Effect on Successors and Assigns. All covenants and agreements in this Supplemental Indenture given by the parties hereto shall bind their successors and assigns, whether so expressed or not.

(10) Trustee Disclaimer. The Trustee makes no representation as to the validity or sufficiency of this Supplemental Indenture other than as to the validity of its execution and delivery by the Trustee. The recitals and statements herein are deemed to be those of the Company and not the Trustee.

[Remainder of Page Intentionally Left Blank; Signature Pages Follow]

IN WITNESS WHEREOF, the parties hereto have caused this Supplemental Indenture to be duly executed, all as of the date first above written.

UNITED STATES STEEL CORPORATION

By: /s/ Arne Jahn

Name: Arne Jahn

Title: Vice President – Treasurer & Chief Risk Officer

[Signature Page to Eleventh Supplemental Indenture]

THE BANK OF NEW YORK MELLON,
as Trustee

By: /s/ Glenn McKeever

Name: Glenn McKeever

Title: Vice President

[Signature Page to Eleventh Supplemental Indenture]

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 23

Obayashi, Y. (2025, August 28) Nippon Steel bets on \$11 billion investment, tech transfer to lift
U.S. Steel profit, *Reuters*.

<https://www.reuters.com/business/nippon-steel-bets-11-billion-investment-tech-transfer-lift-us-steel-profit-2025-08-28/>

Nippon Steel bets on \$11 billion investment, tech transfer to lift U.S. Steel profit

By Yuka Obayashi, Katya Golubkova and Ritsuko Shimizu

August 28, 2025 12:03 PM CDT · Updated August 28, 2025



The Nippon Steel logo is displayed at the company's East Nippon Works Kimitsu Area plant in Kimitsu, east of Tokyo, Japan May 26, 2025. REUTERS/Issei Kato/File Photo [Purchase Licensing Rights](#)

Summary Companies

Nippon steel bets on \$11 bln U.S. Steel investment

Sees profit contribution of 250 billion yen by fiscal 2028

Detailed investment plan to follow later this year

TOKYO, Aug 29 (Reuters) - Japan's Nippon Steel ([5401.T](#)) plans to increase profit at U.S. Steel through an \$11 billion investment and the transfer of its operational techniques and advanced technologies to expand capacity and add more high-grade products, a senior executive said.

Nippon Steel's \$14.9-billion [acquisition of U.S. Steel](#) closed in June, ending an 18-month process that had been caught up in the shifting political landscape during the transition between the Biden and Trump administrations.

The investment, running through 2028, and transfer of expertise aim to lift U.S. Steel's annual profit contribution to 250 billion yen (\$1.70 billion) as early as fiscal 2028, up from an expected 150 billion yen in 2026 and 80 billion this year.

"Real effects from the investment will appear after 2028," Nippon Steel Vice Chairman Takahiro Mori told Reuters on Thursday, adding that profitability could even grow beyond 250 billion yen.

Mori, the lead negotiator on the deal and now Chairman of U.S. Steel, said the investment would raise U.S. Steel's domestic crude steel capacity to around 20 million tons from 17 million.

The acquisition also lifts Nippon Steel's global annual crude steel capacity to 86 million tons, edging closer to its longer-term 100 million-ton target.

A detailed investment plan will be announced later this year as part of Nippon Steel's new medium-term business strategy.

Nippon Steel said in July it would [raise 500 billion yen](#) through a subordinated loan to partially repay a 2 trillion yen bridging loan that funded the deal.

Mori said the steelmaker also has flexibility with hybrid financing and may consider convertible and corporate bonds.

"We'll assess the optimal timing, interest rates, and whether yen or dollar denominations are preferable to pursue the best financing strategy," he said, adding that equity financing was possible, but only within limits to avoid shareholder dilution.

U.S. Steel would fund the \$11 billion investment initially, with Nippon Steel stepping in if resources prove insufficient, Mori said.

He said that U.S. Steel is assessing the impact of an August explosion at its Clairton plant in Pennsylvania, which could lower, although not significantly, the expected 80 billion yen profit contribution to Nippon Steel for the current year.

(\$1 = 147.3300 yen)

Reporting by Yuka Obayashi, Katya Golubkova and Ritsuko Shimizu; Editing by Kirsten Donovan

Our Standards: [The Thomson Reuters Trust Principles.](#)

Suggested Topics:



Yuka Obayashi
Thomson Reuters

Yuka Obayashi reports on Japan's energy, metals and other commodities.



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 24

Lovrien, J. (2024, May 23) Keetac's new DR-grade plant up and running,
Duluth News Tribune.

<https://www.duluthnewstribune.com/news/local/keetacs-new-dr-grade-pellet-plant-up-and-running>

NEWS LOCAL

Keetac's new DR-grade pellet plant up and running

Employees, surrounding community are hopeful it will ensure a more stable future at Keewatin's iron ore mine and pellet plant.



A Keetac employee works in U.S. Steel's new DR-grade pellet plant Thursday. Wyatt Buckner / Duluth Media Group



By **Jimmy Lovrien**

May 23, 2024 at 6:42 PM

 Comments

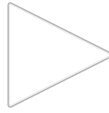
 Share

 News Reporting

KEEWATIN — Of the six operating taconite mines and pellet plants on the Iron Range, U.S. Steel's Keetac facility is often the first to idle and the last to reopen when the economy slumps or steel prices fall.

U.S. Steel Celebrates New Keetac DR-Grad...

Produced by Wyatt Buckner



But workers and community leaders hope Keetac's recently completed \$150 million direct reduced-grade pellet plant could change that.

"It should give us extra options when markets kind of dip ... I think it will be good," said Jake Friend, a Keetac electrician and president of United Steelworker Local 2660.



Flotation tanks remove silica from iron concentrate in the Keetac DR-grade pellet plant. Wyatt Buckner / Duluth Media Group

DR-grade pellets serve as feedstock when making direct-reduced iron or hot-briquetted iron, which in turn supply electric arc

furnaces making steel.

Electric arc furnaces now make more than 70% of steel in the U.S.

Until the first shipment of DR-grade pellets left Keetac on May 7, U.S. Steel's two Minnesota ore operations, Keetac and Minntac in Mountain Iron, only provided pellets to traditional blast furnaces.

More markets could help boost demand for Keetac pellets and keep the facility's approximately 500 employees working consistently and further into the future. According to the company, the DR-grade pellet plant created 33 new jobs.



Steam rises from the new Keetac DR-grade pellet plant. Wyatt Buckner / Duluth Media Group

“It gives our little Keewatin a future to look forward to,” Keewatin Mayor Michael LaBine told the crowd gathered in a tent at Keetac on Thursday to celebrate the plant’s opening.

The DR-grade pellet plant was built to the side of the existing pellet plant, allowing it to intercept iron particles that have already been crushed and concentrated with existing equipment. The new facility then crushes the particles into an even finer powder and removes more waste material with magnets and chemical flotation separation. That leads to an iron concentrate with more iron and less silica.



The iron concentrate then returns to the existing facility, where it is dried, shaped and baked into marble-sized pellets, taken by rail to the Allouez Ore Dock in Superior and shipped to third-party steel producers.

Minnesota Gov. Tim Walz told the crowd it's "the golden age of infrastructure investment." He noted that the raw material needed for steel to build a replacement for the Blatnik Bridge linking Duluth and Superior and other projects will come from the Iron Range.

He said having the vision to see future needs means investments and expansions today and that the new DR-grade plant helps secure Iron Range jobs.



Minnesota Gov. Tim Walz speaks at the ribbon-cutting event for U.S. Steel's new Keetac DR-grade pellet plant. Wyatt Buckner / Duluth Media Group

“These are good-paying union jobs. These are jobs that built the middle class. These are the jobs that allow people in this room to live in communities they choose to live in,” Walz said.

Thursday’s celebration comes as Japan’s [Nippon Steel tries to buy U.S. Steel for \\$14.9 billion](https://www.duluthnewstribune.com/news/national/japan-nippon-steel-to-buy-us-steel-in-14-9-billion-deal).

(<https://www.duluthnewstribune.com/news/national/japan-nippon-steel-to-buy-us-steel-in-14-9-billion-deal>) But the deal faces opposition from the United Steelworkers, President Joe Biden and former President Donald Trump. The U.S. Department of Justice launched an anti-trust investigation into the deal last month.

Representatives from Nippon Steel were at Thursday’s event.

U.S. Steel President and CEO Dave Burritt speaks to the media Thursday. Wyatt Buckner / Duluth Media Group

U.S. Steel President and CEO Dave Burritt said Nippon had “deeper pockets” and could provide “security that would be better than before” for the company.

And Keetac and Minntac would be part of the company’s future.

“This facility is critical to the success of not just U.S. Steel, but also Nippon ... This is clearly a competitive advantage,” Burritt told reporters. “This is the best mine site — Minntac and Keetac — in all of Minnesota. Nobody’s close to us here and that’s good news, and they (Nippon) know that.”

-

”

Earlier this week, U.S. Steel sparred with rival iron ore miner and steelmaker Cleveland-Cliffs through news releases.

U.S. Steel began looking for potential buyers last August after what Burritt called a “hostile takeover” attempt by Cliffs. U.S. Steel rejected Cliffs’ \$7.3 billion, or \$35 per share, offer that month.

It then rejected Cliffs’ sweetened offer of \$54 per share in December over antitrust concerns, picking Nippon’s \$55-per-share offer instead.



A high-intensity grinding mill at Keetac DR-grade pellet plant. Wyatt Buckner / Duluth Media Group

Cliffs has criticized the U.S. Steel-Nippon deal ever since. (<https://www.duluthnewstribune.com/news/local/cleveland-cliffs-slams-us-steel-nippon-deal>) That prompted the U.S. Steel board of directors to issue a statement Monday.

“The investment by (Nippon) has been under attack since day one by one of our competitors and unsuccessful bidder — Cleveland-Cliffs — who have been sowing misinformation to our stakeholders in a relentless and unbridled effort to derail the transaction,” the board wrote.



A screen filters iron concentrate so large iron particles can undergo additional grinding. Wyatt Buckner / Duluth Media Group

Cliffs shot back in a statement a few hours later, noting the United Steelworkers are staunchly opposed to the U.S. Steel-Nippon deal and have said it has a contractual provision allowing it to veto the deal.

“With a USW-represented facility, you are not entitled to sell to whomever you please,” said Lourenco Goncalves, president and CEO of Cliffs. “We knew this, and you apparently did not. We tried to explain to you, but you did not listen to us. The board of directors of U.S. Steel failed its stockholders in this ‘strategic review process,’ and is attempting to blame Cliffs for its own self-inflicted disaster.

"My opinion remains the same: You cannot and will not close your announced deal with Nippon Steel.”

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 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.



REGION 5

CHICAGO, IL 60604

September 6, 2024

Theresa Haugen, Manager
Water and Mining Section
Industrial Division
Minnesota Pollution Control Agency
520 Lafayette Road North
Saint Paul, Minnesota 55155-4194
Theresa.haugen@state.mn.us

Re: Review of Two Draft NPDES Permits, U.S. Steel Keetac Mining Area (MN0031879) and U.S. Steel Keetac Tailings Basin (MN0055948), Keewatin, Minnesota

Dear Ms. Haugen:

The U.S. Environmental Protection Agency has reviewed the two pre-public notice draft National Pollutant Discharge Elimination System (NPDES) permits, fact sheets, and supporting documents for the U.S. Steel Keetac mining operation located in Keewatin, Minnesota. The Keetac Tailings Basin (MN0055948) documents were submitted to EPA on July 30, 2024, and the Keetac Mining Area (MN0031879) documents were submitted to EPA on August 1, 2024. Based on our review to date, EPA has the following comments.

1. ***Anti-Backsliding with the Inclusion of New Compliance Schedules for Sulfate*** – The previously-issued and currently-effective permits contain compliance schedules for the facilities to meet water quality-based effluent limitations (WQBELs) for sulfate of 14 milligrams per liter (mg/L) as an average monthly limit and 24 mg/L as a maximum daily limit by August 17, 2018, at the mine site and August 17, 2019, at the tailings basin site. The draft permits include new compliance schedules for the same parameter, with interim monthly maximum limits set to 167 mg/L, and no fixed date for the facility to come into compliance with final WQBELs. 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\(l\)\(1\)](#)¹ unless one of the exceptions in those statutory and regulatory provisions applies, which does not appear to be the case.
2. ***Compliance Schedules are not Appropriate*** - Even if one of the anti-backsliding exceptions applied, inclusion of compliance schedules in the permits is not appropriate because the

¹ 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](#).

Minnesota Pollution Control Agency (MPCA) has not made a finding supported by the record that compliance schedules are appropriate (see [40 C.F.R. § 122.47](#)). As explained in an EPA memorandum²:

In order to grant a compliance schedule in an NPDES permit, the permitting authority has to make a reasonable finding, adequately supported by the administrative record and described in the fact sheet (40 C.F.R. § 124.8), that a compliance schedule is “appropriate” and that compliance with the final WQBEL is required “as soon as possible.” See 40 C.F.R. §§ [122.47\(a\)](#), [122.47\(a\)\(1\)](#).

And

Factors relevant to whether a compliance schedule in a specific permit is “appropriate” under [40 C.F.R. § 122.47\(a\)](#) include: how much time the discharger has already had to meet the WQBEL(s) under prior permits; [and] the extent to which the discharger has made good faith efforts to comply with the WQBELs and other requirements in its prior permit(s); ...

We are not able to locate an MPCA finding that compliance schedules are appropriate for these permits.

3. ***Compliance Schedules do not Comport with NPDES Permitting Requirements*** - Finally, even if one of the anti-backsliding exceptions applied and MPCA demonstrated that compliance schedules are appropriate, the compliance schedules are not consistent with other aspects of [40 C.F.R. § 122.47](#). Specifically:

- a. The draft schedules do not include an “enforceable sequence of actions or operations leading to compliance with a [water quality-based] effluent limitation [“WQBEL”]” as required by the definition of “schedule of compliance” in [40 C.F.R. § 122.2](#) and 33 U.S.C. § 1362(17). See also the Hanlon Memo in footnote 2. Specifically, the draft permits describe the deadline for achieving compliance with the final sulfate effluent limitations as “within 12 months of completing construction,” but this milestone and others are triggered from milestones that hinge on MPCA’s approval of various submissions, actions that may never occur and are not connected to specific dates. Therefore, there is no final date for compliance in either of the permits.

There is no demonstration that the draft schedules of compliance require compliance with the final effluent limitations “as soon as possible” in accordance with [40 C.F.R. § 122.47\(a\)\(1\)](#).

- b. The draft schedules of compliance do not identify specific dates for the completion of interim requirements (“interim dates”) as required by [40 C.F.R. § 122.47\(a\)\(3\)](#). All

² See Hanlon Memo (https://www3.epa.gov/npdes/pubs/memo_complianceschedules_may07.pdf).

interim dates must be established in accordance with [40 C.F.R. § 122.47\(a\)\(3\)\(i\)](#) and [40 C.F.R. § 122.47\(a\)\(3\)\(ii\)](#).

- c. The draft schedules of compliance do not comply with the 14-day reporting requirements for each interim date and the final date of compliance as specified in [40 C.F.R. § 122.41\(l\)\(5\)](#).
4. ***Evaluation of the need for WQBELs for specific conductance to protect aquatic life*** - The fact sheets indicate that the discharges have elevated specific conductance but do not show that MPCA determined 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. See [40 C.F.R. § 122.44\(d\)\(1\)\(i\)](#). During the course of MPCA's Class 3 and 4 standards revision rulemaking, MPCA determined that ionic pollutants, as measured by specific conductance, may adversely affect aquatic life and cause violations of Minnesota's Class 2 narrative criteria at Minn. R. 7050.0150, Subp. 3 and Minn. R. 7050.0222. This is consistent with analyses that EPA has conducted (see e.g., EPA's [A Field-Based Aquatic Life Benchmark for Conductivity in Central Appalachian Streams](#), EPA/600/R-10/023F, March 2011). MPCA provided assurance³ as well as a white paper that summarized how it would evaluate the need for specific conductivity conditions in implementation of its standards.⁴ That white paper identified ionic pollutants as being of possible concern for waters downstream of the facility.

We understand from the fact sheets that MPCA believes that any water quality issues related to specific conductivity or constituent ions will be resolved when sulfate in the discharge is reduced sufficiently to meet the wild rice criteria. However, the compliance schedule for sulfate does not require the facility to consider and report treatability information for other ions when developing its sulfate treatment/mitigation alternatives plans. Because it is unclear that the plans the facility develops to address sulfate will also reduce ionic pollutants to meet narrative water quality criteria, EPA does not agree that a plan to address sulfate should be a substitute for an analysis that directly addresses specific conductivity or its non-sulfate constituent ions. Please add to the record an analysis of the discharge of specific conductance or constituent ions to determine whether pollutants will cause, have the reasonable potential to cause, or contribute to an excursion above any state water quality standard, including narrative water quality standards. See 40 C.F.R. § 122.44(d)(1)(i). To the extent such "reasonable potential"

³ E.g., See p. 15 of MPCA's Implementing the Aquatic Life Narrative Standard document ("In cases where the evaluation clearly shows that the facility is causing or contributing to a biological impairment, the permit conditions would include specific effluent limits, likely to be based on meeting a specific water quality value for a given pollutant, which may be based on existing benchmark or criteria values or established as a site-specific standard") and p. 185 of MPCA's Statement of Need and Reasonableness in the Matter of Proposed Revisions of Minnesota Rule Chapters 7050 and 7053, Relating to Water Quality Standards – Use Classifications 3 and 4; Revisor ID No. 04335, available at <https://www.pca.state.mn.us/sites/default/files/wq-rule4-17k.pdf> ("Moving forward, when permits for the identified dischargers are reissued or revised, or when new permits are issued for discharges into those waters, the permitting process will specifically consider what permit conditions are needed to ensure the protection of the biological community. Some potential permit actions and conditions are described in the Appendix").

⁴ S-5 Implementing the Aquatic Life Narrative Standard (<https://www.pca.state.mn.us/sites/default/files/wq-wwprm1-36.pdf>)

exists and MPCA stands by the belief captured above, the fact sheet and permit will need to meet 40 C.F.R. § 122.44(d)(1)(vi)(C)(1)-(4).

5. **Functional Equivalent Direct Discharge (FEDD)** - Page 1 of both permits provide broad authorization to discharge from the “facility.” The Keetac Mining Area permit (MN0031879) needs to include language similar to that in the Tailings Basin permit (MN0055948). Specifically, the discharge authorization statement in the Mining Area permit needs to be revised to exclude any point source discharges to waters of the United States through ground water that are the functional equivalent of direct discharges under the Supreme Court decision in [County of Maui v. Hawaii Wildlife Fund, 140 S. Ct. 1462 \(2020\)](#). If the alternative is intended (i.e., the discharges are to be authorized), the permit needs appropriate technology- and water quality-based effluent limitations and other conditions for any authorized “functional equivalent” discharges.

In addition to the comments above, EPA recommends you consider and address the comments identified in Enclosure A to improve each permit and fact sheet.

When the proposed permits are prepared, please forward one copy each and any significant comments received during the public notice period to this office at r5NPDES@epa.gov. Please include the permittee name and permit numbers in the subject line and cc batka.allan@epa.gov. If you have any technical questions related to EPA’s review, please contact Allan Batka of my staff. He can be reached by telephone at (312) 353-7316 or batka.allan@epa.gov.

Thank you for your cooperation during the review process and your thoughtful consideration of our comments.

Sincerely,

STEPHEN JANN

Digitally signed by STEPHEN

JANN

Date: 2024.09.06 16:24:15 -05'00'

Stephen M. Jann
Manager, Permits Branch
Water Division

Enclosure

cc: Stephanie Handeland, MPCA, stephanie.handeland@state.mn.us

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 26

Johnson BL, Johnson MK, An Evaluation of a Field-Based Aquatic Life Benchmark for Specific
Conductance in Northeastern Minnesota, November 2015.

AN EVALUATION OF A FIELD-BASED AQUATIC LIFE BENCHMARK FOR SPECIFIC CONDUCTANCE IN NORTHEAST MINNESOTA

(November 2015)

Prepared by Bruce L. Johnson and Maureen K. Johnson for Water Legacy¹

I. Introduction

A. Specific Conductance

Specific conductance is an accurate, low cost, easily completed measurement directly related to salinity, a difficult-to-measure combined effect of all ions in the water. Under most conditions, specific conductance is applicable to identify ionic changes in surface water that have been shown to affect aquatic life. Native ion concentration levels are necessary to aquatic life, but negative effects on aquatic life from anthropogenic cumulative ionic toxicity are related to higher specific conductance levels.

This evaluation answers two questions:

1. Are the methods used by U.S. Environmental Protection Agency (EPA) to develop a specific conductance aquatic life benchmark for Appalachian ecoregions applicable in developing specific conductance aquatic life protections for ecoregions in Minnesota? For purpose of this evaluation the primary reference is EPA's *A Field-Based Aquatic Life Benchmark for Conductivity in Central Appalachian Streams* (EPA Conductivity Benchmark Study, 2011)².
2. Is the 300 micro Siemens per centimeter ($\mu\text{S}/\text{cm}$) guidance developed by EPA for the Appalachian ecoregions directly applicable as a maximum aquatic life benchmark for northeast Minnesota ecoregions 50n, the northern portion of 50p, and 50t (EPA, 2007)³ or as a Minnesota NPDES permit condition when sufficient background data is available?

This evaluation for northeast Minnesota is not a comprehensive review of all data sources relating to chemistry and benthic invertebrates in the specified area. Its intent is to demonstrate that significant data exists, and that if other existing historical and current data is added, little new data would be needed to support Minnesota's adoption of a

¹ Bruce L. Johnson is a biologist/chemist with 30 years of experience including water quality research with the U.S. Environmental Protection Agency, mining research with Minnesota Department of Natural Resources, mining permit enforcement with Minnesota Pollution Control Agency, and supervisory NPDES and hazardous waste permits compliance and research with Minnesota Department of Transportation. Among other responsibilities, Johnson served as the field chemist in charge of the metal pathways portion of the Minnesota Regional Copper-Nickel Study. Maureen K. Johnson is a biologist with 26 years of scientific experience, including water quality sampling and analysis for both U.S. Environmental Protection Agency and U.S. Forest Service, and managing cleanups of hazardous waste sites for the Minnesota Pollution Control Agency.

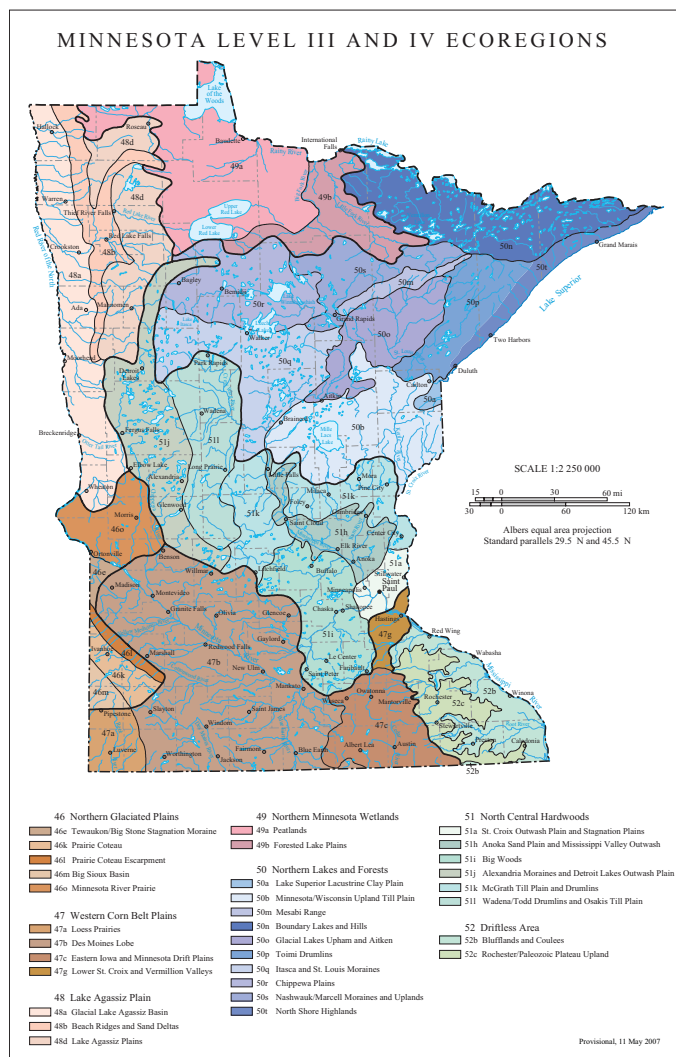
² U.S. Environmental Protection Agency, *A Field-Based Aquatic Life Benchmark for Conductivity in Central Appalachian Streams*, Office of Research and Development, National Center for Environmental Assessment, Washington, DC., 2011 EPA/600/R-10/023F. (hereinafter "EPA Conductivity Benchmark Study")

³ U.S. Environmental Protection Agency, *Minnesota Level III and IV Ecoregions*, 2007, www.epa.gov/wed/pages/ecoregions/mn_eco.htm.

numeric specific conductance benchmark or standard, at least as stringent as the Appalachian 300 $\mu\text{S}/\text{cm}$ specific conductance benchmark, based on protection of aquatic life in Minnesota ecoregions 50n, the northern portion of 50p, and 50t.

Figure 1, Map of Minnesota Level III and IV Ecoregions, illustrates these northeast Minnesota ecoregions. Pending such adoption of a data-driven specific conductance rule, the data is sufficient to support permit conditions implementing this 300 $\mu\text{S}/\text{cm}$ specific conductance benchmark in order to begin meeting Minnesota's existing narrative standards for aquatic life.

Figure 1. Map of Minnesota Level III and IV Ecoregions.



EPA defines “ecoregion” as an ecological region “identified through the analysis of the patterns and the composition of biotic and abiotic phenomena that affect or reflect differences in ecosystem quality and integrity. These phenomena include geology, physiography, vegetation, climate, soils, land use, wildlife, and hydrology. The relative importance of each characteristic varies from one ecological region to another regardless of

the hierarchical level.”⁴ (EPA, 2015). In general the Laurentian Divide delineates the southern boundary of the Ecoregion 50n and the coinciding northern boundary of 50p. At this interface, the area along the northern boundary of 50p is similar to 50n in climate, geology, topography, soils, hydrology, and vegetation. This inclusion is supported by the Minnesota Department of Natural Resources (MDNR) and U.S. Department of Agriculture Forest Service (USFS) Ecological Classification System, which differentiates between this 50p inclusion and the 50p region south of it (MDNR, USFS, et al. 1999).⁵ Thus the review includes this area in evaluating a Specific Conductance benchmark for permit limits or standard development for the 50n, northern part of 50p, and 50t ecoregions in Minnesota.

This review evaluates some of the available data for establishment of a numeric benchmark or standard on which to base permit effluent limits to comply with existing narrative standards for aquatic life in Minnesota. It compares aquatic life genera (a biological classification of a group of species) and specific conductance levels of unimpacted and mining-impacted headwater streams in Minnesota as well as comparing water chemistry and biological data in unimpacted and impacted streams in the coal mining area in two Appalachian headwater ecoregions. These ecoregions were studied in the EPA Conductivity Benchmark Study. After internal, external and public review of the EPA Study, EPA’s Science Advisory Board concluded, “the benchmark is applicable to the regions in which it was derived and the benchmark and the methodology may be applicable to other states and regions with appropriate validation.” (EPA Conductivity Benchmark Study, 2011).⁶

In this evaluation of data, for each genus which both Minnesota and Appalachian ecoregions have in common, the EPA’s specific conductance level at which 5 percent of the taxa have been lost as determined at the genus level (the XC95%) was recorded in column K of Table 1, Detailed Invertebrate Background, which is attached as Appendix A. As explained in the EPA Conductivity Benchmark Study, this evaluation criterion uses field data instead of lab data and is based on the EPA’s “standard methodology for deriving water-quality criteria, in that it uses the 5th centile of a species sensitivity distribution (SSD) as the benchmark value. SSDs represent the response of aquatic life as a distribution with respect to exposure.”⁷ (EPA Conductivity Benchmark Study, 2011).

EPA’s Conductivity Benchmark Study explains,

The method used in this report is based on the standard methodology for deriving water-quality criteria, as explained in Stephan *et al.* (1985), in that it used the 5th centile of a species sensitivity distribution (SSD) as the benchmark value. SSDs represent the response of aquatic life as a distribution with respect to exposure.

⁴ U.S. Environmental Protection Agency, *Ecoregion Maps and GIS Resources*, updated March 30, 2015 and citations therein, including Wiken 1986; Omernik 1987; Omernik 1995. See <http://archive.epa.gov/wed/ecoregions/web/html/ecoregions-2.html>.

⁵ Minnesota Department of Natural Resources, U.S. Department of Agriculture Forest Service, *et al.*, *Ecological Classification System, and Subsections Map*, 1999. <http://www.dnr.state.mn.us/ecs/index.html> and http://files.dnr.state.mn.us/natural_resources/ecs/subsection.pdf

⁶ *Ibid.*, 2, EPA Conductivity Benchmark Study, p. viii.

⁷ *Id.*, 2, EPA Conductivity Benchmark Study, p. xiv.

Data analysis followed the standard methodology in aggregating species to genera and using interpolation to estimate the centile. It differs primarily in that the points in the SSDs are extirpation concentrations (XCs) rather than median lethal concentrations (LC50s) or chronic values. The XC is the level of exposure above which a genus is effectively absent from water bodies in a region. For this benchmark value, the 95th centile of the distribution of the probability of occurrence of a genus with respect to conductivity was used as a 95th centile extirpation concentration. Hence, this aquatic life benchmark for conductivity is expected to avoid the local extirpation of 95% of native species (based on the 5th centile of the SSD) due to neutral to alkaline effluents containing a mixture of dissolved ions dominated by salts of SO_4^{2-} and HCO_3^{-1} . Because it is not protective of all genera and protects against extirpation rather than reduction in abundance, this level is not fully protective of sensitive species or higher quality, exceptional waters designated by state and federal agencies.⁸ (EPA Conductivity Benchmark Study, 2011).

EPA further notes, “an invertebrate genus may represent several species, and this approach identifies the pollutant level that extirpates all sampled species within that genus, that is, the level at which the least sensitive among them is rarely observed.”⁹ (EPA Conductivity Benchmark Study, 2011).

EPA provided Final Guidance in a memorandum to EPA Regional Administrators (EPA Final Guidance, 2011) on reviewing surface coal mining and applying the Conductivity Benchmark Study: “This final peer-reviewed study concludes that 5% of native macroinvertebrate genera are extirpated where the conductivity level reaches 300 $\mu\text{S}/\text{cm}$.” EPA Final Guidance also stated that when 5% of the native macroinvertebrate genera are extirpated, that conductivity level is “associated with significant biological degradation from loss of stream life,” and may prevent compliance with regulations for Clean Water Act Section 404 permits.¹⁰ (EPA Final Guidance, 2011). In other words, “significant biological degradation” indicates unacceptable pollution.

Minnesota rules reflect a similar definition of toxicity for aquatic life, establishing that the absence of toxic effects means “the protection of no less than 95% of all the species in any aquatic community.” (Minn. Rule 7050.0217, Subp. 2A).

It should be noted that this index of unacceptable pollution is not comparable to a watershed stressor evaluation using the Index of Biological Integrity (IBI)¹¹ (EPA, Index of Biological Integrity, 1998). IBI studies identify differences between unimpacted and impacted areas to determine the biological integrity (general health) of a component of a

⁸ *Id.*, 2, EPA Conductivity Benchmark Study, p. xiv. It should be noted that XC95% is equivalent to an EC5% standard.

⁹ *Id.*, 2, EPA Conductivity Benchmark Study, p. 26.

¹⁰ U.S. EPA, *Improving EPA Review of Appalachian Surface Coal Mining Operations Under the Clean Water Act, National Environmental Policy Act, and the Environmental Justice Executive Order*, July 21, 2011, pp. 32-33. [Hereinafter “EPA Final Guidance”]. Guidance approved in *National Mining Association v. McCarthy*, 758 F.3d 243 (D.C. Cir. 2014). EPA reference to regulations at 40 C.F.R. 230.10 and to Clean Water Act Section 404(b).

¹¹ EPA Office of Water, Office of Wetlands and Watersheds, *Developing an Index of Biologic Integrity*, EPA843-F-98e, July 1998, <http://water.epa.gov/type/wetlands/assessment/fact5.cfm>

biological system such as taxa richness. But an IBI does not relate taxa to water chemistry parameters like specific conductance or numeric standards. The IBI score may ignore outliers caused by a stressor that could be damaging numerous genera but is not captured by the “general health.”

B. Approach: Current Scientific Methods in Water Quality Protection

Due to the complexity and diversity of aquatic ecosystems, in practice no single or series of numeric standards or bioassays can be 100% protective of surface waters. There can be unidentified confounding factors such as unacceptable synergistic chemical (elemental and compound) impacts. Because of this, numerous methods have been developed to address impacts. The following is a brief discussion of some of the well-used methods:

Single chemical bioassays use extensively studied aquatic organisms under laboratory conditions. From these tests, acute and chronic toxicity values are determined by using a single toxicant. The resultant standard is then developed for the most sensitive of the laboratory test species for the specific chemical tested. Bioassays are also used to determine the impacts from wastewater by testing known organisms with suspect wastewater over an arbitrary time limit.

Synergistic impacts (multiple chemical toxicity) often can be addressed by using whole effluent toxicity testing (WET) procedures (EPA-821-R-02-013)¹². This method applies a series of standard bioassay organisms likely to be sensitive to the suspected contaminants. But, instead of single toxicant additions, it uses the field water in question to evaluate impact. The standard organisms may not be native to the field water.

Narrative standards may be used to address synergistic effects as well as the effects of single parameters. Examples of these standards in Minnesota are found in Minn. Rules 7050.0150, 7050.0170, 7050.0180, 7050.0185, 7050.0186, and 7052.0230.

Numeric standards can be based on uses such as irrigation of crops, as in Minn. Rule 7050.0224, Subp. 2. Numeric standards can also protect aquatic life and recreation, as in Minn. Rule 7050.0222, where Class 2 waters are protected for fishable and swimmable uses.

Field based benchmark methods are used to develop numeric standards. The field-based method has advantages over laboratory bioassays as follows:

1. The species involved are indigenous to the water tested;
2. The exposure time to the chemical is not arbitrarily limited;

¹² EPA, *Short Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*. October 2002. Available at http://water.epa.gov/scitech/methods/cwa/wet/disk3_index.cfm

3. The method assesses all life stages of the population and ecological interactions;
4. The method represents all exposure conditions for the parameter.

As stated previously, due to the complexity of aquatic life, all methods, among them water chemistry, bioassays, and species sensitivity distributions, must be used as applicable and appropriate to evaluate impacts. This field-based benchmark for specific conductance is the approach on which this paper is focused. Specific conductance is chosen because it is a synergistic measure of the effects of ionized substances in the water on aquatic life.¹³

C. Regulatory Provisions

Exceedances of individual numeric standards are accepted as indicative of polluted conditions (Minn. Rule 7050.0220, Subp. 1). Currently, Minnesota does not have a numeric specific conductance standard based on aquatic life criteria.

The existing Minnesota specific conductance standard of 1000 $\mu\text{S}/\text{cm}$ is a numeric limit applied to class 4A waters used for irrigation statewide (Minn. Rule 7050.0224, Subp. 2). The standard has been in place since 1966 with no change, based on protection of waters for irrigation of crops or vegetation.

Since then, specific conductance has commonly been used to observe daily, seasonal, and significant changes in water quality. However, beyond application to irrigation, Minnesota's standard is antiquated and fails to adequately protect aquatic life. As in Appalachian regions of Kentucky and West Virginia, under Minnesota rules narrative standards also apply. If both numeric and narrative standards are in place, the more stringent standard applies (Minn. Rule 7050.0150, Subp. 2).

The narrative standard in Minn. Rule 7050.0150, Subp. 3 further requires that "lower aquatic biota" not be seriously impaired or altered materially. Minnesota toxic pollutant regulations are applicable to protect the aquatic community from toxic effects, defined to mean "the protection of no less than 95% of all the species in any aquatic community. Greater protection may be applied to a community if economically, recreationally, or ecologically important species are very sensitive." (Minn. Rule 7050.0217 Subp. 1, 2).

Minn. Rule 7050.0180 designates waters of the Boundary Waters Canoe Area Wilderness, Department of Natural Resources designated scientific and natural areas, Lake Superior, and other waters of the state that warrant stringent protection from pollution, as *Outstanding resource value waters*. Those listed waters, unlisted waters, and unlisted wetlands in the Lake Superior Basin that are not designated Outstanding resource value waters or Class 7 waters are designated as *Outstanding international resource waters* under Minn. Rule 7052.0300, Subp. 3. These designations provide specific protections.

¹³American Public Health Association, *et al.*, *Standard Methods for the Examination of Water and Wastewater*, 12th Ed., 1965. p. 280.

Although specific conductance is not a listed toxic pollutant in Minnesota rules, “toxic pollutants” means pollutants, or combinations of pollutants, that will directly or indirectly cause “death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions, including malfunctions in reproduction, or physical deformation.” (Minn. Stat. §115.01, Subd. 20).

In summary, under Minnesota Rules, loss of 5% of the species in a community is considered polluted. The protection of 95% of all genera is the criterion EPA has determined to be protective for specific conductance in the Appalachians. EPA has also determined a loss of 5% of the genera within a community represents a significant degradation¹⁴ (EPA Conductivity Benchmark Study, 2011) and unacceptable. Minnesota’s rules are consistent with the EPA Appalachian specific conductance benchmark determination method, and an aquatic life benchmark for specific conductance could be implemented in Minnesota from a regulatory standpoint.

II. Methods

A. Applicability of Existing Specific Conductance Data

1. Existing Minnesota Data Sets

To obtain a relevant numeric specific conductance standard for Minnesota, existing water chemistry and biological data must be compared. As in the Appalachians, Minnesota has historical background data for the aforementioned Minnesota ecoregions. One source of such data is from the late 1970’s, the State of Minnesota’s Regional Copper-Nickel Study¹⁵ (Copper-Nickel Study, 1980), a comprehensive examination of the potential cumulative impacts, including environmental impacts, of copper-nickel mineral development in northeast Minnesota. The Copper-Nickel Study includes an assemblage of numerous research reports authored by staff from Minnesota Environmental Quality Board, MDNR, Minnesota Pollution Control Agency (MPCA), and the former State Planning Agency, as well as University of Minnesota faculty and students, and consultants.

Objectives of the Copper-Nickel Study included:

- 1) to characterize the region in its pre-copper-nickel development state, and
- 2) to identify and assess the impacts of primary copper-nickel development and secondary regional growth.

The Copper-Nickel Study scientists collected sets of ecological data to assess the background of a 500-square mile area, mainly in ecoregion 50n, preparatory to potential mining. These included lake and stream surface water chemistry and invertebrate identifications. This Regional Study is a relevant background for evaluating current unimpacted and impacted chemistry and invertebrate populations. The Copper-Nickel

¹⁴ *Ibid.*, 2, EPA Conductivity Benchmark Study, p. 32.

¹⁵ State of Minnesota, *Regional Copper-Nickel Study*, 1976-1980, a collection of research papers located at the Minnesota Legislative Reference Library, www.leg.state.mn.us/lrl/lrl.asp. Several specific research papers are referenced in this review. (hereinafter “Copper-Nickel Study”).

Study data significantly reduces the need for additional data collection to apply the EPA protocol to these regions of Minnesota.

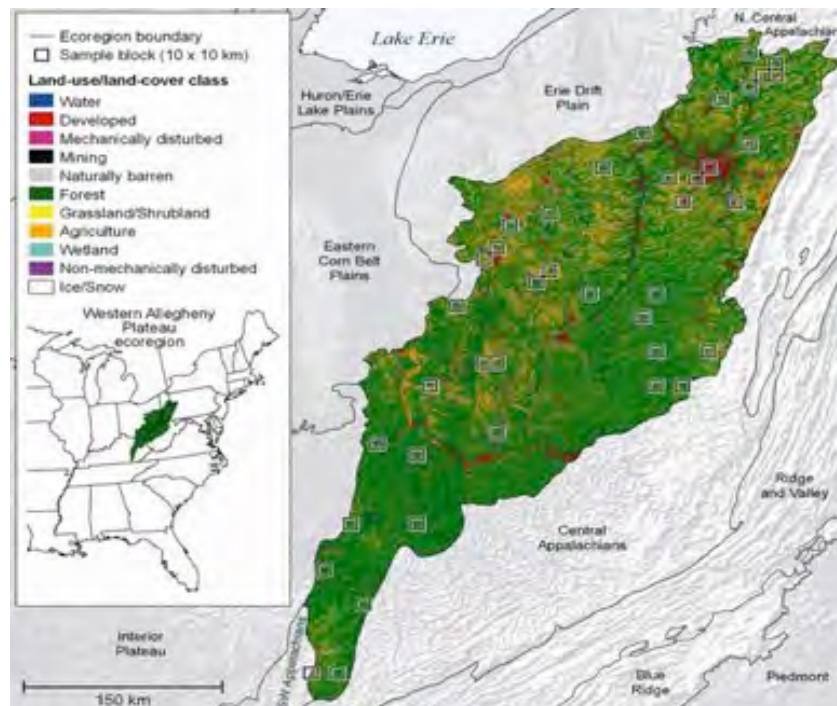
Additional more recent data was obtained by the authors from USFS Superior National Forest (SNF) and MPCA reports and National Permit Discharge Elimination System (NPDES) permit discharge monitoring reports (DMRs).

2. Regional Similarities

Obviously climate differences exist between northeastern Minnesota and the West Virginia/Kentucky Appalachians. However the Appalachian Western Allegheny Plateau ecoregion can be compared to the northeast Minnesota ecoregions in terms of aquatic life. The Appalachian Ecoregions 68, 69, 70 and northeast Minnesota Ecoregions 50n, the northern portion of 50p, 50t have the following similarities:

1. Both are defined by headwater streams (order 1 through 5);
2. Unimpacted streams all share low specific conductance, although Minnesota backgrounds are even lower;
3. Unimpacted ionic mixtures have similar important chemical constituents - low calcium (Ca), magnesium (Mg), sulfate (SO_4), and bicarbonate (HCO_3) at circumneutral to alkaline pH 6.0 to 10;
4. Unimpacted sites contain only trace amounts of heavy metals;
5. Both share benthic invertebrates with similar genera, however Minnesota has more genera than those in common.

Figure 2. Map of Appalachian Western Allegheny Plateau Ecoregion



3. Chemistry of Specific Conductance

Specific conductance is a measurement of the ability of water to conduct an electrical current. Salinity is the total concentration of all dissolved salts in water. Salinity can be calculated from specific conductance where complicating factors do not exist.

Specific conductance is a simple, fast, inexpensive test that can be performed in the field by persons with minimal training. The more cations and anions contained in water, the more electrical current it will conduct. Conductivity represents the sum of all cations and anions in water at 25 degrees Celsius (°C). The most common of these ions are calcium (Ca), magnesium (Mg), sodium (Na), bicarbonate (HCO₃), and sulfate (SO₄), but ions can also include one or more heavy metals including, but not limited to selenium (Se), copper (Cu), nickel (Ni), cobalt (Co), zinc (Zn), and cadmium (Cd).

Crushed and fractured rock from any mining increases the unweathered rock surface exposed to water dissolution and can drastically affect common cation and anion balances, with increases in both common and rare ions that are from within the rock structure. Minnesota has considerable specific conductance data from both unimpacted and impacted waters.

4. EPA Method for Specific Conductance Benchmark

The method EPA used to develop a specific conductance benchmark for West Virginia and Kentucky was based on a standard methodology¹⁶ (EPA Conductivity Benchmark Study, 2011). The EPA method correlated water chemistries with observed changes in a community of benthic invertebrates to determine where there was impact or no impact. As stated previously, EPA applied the criterion that elimination of more than 5% of genera from a community caused by an increased specific conductance indicated an unacceptable level of impact or a polluted condition. This impact/no-impact determination is the same one that EPA uses to set other numeric standards using laboratory bioassays, for chemicals such as copper, nickel, selenium, etc.

In West Virginia and Kentucky ecoregions 69, 70, the threshold for unimpacted or low-impacted waters -- where 5% of the genera were eliminated, resulting in an unacceptable impact -- was determined to be a specific conductance level of 300 µS/cm or greater.¹⁷ (EPA Conductivity Benchmark Study, 2011).

Many aquatic organisms are sensitive to imbalances in the ambient ion concentrations. The EPA has explained: "Exposure of aquatic organisms to salinity is direct. Fish, amphibians, mussels, and aquatic macroinvertebrates are especially exposed on their gills or other respiratory surfaces that are in direct contact with dissolved ions in water. All animals have specific structures to transport nutrient ions and control their ionic and osmotic balance (Bradley, 2009; Evans, 2008a, b, 2009; Wood and Shuttleworth, 2008;

¹⁶ *Ibid.*, 2, EPA Conductivity Benchmark Study, p. 1.

¹⁷ *Id.*, EPA Conductivity Benchmark Study, pp. xiv- xv.

Thorp and Covich, 2001; Komnick, 1977; Smith, 2001; Sutcliff, 1962; Hille, 2001). However, these cell membrane and tissue structures function only within a range of salinities. For example, some aquatic insects such as most Ephemeroptera [mayflies] have evolved in a low-salt environment.”¹⁸ (EPA Conductivity Benchmark Study, 2011, p. 2).

Aquatic life is not dead during the winter. Although adaptations to lower temperatures occur, ion imbalances during the cold period can still cause stress or impact.

B. Application of the EPA Appalachian Method to Minnesota

All waters do not contain a similar diversity of organisms or similar concentrations of ions. In Minnesota, for example, conductivities (and compositional concentrations) in the Minneapolis/St. Paul area are naturally higher than in the northeastern part of the state. Thus, data on Minnesota’s aquatic life and background ion levels in the specific region being evaluated are required to determine applicability of the benchmark found for the Appalachian ecoregions¹⁹ (Thingvold, 1979).

Although EPA cautions that the numeric benchmarks themselves may not be directly applicable nationwide, EPA recommends the methods used for their determination. Generally, to duplicate the EPA’s specific conductance evaluation for other ecoregions, the following basic methods and conditions would be required²⁰ (EPA Conductivity Benchmark Study, 2011):

1. Sampling of rivers with watershed areas under 155 km² (order 5 streams and lower) using sampling methods similar to EPA’s Appalachian study, or other appropriate method; if streams are Order 5 or over, different sampling methods are required.
2. Sampling of surface waters with a natural background - unimpacted or near-unimpacted surface waters as well as impacted waters.
3. Presence of waters dominated by calcium, magnesium, sulfate, and bicarbonate at a circumneutral to alkaline, pH 6.0 to 10.
4. Invertebrate surveys, identified to at least genus level (species level when possible), once per year, in spring or summer, focusing on genera that are mostly sensitive to specific conductance, e.g. Ephemeroptera (mayflies), Plecoptera (stoneflies), Trichoptera (caddisflies).
5. Water chemistry analysis that includes analysis for confounding ions beyond the common ions as discussed in item 3 above.
6. Results are evaluated using a species sensitivity distribution with 95% confidence bounds.

¹⁸ *Id.*, EPA Conductivity Benchmark Study, p. 2.

¹⁹ Thingvold, Daryl, Nancy Sather, Peter Ashbrook, *Water Quality Characterization of the Copper-Nickel Research Area*, December, 1979, pp. 7-19. Available at <http://archive.leg.state.mn.us/docs/pre2003/other/CN153.pdf>

²⁰ *Ibid.*, 2, EPA Conductivity Benchmark Study, pp. 4-22.

III. Results of Data Comparisons and Analysis

A. Minnesota Data to Support a Specific Conductance Benchmark

Minnesota's ecoregion 50n already has significant data that would support a specific conductance standard at least as stringent as the EPA's 300 $\mu\text{S}/\text{cm}$ guideline for Appalachia. In this ecoregion of Minnesota, due to the naturally lower values of major cations and anions, coupled with the lack of confounding factors, the specific conductance standard that would protect 95% of lower aquatic biota may be even lower than 300 $\mu\text{S}/\text{cm}$. Other Minnesota ecoregions with geology and water chemistry similar to ecoregion 50n could be protected with the same specific conductance standard.

The above conclusion is based primarily on data produced in the late 1970's by the Copper-Nickel Study, a \$4 million compilation of many research papers about potential environmental impact of copper-nickel mining on Minnesota's 500 square miles that could be affected. Water quality work was conducted to establish baseline conditions, mostly in ecoregion 50n. This water chemistry and biological data demonstrates significant similarities to the Appalachian study chemistry and biology.

Beyond the Copper-Nickel Study, important data sources demonstrating availability and quality to support Minnesota-specific benchmarks for conductivity include but are not limited to:

1. The United States Forest Service (USFS) has input additional stream water chemistry data to the EPA national water quality data base (STORET) from the lakes and streams in the Superior National Forest;
2. NPDES water chemistry data is available from the Minnesota Pollution Control Agency (MPCA) permit DMRs and in studies related to mine permitting;
3. MPCA also has an EQUIS database that contains water chemistry analyses of numerous streams in the area from their statewide water quality monitoring program.
4. MDNR Fisheries Division, Fond du Lac Resource Management, and 1854 Treaty Authority have compiled specific conductance data along with fish and macroinvertebrate surveys in the ecoregion.²¹ (Lindgren *et al.*, 2006).
5. U.S. Geological Survey (USGS) has been measuring flows and water parameters and conducting research accessible on its website.²² (USGS, 2015)

²¹ Lindgren, John (Minnesota Department of Natural Resources), Nancy Schuldt (Fond du Lac Resource Management), Brian Borkholder (Fond du Lac Resource Management), Andrew Levar (DNR Grand Rapids), Caryle Olson (1854 Treaty Authority), Jeff Tillma (DNR Grand Rapids Area Fisheries), Darren Vogt (1854 Treaty Authority) *A Study of the St. Louis River*, 2006. [Hereinafter "MDNR/Tribal Agencies SLR Study"]. Available at http://files.dnr.state.mn.us/areas/fisheries/duluth/st_louis_river_study.pdf

²² U. S. Geological Survey, www.USGS.gov/water, select surface water, water quality data.

The evaluation in this report includes some of the available water quality data, selected based on ease of access as well as professional judgment.

The unimpacted water chemistry concentrations in both the Appalachian study and the Minnesota ecoregions are similar in that they both have:

1. Similar headwater stream orders (1-5);
2. Low anion and cation concentrations and circumneutral pH;
3. Significant invertebrate data;
4. Impacts from mining waste rock drainage containing similar major ions and impacts to invertebrates;
5. Some of the same genera demonstrated to be sensitive to specific conductance.

Where Minnesota genera differed from those in EPA's Conductivity Benchmark Study, efforts have been made to match water chemistry data with genera data in this evaluation.

B. Chemical Data Comparisons

1. Minnesota Baseline Water Quality and Mining Impacts

Over 37 years of water chemistry data exists in the Minnesota ecoregions for both basic chemistry and other parameters, in reports or on the EPA national water quality database. Before entry into the EPA database, quality control/quality assurance has been checked for appropriate methods, precision and accuracy.

This evaluation uses multiple sources of water quality data, including the Copper-Nickel Study. This Copper-Nickel Study data was a major undertaking in the state of Minnesota designed to characterize the study area's baseline water quality with hundreds of sampling results over three years. It represents a solid baseline. The key parameters in the water chemistry in the Minnesota ecoregions and the Appalachian ecoregions are similar.

Table 2 below compares the Minnesota Copper-Nickel Study water chemistry data ²³ (Thingvold, 1979) with the EPA Conductivity Benchmark Study water chemistry data for Appalachian streams. ²⁴ (EPA Conductivity Benchmark Study, 2011).

Table 2- Water Chemistry Comparison - EPA Appalachia and Minnesota Copper Nickel Study									
		EPA Appalachian streams				Minnesota Cu-Ni Study streams			
Parameter	Units	Median	Min.	Max.	Number Samples	Median	Min.	Max.	Number Samples
Conductivity	µS/cm	261	15.4	11,646	2,210	65	12	1198	463

²³ *Ibid.*, 19, Thingvold, Copper-Nickel Study Water Quality Characterization.

²⁴ *Ibid.*, 2, EPA Conductivity Benchmark Study, Table 2, p. 10.

Hardness	mg/l	91.1	0.5	1,492	1,148	31	5.3	310	206
Alkalinity	mg/l	66.7	0.2	560	1425	23	1	190	457
Sulfate	mg/l	37	1	6000	1428	7.4	1	630	434
Chloride	mg/l	5.2	1	1153	1118	2	0.1	88	462
T. Calcium	mg/l	25.1	0.002	430	1154	7.4	1.8	80	333
T. Magnesium	mg/l	6.3	0.05	204	1150	3.8	1	40	333
TSS	mg/l	4	1	190	1442	nd	nd	nd	nd
T. Iron	mg/l	0.26	0.005	110	1433	0.61	0.099	5.5	457
NO ₂ -NO ₃	mg/l	0.2	0.01	30	1178	0.1	0.01	13	260
T. Al	mg/l	0.11	0.01	12	1436	.090	0.0016	.760	270
Diss. Al	mg/l	0.05	0.01	0.93	1287	nd	nd	nd	0
Diss. Fe	mg/l	0.042	0.001	11.8	1259	nd	nd	nd	0
T. Mn	mg/l	0.004	0.003	7.25	1430	0.05	0.005	1.2	309
Diss. Mn	mg/l	0.07	0.01	1.06	20	nd	nd	nd	0
T. Phosphate	mg/l	0.02	0.01	2.36	1181	nd	nd	nd	260
Diss. Se	mg/l	0.001	0.001	1.26	313	nd	nd	nd	0
T. Se	mg/l	0.001	0.001	1.26	496	nd	nd	nd	0
Fecal Coliform	Counts/110ml	170	0	250,000	2035	nd	nd	nd	0
DO	mg/l	9.2	1.02	18.35	2182	nd	nd	nd	0
pH	std	7.62	6.02	10.48	2210	6.9	4.7	8.4	458
catchment area	km ²	6.965	1.73	153.014	717	nd	nd	nd	0
temperature	C	18.4	-0.28	31.9	2210	nd	nd	nd	0
Potassium	mg/l	nd*	nd*	nd*	nd*	0.6	0.2	8.4	310
Sodium	mg/l	nd*	nd*	nd*	nd*	1.8	0.2	45	304
Bicarbonate	mg/l	nd*	nd*	nd*	nd*	25	6	151	257
T. Cu	mg/l	nd*	nd*	nd*	nd*	0.0015	0.0002	0.012	447
T. Ni	mg/l	nd*	nd*	nd*	nd*	0.0012	0.0002	0.21	447
T. Co	mg/l	nd*	nd*	nd*	nd*	0.0004	0.0001	0.011	410
T. Zn	mg/l	nd*	nd*	nd*	nd*	0.0022	0.0001	0.03	446
*nd= no data available									

Median concentrations in Minnesota unimpacted waters for specific conductance, Ca (calcium), Mg (magnesium), SO₄ (sulfate), HCO₃ (bicarbonate), pH, and trace metals are comparable and, in some respects, are lower in Minnesota than in the unimpacted Appalachian streams. The one exception may be the Minnesota minimum pH of 4.7, the source of which was identified in the Copper-Nickel Study Water Quality Characterization report as a result of acid bog drainage in some headwater streams. This exception does not affect the median pH of 6.9 representing 459 samplings over three years. Background specific conductance and ionic levels compare favorably with the Appalachian data on unimpacted streams.

The Appalachian ecoregions studied are roughly four times larger in area than the northeastern Minnesota ecoregions. Although the number of samples of the Copper-Nickel Study is less than half of EPA Appalachian report, there is more concentrated data per unit area. Additionally, as stated previously, significant additional and confirmatory data exists from the USFS, MPCA and MDNR since the Copper-Nickel Study. The Copper-Nickel Study water quality reports also contain extensive data regarding heavy metals. This data demonstrates unimpacted waters in Minnesota have trace levels of heavy metals. Heavy

metal protocols today use same analytical methods, with the exception of mercury. Thus the 1976 data are directly comparable from a methods standpoint.

Heavy metals values in unimpacted northeast Minnesota streams are near detection limits. Heavy metals would not add to benthic invertebrate toxicity in background streams. This is similar to the data EPA determined for background Appalachian streams.

In both locations, mining activities have increased the same major ions in the water and have increased specific conductivity. As in the Appalachians, the studied Minnesota ecoregions' major impacts are from mining. The difference is the type of ore mined: coal wastes (leachate from mountaintop removal and waste in valley fill) in Appalachia, and iron ore and taconite mining, some of which excavated sulfur-bearing rock (leachate from pits, waste rock, and tailings) in Minnesota. In both cases the major chemicals involved in mining that drive elevated specific conductance are Ca, Mg, SO₄, HCO₃ and pH. In Minnesota mining, sulfide minerals will increase heavy metals, as well as SO₄.²⁵ (MDNR, 2004). Further comparisons and impacts from these minerals will be discussed in the biology section.

Table 1, which is attached in Appendix A to this evaluation, identifies and provides detailed information on macroinvertebrate species. For genera common to Appalachia and the targeted Minnesota ecoregions, Table 1 provides specific conductance levels at which 95% of genera would survive, according to the EPA Conductivity Benchmark Study data. Table 1 also includes water chemistry information from the Minnesota Copper-Nickel Study on tolerances of various Minnesota genera to hardness, sulfate and pH. This table will be discussed in more detail later in terms of biological impacts of parameters on benthic invertebrates.

Dunka Mine.

Minnesota already has an example of consequences of sulfide mining waste rock, based on history with some of the waste rock at Dunka Mine, now owned and managed by Cliffs Erie corporate entities (Hereinafter "Cliffs"). At the Dunka Mine, Duluth Complex copper-nickel bearing waste rock was removed to mine the underlying taconite deposit. The Dunka site has over 37 years of data on waste rock seepages.

The chemistry and biology of the seepage is documented in the Copper-Nickel Study, in DMRs for NPDES permits, and in MDNR reports. When sampled, past and current Dunka Mine seepages routinely have specific conductance similar to 2011 data, which ranged from 350 to 2,761 µS/cm²⁶ (Cliffs, NPDES DMRs).

The seepages from the low sulfur Duluth Complex waste rock flow into recently reconstructed man-made wetland designed to treat some heavy metals. The wetland systems discharge into Unnamed Creek, a Class 2B water, which flows into Bob Bay of Birch

²⁵ MDNR, *Drainage from Copper-Nickel Tailings: Summary of a Three Year Study*, Division of Lands and Minerals, July 2004, Table 3.

²⁶ Cliffs, NPDES Permit MN0042579, DMRs, 2011 -2014.

Lake. Birch Lake is a dammed portion of the Kawishiwi River, a Class 2Bd water which “shall be such as to permit the propagation and maintenance of a healthy community of cool or warm water sport or commercial fish and associated aquatic life and their habitats,” and aquatic recreation of all kinds. (Minn. Rule 7050.0222, Subp. 3).

Since a 2010 Consent Decree as a result of Clean Water Act litigation, Cliffs modified its experimental passive wetland mitigation system with limestone to attempt to resolve the metals toxicity from Dunka Mine discharge. In 2011 the calculated acute toxicity and the chronic whole effluent toxicity bioassays on treated discharges did not violate chronic and acute toxicity limits, although SD009 approached the acute toxicity limit in January and February. However, several inconsistencies with Minnesota Rules contribute to the apparent compliance of the results:

1. Applying a variance to calculate toxicity differently from procedures in Minnesota Rules;
2. Using maximum hardness values of 400 mg/l in toxicity calculations rather than background hardness of unimpacted streams, consistent with Copper-Nickel Study data (see Table 2).
3. Allowing a mixing zone of almost a mile rather than sampling at the discharge. Since Unnamed Creek has a 7Q10 of zero, there is not enough water to dilute the seepages with a mixing zone conditionally allowed at Minn. Rule 7050.0210 Subp. 5.

The passive system at Dunka does not reduce specific conductance in the discharges even approaching background unimpacted levels. Even after dilution of Dunka discharge with clean water from approximately one mile of the unimpacted portions of the watershed, DMRs document that the specific conductance in Unnamed Creek, before it enters Bob Bay of Birch Lake, reaches between 800-900 $\mu\text{S}/\text{cm}$. In the winter, when wetland discharge flows are diminished, concentrations are substantially higher. Recently, from January through May 2014, Unnamed Creek data showed that even Minnesota’s irrigation standard of 1,000 $\mu\text{S}/\text{cm}$ is often exceeded downstream of Dunka, with sampling data respectively for each month of 1,225 $\mu\text{S}/\text{cm}$, 1,255 $\mu\text{S}/\text{cm}$, 1,111 $\mu\text{S}/\text{cm}$, 936 $\mu\text{S}/\text{cm}$, and 417 $\mu\text{S}/\text{cm}$. (Cliffs NPDES DMRs) The more concentrated creek water forms a measurable density current of higher specific conductance along the bottom of Bob Bay.²⁷

Figure 3 shows the locations of Dunka Mine surface discharge sites (SD005 and SD007) and the downstream surface water sampling location (SW-001). Then, Table 3 compares the water chemistry of the Dunka waste rock-impacted Unnamed Creek with background levels from the Copper-Nickel Study Water Quality Characterization. The Copper-Nickel Study background represents the median average of three years of sampling of nine watersheds north of the Laurentian Divide and five watersheds south of the Divide in the 500 square mile Copper-Nickel Study region.

²⁷ Johnson, Bruce, personal knowledge.

[illegible]

	Cu-Ni Study Median Stream Background	Cliffs Impact 2011 Mean		
		SD005	SD007	SW001
Specific Conductance (µS/cm)	65	1,469	2,000	960
Calcium (mg/L)	7.4	131	269	84
Magnesium (mg/L)	3.8	133	153	70
Sulfate (mg/L)	7.4	1,181	1,166	445

Table 3 demonstrates that at the time of the NPDES permit study, all of the specific conductance-related parameters of concern (specific conductance, calcium, magnesium and sulfate) were highly elevated from the ecoregional background concentration. For example, the Dunka Mine NPDES discharge reports document specific conductance discharges between 1,469 and 2,000 $\mu\text{S}/\text{cm}$ from the wetland treatment outfalls SD005 and SD007 into Unnamed Creek. These specific conductance values are between 22 times and 38 times the ecoregional background.

Site SW001, also a sampling location used by Cliffs and the Copper-Nickel Study for benthic invertebrates, is near where Unnamed Creek discharges into Bob Bay of Birch Lake. The specific conductance at this point remains at a mean of 960 $\mu\text{S}/\text{cm}$; this is 15 times the ecoregional background in Table 3. The slightly lower specific conductance values at SW001 are due to freshwater runoff dilution from unimpacted portions of the watershed. Dunka Mine discharges provide a perspective on specific conductance of leachate from sulfide-bearing rock. During 2011 wetland treatment at each of the seepages failed to reduce the source specific conductance below Minnesota's agricultural irrigation standard of 1,000 $\mu\text{S}/\text{cm}$.

Northshore Peter Mitchell Mine Pit

The Northshore Mining Company (Northshore) Peter Mitchell mine pit is one of the largest taconite mining discharge sources in the region. Mineralized rock from the mine is shipped by rail to the Northshore plant on the Lake Superior shore. Approximately eight miles in length, the pit straddles the Laurentian Divide and releases dewatering discharges to both the Dunka River in the Kawishiwi watershed of the Rainy River basin and to the Partridge River in the St. Louis River watershed of the Lake Superior basin. Specific conductance from Peter Mitchell pit dewatering discharged to the Dunka River ranges from 300 $\mu\text{S}/\text{cm}$ to 900 $\mu\text{S}/\text{cm}$. This specific conductance is composed mainly of Ca, Mg, SO_4 , and HCO_3 at elevated levels over background.²⁸ (Benzie, 1977)

Mesabi Nugget.

The Mesabi Nugget smelting facility (MN0067687) has a special process to remove slag from the taconite concentrate, leaving pig iron. It discharges into the former LTV Pit 1, an abandoned, inundated taconite mine pit, about 1.5 miles long and containing an estimated 13.7 billion gallons of water. During 2001, for example, specific conductance averaged 1,291 $\mu\text{S}/\text{cm}$ at the surface. Although no point source discharges out of Pit 1 were reported at the time, Pit 1 demonstrates overflow of the hardrock rim to a shallow ground water flow in surficial soils to Second Creek²⁹ (Northeast Technical Services, 2002). In 2012, 2013 and 2014 DMRs, Second Creek stream sample site SW002 downstream of Pit 1 was reported to have specific conductance averaging 1076 $\mu\text{S}/\text{cm}$, 902 $\mu\text{S}/\text{cm}$, and 791 $\mu\text{S}/\text{cm}$

²⁸ Benzie, Dan, *Water Quality of the Dunka River "the Characterization of a Watershed Affected by Mining"*, Plan B Thesis for Master of Science University of Minnesota, June 1977, p. 4. Minnesota Legislative Reference Library <http://archive.leg.state.mn.us/docs/pre2003/other/CN023.pdf>

²⁹ Northeast Technical Services, *Phase I – Environmental Assessment, Cliffs Erie Properties including: the Hoyt Lakes Facility, Dunka Property, Taconite Harbor, and Railroad Corridors*, September 2002, pp. 10, 13.

respectively. In addition, the DMRs reported elevated hardness (~500 to 750 mg/l) and bicarbonates (~300 mg/l, 4.91 meq/l) in both Pit 1 and Second Creek³⁰ (Mesabi Nugget, 2012-2014).

In October 2012, Mesabi Nugget obtained a variance to discharge hardness, bicarbonates, total dissolved salts (solids) and specific conductance pollutants above Minnesota effluent limits, exceeding even Minnesota's irrigation standard for specific conductance of 1,000 µS/cm. The effluent limits applied in this permit were 1,889 µS/cm monthly average and 1,965 µS/cm daily average³¹ (Mesabi Nugget, 2012). Although the EPA overturned the variance that allowed this excursion from specific conductance standards in July 2014³² (EPA, letter to MPCA, 2014), MPCA has to date taken no action to reopen or revise the Mesabi Nugget NPDES permit.

Abandoned mining pits.

Mined out iron ore and taconite mine pits are scattered over the eastern Mesabi (including the Embarrass Mountains) and Vermillion Iron Ranges. On maps they appear as lakes of various sizes and shapes, and some have lake names.

In addition to the chemistry of the economic minerals of interest, pit water chemistry is directly related to the chemical constituents of the host rock (the non-economic part of the rock, which is also known as waste rock and tailing). In taconite mining this can amount to approximately 60% of the total rock removed. The specific conductance in pit water will depend on the chemistry of the host rock. In an open pit mine, excess inflow into a pit discharges through or to one or all of the following: surface water, granular material on the edge of the pit to surface water and ground water³³ (Jones, 2002).

The MDNR has sampled water quality in 13 abandoned, inundated iron ore (not taconite) mine-pits in the Biwabik Iron Formation. These mines were small compared to today's taconite mines, ranging from 11 acres to 165 acres; in contrast, the Peter Mitchell pit is approximately 8 miles long.

Three of these abandoned iron mines are in the ecoregions covered by this report: St. James, closed in 1963; Embarrass, closed in 1977; and Miners Lake, an underground glory hole, closed in 1967.³⁴ (Pierce *et al.*, 1989). This MDNR study found there were differences in water quality and chemistry from pit to pit for these 13 mines, due to the host rock, including variability in NO₃ (nitrate), SO₄ (sulfate), dissolved solids, hardness, and phosphate.

³⁰Mesabi Nugget, *Permit MN0067687, DMRs*, 2012-2014.

³¹ Mesabi Nugget, *NPDES/SDS Permit MN0067687*, approved October 23, 2012.

³² U.S. EPA, letter, Dr. Susan Hedman, to MPCA Commissioner John Linc Stine, July 2, 2014.

³³ Jones, Perry M., *Characterization of Ground-Water Flow Between the Canisteo Mine Pit and Surrounding Aquifers, Mesabi Iron Range, Minnesota*, U.S. Geological Survey, Water-Resources Investigations Report 02-4198, 2002, available at <http://pubs.usgs.gov/wri/wri024198/pdf/wri024198.pdf>

³⁴ Pierce, Rodney B., Cynthia M. Tomcko, *Limnological Characterization of Mine Pit Lakes in Northeast Minnesota*, Minnesota Department of Natural Resources, Section of Fisheries, November 1989, #399, available at http://files.dnr.state.mn.us/publications/fisheries/investigational_reports/399.pdf

Miners Lake has a permanent chemocline at the 35 m (114 ft) depth, which has rotten egg odor, an indication of hydrogen sulfide (H₂S). Hydrogen sulfide is a toxic gas released during decomposition or degradation of sulfur compounds³⁵ (ATSDR, 2014). The three pits in this evaluation's ecoregions had specific conductance ranging from 289 to 1,380 µS/cm, SO₄ ranging from 13 to 300 mg/l, and hardness ranging from 194 to 353 mg/l. MDNR reported elevated specific conductance in all 13 pits tested ³⁶ (Pierce *et al.*, 1989).

C. Biological Studies and Comparisons

1. Studies Reviewed

Substantial benthic invertebrate sampling data are reported for the Minnesota ecoregions evaluated in this paper. Studies used in this paper are as follows:

1. Minnesota's Regional Copper-Nickel Study surveyed benthic invertebrates on 55,516 km of streams in a 500-square mile study area using drift net and kick samplers³⁷ (Lager *et al.*, 1979). These are all headwater streams. The work surveyed populations to the lowest taxon possible, all to genus, many to species level. The streams were all Order 1 through 5 headwater streams, similar to the Appalachian Study.
2. A Copper-Nickel Study Tolerance Report assessed the environmental requirements and pollution tolerance of the area's Aquatic Insects³⁸ (Bartoo, 1978).
3. MDNR has performed a one-year study on the Pigeon River in far northeast Minnesota using drift nets, hand picking and kick net sampling; the study identified invertebrates to the genus level³⁹ (Montz, 1993);
4. MDNR, Fond du Lac Resource Management, and 1854 Treaty Authority sampled the lower, middle, and upper reaches of the St. Louis River for basic chemistry and invertebrates using kick nets, and identified taxa to the genus level⁴⁰ (Lindgren *et al.*, 2006);
5. As part of the Agency's statewide watershed base monitoring and assessment program, MPCA has identified a number of the St. Louis River headwater streams as impaired for benthic invertebrates in its draft St. Louis River Watershed Stressor Identification

³⁵ Agency for Toxic Substances and Disease Registry, *DRAFT TOXICOLOGICAL PROFILE FOR HYDROGEN SULFIDE AND CARBONYL SULFIDE*, October 2014.

³⁶ *Ibid.*, 34, Pierce *et al.*, Tables 4, 5, 6, and 9.

³⁷ Lager, Thomas, Steven Johnson, Jeffery McCulloch, Steven Williams, Mark Johnson, *Regional Copper-Nickel Study Stream Benthic Invertebrates*, Minnesota Environmental Quality Board, February, 1979, available at <http://archive.leg.state.mn.us/docs/pre2003/other/CN088.pdf>

³⁸ Bartoo, Paul, *The Environmental Requirements and Pollution Tolerance of Aquatic Insects of the Regional Copper-Nickel Study Area*, Minnesota Environmental Quality Board, Author: September 1978, available at <http://archive.leg.state.mn.us/docs/pre2003/other/CN018.pdf>

³⁹ Montz, Gary R., *Aquatic Macroinvertebrates of the Pigeon River, Minnesota*, Minnesota Department of Natural Resources, Ecological Services Section, November 1993, Conservation Biology Research Grants Program, Nongame Wildlife Program, Division of Ecological Services, Minnesota Department of Natural Resources

⁴⁰ *Ibid.*, 21, MDNR/Tribal Agencies SLR Study.

Report (MPCA, Draft SLR Stressor Report, 2013).⁴¹

6. The Regional Copper-Nickel Study performed a 3-year survey on invertebrates impacts at the Dunka Mine from low-level copper-nickel sulfide waste rock that was removed to mine the underlying taconite.⁴² (Johnson *et al.*, 1978). These leachates discharged into Unnamed Creek. Sampling methods used both Hester-Dendy artificial substrates and drift nets.
7. Unnamed Creek has received Dunka Mine sulfate waste rock leachate for over 37 years. Cliffs has sampled Unnamed Creek for the past ten years (after mine closure). They used Hester-Dendy artificial substrates.⁴³ (Hartman, 2011). These surveys identified Ephemeroptera, Plecoptera, and Trichoptera to the genus level. Other invertebrates were not all identified to the genus level, and are not cited in this report.
8. The USFS has sampled 16 streams in the Superior National Forest (SNF) - most of them for three years. This survey, summarized in Table 1, included all benthic invertebrates to the genus level and many to a species level. These samplings used kick nets and the MPCA benthic invertebrate protocols and QAQC.⁴⁴ (USFS SNF data, 2015). The USFS has also compiled significant water chemistry data on the SNF watersheds.
9. MDNR sampled iron ore mine pit lakes for chemistry, other parameters, and for benthic invertebrates.⁴⁵ (Pierce, *et al.*, 1989).

Additional data may be available but are beyond the scope of this report.

2. Considerations for Evaluation of Biological Impacts

Any evaluation of water chemistry and biological impacts in aquatic ecosystems must be examined holistically. Such analysis must consider all life stages of each biological system (plant and/or animal). Both maximum and mean water chemistry concentrations must be used for data for all 12 months of the year.

In this case benthic invertebrates overwinter underwater and are alive, but undergo substantial changes in their metabolic activities. The winter is marginal for survival for most taxa; high single concentrations in water chemistry during this period can result in significant population impacts or mortality. Thus, environmental chemistry data cannot be limited solely to means during open water months.

⁴¹ MPCA, *St Louis River Watershed Identification Report*, Draft October 2013, electronic copy labeled as “12-31-13 (142 pages),” provided in Attachment B. (hereinafter “Draft SLR Stressor Report”).

⁴² Johnson, Mark, Steve Williams, *Regional Copper-Nickel Study Erie Mining Project Biological Sampling*, Minnesota Environmental Quality Board, October 1978, available at <http://archive.leg.state.mn.us/docs/pre2003/other/CN083.pdf>

⁴³ Hartman, Craig, *Memo from Cliffs Natural Resources to Richard Clark*, Minnesota Pollution Control Agency, December 9, 2011.

⁴⁴ Butcher, Jason, USDA Forest Service Superior National Forest, unpublished data, provided as a result of correspondence with Bruce Johnson. April, 2015. (hereinafter “USFS SNF data”). This data was used in the attached Table 1 to provide detailed invertebrate background in columns F through J.

⁴⁵ *Ibid.*, 33, Pierce *et al.*, *Limnological Characterization of Mine Pit Lakes*.

In addition, over-emphasis on average water chemistry concentrations ignores impacts from periods of elevated chemical concentrations. For example, a single relatively short occurrence of a high concentration can heavily impact benthic invertebrates and other populations in any season.

Averaging of concentrations must also be scrutinized since it can demonstrate a continuous low-level stressor impact to populations. These stressors can reduce a population's ability to survive or reproduce, leaving the remaining individuals of a populations open to predation and subsequent extirpation.

In determining impacts of specific conductance on aquatic organisms, stream assemblages are far more reliable indicators than are conventional whole effluent toxicity (WET) tests.

"Generally WET limits alone have not been shown to protect water quality from the effects of conductivity. Available scientific information, including the SAB [Scientific Advisory Board] review of EPA's conductivity benchmark report, has highlighted that the current WET testing organisms are not good surrogates for the native aquatic organisms with respect to the effects of conductivity. EPA believes this evidence makes clear that the macroinvertebrate assemblage in central Appalachian streams is more sensitive to the effects of elevated TDS [Total Dissolved Solids] or conductivity than the standard WET testing organisms."⁴⁶ (EPA Final Guidance, 2011)

For example, some commonly tested invertebrates are quite insensitive to specific conductance. Cliffs' Request for Variance for the Dunka Mining Area stated that Kennedy *et al.* (2005) produced data to show "significant adverse responses from Ceriodaphnia specifically due to specific conductance are not likely until specific conductance reaches approximately 4,000 to 8,000 $\mu\text{mhos/cm}$ " (equal to 4,000 to 8,000 $\mu\text{S/cm}$)⁴⁷ (Cliffs, 2011, p. 24).

3. Pollution Tolerance of Minnesota Benthic Invertebrates

The Copper-Nickel Study Tolerance Report surveyed the pollution tolerance of benthic invertebrates in the Minnesota study area.⁴⁸ (Bartoo, 1979) for the orders Plecoptera (stoneflies), Ephemeroptera (mayflies), Trichoptera (caddisflies), Diptera (true flies), Coleoptera (beetles), and Odonata (dragonflies). This Tolerance Report identified the sensitivity of genera to pH, alkalinity, hardness, sulfate, temperature, and dissolved oxygen (Table 3). In general, the Copper-Nickel study data suggested Plecoptera were sensitive to most parameters other than high pH. Many Ephemeroptera taxa are known to be very sensitive to pollution. With few exceptions, Trichoptera can tolerate high pH and hardness. Diptera demonstrated tolerance to extremes in pH and other chemical stresses. In general, Coleoptera also had tolerance to extremes of pH and hardness, alkalinity and other water

⁴⁶ *Ibid.*, 10, EPA Final Guidance, p. 19-20.

⁴⁷ Cliffs, *Request for Variance from Hardness and Specific Conductance Water Quality Standards at the Dunka Mining Area*, June 7, 2011, p. 24.

⁴⁸ *Ibid.*, 38, Bartoo, Copper-Nickel Study Tolerance Report, 1979.

chemistry parameters.

Overall, the Copper-Nickel Study Tolerance Report concluded that polluted conditions impacted resulted in fewer overall genera. Trichoptera numbers of genera remained the same; Ephemeroptera and Plecoptera numbers of genera decreased; and Odonata and Diptera increased.

4. Minnesota Benthic Invertebrate Data

Two other Copper-Nickel Study reports surveyed stream benthic invertebrates in both unimpacted waters and waters impacted by mining⁴⁹ (Thingvold, 1979; Lager *et al.*, 1979) . The main objective of these reports was to identify general population dynamics. Although the reports were not designed to look at genera sensitivity to specific conductance, the data on genera identified is applicable here, since specific conductance is strongly related to hardness in Minnesota ecoregion waters and other confounding chemistry is documented to be minimal (see Table 2).

In the Appalachian ecoregions, the EPA identified genera and developed an extirpation concentration for each genus.⁵⁰ (EPA Conductivity Benchmark Study, 2011). EPA cited 40 C.F.R. § 230.10(c)(2) and (3) for the requirement to prevent “significantly adverse effects of the discharge of pollutants on life stages of aquatic life and other wildlife dependent on aquatic ecosystems” and “on aquatic ecosystem diversity, productivity, and stability.” The EPA Benchmark Study, as well as other EPA bioassay studies, concluded that extirpation of 5% of sensitive native benthic invertebrate genera would demonstrate significant surface water degradation. In the Appalachians this value was determined to be a specific conductance greater than 300 $\mu\text{S}/\text{cm}$ ⁵¹ (EPA Conductivity Benchmark Study, 2011). This benchmark is generally protective of significant impacts from pollutants to life stages of benthic invertebrates at the genera level, dependent on the aquatic ecosystems or ecosystem diversity.⁵² (EPA Conductivity Benchmark Study, 2011).

Table 1 in Appendix A of this report demonstrates that, in unimpacted waters within the study ecoregion, Minnesota invertebrates are exposed to low ionic strength, low heavy metal water, with specific conductance at a median of 65 $\mu\text{S}/\text{cm}$. The median specific conductance in unimpacted Minnesota waters is below the Appalachian median of 261 $\mu\text{S}/\text{cm}$. This would suggest that sensitive genera in Minnesota may be unable to tolerate high levels of specific conductance from mining activities, particularly at the levels reflected by Minnesota’s irrigation-based standard of 1,000 $\mu\text{S}/\text{cm}$. The invertebrate orders of Ephemeroptera, Trichoptera and Plecoptera are numerous in unimpacted Minnesota ecoregion study streams.⁵³ (Lager *et al.*, 1979). Many of these genera are known to be sensitive to elevated specific conductance ion concentrations.

Table 1 in Appendix A compares some Minnesota streams, which have substantial benthic

⁴⁹ *Ibid.*, 19, Thingvold *et al.*, *Copper-Nickel Study Water Quality Characterization*, 1979; *Ibid.*, 37, Lager *et al.*, *Copper-Nickel Study Invertebrates*, 1979.

⁵⁰ *Ibid.*, 2, EPA Conductivity Benchmark Study,, p. 13.

⁵¹ *Ibid.*, 2, EPA Conductivity Benchmark Study,, p. 23.

⁵² *Ibid.*, 2, EPA Conductivity Benchmark Study, p. xiv.

⁵³ *Ibid.*, 37, Lager *et al.*, *Copper-Nickel Study Invertebrates*. 1979.

invertebrate data, with the Appalachian streams data. Table 1 Column D summarizes all the genera/species that were identified in the specific northeast Minnesota ecoregions by the Copper-Nickel Study. Column C identifies the Appalachian genera common to both areas. Columns D through J identify genera/species in Minnesota unimpacted headwater sites and the study/year(s) where and when each genus was found. Column K identifies the EPA XC95% specific conductance for each genus in common.⁵⁴ Columns L, M and N identify the Hardness (Ca and Mg), Sulfate and pH tolerances for benthic invertebrates derived from the Minnesota Copper-Nickel Study Tolerance Report. (Bartoo, 1978).

The complete Table 1 data demonstrate that Minnesota shares 92 genera or 28% of the total genera identified in Appalachian ecoregional streams. Among the common genera, Minnesota has 31 of the common genera demonstrated to be sensitive below 1,000 $\mu\text{S}/\text{cm}$, 21 sensitive below 600 $\mu\text{S}/\text{cm}$, and 12 that are sensitive below 350 $\mu\text{S}/\text{cm}$. For the remainder of the Minnesota invertebrate genera, there are no comparable EPA calculations of XC95% for specific conductance in the Appalachian Study.

Table 4 below summarizes data on identified benthic invertebrate genera from unimpacted waters of Minnesota and the Appalachians:

Table 4 – Common Benthic Invertebrates in Unimpacted Appalachian and Minnesota Streams		
Order	MN Genera	Genera in Common
Ephemeroptera	45	18
Plecoptera	29	13
Trichoptera	56	14
Odonata	25	3
Coleoptera	12	4
Megaloptera	4	3
Hemiptera	16	1
Diptera	136	36
TOTAL:	323	92

For a point of reference to evaluate low and high specific conductance, Pond, *et al.*, divided coal mined waters with elevated specific conductance into “low” conductivity at < 500 $\mu\text{S}/\text{cm}$ [n = 7], “medium” at 500-1,000 $\mu\text{S}/\text{cm}$ [n = 8], and “high” at >1,000 $\mu\text{S}/\text{cm}$ [n = 12].” (Pond *et al.*, 2008).⁵⁵ These categories were used primarily for graphical interpretations and to interpret taxonomic composition along a categorical gradient.

⁵⁴ The same genus in Minnesota is assumed to be sensitive to the specific conductance identified in the Appalachian study, above which 5% of the individual genus population was extirpated.

⁵⁵ Pond, Gregory J., Margaret E. Passmore, Frank A. Borsuk, Lou Reynolds, and Carole J. Rose, *Downstream effects of mountaintop coal mining: comparing biological conditions using family- and genus-level macroinvertebrate bioassessment tools*, Region 3, US Environmental Protection Agency; J. N. Am. Benthol. Soc., 27(3):717–737 (8 July 2008).

In addition to the data on sensitivity for genera in common with the EPA, Column L in Table 1 of Appendix A identifies Minnesota genera/species that the Copper-Nickel Tolerance Report identified as sensitive to hardness, sulfate, and pH. In many cases, these values identify genera/species that are sensitive to mining pollutants in addition to those found in the EPA's Appalachian XC95% Column K values.

IV. Discussion: Mining Impacts to Northeast Minnesota Waters

This Section of the evaluation will review impacted mining areas in Ecoregion 54n (see Figure 1 Minnesota Ecoregion Map) using some of the existing benthic invertebrate and water chemistry data. Open-pit taconite and copper-nickel mining and production facilities produce waste rock and tailing. As in mountain-top mining for coal, Minnesota's mining leachates contain elevated specific conductance, composed mainly of Ca, Mg, SO₄ and HCO₃, which are released into waters with natural low concentrations of these ions in circumneutral pH. Taconite mine dewatering has not been documented to release levels of heavy metals beyond chronic numeric stream water standards, with some exceptions for iron and mercury where the Duluth Complex or the Virginia Formation have been disrupted.

A. Kawishiwi River Subwatershed, Rainy River Basin

In addition to elevated specific conductance, Duluth Complex and Virginia Formation waste leachates have been demonstrated to contain levels of heavy metals above chronic surface water standards and to be acutely and chronically toxic. Heavy metal ions have been documented in the following Minnesota sites: Cliffs' Dunka taconite mine Duluth Complex waste rock, Minnamax Copper-Nickel test shaft (closed), and INCO's Copper-Nickel bulk sample site (closed) near Filson Creek, all north of the Laurentian Divide. The proposed NorthMet PolyMet would also produce heavy metals, but its primary drainage effects would occur in the St. Louis River subwatershed of the Lake Superior Basin.

1. Dunka Taconite Mine with Sulfide-Bearing Waste Rock

At the Dunka taconite mine (currently owned by Cliffs), the prior owner, LTV, encountered low-level sulfide-bearing waste rock, including both Duluth Complex and Virginia Hornfels overlying the Biwabik Iron Formation (taconite). Leachate seepages from 1970's stockpiles of Duluth Complex waste rock discharge to Unnamed Creek, classified as a water of the United States and of the State in the Rainy River watershed. MDNR reports and NPDES permit DMRs for over 37 years have documented significantly elevated specific conductance at this site.

For example, as illustrated in Table 5, derived from Cliffs NPDES permit MN00042579 DMRs, despite wetland treatment, Dunka discharge into Unnamed Creek and to Birch Lake

from January through May 2014, contain elevated levels of specific conductance.⁵⁶ (Cliffs, Permit DMRs, 2014) as follows:

Table 5 - Dunka Discharge to Unnamed Creek (2014)				
Specific Conductance Levels				
Site	Mean ($\mu\text{S}/\text{cm}$)	High ($\mu\text{S}/\text{cm}$)	Low ($\mu\text{S}/\text{cm}$)	Number
SD007	2,133	2,512	2,133	9
SD009*	2,765	3,284	2,001	9
SW001 (Unnamed Creek)	579	1,225	203	10
* Cycled back to SD007 due to elevated levels.				

The Copper-Nickel Study classified Unnamed Creek as an order 1-2 stream. Since mining has ceased, this Creek is likely an order 1 stream due to the cessation of pit dewatering. The Copper-Nickel Study biologically evaluated the Creek and compared it with six other streams in the study region. The Study's Biological Sampling established that benthic invertebrates in Unnamed Creek "should be similar in streams of nearly equal stream order although the species in each stream may be different." It concluded:

"[A] number of major biological differences between Unnamed Creek and other streams in the region are evident. Most of these differences indicate that Unnamed Creek is stressed. Low invertebrate population size, diversity of drifting invertebrate population, and the number of invertebrate taxa all indicate stress conditions."⁵⁷ (Johnson *et al.*, 1978)

This Biological Sampling report noted that highly fluctuating mine dewatering and heavy metals might have adversely affected the benthic invertebrates in the Creek.⁵⁸ (Johnson *et al.*, 1978). Cliffs has contracted for benthic invertebrate studies starting in 2000.⁵⁹ (Doran, 2012). The sampling is not robust in that it is limited to results from Hester-Dendy multiple plate artificial substrate samplers. Cliffs' contracted research also has not performed detailed genus level identification of all taxa beyond Ephemeroptera, Plecoptera, and Trichoptera (hereinafter referred to as "EPT"). However, Hester-Dendy multiple plate samplers are documented to be more selective for EPT than other invertebrates, and studies have shown that average total abundance and species richness for EPT did not differ between Hester-Dendy and kick samples.⁶⁰ (Letovsky *et al.*, 2012). Thus, for EPT abundance and richness evaluations, the Hester-Dendy samplers should be adequate for EPT comparisons.

⁵⁶ *Ibid.*, 26.

⁵⁷ *Ibid.*, 42, Johnson *et al.*, Copper-Nickel Study Erie Biological Sampling, p. 31.

⁵⁸ *Id.*, p. 31.

⁵⁹ Doran, Peter, Letter to Bruce Trebnick Northeast Technical Services copied to MPCA, September 17, 2012.

⁶⁰ Letovsky, Erin, Ian E. Myers, Alexandra Canepa, Declan McCabe, *Differences between kick sampling techniques and short-term Hester-Dendy sampling for Stream Macroinvertebrates*, 2012, Department of Biology, Saint Michael's College, Colchester Vermont 05439, p. 53, available at http://wolfweb.unr.edu/~cmmore/Christopher_Moore/BIOL322_files/CritiquePaper_SamplingTechniques.pdf

The Cliffs analysis did not compare Unnamed Creek with other unimpacted similar streams in the area. On December 9, 2011 Cliffs reported the benthic invertebrate sampling results for 2011 to the MPCA with the following summary statements: “This total [invertebrates] compares favorably with the previous 12 years of sampling, and suggests no significant decline in overall insect diversity over the 12 year period of sampling.”⁶¹ (Hartman, 2011). Cliffs further stated: “this riffle is characterized by more of the fist-sized, cobble type rocks typically considered optimum habitat for benthic invertebrates in a stream system.” The riffle habitat described by Cliffs is near MPCA NPDES site SW001 in Unnamed Creek, before the Creek discharges into Bob Bay of Birch Lake, shown on the Figure 3 Dunka Mine Map.

Almost 40 years ago, Copper-Nickel Study biological sampling suggested that mine dewatering causing varying flows and substrate disruption might have contributed to the negatively impacted Unnamed Creek invertebrate populations.⁶² (Johnson, 1978). Since the LTV Dunka Mine closure, no pit dewatering discharges have entered the Creek. Cliffs has concluded that the substrate at the sampling location is suitable and the recent 12 years of invertebrate data has had no significant change.⁶³ (Cliffs, Request for Variance, 2011). With neither flow issues nor poor substrates as potential contributors to observed invertebrate impacts, *contaminant chemicals in the water are the most likely cause of continuing negative invertebrate impacts*. Recent invertebrate data underscore that passive wetland treatment and management changes since 2010 have not re-established the invertebrate populations.

Comparison of Cliffs’ report of Unnamed Creek family and genera richness for Ephemeroptera, Plecoptera, Trichoptera with Table 1 Appendix A data from four unimpacted similar streams in the same ecosystem indicates there are far fewer families, fewer genera, and less total richness of EPT than background streams. This data is reflected in the following Table 6.⁶⁴ (Cliffs, 2011; Doran, 2014).

Table 6 - Benthic Invertebrate Richness Comparison Dunka (Impacted) Unnamed Creek & Background Creeks (Cu-Ni Study)						
	Unnamed (6 yrs)	Background Creek Mean	Unimpacted Streams (3 yrs)			
			Keeley	Filson	August	Nira
Ephemeroptera families	3	6.25	7	7	6	5
Plecoptera families	1	3.75	3	3	5	4
Trichoptera families	10	9	7	9	10	10
Ephemeroptera genera	4	11	12	12	9	11
Plecoptera genera	2	5	4	3	8	5
Trichoptera genera	13	15.8	17	17	18	21
Total EPT Genera Richness	19	33.3	29	32	35	37
Total EPT Family Richness	14	19.5	17	19	21	19

⁶¹ *Ibid.*, 43, Hartman, Cliffs Memo to MPCA.

⁶² *Ibid.*, 42, Johnson *et al.*, *Copper-Nickel Study Erie Biological Sampling*, p. 37.

⁶³ *Ibid.*, 47, Cliffs Variance Request, Part 1, p. 31.

⁶⁴ *Id.*, Appendix 2, Table 1; Doran, Peter D., 2014 *Summary Report of Aquatic Macroinvertebrate Sampling for Unnamed Creek, Dunka Mine Area*, Northeast Technical Services Inc., December 5, 2014.

In Table 6, a summary of six years of family and genera EPT for Unnamed Creek is compared with a summary of three years of data from four unimpacted background streams in the same area. Background streams are close to Unnamed Creek and of similar stream order. This table suggests Unnamed Creek is substantially less rich in both Ephemeroptera and Plecoptera families and genera. In the underlying data, the unimpacted Keeley Creek has 29 EPT genera; Filson Creek has 32 EPT genera; August Creek has 35 EPT genera; and Nira Creek has 37 EPT genera. Unnamed Creek has only 19 EPT genera. The composition measure of EPT also decreases when compared with background streams.

In general as discussed previously, Trichoptera tend to be insensitive to pollutants, so the differences in Trichoptera are minor. Far more significant disparities in Ephemeroptera and Plecoptera families and genera are evident: there are more than twice as many Ephemeroptera families and more than three times as many Plecoptera families in unimpacted waters. There are also 275 percent more Ephemeroptera genera and 250 percent more Plecoptera genera in unimpacted waters than in the Unnamed Creek waters impacted by Dunka Mine discharge. These values are consistent with EPT richness losses reported by Pond⁶⁵ (Pond, 2008) in the mined areas of the Appalachians.

This disparity in taxa richness cannot be attributed to non-anthropogenic geology. Filson Creek is located on an exposed Duluth Complex rock similar to the location of Dunka Mine. Yet, as shown in Table 6, Filson Creek has demonstrated no invertebrate impairment. With Filson as a paired background creek, the exposed Duluth Complex at Dunka is unlikely to be a significant contributor to the invertebrate impairment.

Cliffs' report on Unnamed Creek used the Hilsenhoff Biotic Index (HBI) to estimate the overall health of the invertebrate population in Unnamed Creek. The HBI estimates the *general* overall tolerance of the community according to relative abundance of the family taxonomic groups in the Creek community that were given a numeric sensitivity value. In using the HBI, the Cliffs report missed some important aspects of data interpretation.

The HBI protocol counts all Ephemeroptera families as highly sensitive. In fact, for specific conductance, this is not the case. The EPA has determined that many Ephemeroptera genera common to Minnesota (Table 1, Column K, in Attachment A) are tolerant to high specific conductance. For example, Ephemeroptera *Caenis* sp. has a XC95% tolerance that exceeds >3,923 $\mu\text{S}/\text{cm}$, compared to Ephemeroptera *Leptophlebia* sp. with a tolerance of 251 $\mu\text{S}/\text{cm}$. Compared to the methods of the EPA Conductivity Benchmark Study, the HBI as used by Cliffs is a gross method of evaluation and lacks necessary sensitivity for this report, as follows:

1. The HBI was developed using invertebrate sensitivity to organic pollutants that deplete oxygen, such as nutrients.⁶⁶

⁶⁵ *Ibid.*, 55, Pond *et al.*, *Downstream effects of mountaintop coal mining*, 2008.

⁶⁶ See *e.g.*, University of Vermont, Manual for Calculation of Metrics, http://www.uvm.edu/~streams/PDFFiles/Manual_Calc_Of_Metrics.pdf

2. Cliffs used a family tolerance value to calculate the HBI, but often genera within a family are not uniformly tolerant.
3. Although Cliffs described the population in each genus within the Unnamed Creek community, its report failed to compare similar unimpacted communities.

To further establish the relationship between elevated specific conductivity in Unnamed Creek and the loss of EPT richness, Unnamed Creek EPT genera can be compared with the EPA XC95% specific conductivity values and the Copper-Nickel Study Tolerance Study values⁶⁷ (EPA Conductivity Benchmark Study, 2011; Bartoo, 1978). The mean specific conductance for Unnamed Creek at SW001 in 2014 was 579 $\mu\text{S}/\text{cm}$. However, as shown in Table 5 above, Unnamed Creek experienced specific conductance as high as 1,225 $\mu\text{S}/\text{cm}$.

As shown in Table 7 below, each genus identified by Cliffs in Unnamed Creek can be compared to data on sensitivity to contaminants. Two of the genera in Ephemeroptera - Baetis sp. and Caenis sp. - are very tolerant of elevated specific conductance, hardness, sulfate and pH. Two other genera - Leptophlebia and Paraleptophlebia - are more sensitive. Plecoptera has one genus that is very tolerant of specific conductance as high as >3,314 $\mu\text{S}/\text{cm}$, and the other genus is sensitive at 463 $\mu\text{S}/\text{cm}$. Among the 13 Trichoptera genera, two of the seven for which data is identified are sensitive to high specific conductance - Pycnopsyche sp. and Lepidostoma sp. The remaining six genera have no sensitivity levels documented or have inconclusive taxonomies.

Table 7 - EPT Taxa Identified by Cliffs in Unnamed Creek Analysis for Sensitivity to Specific Conductance, other Pollutants				
Cliffs (2005-2010) Unnamed Creek Genera	EPA Benchmark Study XC95% for SC	Copper-Nickel Study Tolerance Report		
		Hardness	Sulfate	pH
<u>Ephemeroptera</u>				
Baetis sp.	>1,395	16-1,000	<10-5,700	5.6-8.5
Caenis sp.	>3,923	6-705	<1-450	5.4-8.5
Leptophlebia sp.	251	nd*	nd*	nd*
Paraleptophlebia sp.	463	nd*	nd*	nd*
<u>Plecoptera</u>		nd*	nd*	nd*
Isoperla sp.	460	nd*	nd*	nd*
Perlesta sp.	3,314	nd*	nd*	nd*
<u>Trichoptera</u>		nd*	nd*	nd*
Hydropsyche sp.	>7,010	nd*	nd*	nd*
Cheumatopsyche sp.	>9,180	nd*	nd*	nd*
Chimarra sp.	>3,792	4-800	7.3-510	6.8-8.7
Pycnopsyche sp.	295	4-705	2.4-750	6-8.8

⁶⁷ *Ibid.*, 2, EPA Conductivity Benchmark Study, 2011; *Ibid* 38, Bartoo, Copper-Nickel Study Tolerance Report, 1979. This data is reflected in Table 1, Appendix A.

Lepidostoma	~121	6-66	2.5-25	6.4-7.3
Polycentropus sp.	>4,713	nd*	nd*	nd*
Ptilostomis sp.	nd*	nd*	nd*	nd*
Anabolia sp.	nd*	nd*	nd*	nd*
Limnephilis sp.	nd*	nd*	nd*	nd*
Phryganea sp.	nd*	nd*	nd*	nd*
Ochrotrichia sp.	>2,971	nd*	nd*	nd*
Neureclipsis sp.	nd*	nd*	nd*	nd*
Ceraclea sp.	nd*	nd*	nd*	nd*
nd* = no data available				

At least five of the 13 genera for which specific conductance XC95% levels are known, or 38% of the identified EPT genera, are sensitive to specific conductance. Additional genera, such as Trichoptera *Lepidostoma* sp. and *Chimarra* sp. might also be sensitive to increased hardness or sulfate.

The Copper-Nickel Study Biological Sampling report from 1978 stated that the sampling areas immediately downstream of the Dunka Mine waste rock seepages had two to ten times fewer organisms than further downstream near Birch Lake.⁶⁸ (Johnson *et al.*, 1978). The Sampling report further stated the “Recolonization of impacted stream areas by aquatic insects is generally rapid after a stress is discontinued.”⁶⁹ The Cliffs data near the SW001 Unnamed Creek site is similar to the Copper-Nickel Study data near the same location despite the passage of 37 years. Unnamed Creek continues to demonstrate significant EPT stress when compared with similar unimpacted streams in the area.

2. Northshore Peter Mitchell Pit

The Northshore Peter Mitchell taconite mine pit, as previously discussed, discharges its eastern dewatering to the Dunka River in the Rainy River watershed. Specific conductivity concentrations in this discharge range from 300 µS/cm to 900 µS/cm, and are high enough to have potential impacts on sensitive genera.

Research in Minnesota has concluded that Peter Mitchell Mine discharge is toxic to aquatic life: “Using toxicity data compiled by Clark (12), parameters in Reserve’s [now Northshore] discharge with a mean concentration above the minimum known toxicity to fish or aquatic invertebrates include Na [sodium], Ca [calcium], NH₃ [ammonia], Mn [magnesium], and Fe [iron].”⁷⁰ (Benzie, 1977).

Peter Mitchell NPDES discharges SD001, SD002, SD003, SD004, and SD005 enter the Dunka River watershed and flow into Birch Lake, a reservoir in the Kawishiwi River.

⁶⁸ *Ibid.*, 42, Johnson *et al.*, Copper-Nickel Study Biological Sampling, 1978, p. 22.

⁶⁹ *Id.*, p. 9.

⁷⁰ *Ibid.*, 28, Benzie, *Water Quality of the Dunka River*, p. 38.

Embarras River

Ridge Creek

Yelp Creek

Fawn Creek

Stubbs Creek

Bunker River

AREA 001
Pit Dewatering
SD001 - SD003

AREA 002
Pit Dewatering
SD004 - SD005

AREA 003
Pit Dewatering
SD006 - SD012

AREA 004
Pit Dewatering
SD013 - SD019

SD018
SD017
SD014
SD015
SD019
SD013
SD016

Location	Mean Conductivity ($\mu\text{S}/\text{cm}$)	Maximum Conductivity ($\mu\text{S}/\text{cm}$)
SD001	374	667
SD002	494	711
SD003	305	527
SD004	667	833
SD005	605	918

-30-

Considering EPA's benchmark and the data on invertebrates in Unnamed Creek, most if not all of these levels are high enough to have potential impacts on sensitive genera.

B. St. Louis River Watershed, Lake Superior Basin

1. Minnesota Pollution Control Agency Draft SLR Stressor Report

In a report prepared in 2013 but not released to the public, the MPCA determined that 32% of the St. Louis River tributary assessment units tested were impaired for fish and/or invertebrates. In the segment of the St. Louis River from mile 72 to mile 193.3 the following major tributaries were determined by the MPCA to be impaired: Embarrass River - fish; Spring Mine Creek - invertebrates, fish; Wyman Creek – fish⁷² (MPCA, Draft SLR Stressor Report, 2013). The MPCA Draft St. Louis River Stressor Identification Report explicitly attributed impairments to discharge from mining facilities:

“Fish results from the upper Embarrass River (the portion upstream of the town of Embarrass) show extremely low fish counts and limited taxa richness. . . Two of the impaired streams in this watershed zone, Spring Mine Creek and the Embarrass River, receive water originating from mine pits. Sampling results from these streams show elevated specific conductance and sulfate concentrations.”⁷³ (MPCA, Draft SLR Stressor Report, 2013)

In explaining the impairment of Spring Mine Creek, MPCA's Draft SLR Stressor report acknowledged the difference in sensitivity of invertebrates and the potential for taxa imbalance as a result of mine discharge:

“Spring Mine Creek is the only stream in this watershed zone that is listed as impaired for macroinvertebrate bioassessments. . . [A]ncillary information considered in the assessment process (elevated specific conductivity readings; invertebrate samples dominated by Gammarus and Corixidae) resulted in an impairment listing. Symptoms of impairment observed in Spring Mine Creek include a very low relative percentage of non-hydropsychid caddisfly taxa (1.6%) and imbalance in the distribution of taxa present. Over 76% of the individuals counted were from the five most abundant taxa in the sample. Bear Creek, the potential reference stream for this watershed zone, shows more balance among taxa present, supports more intolerant taxa, and better representation from the order trichoptera.”⁷⁴ (MPCA, Draft SLR Stressor Report, 2013)

MPCA methods were different from and less sensitive than the methods in the EPA Conductivity Benchmark Study. MPCA used a single background reference stream, and MPCA's statements regarding the relationship between fish or aquatic invertebrate impairments and specific conductance were not definitive. Even with these limitations,

⁷² *Ibid.*, 41, MPCA, Draft SLR Stressor Report, 2013, pdf auto pp. 16, 25, 26, 97 Attachment B.

⁷³ *Id.*, pdf auto p. 16,

⁷⁴ *Id.*, pdf auto p. 109..

MPCA's analysis suggests that there are adverse impacts on fish and invertebrates in the St. Louis River watershed resulting from sulfate and conductivity originating from mine facilities.

In general, the MPCA Draft SLR Stressor Report noted, "With increases in ionic strength, macroinvertebrate taxa richness (particularly Ephemeroptera sp.) have been found to decrease (Piscart *et al.*, 2005). Echols *et. al* (2009) observed a reduction in EPT abundance as conductivity values increased." MPCA found that sites with conductivities "higher than 1,000 $\mu\text{S}/\text{cm}$ rarely meet the biological thresholds for general use streams."⁷⁵ (MPCA, Draft SLR Stressor Report, 2013)

2. Northshore, LTV & Mesabi Nugget Discharges to Yelp Creek and Partridge River

As shown in Figure 4, Map of Northshore Peter Mitchell Mine Pit Discharge Sites, several St. Louis River watershed tributaries receive direct mine drainage and/or flow through heavily mined areas, including Yelp Creek and the Partridge River.

Under Permit MN0046981 the Peter Mitchell Pit has eight permitted discharges south of the Laurentian Divide, all of which eventually reach the Partridge River: two discharge to Yelp Creek, then into the Partridge River and another six discharge to unnamed creeks or to wetlands of the Partridge River.

A winter survey of the Partridge River by the MDNR⁷⁶ (Kruse, 2011) documented that Partridge River flows from November 2008, December 2010, January 2011, February 2011, and March 2011 showed large volumes of discharge. The flows reported ranged from 0 to 41.9 cubic feet per second or cfs (219,912 gallons per minute or gpm). From November 24-26, 2008, the Partridge River had flows between .040 cfs and .063 cfs. Again on Jan. 25, 2011 flows ranged from .030 cfs to 0.41 cfs. This data demonstrates that the main Partridge River flows upstream of Colby Lake are significantly affected by Peter Mitchell discharges. NPDES DMR data reported discharges for the month of January 2010 from SD009 (Yelp Creek) of 5.5 cfs. During certain portions of the year, Partridge River discharge fluctuations mimic the reported fluctuations from the Peter Mitchell Pit to the Dunka River watershed as reported in the Copper-Nickel Study.⁷⁷ (Benzie, 1977). Northshore's NPDES permit requires water chemistry monitoring of the Partridge River at SW004 at the Highway 666 bridge east of Hoyt Lakes, just before Wyman Creek enters the Partridge River. The DMR reports from 2010 to 2014 demonstrate specific conductance in the range of 250 to 350 $\mu\text{S}/\text{cm}$ level.⁷⁸ (Northshore DMRs).

The closed LTV taconite plant and tailing basin were constructed over the headwaters of

⁷⁵ *Id.* pdf auto p. 38.

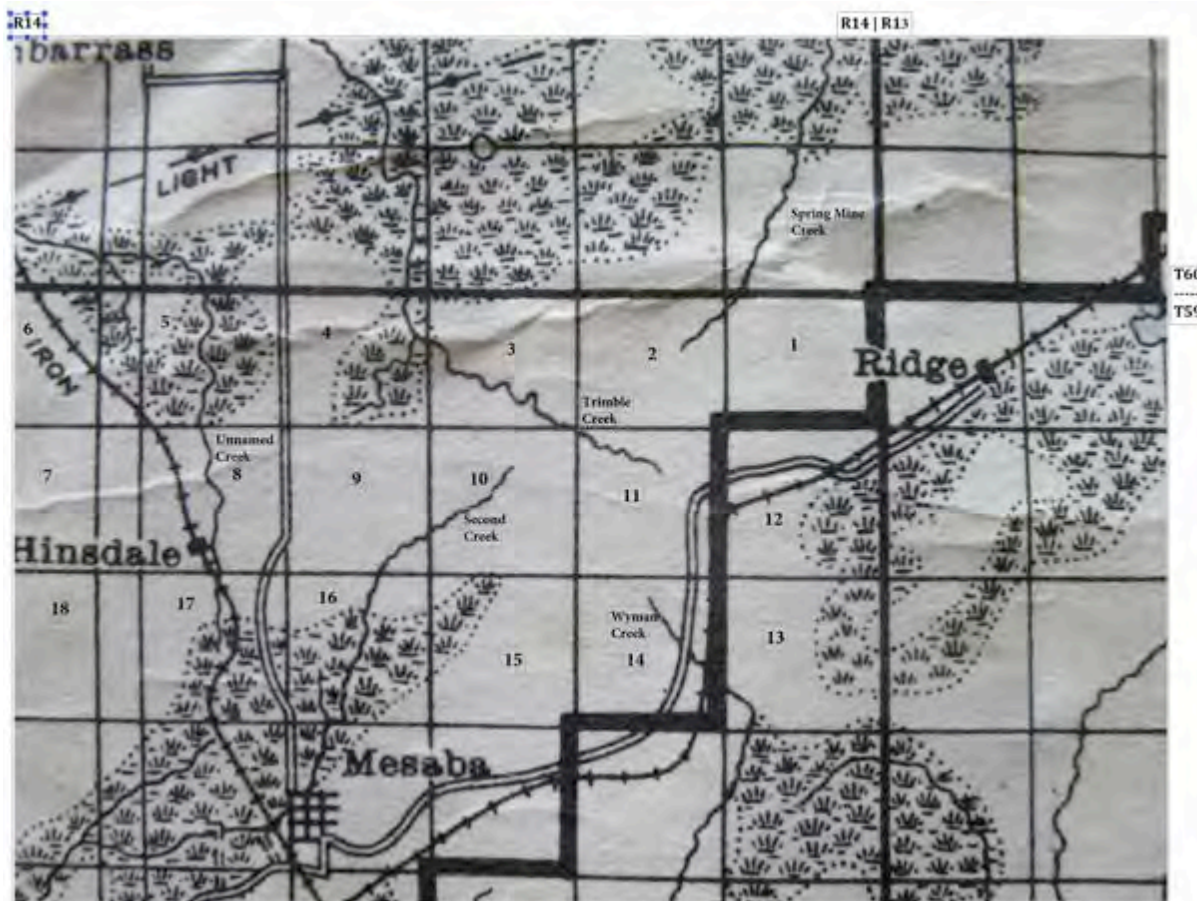
⁷⁶ Kruse, G., Minnesota Department of Natural Resources, *Partridge and Embarrass River Winter Base Flow Study*, 2011, 2008-2011 data.

⁷⁷ *Ibid.*, 28, Benzie, *Water Quality of the Dunka River*, 1977, pp. 3-41.

⁷⁸ *Ibid.*, 71, Northshore NPDES permit DMRs.

three streams. (U.S.F.S., Superior National Forest maps 1938,⁷⁹ and 1977, revised 2011⁸⁰). Figures 5a, 5b, and 5c below illustrate the progression of LTV tailings facility construction.

Figure 5a. Area of LTV facility portions of map, Superior National Forest, Minnesota, 1938.⁸¹



The above map from 1938 shows township, range and section notations along with creek names for Second Creek, Trimble Creek, Wyman Creek, Spring Mine Creek and Unnamed Creek. The LTV tailings basin will be located in the sections of Figure 5a identified as 3, 4, 5, 8, 9, and 10.

The origin of Second Creek lies under the LTV southern tailing basin, facility in the area identified as section 10 on Figure 5a and under mine waste rock piles in and near section 16 on Figure 5a. Second Creek flows south and southwest to the Partridge River. Trimble Creek runs beneath the tailings basin in section 3 of Figure 5a in the northeast quarter of the tailing basin and flows northwest toward the Embarras River. An unnamed creek

⁷⁹ U.S. Department of Agriculture Forest Service, *Superior National Forest, Minnesota, 1938*, map area of R14 T59N, T60N.

⁸⁰ U.S. Department of Agriculture Forest Service, *Superior National Forest, Minnesota*, map constructed in 1997, revised in 2011, map area of R14 T59N, T60N.

⁸¹ *Ibid.*, 78, U.S.F.S. Superior National Forest, map, 1938.

emerges from under the northwest corner of the tailing basin in approximately section 5 of Figure 5a and flows generally west to Embarrass River.

Over time, in addition to headwaters for Second Creek the LTV tailings basin will inundate Trimble Creek and Unnamed Creek. Figure 5b below features portions of the Superior National Forest reflecting 1997 conditions.⁸² Figure 5b also shows the relationship of Second Creek to wetlands. As of 1997, the northeast quadrant of the LTV tailing basin, north of the Taconite Processing Plant still shows Trimble Creek headwaters that will later be inundated with tailings, as shown in Figure 5c.

Figure 5b, LTV facility and Second Creek features as of 1997.



Since the 1997 conditions shown in Figure 5b, Second Creek has received cumulative mining discharges impacting its water quality. Its headwaters are impacted by the plant site and seepage from the LTV tailings basin, monitored at SD026, shown in Figure 5c. This surface discharge location reported bicarbonates averaging 454 mg/l, hardness of 610 mg/l, and specific conductance of 1,115 $\mu\text{S}/\text{cm}$.⁸³ (Cliffs, 2012). Under a 2010 Consent Decree, surface water contaminated with seepage is collected and pumped back to the tailing basin. The pump-back does not capture all seepage and SD026 specific conductance remains high, likely due to continued seepage with underground flow through subsurface tills.

⁸² *Ibid.*, 77, USFS, Superior National Forest, map, constructed 1997, updated 2011.

⁸³ Cliffs, NPDES/SDS Permit MN0042536, Variance Addendum Renewal Cliffs Erie Hoyt Lakes Mining Area Surface Discharge Stations SD026 and SD033, December 10, 2012. p. 2, Table 1,

Monitoring at SD026 in 2013, more than a decade after processing of tailings ceased and despite the implemented pump-back, indicates specific conductance ranging from 666.2 $\mu\text{S}/\text{cm}$ to 980.9 $\mu\text{S}/\text{cm}$, with a mean of 842.5 $\mu\text{S}/\text{cm}$.⁸⁴ (Barr, 2014). These levels are high enough to have potential impacts on sensitive genera.

Figure 5c, Map of PolyMet Proposed Tailings & Mine Locations, with Sampling Sites

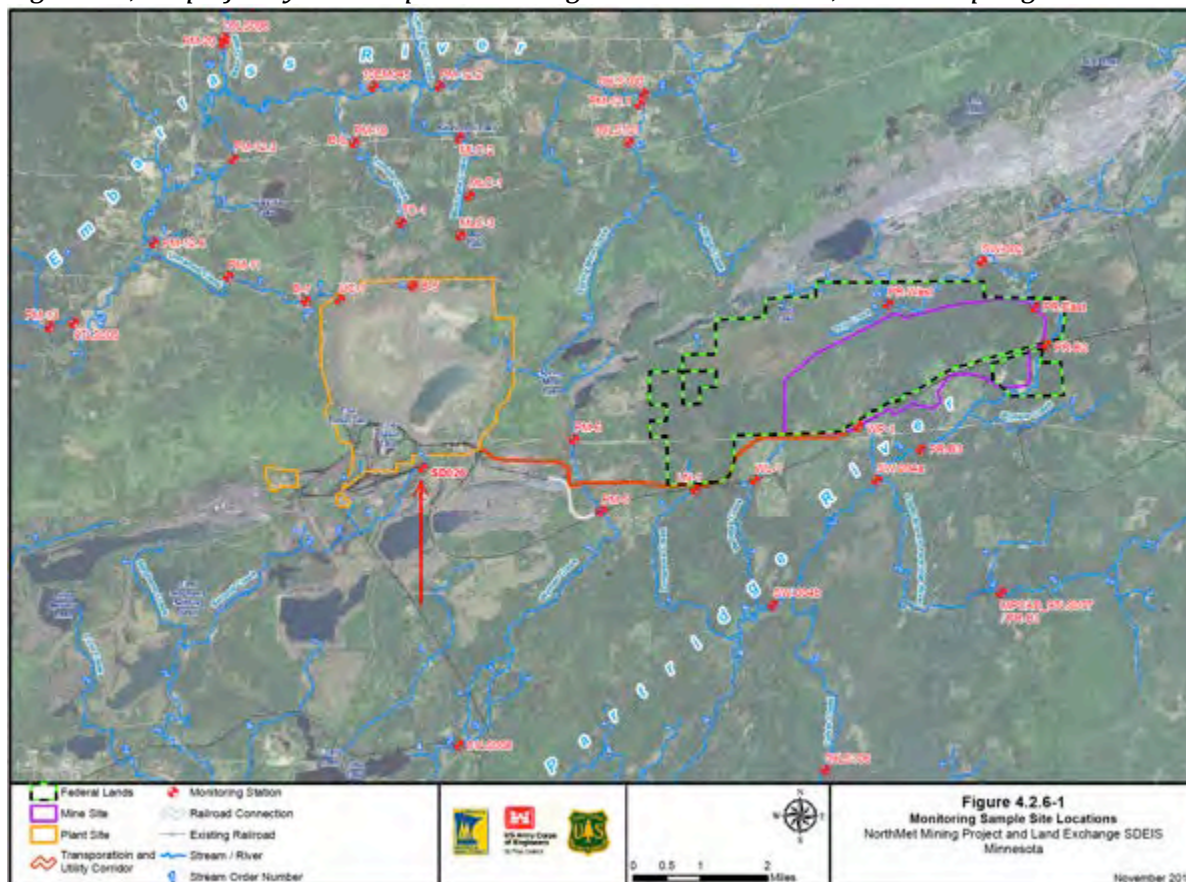


Figure 5c shows the former LTV tailing basin and facility in orange and the SD026 monitoring location on Second Creek with a red arrow. LTV Pit 1 extends to the west from the small orange portion of the facility.⁸⁵ (MDNR *et al.*, 2013).

Downstream from SD026, Second Creek may receive pit water from additional mine sources: from LTV Pit 2/2E water moving through groundwater to Pit 2W, which then flows to Second Creek.⁸⁶ (MDNR *et al.*, 2015); from flow from the Knox and Stephens mines through surface water or shallow groundwater (Figure 5b); and from Pit 9 ground water

⁸⁴ Barr Engineering, Summary of 2013 NorthMet Groundwater and Surface Water Monitoring Data, , *Summary of 2013 NorthMet Groundwater and Surface Water Monitoring Data*, Technical Memorandum to MPCA, March 28, 2014, Table 1.

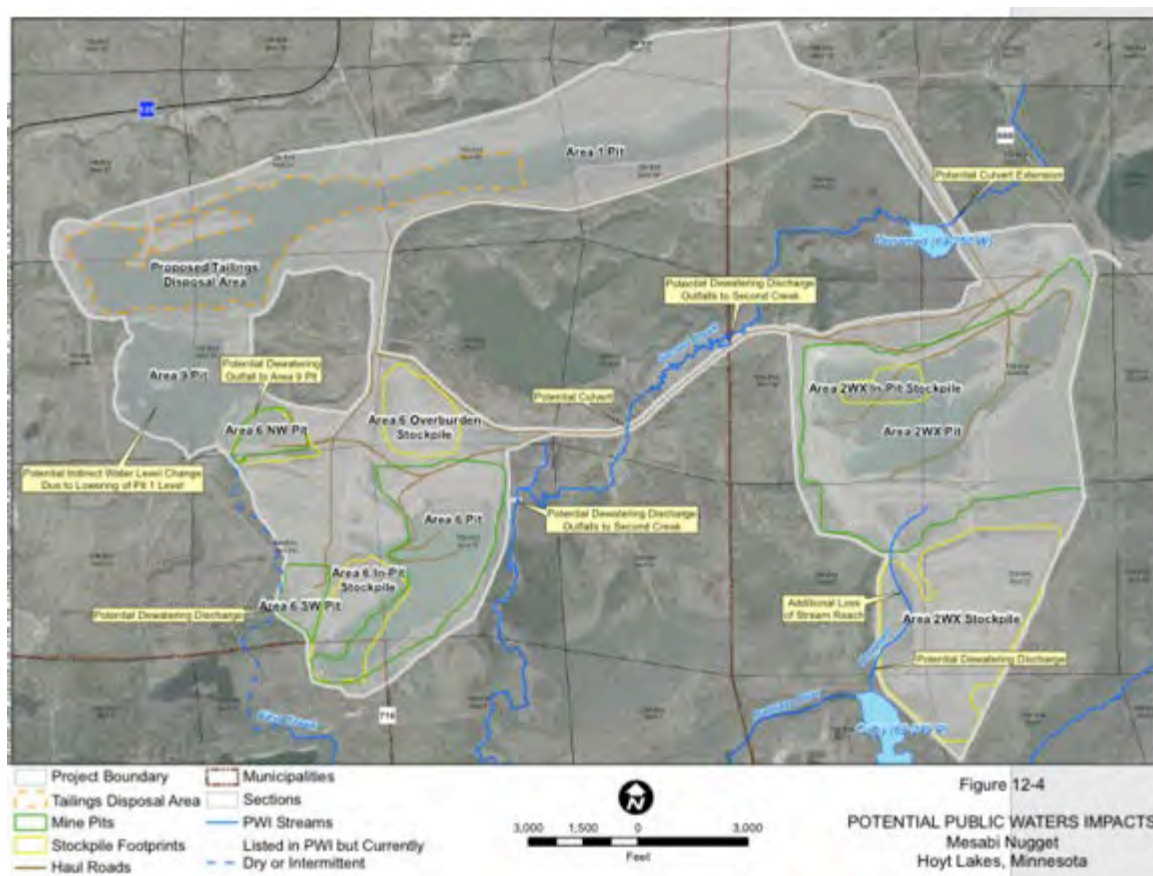
⁸⁵ MDNR, U.S. Army Corps of Engineers, and U.S. Department of Agriculture Forest Service, *PolyMet Supplemental Draft Environmental Impact Statement NorthMet Mining Project and Land Exchange*, November 2013 Figure 4.2.6-1.

⁸⁶ MDNR, U.S. Army Corps of Engineers, and U.S. Department of Agriculture Forest Service, *PolyMet NorthMet Preliminary Final Environmental Impact Statement*, June 2015, p. 6-13. (hereinafter "PolyMet PFEIS")

inflows to Pit 1. According to an EPA site visit report,⁸⁷ LTV mine pits also contain waste rock, increasing the potential release of contaminants from pit water.

Second Creek may also receive Pit 1 discharge from Mesabi Nugget in permit-approved months. Figure 6 illustrates potential locations where Mesabi Nugget could impact public waters during smelting operations.⁸⁸ (Barr, 2008).

Figure 6, Map of Mesabi Nugget Potential Public Waters Impacts



As a result of upstream discharges, specific conductance at Mesabi Nugget NPDES SW001, Second Creek just upstream of Pit 1 discharge location, in 2014 averaged 699 $\mu\text{S}/\text{cm}$. Bicarbonates were also elevated at 266 mg/L and hardness averaged 343 mg/L, with a sulfate mean concentration of 80.9 mg/L. When operating, Mesabi Nugget's smelter discharges into Pit 1, with discharge to WS003 of 75.9 mg/l bicarbonates; 1,224 mg/l hardness (Ca and Mg); 2,031 mg/l sulfate; and specific conductance of 3,873 $\mu\text{S}/\text{cm}$. (Mesabi Nugget DMRs, 2014). Pit 1 is estimated to contain 13.7 billion gallons of water.

⁸⁷ U.S. EPA, Technical Resource Document Extraction and Beneficiation of Ores and Minerals, Volume 3, *Iron*, August 1994, EPA 530-R94-030, NITS PB94-195203, Mine Site Visit: LTV Steel Mining Company

⁸⁸ Barr Engineering, Mesabi Nugget EAW Report, July 28, 2008, Figure 12-4. The proposal for mining has recently been withdrawn.

Average specific conductance of Pit 1 water discharged at SD001 in 2013 (January –March, October -December) was 1,290 µS/cm. Discharge from Pit 1 at SD001 into Second Creek, for 2014 January through March, averaged 334 mg/l bicarbonates; 752 mg/l hardness (Ca and Mg); 480 mg/l sulfate; and 1,389 µS/cm in specific conductance. From 2013-2014, specific conductance in this discharge ranged from 974 µS/cm to 1434 µS/cm.⁸⁹ (Mesabi Nugget DMRs, 2013-2014).

PolyMet’s environmental review documents provide little characterization of benthic invertebrate populations. The PolyMet PFEIS applies the Hilsenhoff Biotic Index (HBI) to two sampling sites downstream of Northshore Peter Mitchell Mine discharge (PR-West and PR-East), and characterizes these sites as having an HBI ranking of “fair.” No other Partridge River sites are assessed for HBI ranking. No invertebrate data is provided downstream of the LTV discharge site SD026.⁹⁰ (MDNR *et al.*, 2015). Single sampling dates at the few locations sampled in either the Partridge River or Embarrass River watershed, and failure to identify specific invertebrate genera and species,⁹¹ and the paucity of data does not permit an assessment of the relative richness of taxa related to various discharge sites. With so little and such poor quality data available regarding benthic invertebrates under current conditions, effective monitoring of potential impacts of the proposed PolyMet copper-nickel mine project on sensitive macroinvertebrate genera is unlikely.

In summary, specific conductance, hardness, sulfate, and bicarbonates concentrations are elevated in Second Creek as a result of mine and smelting drainage. These values are higher than levels in Unnamed Creek impacted by Dunka mine discharge that seem to demonstrate significant invertebrate impact. The scarce data available suggests that benthic invertebrates at the genera and species levels in Second Creek are likely to be significantly impacted by elevated specific conductance and other mining discharge. Background invertebrate data provided for PolyMet environmental review are inadequate either to characterize current conditions or evaluate potential future impacts.

It should be noted that, like other unlisted waters in the northeast Minnesota ecoregions in the Lake Superior basin, Second Creek is considered to be an Outstanding International Resource Value Water. Minn. Rule 7052.0010 Subp. 34.

3. LTV and Impaired Waters - Wyman Creek and Spring Mine Creek

Wyman Creek is a headwaters stream that flows southeast of the LTV tailing basin and then south to the Partridge River just above Colby Lake (See Figures 5a- 5c). Cliffs’ abandoned

⁸⁹ Mesabi Nugget NPDES Permit MN0067687, DMRs, 2013-2014.

⁹⁰ *Ibid.* 85, see PolyMet PFEIS, Table 4.2.6-6, p. 4-259 and sites in Figure 4.2.6-1. See also p, 4-252, “No aquatic biota studies have been conducted in Longnose Creek, Wetlegs Creek, or Second Creek, and no fish or macroinvertebrate community or habitat characteristics could be documented, although, like Yelp Creek, all are first-order streams within the vicinity of the NorthMet Project area.”

⁹¹ *Id.*, see Table 4.2.6-14, p. 4-276 regarding macroinvertebrates in the Embarrass River watershed and sites in Figure 4.2.6-1.

Pit 3 discharges to Wyman Creek at 350 gpm (0.8 cfs).⁹² (MDNR *et al.*, 2015).

The LTV tailing basin has contaminated groundwater that emerges as seeps including one measured at SD012, the closest to Wyman Creek. In 2010, average specific conductance in SD012 tailings seepage was 1,097 $\mu\text{S}/\text{cm}$, and specific conductance at PM5 in Wyman Creek was 431 $\mu\text{S}/\text{cm}$.⁹³ (Barr, 2010). Other Cliffs mining facilities - Pit 5S and Pit 3 discharge to Wyman Creek and may also indirectly discharge to Wyman Creek via groundwater.⁹⁴ (MPCA, Cliffs Permit Approach, 2013).

The MPCA Draft St. Louis River Stressor Report noted that the headwaters of Wyman Creek are impacted by a series of mine pits and that historically Wyman Creek supported small populations of brook trout. In 2012, MPCA determined that Wyman Creek is impaired for fish communities. MPCA automatic sampling “SONDI” recorders reported a mean specific conductance of 360 $\mu\text{S}/\text{cm}$ (range 350 to 364 $\mu\text{S}/\text{cm}$) in 196 samples taken in August 2012 and a mean specific conductance level of 366 $\mu\text{S}/\text{cm}$ (range 350 to 374 $\mu\text{S}/\text{cm}$) in 583 samples taken in August and September of 2013. The MPCA’s Draft SLR report did not complete the analysis of the potential anthropogenic stressors for Wyman Creek or other impaired waters.⁹⁵ (MPCA, Draft SLR Stressor Report, 2013).

Spring Mine Creek originates from a mine pit high on Giants Ridge. Spring Mine Creek headwaters in Section 2 (Figures 5a and 5b) are affected by mine pits and, possibly, by the LTV tailing basin. Buried stream beds continue to conduct water and act as underground conduits after burial. Some drainage from the tailing basin appears to follow a “former channel” into a pit named Spring Mine Lake.⁹⁶ (Barr, 2014). The pit/lake then discharges into Spring Mine Creek to the Embarrass River. Area mine pits and LTV tailing seepages contain elevated specific conductance, bicarbonates, hardness, and sulfates.

Table 9 below summarizes data on Spring Mine Creek specific conductance and sulfate from MPCA site S006-548, just upstream from the Creek’s confluence with Embarrass River approximately 4.5 miles from the tailing basin.⁹⁷ (MPCA, 2015). During this period of sampling in 2011 and 2012, mean specific conductance was 819 $\mu\text{S}/\text{cm}$.

Although detailed benthic invertebrate sampling was provided in this report, MPCA has listed Spring Mine Creek as impaired for both fish and macroinvertebrates.⁹⁸ (MPCA, Draft SLR Stressor Report, 2013).

⁹² *Id.*, PolyMet PFEIS, p. 6-13.

⁹³ Barr Engineering, *Short Term Mitigation Evaluation and Implementation Plan for the Tailing Basin NPDES/SDS Permit No. MN0054089*, June 2010, Table 2 Water Quality Summary SD002,

⁹⁴ MPCA, *Cliffs Erie Permitting Approach* Preliminary Draft, February 27, 2013.

⁹⁵ *Ibid.*, 41, MPCA, Draft SLR Stressor Report, 2013, pdf auto pp. 98, 109,

⁹⁶ *Ibid.*, 84, Barr, *Summary of 2013 NorthMet Groundwater and Surface Water Monitoring Data*, 2014, Figure 1

⁹⁷ MPCA, EQUIS database, on line, 2015.

⁹⁸ *Ibid.*, 41, MPCA, Draft SLR Stressor Report, pdf auto p. 109..

Table 9 - Spring Mine Creek Water Chemistry Specific Conductance and Sulfate		
Date	Specific Conductance ($\mu\text{S}/\text{cm}$)	Sulfate (mg/l)
4/13/11	372	115
6/23/11	788	246
11/30/11	1,406	585
4/17/12	936	378
5/30/12	555	192
7/10/12	858	nd*
nd*= no data available	Mean	819

6. Mining Impacts and St. Louis River

The MDNR, Fond du Lac Resource Management, and 1854 Treaty Authority produced a detailed St. Louis River Study in 2006.⁹⁹ (Lindgren, *et al.*, 2006). This Study identified conditions such as flow and stream bed conditions, basic water chemistry, habitat, fisheries and benthic invertebrate populations at numerous sites along the St. Louis River. Although the Study was only one year in duration, it confirmed biosurveys conducted in prior decades and provided basic data suggesting that impacts related to elevated specific conductance are occurring in what the Study calls the upper and middle St Louis.

In the 2006 St. Louis River Study, benthic invertebrates are identified to the genus level at 22 sites along the St. Louis River and specific conductance and other chemicals are provided in 23 sites.¹⁰⁰ (Lindgren, *et al.*, 2006). From mile 139.6 to the headwaters at 193.3, in the “upper” St. Louis, specific conductance has a mean of 59 $\mu\text{S}/\text{cm}$. At mile 129, the Report documents significant mining activity and the specific conductance increases to 258 $\mu\text{S}/\text{cm}$.¹⁰¹ (Lindgren, *et al.*, 2006). From mile 129 to what was selected as the end of the “middle” St. Louis at Mile 72, specific conductance had a mean of 260 $\mu\text{S}/\text{cm}$.

This “middle” segment of the St. Louis River receives significant mining facility discharges, some of which have been described previously. Identified NPDES permitted discharge sources include Northshore’s active Peter Mitchell Pit, the LTV inundated mine pits, the four-and-a-half square mile tailings facility left when LTV went bankrupt and transferred permits to Cliffs, and the Mesabi Nugget facility.

Table 10 summarizes specific conductance in the upper reaches and the mining-impacted middle segment of the St. Louis River.

⁹⁹ *Ibid.*, 21, MDNR/Tribal Agencies SLR Study, 2006.

¹⁰⁰ *Id.*, Appendices 11 to 17.

¹⁰¹ *Id.*, Appendix 6.

Table 10 - St. Louis River Specific Conductivity Upper Reaches and Mining-Impacted Middle Segment			
	Specific Conductance ($\mu\text{S}/\text{cm}$)		
	Mean	Minimum	Maximum
Upper Reaches Mile 139.6 to 193.3	59	41.4	101
Mining-Impacted Segment Mile 72 to 129	260	160	386

Benthic richness in the two reaches of the St. Louis River studied by the MDNR and Tribal Agencies is summarized in Table 11 below. (Lindgren, *et al.*, 2006).¹⁰²

Table 11- St. Louis River Benthic Invertebrates Richness in Upper Reaches and Mining-Impacted Middle Segment		
	Mile 193.3 to 139.6	Mile 129 to 72
<u>Total Richness</u>	(59 $\mu\text{S}/\text{cm}$ Mean Conductivity)	(260 μS Mean Conductivity)
Family	45	44
Genera	88	72
<u>EPT Richness</u>		
Family	19	17
Genera	35	27

Although this is just one year of sampling, the St. Louis Report data shows a difference in the total richness and richness of Ephemeroptera, Plecoptera, and Trichoptera (EPT) at a genus level. In the mining impacted middle segment of the St. Louis River, from Mile 129 to Mile 72, specific conductance was elevated to 260 $\mu\text{S}/\text{cm}$ - more than 400 percent of background levels in the upper St. Louis. The number of genera observed in this impacted segment was reduced by about 18% and the number of EPT genera observed was reduced by about 23% as compared to the unimpacted reaches further upstream in the St. Louis River.

EPA recommends three years of sampling to provide a more robust data set, but there appear to be some interesting and significant genera losses in the existing data. Comparing genera in the upper segment unimpacted by mining with data in the downstream middle segment impacted by mining activity, some invertebrate genera with populations of over 10 individuals identified in the upstream sampling have only 0 or 1 individuals present in the middle segment of the St. Louis River. Table 12 provides a more detailed analysis of

¹⁰² *Id.*, Appendices 11 to 17.

these deficits. (Lindgren *et al.*, 2006)¹⁰³

Table 12 - St. Louis River Presence of Specific Benthic Invertebrates in Upper Segment and Mining-Impacted Middle Segment*		
Genus and Species	Upper Segment Mile 193.3 TO 139.6 (59 μS/cm Mean Conductivity) Population Present	Middle Segment Mile 129 to 72 (260 μS/cm Mean Conductivity) Population Present
Ephemeroptera		
Baetiscidae		
Baetisca sp.	129	0
Heptageniidae		
Stenacron		
Vicarium sp.	86	1
Leptophlebiidae		
Leptophlebia sp.	114	0
Hemiptera		
Corixidae		
Heserocorixa sp.	62	0
Plecoptera		
Perlidae		
Paragnetina sp.	10	0

There are other genera present in the unimpacted upper reaches of the St. Louis River that do not exist in the middle reaches impacted by mining. But, since this is only one year of data, genera with fewer than 10 individuals in the upper reaches were not included in this table.

Currently available data demonstrates that headwater streams in the mining impacted area of the St. Louis River watershed have specific conductance levels far above background levels and diminished invertebrate richness. Mine facility discharges, waste rock, seepages, a tailing basin, and inundated pits containing waste rock are sources of minerals and salts resulting in high levels of specific conductance. These high levels of specific conductance may persist many miles downstream in the St. Louis River.¹⁰⁴

¹⁰³ *Id.*, Appendices 11, 12, 16

¹⁰⁴ *Tribal Cooperating Agencies Cumulative Effects Assessment*, NorthMet Mining Project and Land Exchange, September 2013, contained in Appendix C of the PolyMet NorthMet Supplemental Draft Environmental Impact Statement, November 2013, at pp. 16-18 suggests that specific conductivity persisted above 150 μ S/cm as much as 200 kilometers downstream of elevated discharge from mining.

V. Conclusions: Recommendation for Development of Aquatic Life Benchmark for Specific Conductance in Northeast Minnesota

A. Findings

Based on the EPA Conductivity Benchmark Study research and the references discussed in this evaluation, this report makes the following findings:

1. The EPA protocols described are applicable to northeast Minnesota surface waters.
2. The median of all 463 Copper-Nickel Study samples (including impacted streams) is 68 $\mu\text{S}/\text{cm}$, so the background conductivity for unimpacted streams alone based on the Copper-Nickel Study would be less than 68 $\mu\text{S}/\text{cm}$.
3. Existing data from Minnesota ecoregions 50n, northern 50p, and 50t demonstrate impacts on invertebrate genera from elevated specific conductance in mining impacted waters.
4. In the Minnesota ecoregions discussed in this report, discharge of specific conductance above the level of 300 $\mu\text{S}/\text{cm}$, established as guidance for Appalachian streams is highly likely to result in extirpation of 5% or more of invertebrate genera. Such discharge should be prohibited under Minnesota narrative standards preventing degradation and toxic pollution.

B. Recommendations

The following recommendations would protect aquatic life and ensure the development of a protective Field-Based Benchmark for specific conductance in Northeast Minnesota:

1. Apply the aquatic life benchmark of 300 $\mu\text{S}/\text{cm}$ as a chronic value for year-round application for organisms exposed throughout their life cycle in ecoregions 50n, the northern part of 50p, and 50t, pending further analysis to determine if a more stringent limit on specific conductance is needed to protect aquatic life in northeast Minnesota ecoregions, according to the XC 95% criterion.
2. Complete existing data gathering for ecoregion 50n and 50t, focusing on invertebrate genera and water chemistry parameters in mining impacted and unimpacted waters and complete the development of a specific conductance benchmark for the specified Minnesota ecoregions.
3. Facilitate and encourage sources with single year benthic invertebrate sampling to add two more years of data and focus on impacts to headwaters streams from mine dewatering, seepage and discharge.
4. Require a reasonable potential analysis for any NPDES-permitted mining facility and make determinations whether the facility discharge would have the potential to

result in degradation and/or toxic pollution under Minnesota narrative standards in addition to potential violation of numeric standards for irrigation.

5. Gather data for other nearby ecoregions in the Lake Superior and Rainy River Basins to determine whether a wider applicability of the 300 $\mu\text{S}/\text{cm}$ specific conductance guideline should be generally applicable or whether a more stringent limit on specific conductance must be developed.

In mining impacted areas, large discharges into headwaters streams from pit dewatering, surface runoff and tailing basin seepages are likely to require regulatory controls without consideration of possible dilution. See Minn. Rules 7050.0210, Subp. 7; 7050.0222, Subp. 7(C). Minnesota's narrative standards that prevent toxic pollution (Minn. Rules 7050.0150 and 7050.0217, Subp. 1, 2) would seem to require that levels of specific conductance that would be chronically toxic to 5% or more of benthic invertebrates in low-volume headwaters streams should be prohibited for NPDES-permitted discharge.

EPA has suggested that "the salt mixture dominated by salts of SO_4^{2-} and HCO_3^{-1} is believed to be an insurmountable physiological challenge for some species."¹⁰⁵ (EPA Conductivity Benchmark Study, 2011). In Minnesota ecoregions discussed in this evaluation, special attention will need to be given to discharges with high sulfate and bicarbonates.

C. Qualifiers

To understand the limits of this review, note that EPA Conductivity Benchmark Study specifically states, "Because it is not protective of all genera and protects against extirpation rather than reduction in abundance, this level is not fully protective of sensitive species or higher quality, exceptional waters designated by state and federal agencies."¹⁰⁶ (EPA Conductivity Benchmark Study, 2011). Additional work will be needed to ensure adequate protection of Minnesota waters affected by mining and governed by NPDES permits, particularly given the lower background level of specific conductance in Minnesota waters and the potential prevalence of more intolerant genera as compared with Appalachia.

This qualification is important, since in Minnesota ecoregions 50n, 50p, and 50t BWCAW waters, scientific and natural areas, unlisted high value waters, and other listed waters are Outstanding Resource Value Waters (ORVW) with special protections for higher quality or exceptional waters. (Minn. Rule 7050.0180, Subp. 2). Subp. 3 of this Rule states, "No person may cause or allow a new or expanded discharge of any sewage, industrial waste, or other waste to waters within the Waters in the Boundary Waters Canoe Area Wilderness; portions of Lake Superior . . . or Department of Natural Resources designated scientific and natural areas." Subp. 9 of this Rule precludes deterioration in the quality of any downstream ORVW.

¹⁰⁵ *Ibid.*, 2, EPA Conductivity Benchmark Study, 2011, p. xv.

¹⁰⁶ *Id.*, 2, p. xiv

Surface waters and wetlands of Minnesota in the Lake Superior Basin not specifically listed as Outstanding Resource Value Waters (ORVW) are "Outstanding International Resource Waters" or "OIRWs" subject to non-degradation standards. (Minn. Rule 7052.0300, Subp. 1(C)(2), Subp. 3). For OIRWs, "Existing water uses under part 7050.0185 and the level of water quality necessary to protect existing uses must be maintained and protected. Where designated uses of the waterbody are impaired, there must be no lowering of the water quality with respect to the GLI pollutants causing the impairment." (Minn. Rule 7052.0300, Subp. 2).

D. Permit Requirements

A lack of attention in northeast Minnesota to designing and enforcing mining permits has resulted in elevated specific conductance in headwaters and further downstream, including waters of the middle segment of the St. Louis River. Minnesota's narrative standards apply to mining discharges and should be enforced to prevent impairment or alteration of lower aquatic life. Under the Clean Water Act, EPA requires that a state permitting authority must examine whether elevated conductivity levels could create a reasonable potential for violation of the narrative standard.¹⁰⁷ (EPA Final Guidance, 2011).

Permit requirements concerning specific conductance should include but are not limited to:

1. Prior to approving new or expanding discharge of specific conductance, multi-year baseline sampling of benthic invertebrates to the genus level both upstream and downstream of the proposed discharge using MPCA methodology.
2. Pertinent sampling and water chemistry including specific conductance and major cations and anions related to specific conductance for the benthic invertebrate community in the area;
3. Sampling and flow measurements of the company discharge, receiving water and similar order streams;
4. Limits based on ORVW/OIRW status and cumulative effects on the receiving water;
5. Bioassays using at least three organisms (one of which should be an aquatic plant) known to be sensitive to low levels of chemicals and possible synergies contained in the tailing process such as flotation reagents and flocculants; and
6. Invertebrate sampling to the species level downstream close to the discharge, and in at least one background site, with permits to reopen if impacts are detected.

E. Requirements for new/expanded facilities

Technical and environmental review for any new or expanded facility must include these

¹⁰⁷ *Ibid.*, 10, EPA Final Guidance, 2011, Appendix 6, p. xviii.

items that concern specific conductance:

1. Establishment of site specific background water chemistry and invertebrate community data to genus and species, using all available data with quality assurance, not only the monitoring of the proposing company, and requiring additional background data where quality and duration is insufficient.
2. Monitoring plans, sampling and analysis immediately upstream of a discharge, of the discharge, at a distance downstream of the discharge, and just after any permit-allowed mixing zone; detection monitoring; and monitoring of both public waters and waters used as treatment systems in time to prevent meromixis, or a lack of mixing between surface and deep water lake strata.
3. Estimates of contaminants, concentrations, and mass loadings of waste rock, tailing, waste and pit inflow and outflow water must be derived from data obtained that is representative of all possible chemicals in the host rock and of all chemicals used in beneficiation and processing.
4. Detailed modeling based on sufficient and quality assured data, rather than assumptions, of specific conductance and contaminants for any proposed new or expanded mining facility to predict whether facility discharges result in degradation or toxic pollution under both numeric and narrative Minnesota rules, including direct, indirect and cumulative impacts. Where facts are insufficient, additional data must be gathered prior to modeling and decision-making.

References

American Public Health Association, et al., *Standard Methods for the Examination of Water and Wastewater*, 12th Ed., 1965, p. 280.

Agency for Toxic Substances and Disease Registry, *Draft Toxicological Profile for Hydrogen Sulfide and Carbonyl Sulfide*, October 2014.

Barr Engineering, *Mesabi Nugget EAW Report*, July 28, 2008,

Barr Engineering, *Summary of 2013 NorthMet Groundwater and Surface Water Monitoring Data*, Technical Memorandum to MPCA, March 28, 2014.

Bartoo, Paul, *The Environmental Requirements and Pollution Tolerance of Aquatic Insects of the Regional Copper-Nickel Study Area, September 1978*. Available at <http://archive.leg.state.mn.us/docs/pre2003/other/CN018.pdf>

Benzie, Dan, *Water Quality of the Dunka River "the Characterization of a Watershed Affected by Mining"*, Plan B Thesis for Master of Science University of Minnesota, June 1997, Minnesota Legislative Reference Library. Available at <http://archive.leg.state.mn.us/docs/pre2003/other/CN023.pdf>

Canada, *Priority Substances List Assessment Report, Road Salts*, , Canadian Environmental Protection Act, 1999, Environment Canada Health Canada, 2001.

Cliffs Erie, LLC, NPDES Permit MN0042579 and Discharge Monitoring Reports, 2011-2014.

Cliffs Erie, LLC, *Request for Variance from Hardness and Specific Conductance Water Quality Standards at the Dunka Mining Area*, NPDES/SDS Permit # MN0042579, June 7, 2011.

Doran, Peter, Letter to Bruce Trebnick Northeast Technical Services copied to MPCA, September 17, 2012.

Doran, Peter D., 2014 *Summary Report of Aquatic Macroinvertebrate Sampling for Unnamed Creek, Dunka Mine Area*, Northeast Technical Services Inc., December 5, 2014.

Johnson, Bruce L., personal knowledge from field work at Unnamed Creek, Bob Bay,

Johnson, Mark, Steve Williams, *Regional Copper-Nickel Study, Erie Mining Project Biological Sampling*, October 1978, Minnesota Environmental Quality Board. Available at <http://archive.leg.state.mn.us/docs/pre2003/other/CN083.pdf>

Lager, Thomas, Steven Johnson, Jeffery McCulloch, Steven Williams, Mark Johnson, *Regional Copper-Nickel Study Stream Benthic Invertebrates*, Feb, 1979. Available at <http://archive.leg.state.mn.us/docs/pre2003/other/CN088.pdf>

Letovsky, Erin, Ian E. Myers, Alexandra Canepa, Declan McCabe, *Differences between kick sampling techniques and short-term Hester-Dendy sampling for Stream Macroinvertebrates*,

Department of Biology, Saint Michael's College, Colchester, VT 05439. 2012. Available at http://wolfweb.unr.edu/~cmmoore/Christopher_Moore/BIOL322_files/CritiquePaper_SamplingTechniques.pdf

Lindgren, John (Minnesota Department of Natural Resources), Nancy Schuldt (Fond du Lac Resource Management) Brian Borkholder (Fond du Lac Resource Management), Andrew Levar (DNR Grand Rapids), Caryle Olson (1854 Treaty Authority), Jeff Tillman (DNR Grand Rapids Area Fisheries), Darren Vogt (1854 Treaty Authority), *A Study of the St. Louis River*, 2006. Available at http://files.dnr.state.mn.us/areas/fisheries/duluth/st_louis_river_study.pdf

Jones, Perry M., *Characterization of Ground-Water Flow Between the Canisteo Mine Pit and Surrounding Aquifers, Mesabi Iron Range, Minnesota*, US Geological Survey, Water-Resources Investigations Report 02-4198, 2002. Available at <http://pubs.usgs.gov/wri/wri024198/pdf/wri024198.pdf>

Kruse, G., Minnesota Department of Natural Resources, *Partridge and Embarrass River Winter Base Flow Study*, 2011.

Mesabi Nugget, *Permit MN 0067687 and DMRs*, 2012-2014.

Minnesota, State of, *Regional Copper-Nickel Study*, 1976-1980, a collection of research papers located at the Minnesota Legislative Reference Library, www.leg.state.mn.us/lrl/lrl.asp. The Executive Summary is available at <http://archive.leg.state.mn.us/docs/pre2003/other/792632.pdf>

Minnesota Department of Natural Resources (MDNR), *Drainage from Copper-Nickel Tailings: Summary of a Three Year Study*, Division of Lands and Minerals, July 2004, Table 3.

MDNR, U.S. Army Corps of Engineers, and U.S. Department of Agriculture Forest Service, *PolyMet Supplemental Draft Environmental Impact Statement NorthMet Mining Project and Land Exchange*, November 2013. (PolyMet SDEIS)

MDNR, U.S. Army Corps of Engineers, and U.S. Department of Agriculture Forest Service, *PolyMet Preliminary Final Draft Environmental Impact Statement NorthMet Mining Project and Land Exchange*, June 2015. (PolyMet PFEIS)

Minnesota Department of Natural Resources, U.S. Department of Agriculture Forest Service, *et al.*, *Ecological Classification System and Subsections Map*, 1999. Available at <http://www.dnr.state.mn.us/ecs/index.html>; http://files.dnr.state.mn.us/natural_resources/ecs/subsection.pdf

MPCA, *Cliffs Erie Permitting Approach Preliminary Draft*, February 27, 2013.

MPCA, Environmental Quality Information System (EQUIS) database, 2015 available at <http://www.pca.state.mn.us/index.php/water/water-monitoring-and-reporting/surface-water-data/environmental-quality-information-system-equis.html>

Minnesota Pollution Control Agency (MPCA), *St. Louis River Watershed Stressor Identification Report*, Draft, October 2013, electronic copy labeled as “12-31-13 (142 pages)

Minnesota Pollution Control Agency, Minnesota Department of Natural Resources, *White Iron Summary*, wq –slice69-0004, February 2009.

Montz, Gary R., *Aquatic Macroinvertebrates of the Pigeon River, Minnesota*, Minnesota Department of Natural Resources, Ecological Services Section Conservation Biology Research Grants Program, Nongame Wildlife Program. November 1993,

Northeast Technical Services, *Phase I – Environmental Assessment, Cliffs Erie Properties including: the Hoyt Lakes Facility, Dunka Property, Taconite Harbor, and Railroad Corridors*, pp. 10, 13. September 2002

Northshore Mining Company, NPDES Permit MN0046981 and DMRs, 2010-2014. (Northshore)

Pierce, Rodney B., and Cynthia M. Tomcko, *Limnological Characterization of Mine Pit Lakes in Northeast Minnesota*, Minnesota Department of Natural Resources, Section of Fisheries, #399, November 1989. Available at http://files.dnr.state.mn.us/publications/fisheries/investigational_reports/399.pdf

Pond, Gregory J., Margaret E. Passmore, Frank A. Borsuk, Lou Reynolds, and Carole J. Rose, *Downstream effects of mountaintop coal mining: comparing biological conditions using family- and genus-level macroinvertebrate bioassessment tools*, Region 3, US Environmental Protection Agency, J. N. Am. Benthol. Soc., 27(3): 717–737, published 8 July 2008.

Ross, Herbert H., *A Textbook of Entomology*, 3rd Edition, Jan 1967, Library of Congress 65-16424.

Thingvold, Daryl, Nancy Sather, Peter Ashbrook, *Water Quality Characterization of the Copper-Nickel Research Area*, December, 1979, <http://www.leg.state.mn.us/ltr/ltr.asp> CN153 (Copper-Nickel Study Water Quality Characterization).

U.S. Department of Agriculture (USDA) Forest Service, Superior National Forest, Minnesota, map, 1938.

U.S. Department of Agriculture (USDA) Forest Service, Superior National Forest, Minnesota, Map, constructed 1997, updated 2011.

U.S. Department of Agriculture (USDA) Forest Service Superior National Forest, unpublished data provided by Jason Butcher to Bruce Johnson. April 2015.

U.S. Environmental Protection Agency (U.S. EPA), *A Field-Based Aquatic Life Benchmark for Conductivity in Central Appalachian Streams*. Office of Research and Development, National Center for Environmental Assessment, Washington, DC. EPA/600/R-10/023. March 2011. (EPA Conductivity Benchmark Study) This study was finalized after internal reviewers,

external reviewers, a review panel of the EPA's Science Advisory Board (SAB), and the panel's review was reviewed by the Chartered SAB, followed by hundreds of public comments.

U.S. EPA, *Aquatic stressors framework and implementation plan for effects research*, EPA 600/R-02/074 September 2002.

U.S. EPA, *Developing an Index of Biologic Integrity*, Office of Water, Office of Wetlands and Watersheds, EPA843-F-98e, July 1998.

<http://water.epa.gov/type/wetlands/assessment/fact5.cfm>

U.S. EPA, *Ecoregion Maps and GIS Resources*, updated March 30, 2015. Available at <http://archive.epa.gov/wed/ecoregions/web/html/ecoregions-2.html>.

U.S. EPA, *Improving EPA Review of Appalachian Surface Coal Mining Operations Under the Clean Water Act, National Environmental Policy Act, and the Environmental Justice Executive Order*, Memorandum, Stoner, Nancy K., acting Assistant Administrator for Water, and Cynthia Giles, Assistant administrator for Compliance Assurance, to Shawn Garvin, Regional Administrator, EPA Region 3, Gwendolyn Keyes Fleming, Regional Administrator, EPA Region 4, Susan Hedman, Regional Administrator, EPA Region 5, July 21, 2011. Available at <http://water.epa.gov/lawsregs/guidance/wetlands/mining.cfm>. On July 31, 2012, a federal district court for the District of Columbia set aside EPA's Final Guidance, but this district court decision was overturned on appeal in *National Mining Association v. McCarthy*, 758 F.3d 243 (D.C. Cir. 2014).

U.S. EPA, letter, Dr. Susan Hedman Administrator Region V, to MPCA Commissioner John Linc Stine, July 2, 2014.

U.S. EPA, *Minnesota Level III and IV Ecoregions*, 2007. A version can be viewed at https://upload.wikimedia.org/wikipedia/commons/8/8b/Minn_ecoregionsmap.pdf

U.S. EPA, Technical Resource Document Extraction and Beneficiation of Ores and Minerals, Volume 3, *Iron*, EPA 530-R94-030, NITS PB94-195203, *Mine Site Visit: LTV Steel Mining Company*, August 1994.

U.S. EPA, *Technical Support Document For Water Quality-based Toxics Control*, EPA/505/2-90-001PB91-127415, March 1991.

US EPA, Office of the Administrator, Science Advisory Board, *Review of Field-Based Aquatic Life Benchmark for Conductivity in Central Appalachian Streams*, Letter to The Honorable Lisa P. Jackson Administrator, EPA, EPA-SAB-11-006, March 25, 2011.

U. S. Geological Survey, *Water Resources of the United States*, 2015, <http://www.usgs.gov/water/> 2015.

TABLE 1 DETAILED INVERTEBRATE BACKGROUND																							
A	B	C	D	E	F			G			H			I	J			K	L				
	Genus/Species in NE MN in Ecoregions 50n,50p(northern),50t	Appalachian Unmined *	Cu-Ni Study (CN088) ****	Pigeon River **	DNR Upper St Louis 2005 ***	USFS *****	Keeley Creek	USFS	USFS Filson Creek *****	USFS August Creek *****	Little Isabella *****	Nira Creek *****	USEPA (KY) SC 5% loss common to Mn	Pollution Tolerance Hardness (mg/l)/Sulfate (mg/l)/pH Cu-Nickel Study (CN018)*****									
					mile 139.6-19	2011	2012	2013	2011	2012	2013	2011	2012	2013	2008	2011	2012	2013	(uS/cm) *	hardness	sulfate	pH	
EPHEMEROPTERA (Mayflies)	GENUS																						
Leptophlebiidae					2	26	28	14	38	29	1	8	14	4	3		21	2					
	Leptophlebia	x	x	x	114														251				
	Tricorythodes sp.																						
	Choroterpes sp.		x																		114-117	24.6-25.1	8.8
	Paraleptophlebia sp.	x	x	x												1			463				
	P.debilis		x																				
	P.guttata	x	x																		705	450	7.9
	P.mollis		x																				
	P.praepedita	x	x																		87	26.5	7.2
	P.volitans	x	x																		21	3.6	6.6
Baetiscidae																							
	Baetisca sp.				129																		
	B.carolina		x																				
	B.lacustris		x																				
Baetidae																							
	Acerpenna sp.	x					1		2	4									~649				
	Baetis sp.	x	x	x	66						1								>1,395	16-1000	<10-5700	5.6-8.5	
	B.brunneicolor		x				1		1														
	B.flavistriga		x																				
	B.hageni		x																				
	B.intercalaris		x																				
	B.levitans		x																				
	B.phyllis		x																				
	B.pygmaeus		x																				
	B.vagans		x																				
	Isawaen sp.														1								
	Labibaetis propinquus								1														
	Paracloedes sp.	x		x	60																		
	Pseudocloeon sp.		x	x																	20-260	3-235	6.6-8.4
	P.anoka		x																				
	P.carolina		x																				
	P.cingulataum		x																				
	P.dubium		x																				
	P.parvulum		x																				
	Cloeon sp.		x	x																			
	Centropitilium sp.		x	x		2	3			1													
	Callibaetis sp.		x	x																			
	Callibaetis ferrugineus			x																			
	Baetisca sp.				129																		
	Heterocloen curiosis		x																				
Ephemeridae							1																
	Ephemerella sp.	x	x	x	21										2				696				
	E. simulans		x	x																			
	Hexagenia sp.		x	x	16																70-233	34.9-45.2	6.2-7.9
	H. limbata																						
	H.bilineata		x																				
	Litobranche recurvata		x																				
Ephemerellidae					8		1							1									
	Seratella deficiens	x		x			9												535 (genera)				
	Eurylophella sp.	x				8	9	14	1	38					6	8		12	490				
	E. funeralis													1									
	Attenella sp.	x		x	1														~698				
	Ephemerella sp.	x																5	299				
	E. attenuata		x																				
	E. aestiva			x																			
	E.bicolor		x							9											322	313	7.2

TABLE 1 DETAILED INVERTEBRATE BACKGROUND																										
A	B	C	F	D	E	F			G			H			I	J			K	L						
	Genus/Species in NE MN in Ecoregions 50n,50p(northern),50t	Appalachian Unmined *	Cu-Ni Study (CN088) ****	Pigeon River **	DNR Upper St Louis 2005 ***	USFS *****	Keeley Creek		USFS *****	USFS Filson Creek			USFS August Creek			Little Isabella *****		Nira Creek *****			USEPA (KY) SC 5% loss common to Mn	Pollution Tolerance Hardness (mg/l)/Sulfate (mg/l)/pH Cu-Nickel Study (CN018)*****				
					mile 139.6-19	2011	2012	2013	2011	2012	2013	2011	2012	2013	2011	2012	2013	2008	2011	2012	2013	(uS/cm) *	hardness	sulfate	pH	
	E.deficiens		x													49	25	7		6				13- 124	7.2	
	E.invaria		x																							
	E.minimella		x																							
	E.needhami		x																							
	E.rotunda		x																							
	E.serrata		x																							
	E.simplex		x																				15	2.7	6.9	
	E.sordida		x																							
	E.subvaria		x																							
	E.temporalis		x																	24			6-216	2-135	6.8-8.4	
	Teloganopsis deficiens																	4								
Isonychiidae	Isonychia sp.	x		x						1								3					1,180			
Caenidae	Brachyercus sp.		x																							
	Caenis sp.	x	x	x	4		2													2		>3,923	6-705	<1-450	5.4-8.5	
	C.Diminuta gr.					7	36	1		3			23	1	1		52	77	74	8						
Siphonuridae	Siphonurus sp.		x	x	7																					
	S. alternans		x alternatus	x																						
	S.isonychia sp.		x																							
	Hydropsyche sp.		x				8				13	4	5						1	5	2		13	43	6.9	
	H.betteni									20	2	5														
Tricorythidae	Tricorxthodes sp.		x	x																			6-705	1.3-450	5.4-8.5	
Heptageniidae	Leucrocuta sp.	x			4					10					1			1								
	L. hebe			x												3						424				
	Rhithrogena sp.		x	x																						
	Eneorus vitrea			x																						
	Heptagenia sp.	x	x flavescens	x																			326			
	H. pulla			x																						
	H. hebe		x																							
	Maccaffertium sp.	x				2	3	11	7	7	6	3	2	2		5	1	10	1			~1,035				
	M. vicarium						1		7								1			1						
	Stenonema sp.				3																		>745(genera)			
	S.candidum.	x	x	x																						
	S. exiguum		x	x	1																					
	S.modestum			x																						
	S.vicarium			x	86																1					
	S.exiquum			x	1																					
	S. terminatum		x		26																					
	S.rubrum		x																							
	S.quinquespinum		x																							
	S.smithae		x																							
	S.tripunctatum		x																							
	Epeorus sp.	x	x																							
	Stenacron sp.	x			16		2		1	3													307 ~782			
	S. interpuctatum		x																					13-705	<1-450	5.6-8.4
	S. minnetonka		x																							
	S.femoratum		x																							
	S. fuscum		x																							
	S. fuscum rivulicolum		x																							
	S. candidum		x																							
	S.annexum		x																							
	S.integrum		x																							
	S.pulchellum		x																					7-233	<1-72.8	5.8-8.4
	Nixe sp.	x											2										319			

TABLE 1 DETAILED INVERTEBRATE BACKGROUND																						
A	B	C	F	D	E	F			G			H			I	J			K	L		
	Genus/Species in NE MN in Ecoregions 50n,50p(northern),50t	Appalachian Unmined *	Cu-Ni Study (CN088) ****	Pigeon River **	DNR Upper St Louis 2005 ***	USFS *****	Keeley Creek	USFS	USFS Filson Creek *****	USFS August Creek *****	Little Isabella *****	Nira Creek *****	USEPA (KY) SC 5% loss common to Mn (uS/cm) *	Pollution Tolerance Hardness (mg/l)/Sulfate (mg/l)/pH Cu-Nickel Study (CN018)*****								
					mile 139.6-19	2011	2012	2013	2011	2012	2013	2008	2011	2012	2013		hardness	sulfate	pH			
	Arthroplea bipunctata		x																			
	Stenacron candidum		x																			
Metretopodidae	Siphloplecton interlineatum		x																			
Polymitacyidae																						
	Ephoron sp.																					
	E. leukon		x																			
PLECOPTERA (stoneflies)																						
Nemouridae																						
	Amphinemura delosa	x	x																>812 (genera)			
	A. linda		x																			
	Prostoia completa		x																			
	Shipsa rotunda		x																			
	Podmosta macdunnoughi		x																			
Lectridae																						
	Leuctra sp.	x									1								>2,087 (genera)			
	L. ferruginea		x																			
Capniidae										1			3		5		1					
	Allocaupina minima	x	x																542 (genera)			
	A. pygmaea		x																			
	Capnia manitoba		x																			
	Paracapnia sp.	x													3				334 (genera)			
	P. angulata		x																			
	P. opis		x																			
Perlidae													4	1			5	1				
	Isogenoides sp.		x																			
	Isoperla bilineata	x	x																460 (genera)			
	I. frisoni?			x																		
	I. dicala		x																			
	I.lata		x																			
	I. Illies		x																			
	I. orata		x																			
	I.signata		x																			
	I. slossonae		x																			
	I. transmarina		x																			
	Acroneuria sp.	x	x abnormis	x									2		2		2		>2,630			
	A. lycorias		x	x				2		1 rare			1	2	1		1	1				
	A. abnormis			x																		
	A. carolinensis													1								
	A. internata?		x	x																		
	Agetinia sp.																					
	Paragnetina sp.	x		x															2,087			
	Paragnetina media						1						1 p		2							
	Perlesta sp.	x		x															3,314			
	Isoperla sp.																					
Pteronarcyidae																						
	Pteronarcys sp.	x	x				2												~634			
	P. dorsata?			x																		
Taeniopterygidae							4															
	Strophopterx fasciata		x																			
	Taeniopteryx sp.	x					2	9	11	4	12		1		12		9	15	260			
	T.burski		x																			
	T. rivlis sp.		x																			
Chloroperlidae																						
	Alloperla? sp.	x		x															246			
	Hastaperla sp.			x																		
Perlodidae														1				1				

TABLE 1 DETAILED INVERTEBRATE BACKGROUND

[illegible]

TABLE 1 DETAILED INVERTEBRATE BACKGROUND																						
A	B	C	F	D	E	F			G	H			I	J			K	L				
	Genus/Species in NE MN in Ecoregions 50n,50p(northern),50t	Appalachian Unmined *	Cu-Ni Study (CN088) ****	Pigeon River **	DNR Upper St Louis 2005 ***	USFS *****	Keeley Creek	USFS	USFS Filson Creek *****	USFS August Creek *****	Little Isabella *****	Nira Creek *****	USEPA (KY) SC 5% loss common to Mn	Pollution Tolerance Hardness (mg/l)/Sulfate (mg/l)/pH Cu-Nickel Study (CN018)*****								
					mile 139.6-19	2011	2012	2013	2011	2012	2013	2011	2012	2013	2008	2011	2012	2013	(u5/cm) *	hardness	sulfate	pH
	O.testacea										4		1	2				1				
Rhyacophilidae																						
	Rhyacophila fuscula	x		x															>1,890 (genera)			
	R.vibox		x													1						
Limnephilidae					2	1	1	15	1	18	12		1	1			1	5				
	Pycnonsyche sp.	x		x	3														295	4-705	2.4-750	6-8.8
	P.suttifer		x																			
	P.scabripennis		x																			
	Glyphopsyche sp.			x																		
	G.goera sp.		x																			
	Hydatophylax argus		x							1	1											
	Limnephilus sp.		x								3		1	2	1			1		6-164	2.4-24	6.4-8.5
	Nemotaulius hostilis		x						1													
	Neophylx nacatus		x																	66-87	25-26	7.2-7.5
	Anabolia bimaculata		x																			
	G.irrorata		x																			
	Platycentropus sp.		x																	66	25	7.3
	P.seudostenophylax sp.		x																			
	Anabolia sp.			x																		
Polycentropodidae									2						1	3						
	Neureclipsis sp.		x	x	67								2							8-800	<1-72.8	5.5-8.5
	Paranyctionphylax sp.				8																	
	Polycentropus sp.	x		x	44	1			1	2									>4,713			
	P. flavus			x																		
	Phylocentropus sp.			x																		
	P.placidus		x																			
	P.centralis		x																			
	P.cinereus		x																			
	P.interruptus		x																			
	P.remotus		x																			
	Nyctiophylax sp.								1													
	N. moestus		x																			
	N.vestitus		x																			
Odontoceridae																						
	Psilotreta indecisa			x																		
Hydropsychidae					6	3		20	3		4	1		14			11					
	Cheumatopsyche sp.	x	x	x		3	14	13	3	2	2	2	3	4	32		1	2	>9,180			
	Ceratopsyche sp.	x			6	3							11						>6,468			
	C.bronta														28							
	C.slossonae				2		1						2		3							
	C.sparma															16	1					
	Pycnopsyche sp.																			4-705	2.4-450	6.0-8.8
	Hydropsyche sp.	x		x	27			20	7	6			5				10	>7,010				
	H. morosa			x																		
	H. slossone		x	x ?																		
	H. bronta			x											3							
	H. sparna			x										10	28							
	H. alhedra			x																		
	H. betteni		x	x				10	7	1			2	5	2					154-2100	56.2-313	5.9-8.5
	H. walkeri??			x																		
	H. cuanis		x																	114-117	2.2-44	6.8-8.8
	H. orris		x																	12-233	2.2-44	6.8-7.9
	H.simulans		x																	9-117	0.6-25.1	6.2-8.8
	Macronema zebratum		x																			
	Stactobiella sp.		x																			
	Potamyia flava															1						
Hydroptilidae																						
	Agraylea sp.		x																			

TABLE 1 DETAILED INVERTEBRATE BACKGROUND

[illegible]

TABLE 1 DETAILED INVERTEBRATE BACKGROUND																							
A	B	C	F	D	E	F			G			H			I	J			K	L			
	Genus/Species in NE MN in Ecoregions 50n,50p(northern),50t	Appalachian Unmined *	Cu-Ni Study (CN088) *****	Pigeon River **	DNR Upper St Louis 2005 ***	USFS *****	Keeley Creek	USFS *****	USFS Filson Creek	USFS August Creek	USFS Little Isabella	USFS Nira Creek	USEPA (KY) SC 5% loss common to Mn	Pollution Tolerance Hardness (mg/l)/Sulfate (mg/l)/pH Cu-Nickel Study (CN018)*****									
					mile 139.6-19	2011	2012	2013	2011	2012	2013	2011	2012	2013	2008	2011	2012	2013	(uS/cm) *	hardness	sulfate	pH	
Coenagrionidae					15					3													
	Argia sp.				1																		
	A. apicalis		x																				
	Enallagma sp.		x																				
	Ischnura/Anomalagrion sp.		x																				
Cordulegastridae																							
	Cordulegaster maculatus	x	x							1										>1,436 (genera)			
	C. maculata																						
Gomphidae			x		12	5	1			1	2				2	3	3	2					
	Dromogomphus spinosus		x																				
	Hagenius sp.																						
	H.brevistylus		x	x	12	3																	
	Hylogomphus berris		x																				
	Gomphus sp.				7					1													
	G. spicatus			x																			
	Ophiogomphus sp.				16																		
	O.aspersus		x																				
	O.colubrinus													1rare									
	Phanogomphus sp.				14																		
	Stygomphus sp.	x			6															>6,468			
	S. albistylus		x																				
	Optioservus sp.			x			10	26	73	36	28	31	18	1	13	8	3			87-800	13-46	7.2-8.2	
	O. anomalus			x																			
Calopterygidae											1					1	9	1	2				
	Calopteryx sp.		x	x	26					1	1	3											
	C. aequabilis						1			4			2	1				3					
Lestidae																							
	Lestes sp.			x																			
Libellulidae					2																		
	Perithemis sp.				1																		
	Enallagma sp.			x																			
Zygoptera																							
	Calopterygidae sp.										3				1								
COLEOPTERA (beetles)																							
Elmidae													8	1									
	Stenelmis sp.	x		2 x	5	2	3	30	22	5	3	88	10	2	2	10	3	1	>9,790				
	S. crenata			x																11-705	<1-450	5.5-8.8	
	Optioservus sp.	x		x	4		10													>9,790			
	O. fastidius			x																			
	Dubiraphia sp.	x		x	2	2	21	11							23	3				>7,370	114-800	14.2-46.1	
	Macronychus sp.	x		x	7							3								>1,890			
	M. glabtrtus											1	2			1	10	5					
Dryopidae																							
	Holichus sp.			x																			
Gyrinidae												1											
	Gyrinus sp.				11					4	3												
	Dineutus sp.				4																		
Dytiscidae					2													1					
	Coptotomus sp.			x																			
	Laccophilus sp.										1												
	Liodessus sp.									8	2												
Hydrophilidae																							
	Sperchopsis tessellatus			x																			
Chrysomelidae																							
	Donacia sp.			x																			
MEGALOPTERA																							
Corydalidae																							
	Nigronia	x										1	3	4		1	2		>9,790				

TABLE 1 DETAILED INVERTEBRATE BACKGROUND

TABLE 1 DETAILED INVENTORY OF WATER BEETLE BACKGROUND																								
A	B	C	D	E	F	G	H	I	J	K	L													
	Genus/Species in NE MN in Ecoregions 50n,50p(northern),50t	Appalachian Unmined *	Cu-Ni Study (CN088) *****	Pigeon River **	DNR Upper St Louis 2005 ***	USFS *****	USFS Keeley Creek	USFS Filson Creek	USFS August Creek	Little Isabella *****	Nira Creek *****	USEPA (KY) SC 5% loss common to Mn	Pollution Tolerance Hardness (mg/l)/Sulfate (mg/l)/pH Cu-Nickel Study (CN018)*****											
					mile 139.6-19	2011	2012	2013	2011	2012	2013	2011	2012	2013	2008	2011	2012	2013	(uS/cm) *	hardness	sulfate	pH		
	N. serricornis		x																					
	Chauliodes rastricornis		x																					
Sialidae	Sialis sp.	x	x	x				1		1	2						1		>11,227					
Corydalidae	Nigronia serricornis	x		x															>9,790					
NEUROPTERA (net winged)																								
Sisyridae	Climacia sp.		x																					
	Sisyra sp.		x			2																		
HEMIPTERA (true bugs)																								
Veliidae	Rhagovelia obesa	x	x																>2,030 (genera)					
	Sigara sp.				32			3						1										
	Palmaricorixa sp.			x	13																			
	Hesperocorixa sp.				62		1								2									
Hydrometridae	Hydrometra sp.		x																					
Notonectidae	Buenoa sp.		x	x																				
	Notonecta sp.				4																			
	N. lunata		x																					
Naucoridae	Pelocoris sp.		x																					
Nepidae	Rantra sp.		x		7		1 rare																	
Mesoveliidae	Mesovelia sp.		x																					
Gerridae	Gerris sp.			x	1																			
	G. remigis		x																					
	Metrobates sp.				2																			
	M hesperius		x																					
	Reumatobates rileyi		x																					
Belostomatidae	Belostoma sp.		x	x	14																			
	B. flumineum (rare)								1					1		1		1						
	Lethocerus sp.		x																					
Pleidae	Plea striola		x																					
DIPTERA (True flies)																								
Athericidae	Atherix sp.																							
	A.variegata	x	x		18														>11,646					
Tabainidae	Chrysops sp.	x	x																>11,646					
Prodiamesinae	Monodiamesa sp.			x																				
Empididae	Phoridae sp.		x																					
	Roederiodes sp.							1						4										
	Neoplasta sp.							1						2										
	Hemerodromia sp.	x					4	34	6		14	21	5				7	68	>9,790					
Syrphidae	Helophilus		x																					
Tanypodinae	Ablabesmia sp.			x	7																			

TABLE 1 DETAILED INVERTEBRATE BACKGROUND

A	B	C	F	D	E	F			G			H			I	J			K	L		
	Genus/Species in NE MN in Ecoregions 50n,50p(northern),50t	Appalachian Unmined *	Cu-Ni Study (CN088) ****	Pigeon River **	DNR Upper St Louis 2005 ***	USFS Keeley Creek *****	USFS	USFS	USFS Filson Creek *****	USFS August Creek *****	Little Isabella *****	Nira Creek *****	USEPA (KY) SC 5% loss common to Mn	Pollution Tolerance Hardness (mg/l)/Sulfate (mg/l)/pH Cu-Nickel Study (CN018)*****								
					mile 139.6-19	2011	2012	2013	2011	2012	2013	2011	2012	2013	2008	2011	2012	2013	(uS/cm) *	hardness	sulfate	pH
	A. mallochii			x																		
	Ablabesmyia sp.					5		1								9	2					
	Clinotanypus sp.			x	4																	
	Coelotanypus sp.																					
	Larsia sp.						1							3								
	Nilotanypus sp.																					
	Natarsia sp.																1					
	Pentaneura sp.																					
	Psectrotanypus sp.																					
	Conchapelopia sp.																					
	Labrundinia sp.			x	24	1																
	Procladius sp.			x	18	3	10	1	2	1		2						1				
	Tanypus sp.																					
	Thienemannimyia complex				26		10		5		39			32	9		10					
	Zavrelimyia sp.			x																		
Culicidae	Ades communis		x																			
	Anopheles punctipennis	x	x																>2,768 (genera)			
Orthoclaadiinae							3		1		1						1					
	Brillia sp.		x	x		1			1			1	3					4				
	Cardiocladius sp.		x																			
	coryneura sp.		x		1																	
	Cricotopus sp.		x	x	10	1	1					2	2		5		3		82-5000	25-135	6.3-8.8	
	C. bicinctus group			x								4										
	C. tremulus group			x																		
	Diplocladius sp.		x																			
	D. cultiger									1												
	Eukiefferiella sp.		x	x													2		82-110	25-45	6-8.7	
	E. gracei group			x																		
	E. devonica group			x																		
	Epicocladius sp.		x		1																	
	Lopescladius sp.			x																		
	Heterotrissocladius sp.		x									1										
	Nanocladius sp.			x	11		2															
	N. narvulus group			x																		
	Parametereocnemus sp.		x	x					2		15											
	Psectrocladius sp.		x	x			1															
	Synorthocladius sp.			x																		
	Tvetenia sp.				3																	
	T. discoloripes group			x									1									
	Thienemanniella sp.		x		3																	
	Trissocladius sp.		x																			
	Parakiefferiella sp.						3		5	1	11	1		2			5					
	Orthocladius sp.		x		1			3					1	19	4							
	Psectrocladius sp.				4																	
	Rheocricotopus sp.		x		6								2				2					
	Smittia sp.		x																			
	Xylotopus sp.				1						5			1								
Chironomidae					54																	
	Chironomini sp.		x			3			1													
	Chironomus sp.	x			1										1	1		>11,646	18-1600	0.7-370	3-8.4	
	Cladotanytarsus sp.	x				20	4		3			1						>11,646				
	Cryptochironomus sp.	x	x	x		10	2	9	1			7			2	1		>3,489				
	Cryptotendipes sp.					1																
	Demicryptochironomus sp.	x		x							1							322				
	Dicrotendipes sp.	x	x		2	1	1					2						>11,646	15-2100	0.6120-0.4	6.3-8.4	
	Endochironomus sp.		x	x	1														7.0-9000	2.4-480	6.4-8	
	Micropectra sp.	x		x		17	18		6	4	5				1		1	>6,468				
	Microtendipes sp.	x			8	88	5	2	2	21	9	4	4		3	7	18	>3,489				

TABLE 1 DETAILED INVERTEBRATE BACKGROUND

TABLE 1 DETAILED INVERTEBRATE BACKGROUND																								
A	B	C	F	D	E	F			G			H			I	J			K	L				
	Genus/Species in NE MN in Ecoregions 50n,50p(northern),50t	Appalachian Unmined *	Cu-Ni Study (CN088) ****	Pigeon River **	DNR Upper St Louis 2005 ***	USFS *****	Keeley Creek	USFS	USFS Filson Creek *****	USFS August Creek *****			Little Isabella *****		Nira Creek *****		USEPA (KY) SC 5% loss common to Mn	Pollution Tolerance Hardness (mg/l)/Sulfate (mg/l)/pH Cu-Nickel Study (CN018)*****						
					mile 139.6-19	2011	2012	2013	2011	2012	2013	2011	2012	2013	2011	2012	2013	2011	2012	2013	(uS/cm) *	hardness	sulfate	pH
	M.pedallus group																							
	Paratendipes sp.		x	x		26												1						
	Paralauterborniella? sp.			x																				
	P.nigrohalterale													2	1									
	Phaenospectra sp.	x	x		17	8	4		3		1	1					9				>2,332			
	Polypedium sp.	x	x	x		17	14	3	5		1	2	38	9							>4,884	Jun-00	<1-315	3.8-8.8
	P. fallax group			x																				
	P. convictum group			x																				
	Stenochironomus sp.		x	x		1		5	1		6						2	2	4					
	Stictochironomus sp.		x	x				2																
	Stempellinella sp.	x				3			3									2			>927			
	Stempellina sp.	x					1					1									644			
	Tribelos sp		x	x		1	4	1		6	1						25	3	7					
	Einfeldia sp.																							
	Glyptotendipes sp.		x																			21-900	3.2-480	6.6-8.5
	Micropsectra sp.	x	x			17			6												>6,468			
	Parachironomus sp.		x																					
	Rheotanytarsus sp.	x	x	x	1		9	12		1	4	1	3	45			7		3		>3,489			
	Ablabesmyia	x			x																>11,646			
	Xenochironomus sp.		x																					
	Xylotopus par								1		5													
	X.xenolabis								1									1						
	Nilothauma sp.		x			5				3	2							3		1				
	Nanocladius sp.								1															
	Pseudochironomus sp.	x	x			3	2														>11,646			
	Paracladopelma sp.		x																					
	Lauterborniella sp.		x																					
	L.agrayloides						1										2	4	2	1				
	Zavrelia sp.	x	x																		413	6	2.5	6.4
	Stegopterna?? sp.		x																					
	Thienemannimyia Gr.					14	10	16	5	14		37	29				10		20		>6,468			
	Parametriocnemus sp.	x					13		2				8	14			13	4	11					
	Trissopelopia ogemawi												9				1							
	Pagastiella sp.							1		3														
	Paramerina sp.									3														
	Parametriocnemus sp.	x							2												>4,713			
	Paratanytarsus sp.	x					2			4	3										>3,489			
	Limnophyes sp.	x						1													>5,120			
	Lauterborniella agrayloides																2		2					
	Psectrocladius sp.						1																	
	Tanytarsus sp.	x	x	x		8	7	1	7	5	2		1				1	3			>9,180			
Tanytarsini	Cladotanytarsus sp.			x				2																
Tabanidae	Chrysops sp.	x			12																>11,646			
Empididae	Hemerodromia sp.	x		x			4	34	6		14	21	5	19			3	7			>9,790			
Ceratopogonidae	Bezzia / Palpomyia	x								2	1						1				380			
	Probezzia sp.		x	x								3												
	Palpomyia sp.		x																					
	Ceratopogoninae sp.					1		1	3	2	1		1	10		1	1	1	4					
	Serromyia sp.											1												
	Mallochohelea sp.											3												
	Neoplasia sp.							1																
Tipulidae	Antocha sp.	x	x										1				5				>6,468			
	Dicranota sp.	x	x																		>7,010			

TABLE 1 DETAILED INVERTEBRATE BACKGROUND																						
A	B	C	F	D	E	F			G			H			I	J			K	L		
	Genus/Species in NE MN in Ecoregions 50n,50p(northern),50t	Appalachian Unmined *	Cu-Ni Study (CN088) ****	Pigeon River **	DNR Upper St Louis 2005 ***	USFS *****	Keeley Creek	USFS *****	USFS Filson Creek *****	USFS August Creek *****	Little Isabella *****	Nira Creek *****	USEPA (KY) SC 5% loss common to Mn (uS/cm) *	Pollution Tolerance Hardness (mg/l)/Sulfate (mg/l)/pH Cu-Nickel Study (CN018)*****								
					mile 139.6-19	2011	2012	2013	2011	2012	2013	2011	2012	2013	2008	2011	2012	2013		hardness	sulfate	pH
	Helius sp.		x					1														
	Hexatoma sp.	x	x																>9,790			
	Limonia sp.	x	x																>5,057			
	Peicia sp.		x																			
	Pedicia sp.		x																			
	Hemerodromyia sp.		x																			
	Limnophila? sp.	x																	~1,503			
	Pseudolimnophila sp.	x	x									1							>1,357			
	Tipula sp.	x	x		7														>1,979			
Simuliidae (Black Flies)																						
	Stegopterna?? sp.			x																		
	Hexatoma sp.		x																			
	Prosimulium sp.	x	x																~531			
	Limnophila? sp.		x																			
	Cnephia sp.		x																			
	Simulium sp.	x	x		30		1	10	1		15			21				4	>6,468			
	S. pictipes		x	x																		
	S. jenningsi??			x																		
	Eusimulium eurmandiculum		x																			
	Byssodon ruggelsi		x																			
Streatiomyiidae																						
	Odontomyia sp.																					
Athericidae																						
	Atherix variegata		x																			
Blephariceridae																						
	Blepharicera.tenuipes		x																			
	S. jenningsi??		x																			
Diamesinae																						
	Atherix variegata		x																			
	Blepharicera sp.		x																			
	Potthastia? sp.		x																			
	Diamesa sp.		x											2					2			
Podonominae																						
	Lasiodiamesa sp.		x																			
Ptychopteridae																						
	Bittacomorpha sp.																					
Limoniidae																						
	Pilaria sp.													1								

Coding: x in Columns C - D means the species or genus is present; a number in Columns E - J is the count of individuals.

References:

*A Field-Based Aquatic Life Benchmark for Conductivity in Central Appalachian Streams, U.S. EPA, Office of Research and Development, NCEA, USEPA Cincinnati OH 45268, EPA/600/R 10/023F, Table D-1.

**Aquatic Macroinvertebrates of the Pigeon River, Minnesota, Gary R. Montz, MDNR, Ecological Services Section, November 1993

***A study of the St. Louis River, John Lundgren, MDNR; Nancy Scholdt & Brian Borkholder (Fond du Lac Resource Management); Andrew Levar, Jeff Tilma (MDNR), Caryle Olson, Darren Vogt(1854 Treaty Authority) 2006, Minnesota F-29-R(p)25Area 220 Study 3, Job 4.

****REGIONAL COPPER-NICKEL STUDY, Stream Benthic Invertebrates, Thomas Lager, Steven Johnson, Jeffery McCulloch, Steven Williams, Mark Johnson, Feb, 1979, <http://www.leg.state.mn.us/ltr/ltr.asp> CN088

***** REGIONAL COPPER-NICKEL STUDY, Environmental Requirements and Pollution Tolerance of Aquatic Insects of the Regional Copper Nickel Study Area, Paul Bartoo, MEQB, 1978, Table 1, (<http://www.leg.state.mn.us/ltr/ltr.asp>, CN018. Table 1, Column Reports Hardness/Sulfate/pH.

***** USDA, U.S. FOREST SERVICE SUPERIOR NATIONAL FOREST, Unpublished STORET Data (benthic invertebrates)

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 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.

REVIEW: “An Evaluation of a Field-Based Aquatic Benchmark for Specific Conductance in Northeast Minnesota” (November 2015). Prepared by B. L. Johnson and M. K. Johnson for WaterLegacy.

PREPARER: Susan M. Cormier, Ph.D.
National Center for Environmental Assessment—Cincinnati,
Office of Research and Development, U.S. EPA

DATE: February 4, 2016

Introduction

The evaluation by Johnson and Johnson (2015) examined the ionic mixtures of mining effluents and their impact on northeast Minnesota waters. The authors made the following inference: Because organisms (benthic macroinvertebrates) are extirpated in Appalachian streams by mineral additions that increase specific conductivity (SC)¹ to 300 microsiemens per centimeter ($\mu\text{S}/\text{cm}$) where natural background is $146 \mu\text{S}/\text{cm}$ (U.S. EPA, 2011), then organisms in waters of northeast Minnesota waters are likely to be affected by the same levels given a similar mineral composition.

“Northeast Minnesota waters” defined by Johnson and Johnson (2015) refers to a portion of the Northern Lakes and Forests Level III Ecoregion 50 (Omernik, 1987), which includes parts of the Boundary Lakes and Hills (50n), the northern portion of Toimi Drumlins (50p), and North Shore Highlands (50t). The Minnesota Pollution Control Agency (MPCA, 2016) describes the Northern Lakes and Forests on their website:

“This heavily forested ecoregion is made up of steep, rolling hills interspersed with pockets of wetlands, bogs, lakes and ponds. Lakes are typically deep and clear, with good gamefish populations. These lakes are very sensitive to damage from atmospheric deposition of pollutants, storm water runoff from logging operations, urban and shoreland development, mining, inadequate wastewater treatment, and failing septic systems” (MPCA accessed 1/5/2016).

¹ This review uses conductivity as a measure of ionic concentration rather than as description of an electrical property of water. As ionic concentration increases, conductivity increases. Both specific conductivity and specific conductance are often used synonymously in the open literature indicating normalization or measurement at 25°C. Conductivity is a property of water expressed in units of micro-Siemens per centimeter ($\mu\text{S}/\text{cm}$). Conductance of a sample or electrical component is measured as Siemens (S). All measurements in this review refer to specific conductivity, $\mu\text{S}/\text{cm}$ at 25°C and background is estimated as the 25th centile of SC measurements.

The Johnson and Johnson (2015) evaluation describes the ionic mixture of effluents in northeast Minnesota. In Appalachia (U. S. EPA, 2011) and northeast Minnesota, the ionic mixture is dominated by bicarbonate and sulfate anions and calcium and magnesium cations (Thingvold et al., 1979). This finding is consistent with dominant ions for Ecoregion 50 (including Minnesota, Wisconsin, and Michigan) reported by Griffith (2014), whose study Johnson and Johnson (2015) did not cite. The data set used in the Johnson and Johnson study had a reported mean (note: not the 25th centile) background SC of 68 $\mu\text{S}/\text{cm}$ in the defined regions of Ecoregion 50 (parts of 50n, 50p, and 50t). This is less than the 25th centile SC of the data set used in the development of the central Appalachian benchmark (146 $\mu\text{S}/\text{cm}$). The Johnson and Johnson (2015) report provides evidence that where the SC is high, there are disturbed environments. In particular, the mean and maximum SC in their study area increase below mineral effluent discharges associated with mines in the northeast region of Minnesota.

The study also provides evidence that benthic invertebrates are adversely affected where SC is greater than background. Where SC is greater than background, benthic invertebrate diversity and abundance decreases and the proportion of dominant genera increases. Attachment A, Table 1 of Johnson and Johnson (2015) identified the genera occurring in both central Appalachia and northeast Minnesota.

Overall, the weight of evidence supports the inference that effluents that increase waterbody SC to more than 300 $\mu\text{S}/\text{cm}$ have adverse effects in northeast Minnesota waters. Using effect levels developed in central Appalachia, more than 5% of these shared genera are likely to be extirpated in waters with SC >300 $\mu\text{S}/\text{cm}$.

Confirmation using independent data sets

Benthic invertebrate and water quality data sets collected by the MPCA had been made available to the U.S. Environment Protection Agency (EPA) for research on stressor-response relationships. These data are used here to assess the validity of the Johnson and Johnson's findings. In Ecoregion 50, the MPCA data set consists of 40,585 water chemistry samples collected from less than 2000 sites between 1996–2013, with most of the water chemistry samples collected from repeated sampling in the same location in the same year between June and September. Annual site averages (geometric means) for SC and several other measured water quality parameters were calculated. The mean, median, minimum, maximum, and several quantiles for the population of sites in the data set are shown in Table 1.

Table 1. Summary statistics of annual geometric mean water chemistry parameters for Ecoregion 50 (MPCA, 1996–2013) prepared for this review. Mean, minimum, 5th–95th quantiles, and maximum are shown.

Parameter	N	Mean	Min	5 th	10 th	25 th	50 th	75 th	90 th	95 th	Max
SC (μS/cm)	1,409	210	23	64	83	135	222	338	461	567	1,458
Alk (mg/L, unfiltered)	293	78.4	7.9	17.1	24.8	47.0	90.8	142	220	249	363
Chl a (μg/L)	200	2.3	0.5	0.8	1.0	1.5	2.3	3.7	5.2	6.6	14.6
DO (mg/L)	1,362	8.8	0.1	4.7	5.8	7.5	9.0	10.2	11.3	11.9	17.2
NH ₃ (mg/L)	616	0.06	0.00	0.02	0.03	0.04	0.05	0.07	0.14	0.22	1.24
NO _x (mg/L)	850	0.09	0.00	0.02	0.03	0.05	0.07	0.15	0.34	0.63	20.8
OP (filtered, mg/L)	149	0.015	0.004	0.005	0.006	0.010	0.012	0.025	0.045	0.078	0.32
OP (unfiltered, mg/L)	339	0.013	0.001	0.005	0.005	0.007	0.011	0.020	0.037	0.058	0.61
TDS (mg/L)	165	170	49	62	70	117	200	250	307	372	780
TKN (mg/L)	632	0.77	0.20	0.43	0.50	0.59	0.74	0.96	1.29	1.54	3.91
TN (mg/L)	799	0.84	0.12	0.44	0.50	0.62	0.79	1.05	1.49	1.95	21.5
TP (mg/L)	1,151	0.043	0.003	0.015	0.019	0.026	0.042	0.066	0.102	0.154	0.91
Transp (cm)	1,768	71.5	4.9	33.6	45	60	79	99	100	100	122
TSS (mg/L)	1,217	6.4	1.0	1.7	2.0	3.0	5.1	10.4	28.3	50.9	1,076
Turbidity (NTU)	223	8.1	0.6	1.7	1.9	2.9	5.9	17.1	52.2	117.0	453

Alk = alkalinity; Chl a = chlorophyll a; DO = dissolved oxygen; NH₃ = ammonia; NO_x = oxides of nitrogen; OP = orthophosphate; TDS = total dissolved solids; TKN = total Kjeldahl nitrogen; TN = total nitrogen; TP = total phosphorous; Transp = transparency; TSS = total suspended solids; NTU = nephelometric turbidity units.

Background conductivity

The 25th centile of all samples from the MPCA data set (years: 1996–2013) was used to estimate the background SC for seven Level III ecoregions in Minnesota (see Figure 1). The estimated background SC for the entire Level III Ecoregion 50 in northeastern Minnesota is 135 μS/cm (90% confidence interval [CI] 130–140 μS/cm, *N* = 1,409). A number of the MPCA sampling sites had paired biological and chemical measurements. The 25th centile estimated background SC for sites with paired MPCA biological and chemical measurements was 108 μS/cm (90% CI 97–116 μS/cm, *N* = 735). Estimates were not made for the Level IV Ecoregions. Using either data set, Ecoregion 50 has the lowest background SC among the ecoregions in Minnesota (see Figure 1).

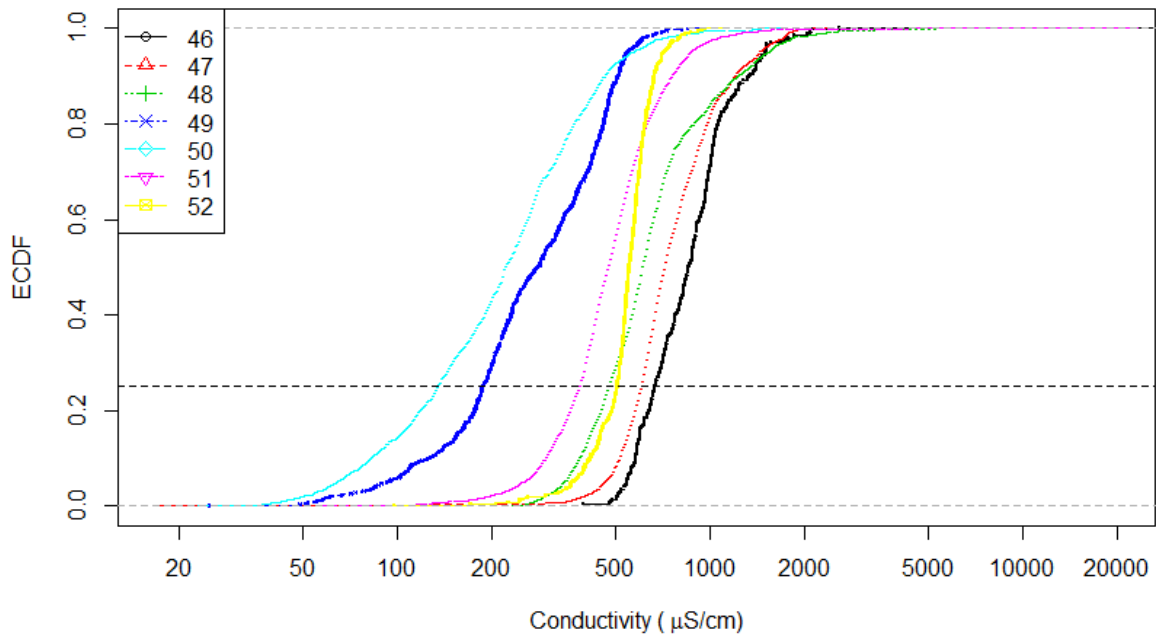


Figure 1. Empirical cumulative distribution function (ECDF) of annual geometric mean conductivity values in ecoregions of Minnesota. The dark horizontal dashed line is the 25th centile of ECDF. Ecoregion 50 is the Minnesota ecoregion with the lowest background SC and is plotted at the far left in turquoise (data: MPCA, 1996–2013).

Another water chemistry analysis was published in 2014 by Griffith for the entire Ecoregion 50 extending from northeastern Minnesota through Wisconsin and into northern Michigan. These published results were generated from data sets compiled from several EPA surveys that used probability-based sampling designs (Griffith, 2014). The 25th centile SC for that data set at the Level III Ecoregion 50 was 111 $\mu\text{S}/\text{cm}$ ($N = 151$), which is less than in the Appalachian study data set.

In comparison, Table 2 contains values from the Minnesota Environmental Quality Board MEQB (1979), which were collected between 1975 and 1977. This earlier sampling effort is confined to an area of interest consisting of 14 watersheds that are included in the Johnson and Johnson evaluation (2015). The median stream SC is reported as 55 $\mu\text{S}/\text{cm}$. Johnson and Johnson (2015) report a mean of 68 $\mu\text{S}/\text{cm}$ using data from a comparable time period. Both values are less than the 25th centile background in Appalachia streams (U.S. EPA, 2011).

Based on these independent data sets, it appears that, currently and 40 years ago, the background SC in the study area has been less than the background estimated from the data set used to derive the conductivity benchmark for the combined Appalachian Ecoregions 69 and 70 (U. S. EPA, 2011). This confirms the Johnson and Johnson claim.

Table 2. Data from Minnesota Environmental Quality Board collected between 1975 and 1977 from streams in “Group C stations” and reproduced here for the reader’s convenience

Parameters	Median stream value
Specific conductivity ($\mu\text{S}/\text{cm}$) (25°C)	55
Al ($\mu\text{g}/\text{L}$)	90
As ($\mu\text{g}/\text{L}$)	0.8
Ca (mg/L)	6.0
Cd ($\mu\text{g}/\text{L}$)	0.03
Cl (mg/L)	1.6
Co ($\mu\text{g}/\text{L}$)	0.4
Cu ($\mu\text{g}/\text{L}$)	1.3
Fe ($\mu\text{g}/\text{L}$)	560
F (mg/L)	310
Hg ($\mu\text{g}/\text{L}$)	0.08
K (mg/L)	0.6
Mg (mg/L)	3
Mn ($\mu\text{g}/\text{L}$)	35
Na (mg/L)	1.6
Ni ($\mu\text{g}/\text{L}$)	1.0
Pb ($\mu\text{g}/\text{L}$)	0.5
Zn ($\mu\text{g}/\text{L}$)	2.0
Alkalinity (mg/L)(CaCO_3)	19
TOC (mg/L)	15
P-total ($\mu\text{g}/\text{L}$)	20
Total Nitrogen (mg/L)	0.79
SO_4 (mg/L)	6.6
pH	6.9
Color (Pt-Co scale)	90.2
Silica (mg/L)	6.3

TOC = total organic carbon; P-total = total phosphorous; Pt-Co = platinum-cobalt.

Biological effect

Extirpation is the loss of a taxon from its normal habitat, such as a portion of a stream or geographic area. For this review, the concentration resulting in extirpation is defined as the SC level above which less than 5% of observations of a genus were made in an ecoregion, an extirpation concentrations (XC_{95}) (U. S. EPA, 2011).

Johnson and Johnson (2015, Attachment A, Table 1 of their report) identified the benthic macroinvertebrate genera occurring in both Appalachia and northeast Minnesota streams. They used XC_{95} values for Appalachian genera to evaluate extirpation of the same genera in northeast Minnesota streams. Using effect levels developed in central Appalachia, more than 5% of these shared genera are likely to be extirpated in waters with $SC > 300 \mu S/cm$. Because Johnson and Johnson did not use Minnesota data to calculate effect levels for individual genera in northeastern Minnesota streams, there is uncertainty whether the species comprising a genus in Minnesota is similar enough to those in West Virginia for comparison. This point is important because the extirpation concentration (XC_{95}) values represent the effect level for the most tolerant species in that genus.

We were able to overcome this limitation for this review because we had a paired biological and SC data from Ecoregion 50 in Minnesota. Using the MPCA data set, we directly calculated XC_{95} levels for benthic invertebrates in northeastern Minnesota streams. Then, we used these Ecoregion 50-Minnesota XC_{95} values to predict the SC at which 5% of benthic invertebrate genera are likely to be extirpated.

Estimation of specific conductivity (SC) likely to cause extirpation

Paired biological and chemical data were analyzed using the MPCA data set from 1996–2013 (see Figure 2) and using the methods described in EPA (2011). XC_{95} values were calculated for 164 genera (see Table 3) that occurred at ≥ 25 sites in the MPCA paired data set (see Figure 2) using the methods in EPA (2011). Although the number of sites was modest (number of samples was 734, number of sites was 596) and the range of SC values is limited, the tolerance range was defined for more than 12% of genera that were analyzed, which allowed confident estimation of the SC that would result in the loss of 5% of genera.

Estimation of the specific conductivity (SC) likely to extirpate 5% of genera

In this review, extirpation of 5% of genera was used as the effect threshold. The SC level predicted to cause 5% extirpation is referred to as the hazardous concentration (HC_{05}) (U.S. EPA, 2011). Using the available data set, the interpolated 5th centile of the ranked XC_{95} values (HC_{05}) for Ecoregion 50 in Minnesota is $320 \mu S/cm$. Note that even if a genus is not extirpated at the HC_{05} , the abundance or ecoregion occurrences may still be reduced. The

Minnesota HC_{05} for Ecoregion 50 ($320 \mu S/cm$) is similar to the HC_{05} of the Appalachian study ($295 \mu S/cm$).

Most samples in the MPCA data set were collected during August and September, and many salt-intolerant genera may not have been collected because they are more likely to be collected earlier in the year. Therefore, this HC_{05} may be higher than would be obtained with a data set that included more mayfly genera which are collected in the spring and tend to be among the more intolerant genera. Also, the estimated HC_{05} is for this review only and it does not represent a benchmark for Ecoregion 50. Additional analyses are recommended to evaluate the seasonal effects in the data set that was used for the estimate.

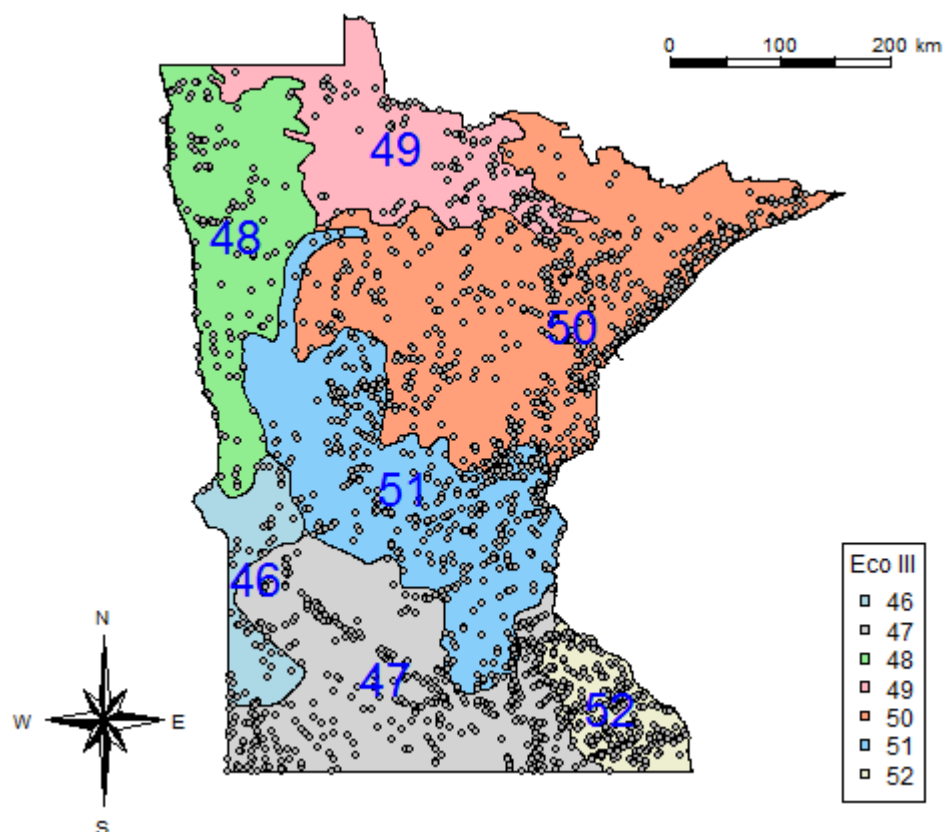


Figure 2. Ecoregion 50 is contained in the orange area in the northeast portion of Minnesota. Circles represent paired biological and water quality sampling sites. There are fewer samples in the area bordering Canada, often referred to as the boundary waters, which are less accessible for sampling.

Table 3. XC₉₅ values for 164 genera with ≥ 25 occurrences in Ecoregion 50 of Minnesota prepared for this review

Genus	XC ₉₅ μS/cm	Samples	Genus	XC ₉₅ μS/cm	Samples	Genus	XC ₉₅ μS/cm	Samples
<i>Dolophilodes</i>	191	82	<i>Protoptila</i>	717	106	<i>Rheotanytarsus</i>	912	477
<i>Epeorus</i>	201	94	<i>Psychomyia</i>	717	71	<i>Tvetenia</i>	912	347
<i>Rhyacophila</i>	254	35	<i>Pycnopsyche</i>	717	51	<i>Nilothauma</i>	1,008	71
<i>Ophiogomphus</i>	272	73	<i>Chimarra</i>	719	277	<i>Dicranota</i>	1,029	70
<i>Serratella</i>	283	40	<i>Ephemera</i>	719	44	<i>Chrysops</i>	1,110	38
<i>Boyeria</i>	298	117	<i>Ephemerella</i>	719	144	<i>Clinotanypus</i>	1,110	31
<i>Agnetina</i>	302	25	<i>Nyctiophylax</i>	719	30	<i>Gammarus</i>	1,110	40
<i>Trissopelopia</i>	327	25	<i>Paratendipes</i>	719	67	<i>Sigara</i>	1,110	52
<i>Xenochironomus</i>	335	36	<i>Pteronarcys</i>	719	82	<i>Ceraclea</i>	1,134	140
<i>Larsia</i>	338	25	<i>Stenonema</i>	719	184	<i>Neophylax</i>	1,134	26
<i>Paraponyx</i>	338	33	<i>Dixa</i>	736	28	<i>Nigronia</i>	1,134	101
<i>Eurylophella</i>	357	151	<i>Neoplea</i>	736	71	<i>Potthastia</i>	1,134	30
<i>Stictochironomus</i>	361	46	<i>Stenochironomus</i>	736	205	<i>Stempellina</i>	1,134	112
<i>Helisoma</i>	374	95	<i>Xylotopus</i>	736	64	<i>Chironomus</i>	1,138	86
<i>Lopescladius</i>	390	60	<i>Hexagenia</i>	829	32	<i>Zavreliomyia</i>	1,138	34
<i>Leptophlebia</i>	416	43	<i>Stenacron</i>	859	125	<i>Micrasema</i>	1,182	162
<i>Leucrocuta</i>	435	124	<i>Acroneuria</i>	867	225	<i>Antocha</i>	1,185	123
<i>Labiobaetis</i>	456	55	<i>Atherix</i>	867	211	<i>Cryptochironomus</i>	1,185	83
<i>Plauditus</i>	464	38	<i>Endochironomus</i>	867	53	<i>Dicrotendipes</i>	1,185	197
<i>Triatnodes</i>	502	58	<i>Isonychia</i>	867	98	<i>Glyptotendipes</i>	1,185	47
<i>Nilotanyus</i>	510	50	<i>Neureclipsis</i>	867	127	<i>Taeniopteryx</i>	1,185	33
<i>Nectopsyche</i>	529	56	<i>Labrundinia</i>	872	198	<i>Conchapelopia</i>	1,353	51
<i>Liodessus</i>	559	73	<i>Oecetis</i>	872	329	<i>Gyraulus</i>	1,353	107
<i>Procloeon</i>	568	131	<i>Paragnetina</i>	872	161	<i>Hydropsyche</i>	1,353	294
<i>Callibaetis</i>	620	26	<i>Sublettea</i>	872	28	<i>Limnephilus</i>	1,353	25
<i>Cryptotendipes</i>	620	35	<i>Tricorythodes</i>	872	141	<i>Nanocladius</i>	1,353	140
<i>Valvata</i>	620	26	<i>Enallagma</i>	879	53	<i>Tanytarsus</i>	1,353	511
<i>Ancyronyx</i>	626	45	<i>Parakiefferiella</i>	879	134	<i>Thienemannimyia</i>	1,353	524
<i>Hexatoma</i>	626	37	<i>Brachycentrus</i>	882	113	<i>Hydraena</i>	1,370	86
<i>Atrichopogon</i>	630	29	<i>Macronychus</i>	882	159	<i>Ablabesmyia</i>	1,412	297
<i>Acentrella</i>	650	164	<i>Rheocricotopus</i>	882	163	<i>Helicopsyche</i>	1,412	213
<i>Cardiocladius</i>	650	30	<i>Probezzia</i>	912	40	<i>Maccaffertium</i>	1,412	244
<i>Glossosoma</i>	650	191	<i>Psectrocladius</i>	912	105	<i>Microtendipes</i>	1,412	412

Table 3. XC₉₅ values for 164 genera with ≥25 occurrences in Ecoregion 50 of Minnesota prepared for this review (continued)

Genus	XC ₉₅ μS/cm	Samples	Genus	XC ₉₅ μS/cm	Samples	Genus	XC ₉₅ μS/cm	Samples
<i>Pseudochironomus</i>	1,412	27	<i>Anacaena</i>	1,594	39	<i>Dixella</i>	1,998	102
<i>Stenelmis</i>	1,412	302	<i>Anopheles</i>	1,594	79	<i>Eukiefferiella</i>	1,998	198
<i>Tribelos</i>	1,412	66	<i>Baetis</i>	1,594	402	<i>Ferrissia</i>	1,998	348
<i>Thienemanniella</i>	1,417	259	<i>Ceratopsyche</i>	1,594	436	<i>Haliplus</i>	1,998	109
<i>Micropsectra</i>	1,426	275	<i>Cladotanytarsus</i>	1,594	97	<i>Hydatophylax</i>	1,998	88
<i>Polypedilum</i>	1,442	628	<i>Dubiraphia</i>	1,594	371	<i>Iswaeon</i>	1,998	87
<i>Cricotopus</i>	1,447	508	<i>Gyrinus</i>	1,594	60	<i>Limnophyes</i>	1,998	69
<i>Hemerodromia</i>	1,447	308	<i>Hyaella</i>	1,594	436	<i>Mystacides</i>	1,998	95
<i>Parachironomus</i>	1,447	34	<i>Lype</i>	1,594	62	<i>Orconectes</i>	1,998	54
<i>Pentaneura</i>	1,447	56	<i>Simulium</i>	1,594	463	<i>Orthocladius</i>	1,998	219
<i>Corynoneura</i>	1,451	274	<i>Somatochlora</i>	1,594	35	<i>Paraleptophlebia</i>	1,998	217
<i>Cheumatopsyche</i>	1,458	422	<i>Tipula</i>	1,594	120	<i>Paramerina</i>	1,998	120
<i>Hydroptila</i>	1,458	223	<i>Physa</i>	1,818	387	<i>Parametriocnemus</i>	1,998	286
<i>Isoperla</i>	1,458	42	<i>Caenis</i>	1,825	369	<i>Phaenopsectra</i>	1,998	187
<i>Optioservus</i>	1,458	401	<i>Acerpenna</i>	1,998	251	<i>Polycentropus</i>	1,998	138
<i>Oxyethira</i>	1,458	233	<i>Aeshna</i>	1,998	79	<i>Procladius</i>	1,998	205
<i>Paratanytarsus</i>	1,458	238	<i>Baetisca</i>	1,998	41	<i>Pseudocloeon</i>	1,998	82
<i>Amnicola</i>	1,527	80	<i>Belostoma</i>	1,998	75	<i>Ptilostomis</i>	1,998	97
<i>Bezzia</i>	1,527	94	<i>Brillia</i>	1,998	118	<i>Sialis</i>	1,998	88
<i>Cordulegaster</i>	1,527	29	<i>Caecidotea</i>	1,998	39	<i>Stempellinella</i>	1,998	330
<i>Fossaria</i>	1,527	49	<i>Calopteryx</i>	1,998	259	<i>Synorthocladius</i>	1,998	47
<i>Lepidostoma</i>	1,527	267	<i>Centropilum</i>	1,998	67			

Conclusion

The results of the analyses performed for this review support the conclusions of Johnson and Johnson (2015) concerning the effects of SC on benthic invertebrates.

1. Independent data sets from different decades confirm Johnson and Johnson's conclusion that the background SC in Ecoregion 50 in Minnesota is less than the background of the data set used to develop the SC benchmark for Ecoregions 69 and 70 in Central Appalachia. Hence, a benchmark value for SC in Ecoregion 50 is not expected to be greater than the benchmark for central Appalachia, i.e. 300 μS/cm.

2. Likewise, the inference that 5% extirpation of benthic invertebrates would occur at similar conductivity levels in central Appalachia and Ecoregion 50 in Minnesota was supported by analysis of an independent data set of paired benthic invertebrate and SC data from Ecoregion 50 in Minnesota. We estimated that more than 5% of genera would be extirpated in streams greater than 320 $\mu\text{S}/\text{cm}$. However, additional analyses are needed to evaluate the effect of seasonal collection.
3. Johnson and Johnson evaluated biological effects where SC was greater than background at several mine sites and streams draining in or near the mines. SC associated with discharges and mine pits exceeded 300 $\mu\text{S}/\text{cm}$. For some sites, dilution may reduce the SC below 300 $\mu\text{S}/\text{cm}$ in the waterbody, but the data are not shown and may not be available for all sites. In other cases, SC is very high ($>1,000$ $\mu\text{S}/\text{cm}$) and biological effects have been reported by MPCA. The severity of the effects are consistent with effects expected for increased level of SC.
4. Metal contamination, habitat alteration, temperature, and nutrient enrichment may contribute to biological effects at some of the mine sites. These stressors may exacerbate the effect, but the extirpation due to SC would still occur if these stressors were removed based on removal of other stressors and persistent effects observed in Appalachia when only conductivity was high and other stressors were low or absent (U.S. EPA, 2011; Timpano et al., 2015; Cook et al., 2015).

Johnson and Johnson (2015) make several recommendations based on their findings. These are policy decisions and are not part of this scientific review.

References

- Cook, NA; Sarver, EA; Krometis, LH; Huang, J. (2015) Habitat and water quality as drivers of ecological system health in Central Appalachia. *Ecol Eng* 84:180–189.
- Griffith, MB. (2014) Natural variation and current reference for specific conductivity and major ions in wadeable streams of the conterminous U.S. *Freshw Sci* 33(1):1–17.
- Johnson, BL; Johnson, MK. (2015) An evaluation of a field-based aquatic benchmark for specific conductance in northeast Minnesota. (November 2015). Prepared for WaterLegacy, St. Paul, MN.
- MPCA (Minnesota Pollution Control Agency). (2016) EDA: Guide to typical Minnesota water quality conditions. Accessed January 7, 2016. <https://www.pca.state.mn.us/quick-links/eda-guide-typical-minnesota-water-quality-conditions>.
- MEQB (Minnesota Environmental Quality Board). (1979) The Minnesota regional copper-nickel study 1976–1979. Volume 1. Executive Summary. August 31, 1979. St. Paul, MN: Minnesota Environmental Quality Board, State Planning Agency. Pp. 18. <https://d-commons.d.umn.edu/handle/10792/2769>.
- Omernik, JM. (1987) Ecoregions of the conterminous United States. *Ann Assoc Am Geograph* 77:118–125.
- Thingvold, D; Sather, N; Ashbrook, P. (1979) Water quality characterization of the copper-nickel water quality research area. St. Paul, MN: Minnesota Environmental Quality Board.
- Timpano, AJ; Schoenholtz, SH; Soucek, DJ; Zipper, CE. (2015) Salinity as a limiting factor for biological condition in mining-influenced central Appalachian headwater streams. *J Am Water Resour Assoc* 51:240–250. DOI: 10.1111/jawr.12247.
- U.S. EPA (Environmental Protection Agency). (2011) A field-based aquatic life benchmark for conductivity in Central Appalachian streams. [EPA/600/R-10/023F]. Washington, DC: Office of Research and Development, National Center for Environmental Assessment. <http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=233809>.

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 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.

**EPA’s 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
WQSTS # TR2018-1280**

Date: October 5, 2020

I. Executive Summary

Section 303(c)(1) of the Clean Water Act (CWA) requires that, every three years, states and authorized tribes¹ hold public hearings for reviewing and, as appropriate, updating water quality standards (WQS) (i.e., the “triennial review”). The objective of this requirement is to ensure that state and tribal WQS reflect current science and public policy. On August 6, 2020, the U.S. Environmental Protection Agency received a triennial review submission from the Fond du Lac Band of Lake Superior Chippewa (hereafter referred to as “Fond du Lac” or “the Band”) containing revisions to the Band’s WQS rules found in the Band’s Ordinance # 12/98². Fond du Lac’s rule revisions include changes to the Band’s antidegradation implementation procedures, adoption of numeric nutrient criteria, adoption of EPA’s recommended criteria for ammonia to protect aquatic life, adoption of a specific conductance criterion to protect aquatic life, and adoption of WQS applicable to wetlands.

As discussed in Section II of this document, EPA has determined that these rule revisions are consistent with the relevant requirements of the CWA and federal regulations at 40 CFR parts 131 and 132 and therefore approves the WQS revisions. Consistent with the requirements of the Endangered Species Act (ESA), EPA evaluated the potential impacts of its approval of the WQS revisions on federally-protected species and designated critical habitat and determined that consultation with the U.S. Fish and Wildlife Service (FWS) is necessary. As discussed in Section III of this document, EPA developed a biological evaluation (BE) that evaluates potential effects of its approval and sent it to FWS on September 18, 2020, seeking concurrence with EPA’s conclusion that approval of the Band’s WQS revisions may affect, but is not likely to adversely affect, federally-listed species. Lastly, as discussed in Section IV of this document, EPA provided substantive opportunity for all tribes with treaty rights near the Fond du Lac Reservation to provide input on EPA’s decision-making process and has therefore fulfilled its duty to consult on a government-to-government basis with federally-recognized tribes on actions that may affect tribal interests, consistent with the “*EPA Policy on Consultation and Coordination with Indian Tribes*.”

¹ “Authorized tribes” in this document refers to those federally recognized Indian tribes with authority to administer a CWA Section 303(c) WQS program. Under EPA’s regulations at 40 CFR § 131.4(c), a tribe that is eligible to administer WQS is likewise eligible to administer CWA Section 401 water quality certifications.

² Fond du Lac Band of Lake Superior Chippewa Water Quality Standards of the Fond du Lac Reservation Ordinance #12/98, as amended by Resolution #1321/20 of the Fond du Lac Reservation Business Committee on July 8, 2020 [hereafter, “Ordinance #12/98, Amended, [Section]”]. Fond du Lac Band’s previously federally approved Water Quality Standards are hereafter referenced as “Ordinance #12/98, [Section].”

II. EPA Review of Fond du Lac's Submittal

WQS requirements of CWA sections 101(a)(2) and 303(c)(2) are implemented through federal regulations contained in 40 CFR Part 131. WQS requirements of CWA Section 118, specific to waters of the Great Lakes System, are implemented through federal regulations contained in 40 CFR Part 132. Consistent with federal regulations at 40 CFR § 131.21, new or revised WQS do not become applicable WQS for CWA purposes until they are approved by EPA. The criteria by which EPA evaluates a state or authorized tribe's adopted WQS are identified in 40 CFR §§ 131.5(a)(1) through (a)(8). Because the revisions included in this rule package do not grant any WQS variances, affect any tribal adopted provisions authorizing the use of schedules of compliance or affect any tribal standards that do not include the uses specified in Section 101(a)(2) of the CWA, the WQS requirements in 40 CFR §§ 131.5(a)(4), (5) and (7) are not relevant in considering whether to approve Fond du Lac's new or revised WQS. EPA's review of each of the applicable criteria of Part 131 can be found in sections II.A - D. EPA's review for consistency with the WQS requirements specific to waters of the Great Lakes System in 40 CFR Part 132 can be found in Section II.E.2.

A. Whether the State or Authorized Tribe has adopted designated water uses that are consistent with the requirements of the CWA. (40 CFR § 131.5(a)(1))

Section 101(a)(2) of the CWA states:

it is the national goal that wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water be achieved by July 1, 1983.

Section 303(c)(2)(A) of the CWA requires states and authorized tribes to establish WQS for their waters, taking into consideration the use of waters for "propagation of fish and wildlife" among other uses. 40 CFR § 131.10 governs designation of uses for surface waters. With respect to the uses specified in Section 101(a)(2) of the CWA (hereafter collectively referred to as "101(a)(2) uses"), states and authorized tribes must adopt uses consistent with those specified in Section 101(a)(2) of the CWA or demonstrate why attaining these uses is not feasible through a use attainability analysis (UAA). With respect to uses not specified in Section 101(a)(2) of the CWA (hereafter collectively referred to as "non-101(a)(2) uses"), states and authorized tribes are not required to designate waters with those uses but must submit documentation justifying how their consideration of the use and value of the water for those uses appropriately supports such a designation. As specified at 40 CFR §§ 131.10(g) and (h)(1), states and authorized tribes may not remove a designated use if it is an existing use.

1. Definition of the Band's cultural use designation

The Band's existing WQS include a cultural use designation at Ordinance #12/98, Section 302(e) that applies to wild rice waters and aesthetic waters. The Band's revisions clarify the cultural use by adding the following general definition:

Water-based activities essential to maintaining the Band's cultural heritage, including but not limited to ceremony, subsistence fishing, hunting and harvesting. This use includes primary and secondary contact. Ordinance #12/98, Amended, Section 302(E).³

Fond du Lac's cultural use designation is not intended to protect aquatic life or recreation in and on the water⁴ and, thus, is a non-101(a)(2) use. As discussed in Section II.A above, states and authorized tribes are not required to establish non-101(a)(2) uses but where they choose to do so, Section 303(c)(2)(A) of the CWA provides that such standards shall be established "taking into consideration their use and value for public water supplies, propagation of fish and wildlife, recreational purposes, and agricultural, industrial, and other purposes."

The Band's revisions do not alter the use designations for any individual waterbodies but only clarify the definition of the existing cultural use by providing examples of the types of water-based activities intended to be protected by the cultural use. Additionally, the revision does not limit protection under the cultural use to only those activities listed in the definition and, thus, would not prevent the Band from applying the cultural use to any water-based activities previously considered to be "essential to maintaining the Band's cultural heritage." Because the adopted revisions do not change the level of protection provided by the Band's cultural use designation, EPA concludes that Fond du Lac's revisions to its cultural use designation at Section 302(e) (now denoted as 302(E)) are consistent with the CWA and 40 CFR § 131.10.

2. Wetland designated use

Fond du Lac's adopted revisions establish a new wetland designated use defined in Chapter 7 of the Band's WQS Ordinance as follows:

For all wetlands, as defined by the Cowardin classification scheme, the uses to be protected include, but are not limited to: baseflow discharge, cultural opportunities, flood flow attenuation, groundwater recharge, indigenous floral and faunal diversity and abundance, nutrient cycling, organic carbon export/cycling, protection of downstream water quality, recreation, resilience against climatic effects, sediment/shoreline stabilization, surface water storage, wild rice, and water-dependent wildlife to the extent that such uses, functions, and values occur as represented by reference wetlands. Ordinance #12/98, Amended, Section 701.

The Band's additional revisions at Ordinance #12/98, Amended, Section 302(I) apply the newly adopted wetland designated use to all wetlands in the Fond du Lac Reservation.

To develop the wetland designated use, the Band used EPA's *Templates for Developing Wetland Water Quality Standards* (hereafter referenced as "Wetland WQS Templates" and accessible at <https://www.epa.gov/wqs-tech/templates-developing-wetland-water-quality-standards>). As

³ EPA notes that the Band's previously approved WQS used lower case letters to denote subsections within Section 302 and that the Band's current submittal includes relabeling these subsections with capital letters.

⁴ While the Band's revised definition states that the use includes "primary and secondary contact," the rest of the definition indicates that the contact with the water would occur as part of water-based activities related to the Band's cultural heritage and, thus, is not intended to protect water-based recreation activities.

discussed in EPA guidance *Narrative Templates for Wetland Water Quality Standards Frequently Asked Questions* (May 2016) (hereafter referenced as “Narrative Templates FAQs”), the templates are intended for states and authorized tribes “to use to simplify and streamline the development of protective standards that will guide maintenance of the spatial and functional components of wetlands.”

The Band’s definition of the wetland designated use includes protection for both aquatic life (“indigenous floral and faunal diversity and abundance” and “water-dependent wildlife”) and recreation and, thus, includes the uses specified in Section 101(a)(2) of the CWA. As discussed above, Section 302(I) of the Band’s revised WQS ensures that the wetland designated use, which includes the 101(a)(2) uses, applies to all wetlands in the Fond du Lac Reservation.

Because the Band’s wetland designated use includes the uses specified in Section 101(a)(2) of the CWA and the Band’s revised WQS apply those uses to all wetlands in the Fond du Lac Reservation, EPA concludes Fond du Lac’s wetland designated use and the application of that use to all wetlands are consistent with the CWA and 40 CFR § 131.10.

3. Downstream protection provision

Fond du Lac’s WQS revisions establish a new provision at Section 301(q) requiring that:

All waters of the Reservation shall maintain a level of water quality that provides for the attainment and maintenance of the water quality standards of downstream waters, including the downstream waters of a state or another federally-recognized tribe. Ordinance #12/98, Amended, Section 301(q).

Federal WQS regulations at 40 CFR § 131.10(b) require that:

In designating uses of a water body and the appropriate criteria for those uses, the State⁵ shall take into consideration the water quality standards of downstream waters and shall ensure that its water quality standards provide for the attainment and maintenance of the water quality standards of downstream waters.

The Band’s revision at Section 301(q) requires the attainment and maintenance of WQS in downstream waters, consistent with 40 CFR § 131.10(b), and, thus, EPA concludes that Ordinance #12/98, Amended, Section 301(q) is consistent with the CWA and 40 CFR § 131.10.

4. Natural background provision

Fond du Lac inserted a new provision into the introductory language of Section 302 of its WQS that provides:

Some waters of the Reservation may have natural ambient water quality containing concentrations of parameters that exceed water quality criteria necessary for the

⁵ As defined at 40 CFR § 131.3(j), the term “state” as it is used in 40 CFR Part 131 includes “Indian Tribes that EPA determines to be eligible for purposes of the water quality standards program.”

protection of a designated use. Natural ambient water quality is defined as the quality in absence of human caused additions of a substance, and shall be determined by water quality monitoring. Designated uses will not be used to control, and are not invalidated by, natural ambient water quality. Ordinance #12/98, Amended, Section 302.

Fond du Lac's revision does not modify the designated use or criteria for any specific waterbody but only establishes the Band's general intention that designated uses reflect natural ambient water quality.

Federal rules regarding designated uses at 40 CFR § 131.10(g)(1) allow states and authorized tribes to modify designated uses based on a use attainability analysis demonstrating, among other factors, that "[n]aturally occurring pollutant concentrations prevent the attainment of the use" and, thus, EPA concludes that Fond du Lac's revision to the introductory language of Section 302 is consistent with the CWA and 40 CFR § 131.10.

As discussed above, Fond du Lac's adopted revision does not modify the designated use or criterion for any specific waterbody but only provides a factor that Fond du Lac will consider in the future. Any individual designated use change or site-specific criterion that Fond du Lac may adopt using these rules will be case-specific and must be submitted to EPA for approval under Section 303(c) of the CWA, taking into consideration the documentation supporting Fond du Lac's decision to adopt any given designated use or criterion change. For such future submittals, EPA will approve those designated use changes that are consistent with the federal regulations at 40 CFR § 131.10 and those criteria that are consistent with 40 CFR § 131.11.

**B. Whether the State or Authorized Tribe has adopted criteria that protect the designated water uses based on sound scientific rationale consistent with §131.11.
(40 CFR § 131.5(a)(2))**

40 CFR § 131.11(a) provides that

States must adopt those water quality criteria that protect the designated use. Such criteria must be based on sound scientific rationale and must contain sufficient parameters or constituents to protect the designated use.

40 CFR § 131.11(b) provides that states and authorized tribes should

- (1) Establish numerical values based on:
 - (i) 304(a) Guidance; or
 - (ii) 304(a) Guidance modified to reflect site-specific conditions; or
 - (iii) Other scientifically defensible methods;
- (2) Establish narrative criteria or criteria based upon biomonitoring methods where numerical criteria cannot be established or to supplement numerical criteria.

1. Numeric nutrient criteria

Fond du Lac's existing narrative criterion for nutrients at Ordinance #12/98, Section 301(d) requires that, "[r]eservation waters shall be free from nutrients (nitrogen and phosphorus) entering the waters as a result of human activity in concentrations that create nuisance growths of aquatic weeds and algae." The adopted revisions modify this criterion by establishing numeric nitrogen, phosphorus and chlorophyll *a* criteria for nine primary fisheries lakes identified in Appendix 5 of Fond du Lac's WQS. As required by Ordinance #12/98, Amended, Section 301(d), the numeric nutrient thresholds for each lake will be applied as follows:

The lakes listed in Appendix 5 will be considered in attainment with their nitrogen thresholds if the summer mean concentration for nitrogen is not exceeded. Exceedance of the summer mean total phosphorus threshold and either the summer mean chlorophyll-*a* threshold or the Fond du Lac Secchi disk transparency index, developed as a component of the Fond du Lac Assessment Methodology, is required to indicate a polluted condition.

The basis for the numeric nutrient criteria is described in a report prepared for the Tribe and included in the Tribe's Triennial Review Submittal. See Patricia Soranno, *Development of Lake-specific Numerical Nutrient Criteria for Water Quality Standards in Reservation Lakes* (May 20, 2011) (hereafter referenced as "the Soranno Report"). The Soranno Report discusses that the basis for the numeric nutrient criteria for these nine primary fisheries lakes is that each lake is currently in a minimally impacted condition, nutrients are not currently impacting designated uses, and therefore, maintenance of current ambient conditions will protect designated uses.

To reach the conclusion that the nine lakes are currently in a minimally impacted condition, the Band considered evidence detailed in the Soranno Report as well as a 2015 report: Phycotech, Inc., *Development of Lake-specific Numerical Nutrient Criteria for Water Quality Standards in Fond du Lac Reservation Lakes: Analysis of the Phytoplankton Rapid Assay Results 1998-2012 Compared to Southern MN Lakes* (August 20, 2015) (hereafter referenced as "the Phycotech Report"). As discussed in the Soranno Report, human land use makes up a small percentage of the watersheds of the nine lakes, which suggests that anthropogenic nutrient loading to the lakes is low. In most cases, the proportion of the watershed subject to human use was less than 5%, with 12% (in the Big Lake watershed) being the highest proportion. Additionally, the Soranno Report compared ambient phosphorus, nitrogen and chlorophyll *a* concentrations in the nine lakes with reference (non-impacted) lakes in the same ecoregion (Northern Lakes and Forests) and concluded that phosphorus and chlorophyll *a* concentrations in the nine lakes were similar to concentrations in the reference lakes. While nitrogen concentrations in the nine lakes were greater than nitrogen concentrations in the reference lakes, the Soranno Report concluded that the nine lakes were more limited by phosphorus than nitrogen and, thus, that the higher nitrogen concentrations in the nine lakes would not be expected to cause excessive algal growth. The fact that the Fond du Lac lakes did not have greater chlorophyll *a* concentrations than the reference lakes supported this conclusion.

To further support the assertion that the nine lakes are currently in a minimally impacted condition, Fond du Lac's Triennial Review Submittal also included information from the

PhycoTech Report, which evaluated data on phytoplankton communities in the nine lakes. The PhycoTech Report analyzed the results of sampling data collected by the Band between 1998 and 2012 using the phytoplankton rapid assay method. As discussed in the PhycoTech Report, because different algal taxa have different pigment composition, chlorophyll *a* measurements may not be able to detect relative changes among the different algal taxa due to nutrient inputs. Therefore, algal community composition is considered to be a more sensitive indicator of system change due to nutrient inputs than chlorophyll *a* measurements.

The PhycoTech Report determined that the composition of algal communities in the nine lakes was relatively stable over the study period, with cryptophytes, dinoflagellates, chrysophytes and diatoms dominating the algal communities in the lakes. Non-toxin-producing bluegreen algae (cyanobacteria) were consistent contributors but rarely dominated phytoplankton communities in the nine lakes. Additionally, the lakes had a low percentage of taxa that produce harmful algal blooms. The PhycoTech Report also compared phytoplankton communities in the nine Fond du Lac lakes with phytoplankton communities in Central Minnesota lakes⁶ with varying levels of productivity. Using multidimensional scaling and cluster analysis, the PhycoTech Report analyzed the phytoplankton community composition in all lakes (both Fond du Lac and Central Minnesota lakes) and identified five groups of lakes. The five groups were characterized by distinct phytoplankton community characteristics. Conversely, lakes classified within the same group displayed similar phytoplankton community characteristics. The nine Fond du Lac lakes all clustered within the highest water quality group (Group 1), which was characterized by “a high proportion of [cryptophyte/dinoflagellate] and [chrysophyte/diatom] taxa, moderately low [chlorophyte], [non-toxin producing cyanobacteria] and [toxin-producing heterocystic cyanobacteria] taxa, and low [euglenophyte/other] taxa.” PhycoTech Report at 14.

To evaluate the effect of using other numeric response variables and to address potential quality assurance/quality control issues, the PhycoTech Report also described a 2014 PhycoTech calibration study using phytoplankton samples collected at each lake (both Fond du Lac and the Central Minnesota lakes). The calibration study compared results based on different quantitative measures of the algal community (i.e., percent biovolume, percent cell concentration, and phytoplankton rapid assay) and phytoplankton results based on different independent algal identification analysts. The PhycoTech Report determined that “[n]one of the response variables produced significantly different clusters, consistent with the analysis of the larger database.” PhycoTech Report at 16.

Since the analyses provided in the Soranno and PhycoTech reports indicated that the current condition of each lake is not affecting algal communities and that nuisance growths of aquatic weeds and algae do not currently occur on the lakes, the Band concluded that the current ambient concentrations of nitrogen, phosphorus and chlorophyll *a* in each lake would be protective of the designated use. The Soranno Report evaluated total nitrogen, total phosphorus and chlorophyll *a* data collected on each lake between 1999 and 2009 (all available data at the time the Soranno Report was written) and identified the threshold protective of current conditions as the upper 90th

⁶ The Central Minnesota lakes considered in the PhycoTech Report include 38 lakes near Minneapolis, sampled by Minneapolis Parks and Recreation and Minnehaha Creek Water District. A full list of the Central Minnesota lakes can be found in Table 1 of the PhycoTech Report and maps of the Central Minnesota lakes can be found in figures 1, 3 and 4 of the PhycoTech Report.

percentile of all samples for each parameter within the summer season (July, August and September) for each lake. Accordingly, the Band set the criteria for total nitrogen, total phosphorus and chlorophyll *a* for each lake at the thresholds identified in the Soranno Report.

As discussed above, the Soranno and PhycoTech reports demonstrated that the nine lakes are currently supporting their designated uses and, thus, that maintenance of the current condition of each lake will ensure continued protection of the designated use in each lake. Additionally, as discussed in the Soranno Report, the numeric nutrient criteria are set to maintain or improve the current condition of each lake, which will ensure protection of the designated use in each lake. Therefore, EPA concludes, in accordance with 40 CFR §§ 131.5(a)(2) and 131.11(a), that Fond du Lac's numeric nutrient criteria at Ordinance #12/98, Amended, Section 301(d) and Appendix 5 are based on sound scientific rationale and are protective of Fond du Lac's aquatic life uses.

2. Ammonia

To protect the Band's aquatic life use designations, Fond du Lac adopted acute and chronic criteria for ammonia at Ordinance #12/98, Amended, Section 301(f) and Appendix 4 that are consistent with EPA's current CWA Section 304(a) criteria recommendations (EPA, "Aquatic Life Ambient Water Quality Criteria for Ammonia – Freshwater," 78 *Fed. Reg.* 52191-52194 (2013)).

Consistent with Section 304(a) of the CWA, EPA publishes national recommended water quality criteria that accurately reflect the latest scientific knowledge regarding criteria necessary to protect the aquatic life uses specified in Section 101(a)(2) of the CWA. As discussed in Chapter 3 of EPA's *Water Quality Standards Handbook*⁷, EPA's CWA 304(a) criteria recommendations, if not exceeded, generally ensure adequate water quality for protection of a 101(a)(2) aquatic life designated use and "[i]f a state or authorized tribe relies on 304(a) criteria recommendations (or other up-to-date EPA guidance documents), they may reference and rely on the data in those documents and may not need to create duplicative or new material for inclusion in their records." WQS Handbook, Chapter 3 at 2-3.

EPA's 2013 CWA 304(a) ammonia criteria include separate criteria recommendations for waters where salmonids in the genus *Oncorhynchus* are present and for waters where salmonids in the genus *Oncorhynchus* are absent. The Band's adopted ammonia criteria are consistent with the recommended criteria for waters where *Oncorhynchus* are present, which are the more stringent set of criteria and, thus, would also be protective of waters where *Oncorhynchus* are absent.

As discussed above, EPA's CWA 304(a) criteria recommendations are developed to ensure protection of the aquatic life uses specified in CWA Section 101(a)(2) and incorporate the latest scientific knowledge. Therefore, EPA concludes in accordance with 40 CFR §§ 131.5(a)(2) and 131.11(a) that Fond du Lac's ammonia criteria at Ordinance #12/98, Amended, Section 301(f)

⁷ U.S. Environmental Protection Agency, Office of Water, Office of Science and Technology, *Water Quality Standards Handbook*, (2017) at <https://www.epa.gov/wqs-tech/water-quality-standards-handbook>, last accessed September 2020 (hereafter referenced as "the WQS Handbook").

and Appendix 4 are based on sound scientific rationale and protective of Fond du Lac's aquatic life uses.

3. Specific conductance

Fond du Lac's existing narrative criterion at Ordinance #12/98, Section 301(j) requires that, "[e]xisting mineral quality shall not be altered by municipal, industrial and instream activities or other waste discharges so as to interfere with the designated uses for a water body." The adopted revisions modify the Band's narrative criterion by establishing a numeric criterion for specific conductance of 300 $\mu\text{S}/\text{cm}$, not to be exceeded as an annual average. Ordinance #12/98, Amended, Section 301(k)⁸.

Fond du Lac submitted the following documents to support its adoption of the 300 $\mu\text{S}/\text{cm}$ numeric criterion:

- Johnson and Johnson, *An Evaluation of a Field-Based Aquatic Life Benchmark for Specific Conductance in Northeast Minnesota* (November 2015) (hereafter referenced as "the Johnson and Johnson Report") and
- Susan Cormier, EPA Office of Research and Development, *Review: An Evaluation of a Field-Based Aquatic Benchmark for Specific Conductance in Northeast Minnesota* (February 2016) (hereafter referenced as "Cormier Review").

In addition, both documents relied on and evaluated the appropriateness of applying the results of an earlier EPA study (EPA, *A Field-Based Aquatic Life Benchmark for Conductivity in Central Appalachian Streams* (March 2011) (hereafter referenced as "the EPA Benchmark Report")) within the Fond du Lac Reservation.

a. EPA's 2011 Benchmark

The EPA Benchmark Report established a 300 $\mu\text{S}/\text{cm}$ benchmark that is consistent with CWA Section 101(a)(2) and protective of aquatic life in parts of West Virginia and Kentucky (in ecoregions 68, 69 and 70). As discussed in the EPA Benchmark Report, conductivity levels at or below 300 $\mu\text{S}/\text{cm}$ would be expected to prevent the extirpation of 95% of invertebrate genera in ecoregions 68, 69 and 70, which corresponds with the level of protection provided under EPA's 1985 Guidelines for Protection of Aquatic Organisms⁹ (protection of 95% of aquatic species).

As discussed in the EPA Benchmark Report, the 300 $\mu\text{S}/\text{cm}$ benchmark was derived using a field-based method modeled on EPA's 1985 methodology for deriving ambient water quality

⁸ EPA notes that the Band's narrative mineral quality criterion was previously found at Section 302(j) but the Band reordered the subsections in Section 302 due to the insertion of a new subsection for the ammonia criteria to protect aquatic life at Section 302(f), as described in Section II.B.2. Therefore, the narrative mineral quality criterion is now found at Section 302(k) in the Band's amended WQS.

⁹ Stephan, C., D. Mount, D. Hansen, J. Gentile, G. Chapman, and W. Brungs, *Guidelines for Deriving Numerical Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses* (1985) (hereafter "Guidelines for Protection of Aquatic Organisms").

criteria for the protection of aquatic life. EPA Benchmark Report at 3. Specifically, Chapter 3 of the EPA Benchmark Report describes the field-based method, which involved three steps:

[F]irst, the extirpation values (XCs) for each invertebrate genus was derived. Second, the XC_{95} values for all genera were used to generate [a species sensitivity distribution] and the 5th centile of the distribution, the 5th centile hazardous concentration (HC_{05}). (The HC_X terminology for concentrations derived from [species sensitivity distributions] is not in the EPA method [Stephan et al., 1985¹⁰], but its usage has become common more recently [Posthuma et al., 2002¹¹]). Finally, background values were estimated for the regions to ensure that the benchmark is not in the background range. EPA Benchmark Report at 13.

Additionally, the EPA Benchmark Report noted that relationships between conductivity and biological responses appear to vary among different mixtures of ions and, thus, that the benchmark would not be applicable in areas with different ionic compositions. Specifically, the EPA Benchmark Report stated that the benchmark is intended to address “loss of aquatic life in the Appalachian Region associated with a mixture of salts dominated by [calcium], [magnesium], [sulfate], and [bicarbonate] at circum-neutral pH” and “might not apply when the relative concentrations of dissolved ions are not dominated by salts of [calcium], [magnesium], [sulfate] and [bicarbonate] or the natural background exceeds the benchmark.” EPA Benchmark Report at 41. On the other hand, in areas where the ionic composition is analogous to that found in ecoregions 68, 69, and 70, the relationship between conductivity and biological responses should be the same.

In summary, the EPA Benchmark Report identified three factors that affect ion toxicity and, thus, the protective level of conductivity in an area:

- 1) The sensitivity of aquatic organisms found in the area,
- 2) The ionic composition of waters in the area, and
- 3) The natural background conductivity levels in the area.

This field-based methodology and the resulting 300 $\mu\text{S}/\text{cm}$ benchmark underwent an extensive peer review process from both reviewers within EPA and external reviewers, including a review by EPA’s Science Advisory Board. EPA’s Science Advisory Board’s Mountaintop Mining Panel concluded that “the general approach, including the use of field data and the resulting benchmark, is sound and provides a degree of protection comparable to or greater than a conventional ambient water quality criterion derived from traditional chronic toxicity testing....” U.S. Environmental Protection Agency Science Advisory Board Panel on Ecological Impacts of Mountaintop Mining and Valley Fills, *Review of Field-Based Aquatic Life Benchmark for Conductivity in Central Appalachian Streams* (March 25, 2011) at 3.

¹⁰ Guidelines for Protection of Aquatic Organisms (as cited in the EPA Benchmark Report).

¹¹ Posthuma, L., G.W. Suter II, and T.P. Traas (eds.), *Species Sensitivity Distributions in Ecotoxicology* (2002) (as cited in the EPA Benchmark Report).

b. Information provided by Fond du Lac and reviewed by EPA in applying the EPA 2011 Benchmark method to Reservation waters

To develop the conductivity criterion, the Band started by requesting that the authors of the Johnson and Johnson Report evaluate whether EPA's 2011 Benchmark would be appropriate for waters within the Fond du Lac Reservation. The Johnson and Johnson Report concluded that the 2011 300 $\mu\text{S}/\text{cm}$ benchmark would be protective of aquatic life in the Fond du Lac Reservation because ion concentrations in northeast Minnesota streams are similar to the Central Appalachian streams considered in the EPA Benchmark Report, and northeast Minnesota streams contain many of the same genera as Central Appalachia that are demonstrated to be sensitive to conductivity. Johnson and Johnson Report at 12.

To evaluate Johnson and Johnson's conclusions and the scientific validity and protectiveness of the 300 $\mu\text{S}/\text{cm}$ benchmark for Reservation waters, the Band subsequently requested that Susan Cormier of EPA's Office of Research and Development review the Johnson and Johnson Report. As discussed in the Cormier Review, Cormier considered the information in the Johnson and Johnson Report, as well as data from other sources, to evaluate whether the assumptions underlying the 2011 Benchmark are met in Reservation waters and to calculate the protective level of conductivity for waters in the Fond du Lac Reservation using the methods described in the Benchmark Report.

As discussed in Section II.B.3.a above, EPA's 2011 Benchmark (i.e., the scientific method used to derive the benchmark) is a scientifically sound approach for deriving criteria sufficient to protect aquatic life from adverse effects associated with a mixture of salts dominated by calcium, magnesium, sulfate and bicarbonate at circum-neutral pH. While the EPA Benchmark Report applied that method specifically to data from Central Appalachian streams, it is reasonable to assume that the same method could also be used to calculate conductivity levels protective of aquatic life outside the region covered in the Report where the assumptions underlying the approach are true. As discussed in Section II.B.3.a above, the methodology in the EPA Benchmark Report is based on the following assumptions:

- 1) Ionic composition in the area waters is dominated by calcium, magnesium, sulfate, and bicarbonate at circum-neutral pH, and
- 2) Natural background conductivity levels do not exceed the benchmark.

As discussed below, the Band's Triennial Review Submittal included documentation analyzing each of the above factors in the context of the Fond du Lac Reservation.

i. Ionic composition in the area waters is dominated by calcium, magnesium, sulfate, and bicarbonate at circum-neutral pH.

As discussed in the EPA Benchmark Report, the 300 $\mu\text{S}/\text{cm}$ benchmark was derived based on biological and water chemistry data from streams where loss of aquatic life is associated with a mixture of salts dominated by calcium, magnesium, sulfate and bicarbonate at circum-neutral pH. As discussed in the EPA Benchmark Report, at the Central Appalachian sites used to derive the 300 $\mu\text{S}/\text{cm}$ benchmark, pH ranged between 6 and 10, with a median pH of 7.62. A pH range

of less than 6 was found at some sites in the ecoregions, but EPA excluded those sites from the analysis to prevent potential confounding effects. EPA Benchmark Report at 10-11. Consequently, pH between 6 and 10 would be considered circum-neutral for the purposes of the benchmark method.

In seeking to translate the EPA Benchmark Report to Reservation waters, the Johnson and Johnson Report considered water chemistry data from the Minnesota Copper-Nickel Study¹². The Minnesota Copper-Nickel Study included hundreds of water quality samples collected from 32 stream sites and 35 lake sites between March 1976 and September 1977. Based on the relative concentrations of the ions measured, Johnson and Johnson concluded that the most prevalent ions were sulfate, calcium, magnesium and bicarbonate. Additionally, pH ranged between 4.7 and 8.4, with a median of 6.9. Consequently, the Johnson and Johnson Report concluded that “[t]he key parameters in the water chemistry in the Minnesota ecoregions and the Appalachian ecoregions are similar.” Johnson and Johnson Report at 12-13.

Subsequently, the Cormier Review evaluated Johnson and Johnson’s results and also considered additional data from stream surveys conducted by EPA and cooperating agencies since 1985¹³. Based on the available data, The Cormier Review concluded that:

In Appalachia (U. S. EPA, 2011)¹⁴ and northeast Minnesota, the ionic mixture is dominated by bicarbonate and sulfate anions and calcium and magnesium cations (Thingvold et al., 1979)¹⁵. This finding is consistent with dominant ions for Ecoregion 50 (including Minnesota, Wisconsin, and Michigan) reported by Griffith (2014)¹⁶, whose study Johnson and Johnson (2015) did not cite. Cormier Review at 2.

Consequently, there is a sound scientific rationale for the Band’s conclusion that ionic composition in Reservation waters is dominated by calcium, magnesium, sulfate and bicarbonate at circum-neutral pH.

ii. Natural background conductivity levels do not exceed the benchmark.

As discussed in the EPA Benchmark Report, background conductivities (estimated to be equal to the 25th percentile of probability based samples) in the ecoregions for which the 300 $\mu\text{S}/\text{cm}$ benchmark was derived were 72 $\mu\text{S}/\text{cm}$ for Ecoregion 69, 153 $\mu\text{S}/\text{cm}$ for Ecoregion 70 and 116 $\mu\text{S}/\text{cm}$ when samples from both ecoregions were combined. EPA Benchmark Report at 22. When considering only reference sites in the ecoregions, background conductivities (estimated to be the 75th percentile of conductivity samples at reference sites) were 66 $\mu\text{S}/\text{cm}$ for

¹² D. Thingvold, N. Sather, P. Ashbrook, *Water Quality Characterization of the Copper-Nickel Research Area* (December 1979), <https://www.leg.state.mn.us/docs/pre2003/other/CN153.pdf> (hereafter referenced as the Minnesota Copper-Nickel Study).

¹³ M.B. Griffith, “Natural Variation and Current Reference for Specific Conductivity and Major Ions in Wadeable Streams of the Conterminous U.S.,” *Freshwater Science* 33(1): 1-17 (as cited in the Cormier Review).

¹⁴ EPA Benchmark Report (as cited in the Cormier Review).

¹⁵ Minnesota Copper-Nickel Study (as cited in the Cormier Review).

¹⁶ Griffith at 1-17 (as cited in the Cormier Review).

Ecoregion 69, 214 $\mu\text{S}/\text{cm}$ for Ecoregion 70 and 150 $\mu\text{S}/\text{cm}$ when samples from both ecoregions were combined. EPA Benchmark Report at 22.

The data from the Minnesota Copper-Nickel Study considered in the Johnson and Johnson Report indicated that median conductivity in the study area was 65 $\mu\text{S}/\text{cm}$, which is lower than both the 300 $\mu\text{S}/\text{cm}$ Appalachian benchmark and the 261 $\mu\text{S}/\text{cm}$ median conductivity in Central Appalachian streams used to derive the Appalachian benchmark. Johnson and Johnson Report at 12-13.

According to information submitted by the Band in its Triennial Review Submittal, the Cormier Review considered the data presented in the Johnson and Johnson Report, along with additional water chemistry data from MPCA collected between 1996 and 2013, EPA surveys in Ecoregion 50 (including Griffith 2014), and Minnesota Environmental Quality Board (MN EQB) data from 1975-1977. Cormier Review at 2-4. Table 1 summarizes these data as compared with the corresponding data from the Central Appalachian streams used to derive the Appalachian benchmark.

Based on the available data, the Cormier Review concluded that:

Independent data sets from different decades confirm Johnson and Johnson's conclusion that the background [specific conductance] in Ecoregion 50 in Minnesota is less than the background of the data set used to develop the [specific conductance] benchmark for Ecoregions 69 and 70 in Central Appalachia. Hence, a benchmark value for [specific conductance] in Ecoregion 50 is not expected to be greater than the benchmark for central Appalachia, i.e., 300 $\mu\text{S}/\text{cm}$. Cormier Review at 9.

Consequently, there is a sound scientific rationale supporting the Band's conclusion that background conductivity levels in Reservation waters do not exceed the Central Appalachian benchmark and are similar to, or less than, conductivity levels in the waters used to derive the Central Appalachian benchmark.

Table 1. Comparison of estimates of natural background conductivity levels ($\mu\text{S}/\text{cm}$) in northeast Minnesota reported in the documents submitted by the Band with natural background conductivity levels in Central Appalachian streams reported in the EPA Benchmark Report.

Region	Ecoregion	Data Source	25 th Percentile	Mean	75 th Percentile (reference sites only)
Central Appalachian streams	Ecoregion 69	EPA Benchmark Report	72		66
	Ecoregion 70	EPA Benchmark Report	153		214
	Combined	EPA Benchmark Report	116		150
Northeast Minnesota	Ecoregion 50	Cormier Review (MPCA)	135	210	
	Ecoregion 50 (paired sites only)	Cormier Review (MPCA)	108		
	Ecoregion 50	Cormier Review (Griffith, 2014)	111		
	Ecoregion 50	Cormier Review (MN EQB)		55	

c. Application of 2011 Benchmark method to Reservation waters.

Because the Band concluded that the assumptions underlying the method used to calculate the 2011 EPA Benchmark are valid for Reservation waters, the Band determined that the method could be applied to Reservation waters.

As discussed in Section II.B.3.a above, the EPA Benchmark Report's 300 $\mu\text{S}/\text{cm}$ threshold was calculated by first determining for each invertebrate genus the specific conductance level that is expected to extirpate the genus (XC_{95}) and then calculating the 5th percentile of the distribution of XC_{95} values, which corresponds to the specific conductance level that is expected to extirpate 5% of the genera in the ecoregion (HC_{05}). For Central Appalachian streams, EPA calculated XC_{95} values for 163 genera, which ranged between 121 and >11,646 $\mu\text{S}/\text{cm}$. The calculated HC_{05} was 295 $\mu\text{S}/\text{cm}$. EPA Benchmark Report at 18 and Appendix D.

The Cormier Review used the methods described in the EPA Benchmark Report to evaluate biological and water chemistry data collected by MPCA in Ecoregion 50 between 1996 and 2013. Cormier Review at 6. Cormier calculated XC_{95} values for each of the benthic

macroinvertebrate genera that occurred at 25 sites or more in Ecoregion 50. Data were sufficient to calculate XC_{95} values for 164 benthic macroinvertebrate genera and Cormier concluded that the data allowed for a “confident estimation of the [specific conductance] that would result in the loss of 5% of genera.” Cormier Review at 6. Using the 164 XC_{95} values, Cormier calculated the specific conductance level estimated to extirpate 5% of genera (HC_{05}) to be 320 $\mu\text{S}/\text{cm}$, which is similar to the corresponding level calculated in the Appalachian study (295 $\mu\text{S}/\text{cm}$). Cormier Review at 67. Consequently, Cormier concluded that “the inference that 5% extirpation of benthic invertebrates would occur at similar conductivity levels in central Appalachia and Ecoregion 50 in Minnesota was supported by analysis of an independent data set of paired benthic invertebrate and [specific conductance] data from Ecoregion 50 in Minnesota.” Cormier Review at 10.

As discussed in the EPA Benchmark Report, the benchmark method is based on exposures to aquatic organisms “throughout their life cycle” and, thus, the resulting benchmark is a chronic value. EPA Benchmark Report at 41. Research by Cormier and others in 2018, further clarified that benchmarks produced using this method are intended to be applied based on an annual average duration.¹⁷ Accordingly, the Band set the duration of specific conductance criterion as an annual average that is not to be exceeded.

As discussed in Section II.B.3.a above, EPA’s 2011 Benchmark (i.e., the scientific method used to derive the benchmark) is a scientifically sound approach for deriving a conductivity benchmark sufficient to protect aquatic life. Because application of that method to Fond du Lac waters resulted in a protective specific conductance level protective of aquatic life that is similar to, if not greater than, the 2011 EPA Benchmark (300 $\mu\text{S}/\text{cm}$), EPA finds that there is a sound scientific rationale to conclude that the 300 $\mu\text{S}/\text{cm}$ specific conductance criterion would be protective of aquatic life in Reservation waters. Ordinance #12/98, Amended, Section 301(k).

d. Conclusion

In summary, the 300 $\mu\text{S}/\text{cm}$ benchmark was developed using a valid scientific method to calculate the conductivity level protective of aquatic life in Central Appalachian streams. EPA Benchmark Report at 1. As discussed above, the Band’s Triennial Review Submittal included information demonstrating that (1) ionic composition of Reservation waters is similar to the waters in which extirpation values were derived, and (2) natural background conductivity in Reservation waters does not exceed the benchmark and, thus, that the assumptions underlying the method used to calculate the 2011 Benchmark are valid for Fond du Lac Reservation waters. Application of the method used to calculate the 2011 Benchmark to Fond du Lac waters indicated that conductivity levels at or below 300 $\mu\text{S}/\text{cm}$ on an annual average basis would protect aquatic life in Reservation waters. Therefore, the Band’s submittal provided a sound scientific rationale to conclude that the 300 $\mu\text{S}/\text{cm}$ benchmark is also protective of aquatic life uses in Fond du Lac’s Reservation waters and is consistent with Section 101(a)(2) of the CWA. Accordingly, EPA concludes, in accordance with 40 CFR §§ 131.5(a)(2) and 131.11(a), that

¹⁷ Cormier, et al. “Field-based method for evaluating the annual maximum specific conductivity tolerated by freshwater invertebrates,” *Science of the Total Environment* 633: 1637-1646 (2018).

Fond du Lac's conductivity criterion at Ordinance #12/98, Amended, Section 301(k) is based on sound scientific rationale and protective of Fond du Lac's aquatic life uses.

4. Narrative wild rice criterion

To protect wild rice, the Band adopted a narrative criterion at Ordinance #12/98, Amended, Section 301(n) requiring that:

Water quantity and quality and habitat alterations that may limit the growth and propagation of, or otherwise cause or contribute to an adverse effect to wild rice and other flora and fauna of cultural importance to the Band shall be prohibited.

Federal rules at 40 CFR § 131.11(a)(1)¹⁸ require that “[s]tates must adopt those water quality criteria that protect the designated use. Such criteria must be based on sound scientific rationale and must contain sufficient parameters or constituents to protect the designated use.”

40 CFR § 131.11(b)(2) provides that states and authorized tribes may “establish narrative criteria or criteria based upon biomonitoring methods where numerical criteria cannot be established or to supplement numerical criteria.”

As described in Ordinance #12/98, Amended, Section 301(n), the narrative criterion is intended to protect aquatic flora and fauna of cultural importance to the Band. The Band specifically identified wild rice as an aquatic plant species of cultural importance to the Band. As part of its Triennial Review Submittal and specifically to support this adopted narrative criterion, the Band provided a report: Fond du Lac Band of Lake Superior Chippewa, *Expanding the Narrative of Tribal Health: The Effects of Wild Rice Water Quality Rule Changes on Tribal Health* (undated) (hereafter referenced as the Wild Rice Report). According to the Wild Rice Report, wild rice may be affected by multiple stressors:

The decline in stands of natural wild rice has been linked to modified hydrology, such as extensive ditching or channelization that drains a rice bed, or inundation from dams or industrial discharges that overwhelm the shallow-rooted plants. ... Shoreline development can increase runoff, sedimentation and nonpoint source pollutants. Wild Rice Report at 50.

In its review of a similar narrative criterion adopted by the Lac du Flambeau Band (*see EPA's Review of Lac du Flambeau Band of Lake Superior Chippewa Indians' Water Quality Standards Under Section 303(c) of the Clean Water Act* (September 17, 2010) (hereafter “EPA LDF Review”)), EPA reviewed the scientific literature on wild rice ecology and the importance of hydrologic cycles, water quality, and habitat (e.g., sediment quality) to support the growth and development of wild rice. EPA LDF Review at 13-16. As part of its review of Fond du Lac's narrative criterion, EPA reviewed additional studies on wild rice ecology published since 2010. This research largely has focused on the effects of surface water sulfate and sediment porewater

¹⁸ Because the narrative criterion at Ordinance #12/98, Section 301(n) does not relate to toxic pollutants, the federal rules regarding narrative criteria for toxic pollutants at 40 CFR § 131.11(a)(2) are not applicable to this provision.

sulfide on wild rice (*e.g.*, see Myrbo et al. (2017)¹⁹), and confirms the role of water quality in supporting the growth and development of wild rice. EPA also reviewed scholarship²⁰ that investigated the role of water quantity and/or habitat on wild rice growth, all of which confirmed the role of water depth as a factor of wild rice growth.

The information submitted in the Band's Triennial Review Submittal is consistent with EPA's 2010 literature review and research conducted since 2010 that indicates the potential for adverse effects to wild rice through effects on water quality and hydrologic and physical modifications of waterways. Therefore, EPA finds that the Fond du Lac Band has demonstrated that its narrative criterion is consistent with the available data on wild rice ecology and ensures protection of the Band's cultural use of waters for wild rice harvesting by maintaining the conditions necessary to support wild rice growth. Consequently, EPA concludes in accordance with 40 CFR § 131.5(a)(2) and § 131.11(a) that Fond du Lac's narrative criterion at Ordinance #12/98, Amended, Section 301(n) is based on sound scientific rationale and protective of Fond du Lac's cultural use designation.

5. Narrative hydrologic conditions criterion

To protect aquatic life, Fond du Lac adopted a narrative criterion at Ordinance #12/98, Amended, Section 301(o) providing that:

Natural hydrologic conditions supportive of the natural biological community, including all flora and fauna, and physical characteristics naturally present in the waterbody shall be protected to prevent any adverse effects. The migration of fish and other aquatic biota normally present shall not be hindered.

As provided by Ordinance #12/98, Section 301 of Fond du Lac's WQS, the narrative criterion applies to all waters of the Fond du Lac Reservation.

EPA guidance has recognized that narrative criteria may be appropriate for the protection of aquatic life from hydrologic alterations. For example, as discussed in Chapter 3 of EPA's WQS Handbook:

The natural flow regime, defined as the characteristic pattern of flow magnitude, timing, duration, frequency, and rate of change, plays a central role in supporting the chemical, physical, and biological integrity of streams and rivers and the services they provide. Hydrologic alteration is a change to a natural flow regime and can include an increase or

¹⁹ A. Myrbo, et al, "Sulfide Generated by Sulfate Reduction is a Primary Controller of the Occurrence of Wild Rice (*Zizania palustris*) in Shallow Aquatic Ecosystems," *Journal of Geophysical Research: Biogeosciences* 122: 2736-2753 (2017).

²⁰ K. Aagard, et al., "Modeling the Relationship between Water Level, Wild Rice Abundance, and Waterfowl Abundance at a Central North American Wetland," *Wetlands* 39:149-160 (2019); Z. Li, et al, "Effects of Water Depth and Substrate Type on Rhizome Bud Sprouting and Growth in *Zizania latifolia*," *Wetlands Ecology and Management* 26:277-284 (2018); R.C. Tucker, et al., "Effects of Water Depth and Seed Provenance on the Growth of Wild Rice (*Zizania aquatica* L.)," *Aquatic Botany*: 113-118 (2011); and Z. Yang, et al, "Responses of an Emergent Macrophyte, *Zizania latifolia*, to Water-level changes in Lakes with Contrasting Hydrological Management," *Ecological Engineering* 151:105814 (2020).

decrease in water volume, seasonal pulse flow disruption, dramatic variation in water temperature, and other factors. CWA programs can incorporate strategies to protect aquatic ecosystems from the harmful effects of hydrologic alteration, and WQS programs in particular can include water quality criteria for flow to protect designated uses such as aquatic life, recreation, fishing, or shellfish harvesting. Several states and authorized tribes have adopted a narrative form of flow criteria in their WQS. EPA, WQS Handbook at 21.

Because the Band's narrative criterion applies to all surface waters and provide protection consistent with the aquatic life designated use, EPA concludes in accordance with 40 CFR §§ 131.5(a)(2) and 131.11(a) that Fond du Lac's narrative criterion at Ordinance #12/98, Amended, Section 301(n) is based on sound scientific rationale and protective of Fond du Lac's aquatic life uses.

6. Criteria to protect the wetland designated use

As discussed in Section II.A.2 above, Fond du Lac adopted a new wetland designated use that applies to all wetlands in the Fond du Lac Reservation. To protect the wetland designated use, the Band adopted narrative wetland criteria in Ordinance #12/98, Amended, Chapter 7:

All wetlands, as defined by the Cowardin classification scheme, shall maintain biological, physical, chemical, and hydrological conditions - as determined by reference wetlands - including, but not limited to: base flow, flow regime, wetland hydroperiod; chemical, nutrient, dissolved oxygen regime of the wetland; conditions favorable to protect propagation of threatened, endangered, and at-risk species; conductivity; floristic quality; integrity of species diversity, abundance, and zonation; normal movement of fauna; pH of wetland waters; salinity; size and shape; soil type horizon structure; water currents, erosion, or sedimentation patterns; water levels or elevations; and water temperature variations. Ordinance #12/98, Amended, Section 702.

To develop the wetland narrative criterion, the Band used EPA's Wetland WQS Templates. As discussed in EPA's Narrative Templates FAQs, the templates are intended for states and authorized tribes "to use to simplify and streamline the development of protective standards that will guide maintenance of the spatial and functional components of wetlands."

EPA guidance has recognized that narrative criteria may be appropriate for the protection of attributes and functions unique to wetlands:

[W]etlands are different from other surface water systems in that they provide different functions and have different vulnerabilities. Without specific recognition of these attributes and functions – along with statements to protect and maintain those attributes and functions – it is possible to lose or impair these features. ... Given the complex spatial and temporal heterogeneities of these unique ecosystems, narrative (rather than numeric) statements may be the best approach for states when first developing water quality standards for wetlands. Narrative Templates FAQs at 3.

The Fond du Lac narrative criterion requires the maintenance of all biological, physical, chemical and hydrological conditions in wetlands and, thus, would prevent adverse impacts to wetland functions and attributes. Consequently, EPA concludes in accordance with 40 CFR §§ 131.5(a)(2) and 131.11(a) that Fond du Lac's narrative criterion at Ordinance #12/98, Amended, Section 702 is based on sound scientific rationale and protective of Fond du Lac's wetland use.

In addition to the narrative criterion at Ordinance #12/98, Amended, Section 702, the Band also revised appendices 1 and 2 of its WQS to apply the Band's existing criteria for aquatic life, human health and wildlife to the wetland designated use. Ordinance #12/98, Amended, Appendices 1 and 2. As discussed in EPA's Narrative Templates FAQs:

Water quality criteria for the protection of human health are based on the toxicity of a contaminant and the amount of the contaminant consumed through ingestion of water and fish regardless of the type of water body. Narrative Templates FAQs at 4.

The Band's numeric criteria, although not designed specifically for wetlands, were designed to be protective of aquatic life, wildlife and human health regardless of waterbody type. Ordinance #12/98, Amended, Section 601. EPA previously reviewed those criteria and determined that there was a sound scientific rationale to conclude that those criteria are protective of aquatic life, wildlife and human health in surface waters. EPA, *U.S. EPA Record of Decision for Approval of Fond du Lac Band's Water Quality Standards Under § 303 of the Clean Water Act* (2001). EPA's review of the Band's criteria at that time was not based on the type of water body that the criteria applied to but was only based on the available data on potential effects to aquatic life, wildlife and human health.

Because those criteria are protective of the aquatic life, wildlife and human health use designations irrespective of water body type, there is a sound scientific rationale to conclude that those criteria are also protective of the aquatic life, wildlife and human health components of the wetland use adopted by the Band.

**C. Whether the State or Authorized Tribe has adopted an antidegradation policy that is consistent with §131.12, and whether the State or Authorized Tribe's adopted antidegradation implementation methods are consistent with §131.12.
(40 CFR § 131.5(a)(3))**

Federal regulations regarding antidegradation implementation methods at 40 CFR § 131.12(b) require that:

The State shall develop methods for implementing the antidegradation policy that are, at a minimum, consistent with the State's policy and with paragraph (a) of this section. The State shall provide an opportunity for public involvement during the development and any subsequent revisions of the implementation methods, and shall make the methods available to the public.

The adopted revisions do not modify the Band's existing EPA-approved antidegradation policy at Ordinance #12/98, Section 105(a), but the Band made several revisions to its antidegradation implementation methods in Ordinance #12/98, Amended, Section 105(b). These revisions are discussed below.

1. Whether Fond du Lac's methods for implementing the antidegradation policy are consistent with the State or Authorized Tribe's policy and 131.12(a).

a. Identification of waters for Tier 2 protection

Fond du Lac's previously approved antidegradation implementation procedures define "High Quality Waters" as:

Surface waters of the Reservation in which, on a parameter by parameter basis, the quality of the waters exceeds levels necessary to support propagation of fish, shellfish and wildlife and recreation in and on the water. Ordinance #12/98, Section 201(z)²¹.

In Fond du Lac's Triennial Review Submittal, these "High Quality Waters" have been renamed as "Exceptional Resource Waters," and

. . . shall mean high quality waters not specifically classified as Outstanding Reservation Resource Waters. Exceptional Resource Waters are subject to the provisions of 105(a)(2) and (4) of the Fond du Lac antidegradation policy. Ordinance #12/98, Amended, Section 201(t).

The Band's "Outstanding Reservation Resource Waters (ORRW)" continue to be defined as:

. . . those waters of the highest quality that are designated by the Reservation Business Committee for their uniqueness or ecological sensitivity. Waters may be designated as ORRW because of their exceptional cultural, aesthetic, recreational or ecological significance. Ordinance #12/98, Amended, Section 201(oo).²²

The Band's change at Ordinance #12/98, Amended, Section 201(t) removes ORRWs from being included in the definition of Exceptional Resource Waters. This change reflects the fact that, under Fond du Lac's antidegradation policy, ORRWs are subject to separate, more stringent antidegradation requirements. Section 105(a)(5) of Fond du Lac's antidegradation policy continues to require that water quality in ORRW waters "shall be maintained and protected without degradation." Ordinance #12/98, Section 105(a)(5).

In contrast, the Band's existing WQS provided that a lowering of water quality may be allowed in Exceptional Resource Waters "where lower water quality is determined to be necessary to support important social and economic development." Ordinance #12/98, Section 105(a)(4). The

²¹ Due to the insertion of new definitions to Section 201, the Band's existing definition of "High Quality Waters" was renumbered as Section 201(bb).

²² In the Band's existing WQS, Outstanding Reservation Resource Waters are defined in the same way. Ordinance #12/98, Section 201(mm).

antidegradation implementation procedures regarding Exceptional Resource Waters at Ordinance #12/98, Amended, Section 105(b)(4) pertain to the process by which a lowering of water quality may be allowed in those waters. Since no lowering of water quality is allowed in ORRWs, it is appropriate to not apply those procedures to ORRWs. Consequently, EPA concludes that the removal of ORRWs from the definition of Exceptional Resource Waters serves to clarify the Band's classification of waters and is consistent with the Band's antidegradation policy and federal requirements at 40 CFR § 131.12(a).

b. Expansion of current Tier 2 antidegradation implementation procedures to “other pollutants”

Section 105(b)(4) of Fond du Lac's antidegradation implementation procedures for Exceptional Resource Waters provides that an antidegradation review is not required for “changes in loadings of any [bioaccumulative chemical of concern (BCC)] within the existing capacity and processes and that are covered by the existing applicable control document.” Ordinance #12/98, Section 105(b)(4). Fond du Lac's revisions extend this provision to other (non-BCC) pollutants: “For BCCs or other pollutants known or believed to be present in a discharge. . . .” Ordinance #12/98, Amended, 105(b)(4).

As provided by Section 105(b)(4) of the Band's antidegradation implementation procedures, an antidegradation review is required for any action resulting in a lowering of water quality. The Band's antidegradation implementation procedures continues to define a lowering of water quality as:

- 1) the projected or observed diminished chemical or biological integrity of Reservation surface waters as established by the Fond du Lac Environmental Program through the collection and analysis of baseline biological data, and the determination of reference conditions for such surface waters; or, 2) a new or increased loading of a pollutant from any regulated existing or new facility, either point source or nonpoint source, for which there is a control document or reviewable action, as a result of any activity including, but not limited to:
 - A. Construction of a new regulated facility or modification of an existing regulated facility such that a new or modified control document is required;
 - B. Modification of an existing regulated facility operating under a current control document such that the production capacity of the facility is increased;
 - C. Addition of a new source of untreated or pretreated effluent containing or expected to contain any pollutant to an existing wastewater treatment works, whether public or private;
 - D. A request for an increased limit in an applicable control document; and

- E. Other deliberate activities that, based on the information available, could be reasonably expected to result in an increased loading of any pollutant to any waters of the Fond du Lac Reservation. Ordinance #12/98, Section 105(b)(1).

Thus, as defined by the Band's antidegradation implementation procedures, a lowering of water quality does not include modifications to existing regulated facilities that would not require a new or modified control document. Ordinance #12/98, Section 105(b)(4). This approach is consistent with the definition of a "significant lowering of water quality" included in federal antidegradation requirements for BCCs in the Great Lakes Basin at 40 CFR Part 132, Appendix E. The Band's definition of a lowering of water quality, which would trigger an antidegradation review, is not based on the type of pollutant but only on whether a proposed activity is expected to increase loading rates beyond what is currently authorized by the existing control document.

Because the Band's definition of a lowering of water quality is based on the nature of the proposed activities rather than the nature of the pollutant, it is reasonable to apply the same definition of a lowering of water quality to BCCs and non-BCCs. Consequently, EPA concludes that the Band's revision to Section 105(b)(4) to include "other pollutants" is consistent with the Band's antidegradation policy and 40 CFR § 131.12(a).

c. Expansion of Tier 2 antidegradation monitoring requirements to non-BCC pollutants

Section 105(b)(4) of Fond du Lac's antidegradation implementation procedures for Exceptional Resource Waters includes an existing requirement that "[f]or BCCs known or believed to be present in a discharge, from a point or nonpoint source, a monitoring requirement shall be included in the control document." Fond du Lac's revisions extend this requirement to "other pollutants." Ordinance #12/98, Section 105(b)(4).

Federal antidegradation regulations and guidance do not specify any monitoring requirements applicable to antidegradation policies or implementation procedures for non-bioaccumulative pollutants. The federal regulations at 40 CFR § 131.12(b) provide that state and tribal antidegradation implementation policies are acceptable if they are consistent with the State's or Tribe's antidegradation policy and 40 CFR § 131.12(a). 40 CFR § 131.12(a) states that an antidegradation review is required when an activity or action is proposed that would lower water quality but is silent on the specifics of how that lowering of water quality is to be quantified for purposes of triggering antidegradation review. Discharge monitoring is used routinely in water quality management to evaluate the effects of a discharge on water quality (e.g., *see* EPA's *Technical Support Document for Water Quality-based Toxics Control* (March 1991)).

For the reasons described above, EPA concludes that the Band's provision requiring a monitoring requirement to be included in control documents for "other pollutants" as set forth in revised Ordinance #12/98, Amended, Section 105(b)(4) is consistent with the Band's antidegradation policy and 40 CFR § 131.12(a).

d. Revision of short-term, temporary exemption for Outstanding Reservation Resource Waters (Tier 3)

Section 105(b)(3) of Fond du Lac's existing EPA-approved antidegradation implementation procedures (which generally correspond with the "Tier 3" requirements of 40 CFR § 131.12(a)(3)) allow that "a short-term, temporary exemption may be permitted." The Band's WQS revisions modify this provision by requiring that:

an entity seeking to engage in such discharge demonstrate that such discharge will arise entirely from one of the following and meets the Outstanding Reservation Resource Waters Antidegradation Demonstration requirements below:

- a. Maintenance or repair of existing roads, bridges, culverts, boat landings, septic systems, or other similar structures: construction of buildings, wells, roads, or other similar structures.
- b. Response actions undertaken to alleviate a release into the environment of hazardous substances, pollutants, or contaminants which may pose an imminent and substantial threat to public health or welfare.
- c. Actions undertaken to restore culturally important species and their habitats. Ordinance #12/98, Section 105(b)(3).

EPA has explained that it is consistent with federal antidegradation requirements pertaining to Outstanding National Resource Waters (40 CFR § 131.12(a)(3)) for states and authorized tribes to allow "some limited activities that result in temporary and short-term changes in the water quality of ONRWs." 48 *Fed. Reg.* 51400, 51403 (Nov. 8, 1983); *see also* EPA's WQS Handbook at 12-13. The Band's revisions have the effect of restricting its existing provision for temporary and short-term changes in the water quality of ORRWs by limiting the exemption to the specific types of activities listed in rule. The Band's modifications thus increase the level of protection provided for ORRWs.

Consequently, EPA concludes that Fond du Lac's revisions to Ordinance #12/98, Amended, Section 105(b)(4) regarding activities that would have only short-term, temporary effects on water quality in ORRWs are consistent with 40 CFR § 131.12(a) and Fond du Lac's antidegradation policy.

e. Designation of Five Lakes as ORRWs

Fond du Lac's WQS revisions designate five lakes (Perch Lake, Rice Portage Lake, Dead Fish Lake, Jaskari Lake, and Wild Rice Lake) as ORRWs. Ordinance #12/98, Amended, Section 105(b)(3). Section 105(a)(5) of the Band's antidegradation policy requires that "[w]ater quality in ORRWs shall be maintained and protected without degradation" and, thus, designation as ORRW provides the highest level of antidegradation protection within the Band's antidegradation policy. Ordinance #12/98, Section 105(a)(5).

Fond du Lac’s antidegradation policy provides that “[w]aters may be designated an ORRW because of exceptional cultural, aesthetic, recreational or ecological significance. ... [O]ther waters may be designated ORRW as determined by the Reservation Business Committee after at least one public hearing.” Ordinance #12/98, Section 105(a)(5). As discussed in Section II.F below, Fond du Lac followed these procedures in making its ORRW designation for the five lakes: the Band held a public hearing on December 6, 2018 to discuss and provide an opportunity for the public to comment on the proposed WQS revisions, which included the designation of the five lakes as ORRWs, and the Reservation Business Committee approved and adopted the WQS revisions on July 8, 2020. Fond du Lac’s Triennial Review Submission includes a discussion of this process and the Band’s supporting documents. Consequently, EPA concludes that Fond du Lac’s designation of five lakes as ORRWs is consistent with 40 CFR § 131.12(a) and Fond du Lac’s antidegradation policy.

f. Antidegradation requirements for wetlands

Fond du Lac’s revisions add antidegradation requirements specific to wetlands. To develop the wetland narrative criterion, the Band used EPA’s Wetland WQS Templates.

As seen in Table 2 below, the antidegradation requirements for wetlands in Chapter 7 of the Band’s WQS correspond directly to the Band’s antidegradation policy, but account for functions and attributes specific to wetlands. As discussed in EPA’s Narrative Template FAQs,

wetlands are different from other surface water systems in that they provide different functions and have different vulnerabilities. Without specific recognition of these attributes and functions—along with statements to protect and maintain those attributes and functions—it is possible to lose or impair these features. Wetland-specific standards provide for more robust wetland protection when implementing the Clean Water Act and other resource protection programs. Narrative Template FAQs at 3.

Table 2. Comparison of Fond du Lac’s wetland antidegradation requirements added at Chapter 7 with the Band’s existing, EPA-approved antidegradation policy at Section 105(a) (italics showing emphasis added).

New Wetland antidegradation requirements (Chapter 7)	Existing Antidegradation policy (Section 105(a))
Tier I: For all wetlands, using the Cowardin classification scheme, <i>there shall be no degradation of existing uses.</i> Ordinance #12/98, Amended, Section 703 (paragraph 1).	Existing instream water uses, as defined pursuant to 40 C.F.R. Part 131, and the level of water quality necessary to protect existing uses shall be maintained and protected. <i>No further water quality degradation which would interfere with or become injurious to existing or designated uses shall be permitted.</i> Ordinance #12/98, Section 105(a)(1).

New Wetland antidegradation requirements (Chapter 7)	Existing Antidegradation policy (Section 105(a))
Tier II: Using the Cowardin classification scheme: <i>there shall be no net loss to the water quality</i>, functions, area, or ecological integrity of high quality lacustrine, lacustrine fringe, palustrine, riverine, and slope wetlands, <i>unless, after satisfying applicable antidegradation provisions including avoidance, minimization, and mitigation/replacement requirements, the authorized tribe determines that allowing degradation is necessary to accommodate important social or economic development in the area in which the wetlands are located.</i> Ordinance #12/98, Amended, Section 703 (paragraph 2).	For waters identified as high quality under 105.a.2 of this Ordinance, the Fond du Lac Reservation Business Committee, after appropriate public notice and intergovernmental coordination requirements and after due consideration of such technical, economic, social and other criteria in the area in which the water is located, <i>may choose to allow lower water quality, where lower water quality is determined to be necessary to support important social and economic development.</i> Ordinance #12/98, Section 105(a)(4).
Tier III: There shall be no loss to the water quality, functions, values, area, or ecological integrity of wetlands designated as Outstanding Reservation Resource Waters (ORRW), as per applicable Tier III requirements. Ordinance #12/98, Amended, Section 703 (paragraph 3).	Waters proposed in this Ordinance as Outstanding Reservation Resource Waters (ORRW) shall be designated as such upon approval of this Ordinance and maintained and protected. Waters may be designated an ORRW because of exceptional cultural, aesthetic, recreational or ecological significance. Upon approval of this Ordinance, other waters may be designated ORRW as determined by the Reservation Business Committee after at least one public hearing. <i>Water quality in ORRWs shall be maintained and protected without degradation.</i> Ordinance #12/98, Section 105(a)(5).

On the basis of the discussion above, EPA concludes that Fond du Lac’s revised wetland antidegradation requirements in Chapter 7 are consistent with 40 CFR § 131.12(a) and Fond du Lac’s antidegradation policy.

2. Whether the Tribe provided an opportunity for public involvement during the development and any subsequent revisions of the implementation methods and has made the methods available to the public. (40 CFR § 131.12(b))

Federal regulations at 40 CFR § 131.12(b) require that a state or authorized tribe “provide an opportunity for public involvement during the development and subsequent revisions of the implementation methods, and shall make the methods available to the public.” As described in Section II.D below, Fond du Lac held a public hearing consistent with 40 CFR § 25.5 and provided an opportunity for public comment during the development of these rules. Fond du Lac

also prepared a response to public comments received. Fond du Lac provided information regarding its public process, comments received, and response to comments in its Triennial Review Submittal to EPA. Additionally, the Band duly adopted its revisions into Ordinance #12/98 through its legislative process. Ordinance #12/98, Amended, is posted on the Band's website and, thus, is available to the public. Consequently, EPA concludes that the Band has satisfied the public involvement requirements at 40 CFR § 131.12(b).

3. Conclusion

For the reasons described above, EPA concludes that Fond du Lac's revisions to its antidegradation implementation procedures at Ordinance #12/98, Amended, Section 703 are consistent with 40 CFR § 131.12.

D. Whether the State or Authorized Tribe has followed applicable legal procedures for revising or adopting standards. (40 CFR § 131.5(a)(6))

In a letter dated August 4, 2020 and received by EPA on August 6, 2020, Kevin R. Dupuis, Sr. of Fond du Lac's Reservation Business Committee certified that the rules were duly adopted in accordance with the laws of the Band.

In adopting the rules, Fond du Lac also provided opportunities for public input consistent with federal requirements at 40 CFR § 131.20(b) and 40 CFR Part 25. On September 28, 2018, Fond du Lac published a public notice and a copy of the draft rules on its website, requesting comments by November 19, 2018. Fond du Lac also published a public notice in the *Duluth News Tribune* and mailed electronic copies of the public notice and the draft rules to all interested parties. The Band subsequently extended the deadline for comments until December 7, 2018. The Band held a public hearing on December 6, 2018, in Cloquet, Minnesota. Fond du Lac publicized the public hearing more than 45 days prior to the date of the hearing, recorded the hearing and met other requirements for public hearings specified at 40 CFR § 25.5.

The Band received more than 500 written comments during this comment period and 16 individuals provided comments at the public hearing. Fond du Lac considered and responded to the public comments before adopting the rules. Fond du Lac proposed amendments to the rules in response to some of the comments. EPA reviewed the comments and Fond du Lac's responses in deciding whether to approve the Band's new and revised WQS, and nothing in those comments causes EPA to conclude that the Band's WQS revisions are not based on sound scientific rationale or do not protect applicable designated uses. Consequently, EPA concludes that the Band satisfied the public participation requirements of 40 CFR § 131.20(b) and 40 CFR § 25.5.

E. Whether the Tribal submission meets the requirements included in §131.6 of this part and, for Great Lakes States or Great Lakes Tribes (as defined in 40 CFR § 132.2) to conform to section 118 of the Act, the requirements of 40 CFR 132. (40 CFR § 131.5(a)(8))

40 CFR § 131.6 identifies the minimum requirements of a WQS submission. As described below, Fond du Lac's submittal meets all the relevant requirements of 40 CFR § 131.6.

1. Minimum requirements for WQS submission (40 CFR § 131.6)

a. Use designations consistent with the provisions of sections 101(a)(2) and 303(c)(2) of the Act (40 CFR § 131.6(a))

The Band's WQS revisions establish a wetland designated use and designate all wetlands with that use. As discussed in Section II.A.2 above, the wetland use includes aquatic life and recreation protections consistent with Section 101(a)(2) of the CWA.

b. Methods used and analyses conducted to support WQS revisions (40 CFR § 131.6(b))

The Band submitted the following documents in support of these rules:

- Fond du Lac Reservation Business Committee Certification of Proper Adoption of Tribal Water Quality Standards, as amended (August 4, 2020 and received August 6, 2020);
- Transmittal Letter from Nancy Schuldt, Fond du Lac, to Tera Fong (August 5, 2020 and received August 6, 2020);
- Fond du Lac Band of Lake Superior Chippewa Water Quality Standards of the Fond du Lac Reservation Ordinance # 12/98, as amended by Resolution #1321/20 of the Fond du Lac Reservation Business Committee on July 8, 2020;
- Fond du Lac Reservation Ordinance #12/98, with revisions shown in redline/strikeout format;
- Resolution #1821/20 Amending the Water Quality Standards for the Fond du Lac Reservation, Fond du Lac Ordinance #12/98;
- Public Notice for Water Quality Standards Public Meeting held January 12, 2018;
- Public Notice Seeking Public Comment on Revised Water Quality Standards, published September 28, 2018;
- Transcript of public hearing held December 6, 2020;
- Public comments received;
- Fond du Lac Water Quality Standards Triennial Review Final Report and Summary of Responses (December 2019);
- Devin Edge, Adam Frankiewicz, Jacob Fredrickson and Audrey Huff, University of Minnesota Duluth, *An Evaluation of the Specific Conductivity and Benthic Invertebrate Population in the Streams of the Fond du Lac Band of Lake Superior Chippewa Reservation* (May 6, 2020);
- Bruce L. Johnson and Maureen K. Johnson for WaterLegacy, *An Evaluation of a Field-Based Aquatic Life Benchmark for Specific Conductance in Northeast Minnesota* (November 2015);
- Susan M. Cormier, Ph.D., EPA Office of Research and Development, *Review: "An Evaluation of a Field-Based Aquatic Life Benchmark for Specific Conductance in Northeast Minnesota" (November 2015) Prepared by B.L. Johnson and M.K. Johnson for WaterLegacy* (February 4, 2016);
- Patricia Soranno, Associate Professor, Michigan State University, *Development of Lake-specific Numerical Nutrient Criteria for Water Quality Standards in Reservation Lakes* (May 20, 2011);

- Ann St. Amand, PhycoTech, Inc., *Development of Lake-specific Numerical Nutrient Criteria for Water Quality Standards in Fond du Lac Reservation Lakes: Analysis of the Phytoplankton Rapid Assay Results 1998-2012 Compared to Southern Minnesota Lakes* (August 20, 2015);
- *Expanding the Narrative of Tribal Health: The Effects of Wild Rice Water Quality Rule Changes on Tribal Health, Fond du Lac Band of Lake Superior Chippewa Health Impact Assessment* (undated);
- Earth Economics, *The Food that Grows Out of the Water: The Economic Benefits of Wild Rice in Minnesota* (2018);
- S. LaFond-Hudson, Johnson, N.W., Pastor, J., Dewey, B., *Iron sulfide formation on root surfaces controlled by the life cycle of wild rice (Zizania palustris)*, *Biogeochemistry* 141: 95-106 (2018);
- Sophia LaFond-Hudson, *Iron and Sulfate Cycling in the Rhizosphere of Wild Rice (Zizania palustris)* – A thesis submitted to faculty of the University of Minnesota (May 2016); and
- Minnesota Pollution Control Agency, *Wild Rice Sulfate Standard – Summary of Findings and Preliminary Recommendations, Legislative Briefing Document* (February 2014).

c. Water quality criteria sufficient to protect the designated uses (40 CFR § 131.6(c))

The WQS revisions include the adoption of several numeric and narrative criteria. As discussed in Section II.B above, the revisions are consistent with 40 CFR § 131.11.

d. An antidegradation policy consistent with 40 CFR 131.12 (40 CFR § 131.6(d))

The Band's WQS revisions modify several of the Band's existing EPA-approved antidegradation rules. These revisions do not modify the Band's existing, approved antidegradation policy but only affect the implementation of that policy. As described in Section II.C above, these revisions are consistent with Fond du Lac's existing antidegradation policy and 40 CFR § 131.12.

e. Certification by the State or Authorized Tribe's Attorney General or other appropriate legal authority within the State or Tribe that the WQS were duly adopted pursuant to State or Tribal law (40 CFR § 131.6(e))

Fond du Lac's Reservation Business Committee certified the rules in a letter from Kevin R. Dupuis, Sr. to Kurt Thiede, dated August 4, 2020.

f. General information which will aid the Agency in determining the adequacy of the scientific basis of the standards which do not include uses specified in section 101(a)(2) of the Act as well as information on general policies applicable to State or Authorized Tribe's standards which may affect their application and implementation (40 CFR § 131.6(f))

The Fond du Lac WQS revisions establish a wetland designated use and designate all wetlands of the Fond du Lac Reservation for that use. As discussed in Section II.A.2, the wetland designated use includes the uses specified in Section 101(a)(2) of the CWA. The WQS revisions

do not modify Fond du Lac's existing, effective designated uses as they are applied to specific Fond du Lac surface waters.

The adopted revisions include rule revisions that affect the application and implementation of Fond du Lac's antidegradation policy. See Section II.C for EPA's review of these implementation procedures for consistency with 40 CFR § 131.12(b).

2. Requirements of 40 CFR Part 132

The adopted revisions affect the entire Fond du Lac Reservation, a majority of which is located within the Lake Superior Basin. Therefore, the Band's WQS revisions apply to waters in the Great Lakes Basin and the requirements of 40 CFR Part 132 apply to the adopted revisions.

Federal WQS requirements in 40 CFR Part 132 that apply to waters in the Great Lakes System do not specifically address how states and authorized tribes may designate and modify uses. Therefore, there are no designated use requirements of 40 CFR Part 132 that are applicable to EPA's review of the Band's cultural use designation and wetland designated use, discussed in Section II.A above.

As discussed in Section II.B of this document, Fond du Lac's WQS revisions include the adoption of numeric criteria for nutrients, ammonia and specific conductance and narrative criteria to protect wild rice and hydrologic conditions. Federal regulations specific to the Great Lakes System in 40 CFR Part 132 do not include specific requirements regarding narrative criteria and, thus, there are no requirements of 40 CFR Part 132 that are applicable to EPA's review of the Band's adopted narrative criteria. Phosphorus (nutrients), ammonia, and dissolved solids (specific conductance) are included in Table 5 of 40 CFR Part 132 as pollutants subject to federal, state and tribal requirements. For pollutants listed in Table 5 of 40 CFR Part 132, 40 CFR § 132.4(g)(1) requires Great Lakes states and tribes to "[a]pply any methodologies and procedures acceptable under 40 CFR Part 131 when developing water quality criteria or implementing narrative criteria." As discussed in Section II.B above, the Band's numeric nutrient criteria, ammonia criteria, and specific conductance criterion are consistent with 40 CFR § 131.11.

State and tribal antidegradation rules applicable to the discharge of BCCs within the Great Lakes basin must be consistent with 40 CFR Part 132, Appendix E. Fond du Lac's existing antidegradation rules at sections 105(a) and (b) apply to the discharge of BCCs. EPA previously approved these as being consistent with 40 CFR Part 132 and nothing in the adopted revisions removes or modifies these antidegradation requirements. Consequently, EPA concludes that the Band's revisions to its antidegradation implementation procedures discussed in Section II.C of this document are consistent with 40 CFR Part 132, Appendix E.

F. Other items that EPA is approving

In addition to the revisions discussed above, Fond du Lac made several other revisions to the Band's WQS. EPA reviews each of these below.

1. Provisions clarifying the intent of Fond du Lac's WQS

Section 102 of Fond du Lac's existing WQS rules establish the purpose of the Band's WQS, which is to "protect the health and welfare of the Fond du Lac Band and other residents of the Fond du Lac Reservation." Ordinance #12/98, Section 102 also includes a list of methods by which the WQS shall achieve this purpose (e.g., "[t]he designation of uses for which the waters of the Fond du Lac Reservation shall be protected").

Fond du Lac's WQS revisions add the following two items to the list of methods by which the Band's WQS shall achieve its stated purpose:

- d. The prevention of degradation of existing water quality; and
- e. The protection of the Fond du Lac Band's political integrity, economic security, and health and welfare.

Ordinance #12/98, Amended, Section 102(d)-(e). Federal regulations at 40 CFR § 131.2 describing the purpose of WQS states that states and authorized tribes "adopt water quality standards to protect public health or welfare, enhance the quality of water and serve the purposes of the Clean Water Act." The Band's added purposes for their WQS are consistent with 40 CFR § 131.2 in that they establish the Band's intention to use WQS to enhance the quality of water and protect public health or welfare. Consequently, EPA concludes that the Band's revisions to Section 102 are consistent with the CWA and 40 CFR parts 131 and 132.

2. Provisions clarifying the intent of designated uses and water quality criteria

Fond du Lac's WQS revisions add language to sections 302 and 601 of the Band's WQS defining designated uses and water quality criteria.

As seen in Table 1 below, the Band's definitions of designated uses and criteria are consistent with federal regulations at 40 CFR § 131.3 and, thus, EPA concludes that Fond du Lac's revisions to sections 302 and 601 of its WQS are consistent with the CWA and 40 CFR parts 131 and 132.

Table 3. Comparison of Fond du Lac’s definitions of designated uses and water quality criteria with federal regulations in 40 CFR Part 131.

Term	Fond du Lac Definition	Federal Regulation
Designated Use	Waters of the Reservation are assigned designated uses to serve the purposes defined in Sections 101(a)(2) and 303(c) of the Clean Water Act: to ensure that water quality standards should provide, wherever attainable, water quality sufficient for the protection of fish, shellfish, and wildlife, recreation in and on the water, as well as considering the use and value of waters for cultural purposes, public water supplies, industrial purposes, and navigation. Designated uses are assigned to individual waterbodies in order to protect water quality appropriate for each use. Ordinance #12/98, Amended, Section 302.	States adopt water quality standards to protect public health or welfare, enhance the quality of water and serve the purposes of the Clean Water Act (the Act). “Serve the purposes of the Act” (as defined in sections 101(a)(2) and 303(c) of the Act) means that water quality standards should, wherever attainable, provide water quality for the protection and propagation of fish, shellfish and wildlife and for recreation in and on the water and take into consideration their use and value of public water supplies, propagation of fish, shellfish, and wildlife, recreation in and on the water, and agricultural, industrial, and other purposes including navigation. 40 CFR § 131.2.
Criteria	Criteria are elements of the Fond du Lac water quality standards, expressed as constituent concentration, levels, or narrative statements, representing a quality of water that supports a particular use. When criteria are met, water quality will generally protect the designated use. When criteria are not met, the designated uses may be affected adversely. Ordinance #12/98, Amended, Section 601.	<i>Criteria</i> are elements of State water quality standards, expressed as constituent concentrations, levels, or narrative statements, representing a quality of water that supports a particular use. When criteria are met, water quality will generally protect the designated use. 40 CFR § 131.3(b).

3. Provisions clarifying the applicability of Fond du Lac’s WQS

Section 103 of Fond du Lac’s existing WQS establish that the Band’s WQS apply to all “waters of the Fond du Lac Reservation” and provide a list of the types of activities to which WQS will be applied. The Band’s revisions modify this section by adding “the physical alterations of waterbodies including wetlands” to the list of activities to which WQS will be applied.

Ordinance #12/98, Amended, Section 103. Section 101(a) of the CWA establishes that “[t]he objective of this Act is to restore and maintain the chemical, physical, and biological integrity of the Nation’s waters.” Additionally, the addition is consistent with implementation of EPA approved WQS within CWA Section 401 certifications. Consequently, EPA concludes that Fond du Lac’s revisions to Section 103 of its WQS are consistent with the CWA and 40 CFR parts 131 and 132.

Fond du Lac's WQS revisions also add the following definition of "Waters of the Fond du Lac Reservation" at Section 201(ccc):

Waters of the Fond du Lac Reservation shall mean all waters within the exterior boundaries of the Fond du Lac Reservation, including but not limited to lakes, ponds, reservoirs, springs, streams, flowages, rivers, wetlands, and any subterranean waters having a demonstrable hydrologic connection with the surface. Ordinance #12/98, Amended, Section 201(ccc).

As discussed above, Section 103 of the Band's WQS require that the Band's WQS apply to all "waters of the Fond du Lac Reservation" and, thus, this definition affects the waterbodies to which the Band's WQS apply. Ordinance #12/98, Section 103. The Band's definition of "Waters of the Fond du Lac Reservation" does not exclude any surface waters and, thus, allows the Band to apply its WQS to all navigable waters. Consequently, EPA concludes that Fond du Lac's definition of "Waters of the Fond du Lac Reservation" at Ordinance #12/98, Amended, Section 201(ccc) is not inconsistent with the CWA and 40 CFR parts 131 and 132.

The CWA and federal regulations implementing the CWA extend only to waters of the United States. Application of the Band's WQS to waters outside the definition of waters of the United States is under Fond du Lac's own inherent authority and outside of EPA's authority under Section 303(c) of the CWA to approve or disapprove.

Additionally, EPA approves these WQS for the surface waters within the exterior boundaries of the Fond du Lac Reservation that are included in EPA's May 16, 1996 approval to obtain authorization for a WQS program. Application of these WQS by the Band to waters other than those specifically described above is under the Band's own inherent authority and outside of EPA's authority under CWA 303(c) to either approve or disapprove.

4. Non-substantive revisions to the Tribe's WQS

Fond du Lac also made numerous non-substantive revisions to revise or replace existing definitions, rename terms, clarify intent, add tribal names to definitions and lakes, and make grammatical edits. EPA reviewed these non-substantive revisions and concluded that these revisions do not change the meaning or implementation of the Band's existing federally-approved WQS. Therefore, EPA concludes that these reorganizational revisions are consistent with the CWA and 40 CFR parts 131 and 132.

G. Items that EPA has determined are not new or revised WQS

As described in Section II above, EPA has authority and duty to review state and tribal rules under Section 303(c) of the CWA if those rules constitute new or revised WQS. The EPA document entitled *What is a New or Revised Water Quality Standard Under CWA 303(c)(3)? Frequently Asked Questions* (October 2012) describes the criteria by which EPA determines whether a provision constitutes a new or revised WQS, one of which is whether the provision "address[es] designated uses, water quality criteria (narrative or numeric) to protect designated

uses, and/or antidegradation requirements for waters of the United States.” *What is a New or Revised Water Quality Standard Under CWA 303(c)(3)? Frequently Asked Questions* at 3.

Fond du Lac’s revisions include several revisions to the Band’s list of documents for Sample Collection, Preservation and Analysis in Section 501. Ordinance #12/98, Amended, Section 501. These revisions address the documents and methods the Band uses to collect, preserve and analyze samples. These revisions do not address designated uses, water quality criteria or antidegradation requirements and, thus, EPA concludes that these revisions are not new or revised WQS and is taking no action under Section 303(c) of the CWA on these revisions.

Additionally, Fond du Lac’s revisions add language at Section 301(m) specifying the methods that the Band will use to assess waters based on its existing narrative biological criterion. Ordinance #12/98, Amended, Section 301(m). Nancy Schuldt, Fond du Lac Water Projects Coordinator, clarified in an email to Aaron Johnson, EPA Region 5, Watersheds and Wetlands Branch, on June 5, 2020, that the provision only addresses the methods the Band will use to conduct condition assessments based on the narrative biological criterion and does not revise the narrative criterion itself. Therefore, EPA concludes that this revision only addresses implementation of the existing narrative criterion and does not address designated uses, water quality criteria or antidegradation requirements. Consequently, EPA concludes that the Band’s revision of Section 301(m) is not a new or revised WQS and is taking no action under Section 303(c) of the CWA on this revision.

H. Conclusion

For the reasons described above, EPA concludes that the Band’s WQS revisions adopted as part of its WQS triennial review are consistent with the CWA and federal WQS regulations in 40 CFR parts 131 and 132 and approves these revisions.

III. Endangered Species Act (ESA) Requirements

Consistent with Section 7 of the ESA and federal regulations at 50 CFR Part 402, EPA is required to consult with FWS on any action taken by EPA that may affect federally-listed threatened or endangered species or designated critical habitat. Actions are considered to have the potential to affect listed species if listed species are present in the action area.

According to the FWS Section 7 consultation assistance webpage²³, the listed threatened or endangered species in Carlton and St. Louis counties, Minnesota that could possibly be in the action area include Canada lynx, gray wolf, northern long-eared bat, piping plover and rufa red knot. Additionally, critical habitat for piping plover is located in St. Louis County.

Based on a review of the available information for these species, EPA concluded that Canada lynx, piping plover and rufa red knot are not located in the action area, and therefore, the WQS revisions will have no effect on those species. EPA also determined that critical habitat for piping plover is located more than 20 miles downstream of the Fond du Lac Reservation and,

²³ Accessed by EPA staff September 3, 2020, <https://ecos.fws.gov/ipac/> and/or <https://www.fws.gov/midwest/endangered/lists/minnesot-cty.html>.

thus, the WQS revisions will not affect any critical habitat. However, based on the potential presence of aquatic, aquatic-dependent, and/or wetland species in the action area, EPA decided that consultation under Section 7 of the ESA is required. EPA drafted a BE during its review of the Band's WQS revisions and concluded that its approval of the Band's WQS revisions may affect, but is not likely to adversely affect, the gray wolf and northern long-eared bat. EPA sent its BE to FWS on September 18, 2020, seeking concurrence on the Agency's conclusion.

IV. Tribal Consultation

On May 4, 2011, EPA issued the "EPA Policy on Consultation and Coordination with Indian Tribes" to address Executive Order 13175, "Consultation and Coordination with Indian Tribal Governments." The EPA Tribal Consultation Policy states that "EPA's policy is to consult on a government-to-government basis with federally-recognized Tribes when EPA actions and decisions may affect tribal interests." EPA consulted the location of tribal lands in Minnesota and determined that the Fond du Lac Reservation is located within and upstream of ceded territory where 12 federally-recognized tribes (including Fond du Lac) have treaty rights.

On August 12, 2020, EPA sent letters outlining the proposed WQS revisions and offering government-to-government consultation to the tribal leaders of the 11 federally-recognized tribes that are party to the 1854 Treaty. The consultation letter further clarified that if EPA did not receive a response from the Tribe within 30 days of the date of the letter (September 11, 2020), as either written comments or an attempt to schedule a conference call, EPA would conclude that the Tribe did not wish to engage in consultation and EPA could therefore move forward with a decision.

None of the 11 identified tribes responded to the letter in written or verbal means by September 11, 2020. EPA therefore provided substantive opportunity for the 11 tribes to provide input on EPA's decision-making process and has therefore fulfilled its duty to consult on a government-to-government basis with federally-recognized tribes on actions that may affect tribal interests.

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 29

MPCA, S-5 Implementing the Aquatic Life Narrative Standard, SONAR for Proposed Class 3
and 4 Rule Revisions, December 14, 2020 (excerpt).

Implementing the Aquatic Life Narrative Standard

1. Policy: Implementing the Aquatic Life Narrative Standard

A. Background

During the development of revisions to the Class 3 and Class 4 water quality standards, Tribal partners and stakeholders expressed serious concerns about the protection of aquatic life. Many felt that the numeric values in the existing Class 3 and, especially, Class 4A water quality standards were providing some degree of protection to aquatic life, particularly from the impacts of ionic pollutants such as bicarbonates, total dissolved salts, specific conductance, and sulfate. However, commenters also noted that the values in the existing Class 3 and 4 water quality standards are not sufficient to protect aquatic life.

The choice of values in a water quality standard is inextricably linked to the beneficial use that the standard is designed to protect. The values in the existing Class 3 and Class 4 water quality standards were designed to protect the Class 3 and Class 4 beneficial uses – industrial consumption and agriculture. The values in the existing Class 2 water quality standards were designed to protect aquatic life beneficial uses. Values cannot simply be moved between use classes. The MPCA agrees that additional water quality standards are needed to fully protect Class 2 aquatic life beneficial uses from the impacts of certain pollutants – particularly ionic or salty parameters. There is active research around the appropriate magnitude or level of those Class 2 standards, specifically around chloride and sulfate, that MPCA anticipates being the foundation for a future Class 2 rulemaking. Because this present rulemaking is to revise Class 3 and Class 4 standards to protect industrial consumption and agriculture beneficial uses, the consideration of aquatic life beneficial use protection is not relevant.

While not relevant to the current Class 3 and Class 4 rulemaking, it may be helpful to share information on steps the MPCA is taking related to Class 2 aquatic life and ionic pollutants. This document lays out an interim approach to protecting aquatic life from the adverse impacts of ionic pollutants, until numeric standards for those pollutants are developed and incorporated through future rulemaking into Minnesota's Class 2 water quality standards.

B. Narrative Standard to Protect Aquatic Life

This interim approach is grounded in Minnesota's Class 2 narrative water quality standard to protect aquatic life. The main expression of the narrative standard is in Minn. R. 7050.0150, Subp. 3. This states that "For all class 2 waters...the normal aquatic biota and the use thereof shall not be seriously impaired or endangered, the species composition shall not be altered materially, and the propagation or migration of aquatic biota normally present shall not be prevented or hindered by the discharge of any sewage, industrial waste, or other wastes to the waters."

In addition, Minn. R. 7050.0222 contains narrative statements that the quality of each surface water with a Class 2 designation should be “such as to permit the propagation and maintenance of a health community of...aquatic biota and their habitats[,]” as appropriate to the Class 2 subclass (Class 2A cold water, Class 2B warm or cool water, Class 2D wetlands).

While a narrative standard provides a clear statement of the conditions that should be present in waterbodies, it does not provide numeric values that must be met to ensure those conditions. It therefore is less easily used to craft permit conditions, and an additional step is needed in order to implement narrative standards in discharge permits.

C. Implementing Narrative Standards

The additional step(s) needed to implement a narrative standard in a facility permit include the concept of a “translator.” A “translator” is a process or method to regulate a permitted point source discharger to ensure compliance with a narrative standard. The EPA offers guidance on the use of translators and they are used by many states. A translator often results in a numeric effluent limit for a specific pollutant which, if met, ensures that the narrative standard is met in the waterbody. Although a translator can be developed as part of the design of a narrative standard, it can also be developed as part of separate implementation procedures.¹ Minnesota’s Class 2 narrative standard to protect aquatic life has been in place for some time, but has not had separate implementation procedures.

Stakeholders and Tribal partners have asked the MPCA to develop a mechanism to implement the Class 2 narrative standard in 7050.0150 in permits – namely by figuring out a way to “translate” the narrative standard into numeric effluent limits that can be applied to permitted facilities that discharge to Minnesota’s waters. Key pollutants of concern that stakeholders have raised for potential development of translators are “salty” or ionic parameters (such as specific conductance and sulfate) and nitrate.

The MPCA agrees that clearer implementation procedures for the Class 2 narrative aquatic life standard are warranted. This document lays out those procedures, which may ultimately result in one or more of a wide range of permit conditions – ranging from monitoring requirements to effluent limits based on water quality conditions and goals. Although this document is specific to protecting aquatic life from salty parameters, a general process could be extrapolated to any pollutant likely to have an impact on aquatic life, depending on the available data and information. If numeric standards for protecting aquatic life are adopted through rulemaking, the translator process would no longer be needed for those pollutants.

There are some exceptions to the permitting framework described below. Waterbodies that are currently identified as impaired for chloride, are known to have naturally high background levels of chloride, or are determined to have chloride as the primary stressor will not be subject to this narrative translator, as aquatic life standards for chloride already exist.

¹ More information can be found in EPA’s Water Quality Standards handbook, chapter 3.

2. Permitting Framework for Protecting Aquatic Life from Salty Parameters

The remainder of this document lays out a framework for implementing the Class 2 aquatic life narrative standard. The process is designed to identify the Class 2 waterbodies that are potentially impacted by ionic or salty parameters; and then support a case-specific determination of permit conditions necessary to ensure that the Class 2 aquatic life narrative standard is maintained.

A. Determining Waterbodies Impacted by Specific Conductance

The first step in the process is to determine those waterbodies most likely to have aquatic biology that is adversely impacted by salty pollutants, as indicated by specific conductance. Specific conductance was chosen as the surrogate indicator for multiple individual ionic pollutants.

Developing Metrics to Evaluate Impacts

First, specific conductance is a known stressor to aquatic life. Although the impact of a specific individual ion may be more important to certain aspects of the biological community, the generalized impact of specific conductance to the biological community and aquatic ecosystem health is well documented (Cañedo-Argüelles, et. al. 2013, Dunlop, et. al. 2008, Nielsen, et. al., 2003). Second, while it would be ideal to have indicators reflective of individual ions, or ion mixtures, these standards are not yet available, and even when available they may not be sensitive to all life stages of sensitive native taxa. Third, conductivity is well known to be correlated with anthropogenic stress, including urban development, agriculture, and mining activity. The ion mixture associated with each of these disturbance categories may differ, but, again, the generalized impact of conductivity is well documented. Finally, conductivity is one of the most commonly collected water quality parameters, and the MPCA has a very large dataset in which both biological data and specific conductance are collected concurrently. This large dataset has allowed for a robust approach to the development of tools to support this narrative translator, including calculation of regional benchmarks, as well as developing the relationship between aquatic life use support and conductivity.

The MPCA collects biological and water quality data throughout the state to determine if waterbodies are meeting aquatic life use goals. The primary biological indicators used in assessment of aquatic life are fish and macroinvertebrates. Macroinvertebrates are well known to be sensitive to many of the constituent ions that comprise specific conductance, and thus are the focus of this screening tool (Clements and Kotalik, 2015; Kefford, 1998; Hart et. al., 1990).

To determine if a waterbody is potentially adversely impacted by specific conductance, the MPCA proposes a weight of evidence approach that considers three metrics that represent different ways of looking at the relationship between specific conductance and biological response. All metrics were considered based on the last 10 years of information, in keeping with MPCA's assessment window.

- **MIBI** - The macroinvertebrate index of biotic integrity (MIBI) scores that are used in assessing aquatic life in rivers and streams. The MIBI was designed and calibrated to be an indicator of overall stress on the biological community, and is therefore our ultimate endpoint in determining if anthropogenic stressors are impacting aquatic life. It was not designed to

respond to any one stressor, but it is capable of showing a response to a single stressor, if that stressor is the overwhelming influence impacting aquatic health. When attempting to understand if the aquatic life of a stream is being impacted by a suspected stressor, the first step is to look at the MIBI score.

- **Conditional Probability** - A conditional probability approach based on a relationship between specific conductance and attainment of the MIBI General Use criterion. The conditional probability model was developed to reflect the extent to which conductivity measurements may be in alignment with impairment of the biological community, and allow us to make an inference about the potential impact of specific conductance when biological data is not available.
- **Regional Benchmarks** - Regional benchmarks based on the Criterion Continuous Concentrations (CCC). - An approach comparing measures of specific conductance to draft “benchmark” values that were calculated using a field-based method for the determination of water quality criteria (Cormier and Suter, 2013; US EPA, 2011). The benchmark values were developed as ecotoxicological endpoints to reflect the response of taxa that are sensitive to specific conductance. These values represent the point at which 5% of sensitive taxa are no longer present. These benchmark values were calculated for the purpose of supporting waterbody screening using data collected by the MPCA biological monitoring program from 1996 through 2018.

Evaluating Waterbodies Based on Metrics

After developing these three metrics, the MPCA reviewed individual waterbodies (lakes and stream reaches) and analyzed their conditions relative to each of the three metrics. A summary of the evaluation is provided in Attachment 1.²

1) Attainment of aquatic life use based on macroinvertebrate index of biotic integrity (MIBI) scores.

The MPCA currently has biological indicator data collected from 6800 monitoring locations, representing 3390 waterbodies, or stream segments, throughout Minnesota. Each waterbody is assigned a reference number called the Waterbody Identification number, or WID; there may be multiple monitoring locations within a WID.

The MPCA regularly assesses waterbodies to determine whether they fully support the aquatic life beneficial use based on fish and macroinvertebrate indices of biotic integrity (MIBI) scores. Assessment of biological condition is done at the waterbody level, and is the result of a weight of evidence approach that considers all assemblage-specific information collected in the 10-year window associated with the assessment. The MPCA’s detailed methods for assessment can be found in the *Guidance Manual for Assessing the Quality of Minnesota Surface Waters for Determination of Impairment: 305(b) Report and 303(d) List*.

When considering the potential for adverse impacts of specific conductance on aquatic life, aquatic life use support can be analyzed at both the waterbody level (WID), or reach level.

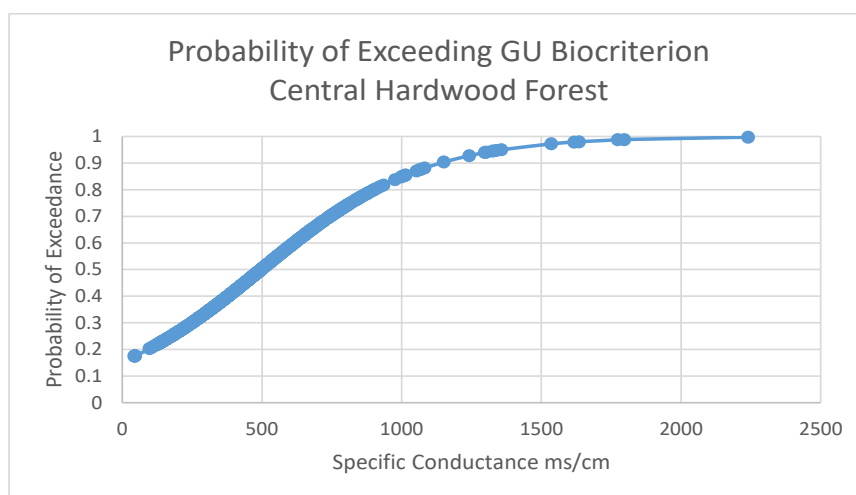
² This data is available in tabular format to allow for a straightforward interpretation of both summarized and site-specific data. It can be provided in more detail upon request.

Initial screening of aquatic life use should be done based on waterbody level assessment results. Reach level information can be analyzed if a more granular approach is needed to determine impacts of specific conductance on aquatic life.

2) Conditional probability of meeting general aquatic life use (GU) goals based on measurements of specific conductance.

Binary logistic regression was used to determine the probability of meeting the macroinvertebrate index of biotic integrity (MIBI) general use biocriterion based on measured values of specific conductance, for the purpose of determining potential biological impacts in areas where no biological data was present. Binary logistic regression is a modeling tool used to determine the probability of a binary event occurring (pass/fail) for a given predictive variable. In this case, that is the probability of meeting the biological standard, as demonstrated by the MIBI, based on the known specific conductance data. Conditional probability equations were derived based on datasets grouped at the level 3 ecoregion. Pass/fail outcomes were based on support/non-support of the relevant station-specific biocriterion; the predictive variable used was specific conductance. Coefficient values, constant values, and the equation used in the calculation of regional conditional probabilities are included below in Table 1.

Figure 1. Example conditional probability plot



Measures of specific conductance and associated conditional probabilities can be considered at both the waterbody and station levels. Aggregating specific conductance data at the waterbody level is done by taking the average values by month/year when multiple data points are present. Site specific and daily values are available for a more granular approach to understanding waterbody conditions. Similar to waterbody values, site-based specific conductance values are averaged values by month/year when multiple data points are present.

The logistic regression outputs for most ecoregions suggest that a more conservative (high) value be used to infer a likelihood of impairment for any given waterbody. For the purposes of this tool, any waterbody or station with a conditional probability value of 75% or higher should be flagged for further investigation of biological stress related to specific conductance.

Note on use of ecoregions. Ecoregions are biogeographic regions that reflect a recurring pattern of ecosystems associated with a characteristic combination of geology, soil, landform, vegetation, climate, land use, wildlife, and hydrology (Omernik 1987, 1995). Ecoregions are defined at four, hierarchical levels. Level 3 ecoregions are commonly used by the EPA and other

states to define regions for the development of water quality criteria (EPA, 2019). Minnesota has seven level three ecoregions.

3) Attainment of regionally derived benchmarks for specific conductance.

Criterion continuous concentration (CCC) values are intended to be used as a surrogate for chronic (long-term) exposure criteria and are designed to be protective of 95% of the native genera for a region. CCCs were derived at the level 3 ecoregion level from a field-based relationship between specific conductance and macroinvertebrate data (U.S. EPA, 2011; Cormier and Suter, 2013; Cormier, Zheng, and Flaherty, 2018). Regional benchmarks based on updating these CCCs were calculated by the MPCA using a statewide dataset collected by its biological monitoring program from 1996-2018. CCCs are based on the derivation of two relationships, one at the genus level and one at the community level. The genus-based relationship identifies the extirpation concentration (XC_{95}) for specific conductance for each genus in the ecoregion. The XC_{95} is the specific conductance value associated with the 95th percentile of the distribution of occurrence of each genus. The community level relationship identifies the 5th percentile hazard concentration (HC_{05}), and is the value used for the CCC. The HC_{05} is based on the cumulative rank distribution of XC_{95} values for the region. It reflects the specific conductance value that is protective of 95% of native regional macroinvertebrate genera. The taxa that disappear first are those considered most sensitive to increases in specific conductance. For each ecoregion, sensitivity values were determined for each genera that occurred a minimum of 20 times. These values can be made available for a more refined analysis of community level data at the site specific level.

These CCCs serve as regional benchmarks used to interpret measures of specific conductance. These values are present in the summary table, and are listed in Table 1 below.

Table 1. Regional specific-conductance benchmarks, regional coefficient and constant values, and equation for calculation of conditional probabilities.

Minnesota Ecoregion	Regional Benchmark For Specific Conductance	Coefficient for conditional probability calculation	Constant for conditional probability calculation
46 – Northern Glaciated Plains	1333 $\mu\text{S}/\text{cm}$	0.001021	0.095666
47 - Western Cornbelt Plain	1117 $\mu\text{S}/\text{cm}$	0.001349	0.080323
48 – Lake Agassiz Plain	859 $\mu\text{S}/\text{cm}$	0.002758	-2.06005
49 – Northern Minnesota Wetlands	405 $\mu\text{S}/\text{cm}$	0.003147	-1.74711
50 – Northern Lakes and Forests	329 $\mu\text{S}/\text{cm}$	0.001938	-1.40971
51 – North Central Hardwood Forests	488 $\mu\text{S}/\text{cm}$	0.003426	-1.70203
52 – Driftless Area	628 $\mu\text{S}/\text{cm}$	0.003886	-2.71473

Conditional Probability Equation: $CB = 1/(1+\text{EXP}(-(\text{coefficient}*\text{SC})-\text{constant}))$

Using these three metrics allows the MPCA to determine those waterbodies that are potentially experiencing aquatic life impacts due to salty parameters.

The clearest demonstration of impacts is a failing MIBI score. Those waterbodies where the MIBI scores indicate that the aquatic life use is not fully supported can be further reviewed using estimates of conditional probability and regional benchmarks, to determine if conductivity is likely to be the reason for the concern. If the conditional probabilities suggest a high likelihood (i.e. > 75%) that the specific conductance levels would cause the waterbody to “fail” the general use biocriterion and/or the specific conductance is above the regional benchmark, then the waterbody should be further investigated at the station level to determine if specific conductance values are problematic throughout the waterbody.

If no MIBI score is available, then reviewing the conditional probability and specific conductance compared to the benchmark alone will provide an indication. Prior to reaching conclusions about the impacts of specific conductance, it should be determined if there is additional information available. For instance, a stressor identification report for the associated waterbody could provide a more detailed assessment of the specific stressors on the aquatic community, perhaps differentiating between specific conductance and other pollutants. Similarly, if a biological effluent review has been completed for any effluent present in the waterbody it may describe potential impacts related to an effluent, and may identify potential causes. More detail is provided in the next section as to how additional information may be used or gathered, if deemed necessary for the next steps.

Note on this evaluation and aquatic life use goals. When assessing streams for aquatic life, two different approaches are used in the determination of appropriate aquatic life use goals.

For streams in which biological and habitat data have been collected, each waterbody segment is given a use class based on the tiered aquatic life use (TALU) approach (MPCA, 2016). TALU criteria differ based on habitat, channel, and biological characteristics. This use class approach is only applied to the direct interpretation of biological data. When interpreting MIBI scores in the context of aquatic life use support, it is best to maintain the tiered use approach, as this is ultimately the manner in which aquatic life use support is determined. Therefore, for waterbodies in which biological data was available, review of biological condition was done using the weight of evidence-based assessment and associated tiered aquatic life use (TALU) criterion.

When assessing aquatic life use based on non-biological water quality parameters, there is typically only a single use applied, the general use (GU). The general use is the middle tier in the tiered use approach; prior to the implementation of the TALU approach the general use was the only use applied to biological data. When making translations between specific conductance and aquatic life use for the conditional probability model, it was determined that it would best to make the general use the benchmark for comparing biological data and specific conductance. Therefore, conditional probabilities were developed using the TALU general use criteria, which makes no provision for habitat or stream channel modifications, and is way to compare all stream segments similarly. The water quality benchmarks could be considered as a surrogate for water quality criteria, and as a means to compare regional water quality conditions to a level of pollution that is likely protective of aquatic life.

Note on non-invertebrate aquatic life.

This evaluation was constructed to evaluate benthic macroinvertebrates, as they are generally the most sensitive to salty pollutants. They are more sensitive than fish species. However, some commenters raised questions about the protection of aquatic plants, particularly wild rice. MPCA scientists have done some investigation of Minnesota wetland plant response to salinity stressors: conductivity, chloride, and sulfate. They note that “aquatic plants are sensitive to specific conductance, chloride and sulfate and their response should be considered in

development of any aquatic life salinity related criteria or standards development”. The MPCA therefore would consider the response of wetland plants to these pollutants as we proceed in future rulemakings to develop aquatic life based water quality standards.

Although the review notes that additional data and analysis regarding wetland plant responses are needed, the MPCA scientists did construct preliminary XC95 values for select wetland plant species related to conductivity both statewide and in three ecoregions. Extirpation response benchmark or XC95 (extirpation concentration at 95%) represents the concentration below which 95% of observations of specific species occur. This included estimates of XC95 values with conductivity for wild rice, statewide and in the mixed wood plains ecoregion. These respective XC95 values for wild rice were 407 $\mu\text{S}/\text{cm}$ statewide and 398 $\mu\text{S}/\text{cm}$ in the mixed wood plains ecoregion. These values are roughly similar to those constructed for macroinvertebrate response to conductivity. Therefore, the interim approach to protecting aquatic life should be sufficient for both macroinvertebrates and wetland plants.

Identifying Dischargers

If available indicators point to a potential problem with specific conductance for a waterbody, then a plan needs to be developed for approaching permitting for sources that discharge to those waters.

The next step is to identify dischargers and determine which dischargers are likely to be discharging levels of ionic pollutants that are contributing to high levels of specific conductance. If dischargers are unlikely to be contributing to high levels of specific conductance (demonstrated either through monitoring of their effluent or based on knowledge of the type of discharger), those dischargers may not need to be further evaluated.

Some dischargers in Minnesota do monitor for levels of ions in their effluent, and we have general knowledge of the types of industries and activities that are likely to have high ionic strength effluent. Based on data currently available, looking at:

- Facilities with elevated effluent salt concentrations; and
- Facilities with likely ions in their discharge and that have a continuous wastewater discharge to low dilution ratio stream.

The MPCA has developed an initial list (Attachment 2) of facilities that are discharging to waterbodies that are potentially impacted by specific conductance and that may have effluent characteristics that mean they are likely contributing to the levels of specific conductance. This list is based on current information, but should be considered as screening level information and analysis. Facility design flow rates, which are shown in the table, are usually much higher than actual flows from the facility. Some discharges may no longer be active. The MPCA will consider refined facility-specific information during the permitting process. In addition, other dischargers – or new facilities – that meet the requirements may also need to be considered in this process. It is particularly likely that facilities that do not currently monitor ions are not on the list of dischargers.

Permitting Process

In these cases, a permitting plan will be developed to, as needed, refine our understanding of the sources and impacts of specific conductance in the waterbody and determine what actions need to be taken to help improve conditions. We intend to focus on individual permit holders, not those with general permits. Once the MPCA has identified a facility with the potential to discharge salts that may negatively impact aquatic life, further evaluation and appropriate permit conditions will be considered during the process of the next permit issuance.

S-5 Implementing the Aquatic Life Narrative Standard

When a permit for one of the dischargers identified above is being revised (or if a new permit is being issued for a discharge including ions that impacts one of the identified water bodies), the MPCA's permitting process will consider the need to review and gather additional information. If information to complete the types of analyses listed in the "additional analysis and review" column is not available, a first step may be to establishing permit conditions to require collection of additional information. The MPCA may also establish permit conditions or a permit limit for specific conductance (or one or more of the pollutants that contribute to specific conductance) in order to protect aquatic life.

Potential actions that could be taken during permitting would depend on the condition of the waterbody and the characteristics of the permitted facility.

MPCA envisions a transparent process that includes engagement with the permittee, Tribes, and stakeholders or interested parties. That process will include a case-by-case evaluation, depending on the specific situation and the characteristics of the permitted facility. In some cases, limits required for other standards or other reasons may be deemed sufficient to protect aquatic life in the identified reaches where specific conductance may be a concern. In some cases, more data gathering and monitoring may be needed. Or, permit conditions that limit specific conductance (or a component thereof) may be needed to ensure aquatic life is protected.

The following table lays out some potential actions based on conditions.

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 30

EAW, U.S. Steel Keetac Tailings Storage Facility Project, August 7, 2025.

Environmental Assessment Worksheet

This most recent Environmental Assessment Worksheet (EAW) form and guidance documents are available at the Environmental Quality Board's website at: <https://www.eqb.state.mn.us/>. The EAW form provides information about a Project that may have the potential for significant environmental effects. Guidance documents provide additional detail and links to resources for completing the EAW form.

Cumulative potential effects can either be addressed under each applicable EAW Item or can be addressed collectively under EAW Item 21.

Note to reviewers: Comments must be submitted to the responsible governmental unit (RGU) during the 30-day comment period following notice of the EAW in the *EQB Monitor*. Comments should address the accuracy and completeness of information, potential impacts that warrant further investigation and the need for an Environmental Impact Statement (EIS).

1. **Project Title:** U. S. Steel Keetac Tailings Storage Facility Project
2. **Proposer: United States Steel Corporation, Minnesota Ore Operations – Keetac Mine**

Contact person: Chrissy Bartovich

Title: Sr. Director – Environmental

Address: United States Steel Corporation – Keetac Mine

1 Mine Road

City, State, ZIP: Keewatin, MN 55753

Phone: (218) 749-7364

Email: clbartovich@uss.com

3. **RGU: Minnesota Department of Natural Resources (DNR)**

Contact person: Becky Horton

Title: Project Manager

Address: 500 Lafayette Road, Box 25

City, state, ZIP: St. Paul, MN 55155-4032

Phone: 651-259-5122

Email: becky.horton@state.mn.us

4. **Reason for EAW Preparation:** (check one)

Required:

Discretionary:

EIS Scoping

Citizen Petition

X Mandatory EAW

RGU discretion

X Proposer initiated

If EAW or EIS is mandatory give EQB rule category subpart number(s) and name(s):

The Project requires a mandatory EAW under Minnesota Rules part 4410.4300, subpart 11, (Metallic mineral mining and processing) Item B (expansion of a stockpile, tailings basin, or mine by 320 or more acres).

A list of tables, figures, and appendices is provided below.

Tables

Table 5.1	Project Location
Table 6.1	Project Impact Acreages
Table 6.2	Project Components
Table 6.3	TSF Stages and Dike and Dam Heights
Table 6.4	Project Footprint
Table 7.1	Proposed Climate Adaptation
Table 8.1	Existing and Proposed Cover Types for the TSF
Table 8.2	Existing and Proposed Green Infrastructure
Table 8.3	Existing and Proposed Canopy Cover
Table 9.1	Applicable Regulatory Authorities and Required Permits
Table 10.1	Farmland Classification Within the Project Area
Table 10.2	Water-Related Land Use Management District Impacts
Table 10.3	Tailing Basin Reclamation Mitigation
Table 11.1	Soils Characteristics Within the Project Area
Table 12.1	Lakes/Reservoirs Within the Project Area
Table 12.2	Streams Within the Project Area
Table 12.3	Water Quality and Trophic Status for Lakes and Reservoirs in the Project Area Based on a 10-Year Average of All Summer Samples
Table 12.4	Water Quality and Index of Biotic Integrity Scores for Streams in the Project Area, 2015 Survey
Table 12.5	Impaired Waterbodies Within 5 Miles Downstream of Project Area
Table 12.6	Field Delineated Potentially Direct WCA-Regulated Wetlands Impacts Within Project Area
Table 12.7	Field Delineated Potentially Indirect WCA-Regulated Wetland Impacts Within Project Area
Table 13.1	MPCA Permitted Facilities, Contamination and Leak Sites Within 0.5 Mile of the Project Area
Table 13.2	Potential Solid and Hazardous Wastes Within the Project Boundary

Table 14.1	Non-Protected Wildlife Species With Potential to Occur Within the Project Area
Table 14.2	Lake Distances from the Project Area
Table 14.3	Stream Distances from the Project Area
Table 14.4	State-listed Plant Species With Potential Habitat in and Documented near the Project Area
Table 14.5	Federal and State-Listed Species with Potential to Occur in the Project Area
Table 16.1	2010 FEIS Visual Impacts Analysis
Table 16.2	Current, Authorized, and Proposed Elevations of Stage 2 Interior and Exterior
Table 18.1	Estimated Construction Emissions
Table 18.2	Operational Emissions
Table 19.1	Existing NSAs
Table 19.2	Minnesota Noise Standards
Table 19.3	Noise Levels of Typical Mine Equipment
Table 19.4	Construction Noise Levels at NSAs Closest to the Project Area (dBA)
Table 19.5	Construction Noise Levels at NSAs Farthest from the Project Area (dBA)
Table 21.1	Summary of Cumulative Potential Effects on Environmental Features

Figures

Figure 6.1	Keetac Operations
Figure 6.2 (parts 1–4)	U. S. Steel-Owned Parcels
Figure 6.3	Keetac TSF Areas
Figure 6.4	Project Footprint and Permit to Mine Mining Area
Figure 6.5	Permanent Impacts Footprint
Figure 6.6	Separation Facility Infrastructure
Figure 7.1	Historic Annual Average Temperature in Itasca and St. Louis Counties (1895–2024)
Figure 7.2	Historical Annual Maximum Temperature in Itasca and St. Louis Counties (1895–2024)
Figure 7.3	Historical Annual Minimum Temperature in Itasca and St. Louis Counties (1895–2024)
Figure 7.4	Historical Annual Average Precipitation in Itasca and St. Louis Counties (1895–2024)
Figure 7.5	Historical Palmer Drought Severity Index (PDSI) Values in July for Itasca and St. Louis Counties (1895–2024)
Figure 7.6	Projected Average Temperatures for Itasca and St. Louis Counties
Figure 7.7	Potential Changes in Extreme Heat
Figure 7.8	Projected Precipitation for Itasca and St. Louis Counties
Figure 7.9	Potential Changes in Rainfall Intensity

Figure 7.10	SSURGO - Flooding Frequency
Figure 8.1	NLCD Landcover
Figure 10.1	Landownership and Recreation
Figure 10.2	Project Location – 1855 Treaty Area
Figure 10.3	Zoning
Figure 11.1	Mine Pits within 10 miles of the Keetac Process Facility
Figure 11.2	SSURGO Soils Map
Figure 12.1	Watersheds
Figure 12.2	USGS NHD Mapped Waterbodies
Figure 12.3(parts 1-4)	DNR Determination Field Delineated Wetlands and Waters
Figure 12.4	DNR Wetland Determination
Figure 12.5	Groundwater Resources
Figure 12.6	Conceptual Cross Section and Stormwater Runoff - Eastern side of TSF
Figure 12.7	Post-Construction Watersheds
Figure 12.8	Keetac Water Flows
Figure 13.1	MPCA Contamination Sites
Figure 14.1	Wild Rice Producing Waterbodies
Figure 16.1	2010 FEIS Visual Impacts Analysis

Appendices

Appendix A	Project Location Figure
Appendix B	USS Keetac Topography Map
Appendix C	Natural Heritage Review Letter
Appendices D through O, available upon request	
Appendix D	FEMA Floodplains Map
Appendix E	Wetland Assessment and Delineation (Barr July 2021)
Appendix F	Wetland Delineation & Functional Assess Report (Barr November 2021)
Appendix G	Fugitive Dust Emissions Control Plan
Appendix H	Spill Prevention Control and Countermeasure Plan (SPCC)
Appendix I	Revised Wetland Delineation and Functional Assessment Report (Barr 2023)
Appendix J	Final 2023 SWPPP
Appendix K	IPaC
Appendix L	Cultural Resource Literature Review
Appendix M	Mining Area Boundary Revisions

Appendix N	Greenhouse Gas Calculation Spreadsheet
Appendix O	DNR Permit to Mine Notice of Decision (Wetland Boundary or Type) (DNR 2023)

5. Project Location:

U. S. Steel owns and operates the Keetac Mine in Keewatin, Minnesota. The tailings storage facility (TSF) is located approximately two miles south of the Keetac Processing Facility (Figure 6.1).

The specific location details of the Project are as follows:

Watershed (81 major watershed scale): St. Louis River Watershed (3) and Mississippi River- Grand Rapids Watershed (9) (Figure 12.1)

County: St. Louis and Itasca Counties

City/Township: Cities of Hibbing and Nashwauk/Township of Lone Pine

GPS Coordinates: 47.337136, -93.064939

PLS Location (¼, ¼, Section, Township, Range): See Table 5.1.

Table 5.1 summarizes the Public Land Survey (PLS) location, project components, and tax parcel numbers for the Project which make up the Project Location.

Table 5.1: Project Location

Project Component	PLS Location	Tax Parcel Number
Permanent Impacts	T56 R21W Section 17, T56 R21W Section 18, T56 R21W Section 4, T56 R21W Section 8, T56 R21W Section 9, T56 R22W Section 1, T56 R22W Section 11, T56 R22W Section 12, T56 R22W Section 13, T56 R22W Section 2, T57 R21W Section 32, T57 R21W Section 33	25-001-1100,25-001-1200,25-001-1300,25-001-2100,25-001-2400,25-001-3100,25-001-3200,25-001-3300,25-001-3400,25-002-4303,25-002-4304,25-002-4400,25-011-1100,25-011-1203,25-011-1204,25-011-1301,25-011-1302,25-011-4201,25-011-4202,25-011-4300,25-011-4400,25-012-3300,25-013-1100,25-013-1200,25-013-1300,25-013-1400,25-013-2100,25-013-2200,25-013-2400,25-014-1100,141-0040-00870,141-0040-01560,141-0040-00890,141-0040-01550,141-0040-00820,141-0040-00830,141-0040-00860,141-0040-01730,141-0040-01740,141-0040-00850,141-0040-01720,141-0040-03110,141-0040-00880,141-0040-03280,141-0040-00800,141-0040-00840,141-0040-03080,141-0050-06490,141-0050-06210,141-0040-03230,141-0040-03270,141-0050-06390
Temporary Impacts	T56 R21W Section 17, T56 R21W Section 18, T56 R21W Section 4, T56 R21W Section 8, T56 R21W Section 9, T56 R22W Section 1, T56 R22W Section 11, T56 R22W Section 13, T56 R22W Section 2, T57 R21W Section 32, T57 R21W Section 33	25-001-1100,25-001-1200,25-001-2100,25-001-2400,25-002-4303,25-002-4304,25-011-1204,25-011-3101,25-011-3102,25-011-4201,25-011-4202,25-011-4300,25-013-1300,25-013-1400,25-013-2100,25-013-2200,25-013-2300,25-013-2400,141-0040-01560,141-0040-00890,141-0040-01550,141-0040-00860,141-0040-01730,141-0040-01740,141-0040-00850,141-0040-01720,141-0040-03110,141-0040-03280, 141-0040-03080,141-0050-06490,141-0050-06520,141-0050-06210,141-0040-03230,141-0050-06390
Pipeline (for Separation and/or Dewatering Infrastructure)	T56 R22W Section 1, T56 R22W Section 2, T57 R22W Section 36	25-002-1103,25-002-1401,25-002-1402,25-002-4100,25-002-4200,25-002-4303,25-002-4400,95-036-1301,95-036-1401,95-036-3400,95-036-4200,95-036-4300,25-001-2203,25-001-2100
Separation and/or Dewatering Infrastructure	T56 R22W Section 1	25-001-2100, 25-001-2203

Project Component	PLS Location	Tax Parcel Number
Stage 2 Exterior	T56 R21W Section 17, T56 R21W Section 18, T56 R21W Section 4, T56 R21W Section 5, T56 R21W Section 7, T56 R21W Section 8, T56 R21W Section 9, T56 R22W Section 1, T56 R22W Section 11, T56 R22W Section 12, T56 R22W Section 13, T56 R22W Section 2	25-001-1200,25-001-1300,25-001-2400,25-001-3100,25-001-3300,25-001-3400,25-001-4201,25-001-4202,25-001-4301,25-001-4302,25-002-4400,25-011-1100,25-011-1203,25-011-1301,25-011-1302,25-011-4201,25-011-4202,25-011-4300,25-011-4400,25-012-1100,25-012-1201,25-012-1202,25-012-1301,25-012-1302,25-012-1400,25-012-2100,25-012-2300,25-012-2401,25-012-2402,25-012-3101,25-012-3102,25-012-3200,25-012-3300,25-012-3400,25-012-4100,25-012-4200,25-012-4300,25-012-4400,25-013-1100,25-013-1200,25-013-2100,25-013-2200,141-0040-00870,141-0040-01000,141-0040-01080,141-0040-01520,141-0040-01560,141-0040-01450,141-0040-01460,141-0040-01550,141-0040-00830,141-0040-00970,141-0040-01730,141-0040-01740,141-0040-00990,141-0040-01360,141-0040-03110,141-0040-00880,141-0040-03280,141-0040-00800,141-0040-00840,141-0040-03230,141-0040-03270

Overall Project Location: See Table 5.1 above and Figure 6.1.

Watershed (81 major watershed scale): 07010103 (HUC8) and 04010201 (HUC8)

GPS Coordinates: 47.346003, -93.061772

Tax Parcel Number: See Table 5.1 above and Figure 6.2

At a minimum attach each of the following to the EAW:

- **County map showing the general location of the Project.** Attached as Appendix A.
- **U.S. Geological Survey 7.5 minute, 1:24,000 scale map indicating Project boundaries (photocopy acceptable).** Attached as Appendix B.
- **Site plans showing all significant Project and natural features. Pre-construction site plan and post-construction site plan.** Pre- and post-construction depictions are provided as figures. Figure 6.3 depicts existing conditions (pre-construction). Figure 6.4 depicts the Project components and mining area (post-construction).
 - **List of data sources, models, and other resources (from the Item-by-Item Guidance: *Climate Adaptation and Resilience* or other) used for information about current Minnesota climate trends and how climate change is anticipated to affect the general location of the Project during the life of the Project (as detailed below in Item 7. *Climate Adaptation and Resilience*). A list of sources, models, and resources used for this analysis is provided in Part 7 of the bibliography.**

6. Project Description:

- Provide the brief Project summary to be published in the *EQB Monitor*, (approximately 50 words).**

U.S. Steel is proposing to modify its existing Tailings Storage Facility for its Keetac taconite mining operation in St. Louis and Itasca Counties. Activities would involve vertically raising the existing dams and dikes using downstream and modified centerline construction methods, that would extend the dam and dikes beyond the current tailings storage facility's footprint. The Project would also involve constructing a new access road, as well as new industrial building and infrastructure for tailings separation and tailings dewatering. The infrastructure would produce coarse tailings for use in dam and dike construction and thickened fine tailings for discharge to the tailings storage facility. The project proposes revisions to the existing tailings basin, but there are no proposed revisions to mining activities or taconite processing facilities.

- b. Give a complete description of the proposed Project and related new construction, including infrastructure needs. If the Project is an expansion include a description of the existing facility. Emphasize: 1) construction, operation methods and features that will cause physical manipulation of the environment or will produce wastes, 2) modifications to existing equipment or industrial processes, 3) significant demolition, removal or remodeling of existing structures, and 4) timing and duration of construction activities.**

The Keetac Mine extracts taconite (low-grade magnetic iron ore) from open pit mines in the sub-crop of the Biwabik Iron Formation of the Mesabi Iron Range. Taconite generally contains iron oxides, quartz, iron silicates, and iron carbonate minerals. Taconite is processed on-site to concentrate iron content and form taconite pellets that can be sold and shipped to steel mills to be melted down into steel.

Tailings are a byproduct from processing. Tailings produced at Keetac are piped to an existing TSF (Figure 6.1). Tailings were first discharged to the TSF in 1967. The TSF has subsequently been developed in 3 stages, each one leveraging natural topography, supplemented by constructed perimeter dikes. Stage 1 comprised approximately 1,560 acres and was the sole tailings deposition location from 1967 until the Stage 2 Exterior was constructed in the 1980s. The Stage 2 Exterior expanded the TSF to the south by constructing clay core perimeter dams and created a new approximately 4,300-acre deposition area. Stage 2 Exterior was utilized for tailings storage for 10+ years until it was idled in 1993. During that time, the Stage 2 Interior was constructed, which raised portions of the Stage 1 area and the Stage 2 area to create an internal basin (i.e., the Stage 2 Interior). The Stage 2 Interior is 2,500 acres and has been the active TSF since that time. Most of the Stage 2 Interior dike was constructed upon tailings that had been deposited into the Stage 2 Exterior. An additional area was originally planned for Stage 3 that has not been used. Stage 3 is reflected in the mining area, and all stages described above are shown on Figure 6.3.

The TSF operates under Minnesota Department of Natural Resources (DNR) Dam Safety Permit No. 2022-0721. The permit authorizes construction and operation of the TSF to its safe design parameters. Stage 1 is near the design storage capacity and cannot accept additional tailings. Currently, tailings are mostly discharged to the Stage 2 Interior with some strategic placement in the Stage 2 Exterior.

The current operation delivers total tailings at a rate of approximately 16,000 gallons per minute (GPM) via a 22-inch diameter pipeline that can deliver total tailings around the entire perimeter of Stage 2 Interior. Only one discharge location is active at any one time. During direct reduction (DR)-grade pellet production an additional 10 percent of tailings are generated and are discharged to the northern portion of the facility via a dedicated DR tailings line. The tailings slurry is discharged via spigot and settles within the TSF according to particle size. Coarse material deposits near the discharge point while the fines travel downstream toward the center of the TSF. Keetac uses this natural segregation process to provide coarse borrow material which is used for upstream construction of the dikes.

At current mining rates, the Stage 2 Interior is anticipated to soon reach its designed and permitted height. U. S. Steel was approved via the 2022 Permit to Mine amendment to raise the Stage 2 Exterior dikes and construct an internal diversion berm within the Stage 2 Exterior footprint (referred to as Phase 1 in the Permit to Mine amendment application). These features, constructed in 2022, created freeboard and allowed for short-term, controlled deposition of tailings into the Stage 2 Exterior, with the intent to improve the stability of the Stage 2 Interior basin embankments. U. S. Steel began discharging tailings into the Stage 2 Exterior as Phase I in July 2023.

The current design of the Stage 2 Interior and permitted Stage 2 Exterior is expected to be at full capacity by 2028. A second phase of vertical development of the Stage 2 Exterior is proposed to provide longer term storage to align with the Keetac life of mine (Phase 2).

The Project assessed in this document represents Phase 2 (Figure 6.4). Phase 2 is designed to vertically raise the Stage 2 Exterior dams and dikes to allow for long-term controlled deposition of tailings into the existing Stage 2

Exterior. Vertically raising the existing dams and dikes would be achieved using downstream and modified centerline construction methods, that would extend the dam and dikes beyond the current TSF footprint. Downstream dams and modified centerline dikes are described by their construction methods. In this context, dams are considered to be hydraulic retaining features designed to store water while dikes are features designed to store tailings. Downstream dams are built in stages, starting with a foundation and then adding layers of material downstream. This method ensures that the entire dam is on a stable foundation and is robust enough to store large amounts of water. Modified centerline dikes are also built in stages starting with the foundation but are raised vertically from the centerline of the original dam. This method ensures the entire dam footprint is supported by a firm foundation while minimizing downstream impacts.

The Phase 2 water retention dam would be constructed using downstream methods to vertically raise the existing embankment. The water retention dam would be constructed primarily of coarse tailings material. The design of the water retention dam includes a seepage reduction feature along the upstream face of the dam to lower the phreatic surface and limit seepage through the dam. The seepage reduction feature would consist of either a linear low-density polyethylene (LLDPE) geomembrane or an inclined mechanically placed soil-cement blanket consisting of a mixture of coarse tailings and cement. The Phase 2 dike would be constructed using modified centerline methods and be constructed of coarse tailings. The Phase 2 dikes and dams are shown on Figure 6.5.

Site preparation activities would need to be completed prior to vertically raising the dams and dikes. Typical site preparation activities would include grubbing any vegetation, stripping (removal of debris, loose rock, organic material, and unsuitable material), topsoil excavation (stockpile for progressive reclamation), and clearing. Site preparation would be completed using mechanical equipment common for such activities. This could include dozers, excavators, haul trucks, logging equipment, and loaders.

Once the foundational site is prepared both the water retention dam and the dike would be mechanically raised in lifts using typical construction equipment that could include haul trucks, dozers, graders, sheepsfoot rollers, and excavators.

During construction Keetac would establish and maintain erosion control features until the Project is completed. General practices below would be used, where applicable:

1. Minimize disturbed areas and sequence work to minimize exposure time.
2. Use temporary vegetation, mulch, or other cover to protect areas during construction.
3. Utilize stone check dams, haybale dikes, or sit fence to trap sediment.
4. Reduce volume and velocity of water crossing disturbed areas by using diversion dams, berms, or other facilities.

Additionally, site stabilization measures would be ongoing as applicable. For example, once final grade is reached for any one construction stage, topsoil would be placed to a minimum depth of six inches on the slope then fertilized, seeded, and mulched. In some cases, hydroseeding may be used for greater effectiveness.

The intent of Keetac Phase 2 Project is to not only to align the TSF with Keetac's mine life but also to reduce risk and improve the safety of the TSF while minimizing impacts to the environment - with the ultimate goal of reducing the risk of dam failure. While the DNR does not specify factor of safety criteria for analysis, U. S. Steel along with GEI (Engineer of Record) have selected a minimum factor of safety criteria for evaluation of Phase 2 that meets or exceeds industry standards and is defensible to independent review. Results from stability analysis throughout the life of Phase 2 have factors of safety higher than the minimum criterion and provide further evidence of the robustness of design. Keetac currently has over 190 piezometers, 40 inclinometers, and 3 shape accelerator arrays (SAA) to help measure the performance of the facility. During the life of Phase 2, continual improvement of geotechnical monitoring would take place. Additional geotechnical investigations, piezometers

(to measure pore pressure), inclinometers and SAA (to measure horizontal deformations), observation wells (to measure water levels and water quality), settlement monitoring devices (to measure vertical displacements), and adoption of new technologies would be installed to monitor the health and performance of the facility as per USS Tailings Management System.

The Project would occur in stages to align with the Keetac life of mine predicted from permitted reserves through 2048 which includes time for reclamation and closure. At current mining rates, total tailings delivered to the TSF are anticipated to be approximately 340 million long tons. However, the ultimate dam configuration was designed conservatively to accommodate greater storage volume generated from potential lower head grades (would lead to more tailings tonnage), nearby mineral resources which are in the current permitted footprint but require in-fill drill spacing and/or mineral leases to be converted to reserve, or possible variations in in-situ tailings characteristics (this proposal does not involve any change in mining or processing from what has been permitted). At full design capacity the project could safely contain 590 million long tons of tailings, the Stage 2 Exterior dikes and dams would be 1,580 feet elevation (5 feet lower than the height of the Stage 2 Interior dike) and accommodate 225,000 acre-feet of fine tailings storage. This Project does not propose to increase the permitted life of the mine.

The Project would also involve building new infrastructure for tailings separation and tailings dewatering (Figure 6.6). The infrastructure would produce coarse tailings for use in dam and dike construction and thickened fine tailings for discharge to the TSF. The infrastructure would include an industrial building housing hydroseparators, screw classifiers, and dewatering screens necessary to separate and dewater the tailings by size. Inside the industrial building, it is also proposed to include a workers dry and meeting space. A fine tailings thickener, conveyors, load-out bin, and minimal haul truck service area would be located near the building. The building and associated infrastructure is proposed to be constructed north of Reservoir No. 6 to minimize new environmental impacts.

Site preparation for the industrial building and associated infrastructure would include grubbing any vegetation, stripping, topsoil excavation, and clearing. Site preparation will be completed using mechanical equipment common for such activities. This could include dozers, excavators, haul trucks, logging equipment, and loaders.

Using the dewatered coarse fraction of the tailings for construction would have a smaller environmental footprint than developing off-site natural borrow sources to obtain dam and dike construction materials, reduce the amount of tailings storage required within the TSF footprint, and enhance water management for the Keetac facility. The addition of the fine tailings thickener allows for increased water recycling (by reducing water loss to pore space during deposition) and provides better management for fugitive dust (by increasing trafficability of fine tailings and reducing surface area per discharge point).

A new permanent road would be built around the Stage 2 Exterior for access and maintenance. The road would be mechanically built using coarse tailings using the same equipment for site preparation and dam/dike construction (see Figures 6.4 and 6.5). Tailings would be piped to the TSF from the point of separation in pipelines laid on wooden blocks one to two feet above ground and along existing infrastructure corridors. Fixed frame haul trucks would convey the coarse tailings from the separation and dewatering infrastructure to the TSF 24 hours a day, seven days a week. The exact size of the haul trucks is to be determined. Preliminary haulage assessments indicate five Cat 785 mining trucks would adequately handle the coarse tailings material and dam construction while reducing the environmental impacts when compared to fewer but larger haul trucks.

The Project would permanently impact 608.6 acres and would temporarily impact 89.7 acres of land (Figure 6.4). However, most impacts would occur within the existing mining area. Of the 608.6 acres of permanent impacts, only 108.1 acres are located outside of the existing mining area. Of the 89.7 acres of temporary impacts, only 30.6 acres are located outside of the existing mining area.

The Project impact acreages and components are shown in Table 6.1 and Table 6.2. TSF stages and dike and dam heights are shown in Table 6.3.

Table 6.1: Project Impact Acreages

Area of Impact*	Permanent Impact Areas			Total Permanent Impact Area	Total Temporary Impact Area	Total Impact Area
	Permanent Impacts (Dike and Dam footprints)	Pipeline and Separation and tailings Dewatering Infrastructure	Permanent Access Road			
Portion inside of the Permit to Mine (acres)	434.6	28.2	37.7	500.5	59.1	559.6
Portion outside of the Permit to Mine (acres)	81.8	13.3	12.9	108.1	30.6	138.7
Total Acres	516.4	41.5	50.7	608.6	89.7	698.3

*Acreage of disturbance outside of current TSF or other Keetac Operational footprint.

Construction is proposed to begin in the winter of 2026-2027 and would take 2 years. Vegetation clearing would occur during the winter months to minimize potential impact on bats and migratory birds. The TSF would be built in stages throughout operations. Similarly, temporary workspaces would be utilized in stages of six months or less. Outside of site preparation, it is anticipated construction would occur throughout the entire calendar year.

The Project does not require any demolition and no new waste streams would be generated. Water would be managed consistent with current TSF operations.

Table 6.2: Project Components

Project Component	Notes
New Permanent Footprint Impacts*	Up to 608.6 acres would be permanently impacted to create the additional dams and the separation and/or dewatering infrastructure of the 608.6 acres, only 108.1 acres are located outside of the mining area.
Vertically Raising Existing Retention Dikes	Dikes would be constructed using a modified centerline construction method completed in staged lifts.
Vertically Raising Existing Water Dams	Dams would be built using downstream construction methods including a seepage reduction feature completed in staged lifts.
New Tailings Separation and/or Dewatering Infrastructure	Located near the TSF in mostly upland area. The infrastructure would separate coarse tailings for dike and dam construction. The enclosed infrastructure would include machinery to separate the tailings (as needed), dewater the coarse tailings, and load coarse tailings into haul trucks. The building would have parking, potable water, and sewage (septic holding tank meeting the requirements of the MN Statute 7080) facilities. Maintenance facilities for trucks and machinery and fuel storage.
Power	Powerline upgrades may need to be constructed to connect the separation and/or dewatering infrastructure to the grid. Minnesota Power would perform this. Two 10-15 HP mobile generator units would be used 12 hours per day for lighting around the TSF as needed. They would be powered by Ultra Low Sulphur Diesel #2, except in the winter a blend of #1 and #2 will be used to avoid cloud and pour point issues.
Pipelines	New pipelines would be required to convey fine tailings from the separation and/or dewatering infrastructure to the TSF. These would be above ground lines, raised on blocks, and routed along existing roads and corridors.

Project Component	Notes
Roads	A new road along the exterior of proposed dams and dikes would be constructed for access and maintenance.
Temporary Footprint Impact*	Up to 89.7 acres, of which only 30.6 acres are located outside of the existing mining area.
Temporary Construction Areas	Needed to support construction of the dikes, dams, and separation and/or dewatering infrastructure. Located in upland areas as much as possible and reclaimed following use.
Other Activities and Controls (no new direct footprint impacts)	
Tailings disposal	Tailings stored within the existing active Stage 2 Exterior (brownfield), retained by the vertically raised dikes and dams through the life of mine. The ultimate height of the Stage 2 Exterior would be 1,580 feet. (similar to Stage 2 Interior).
Water management and treatment	Tailings water would drain to the Stage 2 Exterior Pond and eventually be gravity fed into Reservoir No. 6 to be pumped for use as process water. Stormwater would be managed under the Stormwater Pollution Prevention Plan, which would include best management practices.
Waste management	Waste would be hauled to approved facilities per Keetac operational management.
Transport and mobile machinery	Haul trucks used to transport coarse tailings from the separation and/or dewatering infrastructure to the TSF, mobile construction equipment, and staff vehicles.
Lighting	Lighting would be required at the separation and/or dewatering infrastructure and the TSF for safe 24-hour operation.
Dust control	Dust would be mitigated in accordance with the Dust Control Plan.
Employment	The Project would require approximately 10 new employees through construction and operation.

*Acreage of disturbance outside of current TSF or other Keetac Operational footprint.

Table 6.3: TSF Stages and Dike and Dam Heights

Stage	Current Permitted Height (feet)	Current Actual Height (feet)	Proposed Maximum Height (feet)	Estimated Date Maximum Height Would Be Reached
Stage 1	1,500	1,500	1,500	at capacity
Stage 2 Interior	1,585	1,553-1,580	1,585	2028
Stage 2 Exterior	1,470 South 1,510 East	1,465 South 1,495 East	1,580	2063*

*The Project's proposed design would accommodate tailings through the current 2022 Permit to Mine period (2048) and allow for additional capacity for potential increased tailings generation.

Reclamation

Reclamation techniques such as grading, disking, seeding or planting, fertilizing, and mulching would be used in the establishment of vegetation. Vegetation would be established on exposed soils along roads, TSF, dikes, and dams. Waste rock and coarse tailings stockpiles' exterior slope lifts would be designed not to exceed 30 feet in height, or 40 feet in height if covered with overburden and vegetation.

Progressive reclamation activities in the TSF would be conducted on the interior of the TSF and on the exterior portion of the dikes and dams (meaning these areas would be reclaimed as soon after initiation of the operations as practical and as continuously as practical throughout the life of the operation). The TSF would be designed and constructed according to Minnesota Rules, part 6130.3000 and in accordance with the Dam Safety Permit. The

dust generation on the TSF would be minimized by maximizing the water pond area, vegetating exposed surfaces (either permanently or temporarily), through non-vegetative methods described in Minnesota Rules, part 6130.3700, and by modifying TSF operations. This operational modification would allow for more water retention and would move the beach area from the middle of the TSF, where it was inaccessible, to the outside edges of the TSF, where it would be accessible for the establishment of vegetation. These changes would reduce fugitive dust emissions from the TSF.

Fertilizing, seeding and mulching would occur to expedite revegetation and to minimize erosion. Herbaceous plants would be seeded using a hydro-seeder or other methods. Seed mixes would be designed to achieve early stabilization and long-term cover. When necessary to control dust, temporary seeding may be used. In areas where erosion is a concern, mulch may be used to hasten stabilization. Removal of equipment, facilities, and structures would be accomplished, and provisions would be made for subsequent use and continued maintenance where necessary. Areas exposed during such removal (i.e., the building sites) would be vegetated. After three growing seasons (five growing seasons if it is a south or west facing slope) the surface would be repaired or replaced if 90 percent ground cover, consisting of living vegetation and its litter, has not been established. The repair or replacement would take place during the next normal planting period after it is determined that 90 percent ground cover has not been established.

Within ten growing seasons, established vegetation consistent with subsequent land use is required before a release from the Permit to Mine can be granted (Minnesota Rules, part 6130.3600, subpart 4, Item B). The reclamation process would include creation of wetlands where feasible, replacing some of the wetland functions and values lost through mining activities. Post-mining land uses would be presented to the commissioner of the DNR for approval at least two years prior to the deactivation of the mining area. The proposed land uses would be selected pursuant to Minnesota Rules, part 6130.4100, subp. 2. The deactivation activities for final closure of the mine would be fulfilled as prescribed in Minnesota Rules, part 6130.4100.

c. Project magnitude:

The specific footprint acreages of the Project components are shown in Table 6.4.

Table 6.4: Project Footprint

Project Component	Size
Stage 2 Exterior*	2,236.1 acres
Dam and Dike Footprint	516.4 acres
Pipeline and Separation and/or Dewatering Infrastructure	41.5 acres
Permanent Access Road	50.6 acres
Number and Type of Residential Units	None
Residential Building Area	None
Commercial Building Area	None
Industrial Building Area*	19,600 square feet
Institutional Building Area	None
Other Uses—specify	None
Structure Height(s)	70 feet: separation and/or dewatering infrastructure 1,580 feet: TSF

**This is a disturbed brownfield area with historic and current tailings deposition. This portion of the TSF is included in the Project description because it will be raised higher than what was previously permitted.*

d. Explain the Project purpose; if the Project will be carried out by a governmental unit, explain the need for the Project and identify its beneficiaries.

The Keetac Mine has taconite reserves to support mining through 2048 (at current mining rates) as approved under the Permit to Mine. There are also additional taconite resources beyond the Permit to Mine reserves that, in the future, may also be economical to mine. Taconite mined at Keetac is processed and tailings are stored in an existing TSF. At current mining rates, the existing TSF is estimated to meet its design safe storage capacity by approximately 2028.

The Permit to Mine was issued following the completion of the Keetac Mine Expansion Environmental Impact Statement (EIS) in 2010. At that time, it was planned that Keetac would raise Stage 2 Interior vertically using an upstream construction method with hydraulically placed tailings. Since that time however, U. S. Steel has undertaken measures to assess the risk associated with the Tailings Facilities it operates; it was identified that continuing to vertically raise Stage 2 Interior at Keetac in an upstream method was not sustainable. Option evaluations to reduce risk prompted Keetac Phase I and the proposed Keetac Phase II.

Keetac Phase 1 began by U. S. Steel communicating to the DNR that it would like to reduce the risk of the Stage 2 Interior first by buttressing and followed by a new robust design change (Keetac Phase II) that would allow additional capacity and strengthen the existing Stage 2 Interior. During those communications U. S. Steel and its Engineer of Record recommended that the Stage 2 Interior does not raise higher than 1585 feet on the south dike without substantial work (requiring additional permitting activity beyond the Permit to Mine and Dam Safety Permit). This language was then adopted in permits as a constraining height limit, which is estimated not to support tailings disposal past 2028.

Thus, U. S. Steel needs a longer-term solution to safely manage tailings generated by the Keetac Mine under the existing Permit to Mine, and with capacity for the ultimate life of mine.

e. Are future stages of this development including development on any other property planned or likely to happen? ☐ Yes ☒ No

If yes, briefly describe future stages, relationship to present Project, timeline and plans for environmental review.

The Project is intended to fulfill tailings storage requirements for the Keetac life of the mine. No future phases are anticipated.

While the Project would result in a TSF capacity that could accommodate tailings beyond the current Permit to Mine (2048), this Project does not propose any expansion of mining or processing. U. S. Steel has not proposed future expansion of mining or processing. Mineral resources have not been properly evaluated, and there is no mine plan beyond what is currently approved.

f. Is this Project a subsequent stage of an earlier Project? ☒ Yes ☐ No

If yes, briefly describe the past development, timeline and any past environmental review.

Below is a brief history of milestones regarding the Keetac TSF and the associated references:

1967	Tailings deposition into Stage 1 began. Taconite mining and taconite pellet production initiated. Keetac began production using rotary hearth technology, which was later abandoned for grate kiln technology.
1969	The original Phase I grate kiln pellet line began operation.
1977	The Phase II expansion added a second grate kiln pellet line.
1980	The Phase I facility was idled; Stage 2 constructed in the 1980's

1986	Permit to Mine issued to the National Steel Pellet Company #1 for areas including the Proposed TSF
1993	Permit to Mine Amendment issued to National Steel Pellet company authorizing a new “tailings stacking method” i.e., upstream construction of Stage 2 Interior. Stage 2 Exterior idled.
2003	The former National Steel Pellet Company facility was purchased by U. S. Steel and renamed Keetac.
October 2003	The DNR issued permit 65-1138 authorizing appropriation of water from a well located in the SW1/4 NW1/4, Section 19, Township 57 North, Range 21 West for potable and sanitary use and emergency pellet process cooling at the Keewatin Taconite Plant. This permit was issued to Hannah Mining Company October 11, 1965. The permit was amended in 2003.
2008	Scoping Environmental Assessment Worksheet and a Draft Scoping Decision Document was submitted to provide information about the Keetac Expansion Project. This served as the blueprint for the Environmental Impact Statement submission (see 2010 for Final Environment Impact Statement).
October 2010	Minnesota Pollution Control Agency (MPCA) approved the Water Management Study Plan for the Keetac facility which evaluates water discharge and water consumption alternatives.
October 2010	MPCA approved the Sulfate Reduction Strategy Study Plan for water quantity and quality data review, and evaluation of source control strategies and sulfate treatment technologies.
November 2010	Final Environmental Impact Statement was submitted with the intent to restart an idled production line and expand sections of the open pit iron ore mine at the Keetac Mine and processing facility. The intent of the Project would increase the taconite pellet production capacity by expanding the mine pit, adding stockpile areas, upgrading the concentrating and agglomerating process, and restarting the Phase I line.
November 2011	MPCA issued NPDES/SDS Permit No MN0055948 allowing for the construction, installation, and operation of a disposal system at the Keetac facility and to discharge from the facility to Reservoir 2, Welcome Creek.
January 2012	DNR approved Keetac’s Wetland Permit Application for impacts due to the Keetac Mine Expansion Project with revised Palisade Mitigation Plans. 75.9 credits were debited from the Thompson Site, and remaining credits from Palisade Wetland Mitigation Site.
October 2012	U.S. Army Corps of Engineers (USACE or the Corps) approved the modification of permit 2008-02481-JCP, which included the discharge of dredged or fill material into 553.31 acres of wetlands at the Keetac Mine site, permanent dewatering of 24.96 acres of deep water habitat at the mine site for the expansion of the east mine pit, south mine pit, east stockpile, and south stockpile and the discharge of dredged and fill material into 36.76 acres of wetlands for the construction of upland berms at the Palisade I mitigation site.
October 2012	A Programmatic Agreement was developed between the Corps, State Historic Preservation Office (SHPO), the Ojibwe Bands, and U. S. Steel, agreeing that if a permit is issued for the Keetac Expansion, stipulations would be implemented which consider historic properties.

November 2012	USACE issued approval for the discharge of dredged and fill material into 75.89 acres of wetlands for the construction of an eastern stockpile and for the structural reinforcement of an existing TSF at the Keetac Mine. Known as “Keetac Phase 1 Permit”.
September 2014	MPCA issued Air Emission Permit Major Amendment No 13700063-005 for an administrative amendment. The request served two purposes, first to revise the form of the mine fleet mobile source limit and associated monitoring and recordkeeping to mitigate impacts in Class I areas from operation of the expansion line, and second, to incorporate an 18-month extension of the construction deadline (authorized until October 2014).
September 2015	MPCA issued NPDES/SDS Permit No MN 0031879 for the operation of a disposal system at the Keetac facility and to discharge at Welcome Lake.
April 2022	DNR issued a Permit to Mine amendment for the purpose of raising the exterior dikes at the Keetac Stage 2 exterior TSF to a maximum elevation of 1,500 feet, and the construction of an interior diversion dike.
September 2022	DNR approved the Keetac Wetland Replacement Plan for impacts at the Keetac TSF for tailings basin modifications and deposition (Phase I). The wetland delineation and incidental determination were approved by the DNR on January 24, 2022. A total of 127.31 acres of wetlands regulated under WCA were debited from Palisade Project Specific Wetland Mitigation Site surplus credits.
October 2022	USACE made an approved jurisdictional determination for impacts at the Keetac TSF. The area contained 119.96 acres of approved compensatory wetland mitigation areas used to satisfy previous compensatory mitigation requirements as part of the Keetac mine expansion (MVP-2008-02481). 120.0003 credits were debited from Palisade III Mitigation Bank.
May 2023	DNR approved Permit to Mine Amendment which granted U. S. Steel approval to construct a plant expansion for the purpose of producing Direct Reduced Pellets. The expansion increased the plant by approximately one acre and added approximately 13,400 feet of additional tailings pipeline.
July 2023	U. S. Steel began construction of a buttress against Stage 2 interior that extends into the Stage 2 Exterior as Phase I.
January 2024	USACE provided a jurisdictional determination of the 2021 Study Area and 2023 Study area.
January 2025	MPCA reissued Keetac’s Title V air emission permit 13700063-102, which included an updated Fugitive Dust Control Plan
February 2025	DNR clarified the mining area in the Permit to Mine TSF mining area based upon more accurate mapping tools and historical documents to include Reservoir 6, among other areas (Appendix N)
July 2025	NPDES/SDS permits were placed on public notice by the MPCA; permits include compliance schedule for sulfate.

7. Climate Adaptation and Resilience:

- a. **Describe the climate trends in the general location of the Project (see guidance: *Climate Adaptation and Resilience*) and how climate change is anticipated to affect that location during the life of the Project.**

Climate Trends Summary

The area of Minnesota where the Project is located has been increasing in annual average temperature, along with rising minimum and maximum temperatures overall (Minnesota Climate Trends; MPCA 2023). Throughout the next century, the Intergovernmental Panel on Climate Change (IPCC) projects an increase in mean-average temperature under three of the IPCC Coupled Model Intercomparison Project Phase 6 climate scenarios: SSP2-RCP4.5, SSP3-RCP7.0, and SSP5-RCP8.5. These scenarios were developed by the IPCC and correspond with climate change trends projected by over 30 global climate models which incorporate Shared Socioeconomic Pathways (SSPs).

- SSP2-RCP4.5 is a lower emissions scenario where warming stays below 3°C.
- SSP3-RCP7.0 is a high emissions scenario where average warming will likely be higher than 3°C.
- SSP5-RCP8.5 is a very high emissions scenario resulting in warming above 4°C.

Projection data in the following sections utilizes the climate output corresponding to the above scenarios for both St. Louis and Itasca Counties.

The climate in the Project Area is projected to have increasing temperatures over the next 30 years (MNDNR 2023). Northern Minnesota has experienced an increase of 7.5°F in nightly winter temperatures over the last century (IPCC 2021). Snowfall is expected to decrease, though Minnesota is expected to experience more frequent and severe rainfall events (get wetter) (MPCA 2023). Heavy rains and severe rain events have increased in frequency. Long-term monitoring has revealed significant increases in rainfall events greater than 1 to 3 inches (MPCA 2023). Rains that previously would have been in the 98th percentile annually have seen a significant uptick since 2000 in Minnesota. Historically, the total precipitation in 24 hours during a 10-year storm event is 3.08 inches, a 50-year event is 4.53, and a 100-year event is 5.28 (Hibbing Power Substation, NOAA station ID USC00213727). This area is unlikely to be impacted by extreme winds (First Street Foundation 2023). According to the 2018 Planning for Climate & Health Impacts in Northeast Minnesota, there is increased fire risk in this area due to projected higher frequency of late growing season drought, reduced snowpack, and elevated temperatures (Minnesota Climate & Health Program 2018).

Historical Climate

Historical climate data for Itasca and St. Louis counties were selected using the DNR “Minnesota Climate Explorer” tool from 1895-2024 and are presented below.

Temperature

The average temperature in St. Louis and Itasca Counties is increasing at a rate of 0.29°F per decade (Figure 7.1).

The maximum average annual temperature for St. Louis and Itasca Counties has been increasing at a rate of 0.21°F per decade (Figure 7.2).

The minimum average temperature has been increasing at a greater rate than maximum annual average temperature at 0.37°F per decade (Figure 7.3).

The average annual precipitation has been increasing by 0.19 inches per decade (Figure 7.4).

The Palmer Drought Severity Index is based on soil water balance and estimates relative soil moisture conditions. Values below -3 indicate a severe drought and positive values indicate greater soil moisture (Dai 2012). The average Palmer Drought Severity Index in July for Itasca and St. Louis counties is increasing at 0.18 per decade

indicating wetter soils over time (Figure 7.5) July was chosen as a representative of the wettest months in Minnesota, which are typically May through September (MNDNR 2024).

Projections

Temperature

Projected climate trends indicate that temperatures within both counties will continue to increase. Figure 7.6 illustrates projected average temperatures for the counties. Several climate models are shown in the projected temperature analysis. The model mean, shown in blue, illustrates the average of all models included in the analysis. Figure 7.6 shows the modelled present conditions, mid-century (2040-2059) at Representative Concentration Pathway (RCP) 4.5, late-century (2080-2099) at RCP 4.5, and late-century (2080-2099) at RCP 8.5. RCP is a greenhouse gas concentration scenario used by the IPCC in the fifth assessment report. RCP 4.5 is an intermediate scenario in which emissions decline after peaking around 2040 and RCP 8.5 represents a worst-case scenario in which emissions continue rising through the 21st century. Under the RCP 4.5 scenario, the annual temperature is anticipated to increase within the counties from a modeled present mean of 45.4°F (1980-1999) to a mid-century (2040-2059) model mean of 49.0°F and a late-century (2080-2099) model mean of 51.4°F. Under the RCP 8.5 worst-case scenario, the counties would experience a late-century (2080-2099) model mean temperature of 55.1°F. Under RCP4.5 and RCP8.5 the number of days over 100°F will from 0 days in 2010 to 2 days and 6-8 days respectively by 2081 as shown on Figure 7.7.

Precipitation

Projected climate trends indicate that precipitation within both counties will continue to increase. Figure 7.8 illustrates projected average precipitation for the counties. Like the temperatures, the precipitation climate models are shown in the projected temperature analysis. The model mean, shown in blue, illustrates the average of all models included in the analysis. Figure 7.9 shows the modeled present conditions, mid-century (2040-2059) at RCP 4.5, late-century (2080-2099) at RCP 4.5, and late-century (2080-2099) at RCP 8.5. RCP is a greenhouse gas concentration scenario used by the IPCC in the fifth assessment report. RCP 4.5 is an intermediate scenario in which emissions decline after peaking around 2040 and RCP 8.5 represents a worst-case scenario in which emissions continue rising through the 21st century. Under the RCP 4.5 scenario, the annual precipitation is anticipated to increase within the counties from a modeled present mean of 0.87 inches (1980-1999) to a mid-century (2040-2059) model mean of 0.94 inches, and a late-century (2080-2099) model mean of 1.04 inches. Under the RCP 8.5 worst-case scenario, the counties would experience a late-century (2080-2099) model mean precipitation of 1.16 inches.

Flooding

According to the Federal Emergency Management Agency Flood Plain Map Service Center, there are no mapped floodplains within or in the vicinity of the Project Area (FEMA 2021). Flooding frequency in the vicinity of the Project Area is derived from the Natural Resource Conservation Service SSURGO database (Figure 7.10). If unmapped floodplains are present in the Project Area, they could be impacted by soil compaction. Impacts associated with compaction and mitigation measures that would be implemented to minimize such impacts are identified in Section 4.9-Soils.

7b: Project Interaction with Climate Trends The climate risk for construction, operation, and closure of the Keetac TSF is considered below. U. S. Steel has an emergency action plan that would be implemented in the event of dam or dike break or overtopping.

Construction Climate Interactions

The initial construction phase of the Project is anticipated to take two years and begin 2026. It is not expected that climate would be significantly different during this period than today's conditions, and construction should

be able to work around weather events. The dams and dikes would be built in stages throughout operations, which is discussed below.

The separation and/or dewatering infrastructure is located in predominantly upland area. Construction of the separation and/or dewatering infrastructure would permanently impact 0.06 acres of WCA-regulated deep marsh wetlands, 1.08 acres of WCA-regulated fresh (wet) meadow wetlands, and 0.15 acres of shallow marsh (1.29 acres total). However, since the separation and/or dewatering infrastructure would be constructed at a higher elevation (i.e., why there are few delineated wetlands in this location), it would be less prone to flooding. Access to the separation and/or dewatering infrastructure does not cross any waterways susceptible to flooding.

Construction would result in loss of wetlands and associated flood storage within the proposed Project footprint. Loss of vegetated areas has the potential to increase stormwater runoff. The Project would adhere to the Stormwater Pollution Prevention Plan (SWPPP) that U. S. Steel is currently operating under for the existing TSF. Potential wetland mitigation measures could include the purchase of wetland bank credits, Palisade Wetland Mitigation Site or restoration of wetlands elsewhere on-site.

Operation Climate Interactions

The relevant potential climatic hazards for operations include increased precipitation and extreme weather events which may result in flooding and water stress/drought. Extreme rainfall and flooding are potential major hazards that could last for long periods of time and have an impact on the Project.

Twenty-five percent of global tailings dam failures between 1917 and 2006 were caused by heavy precipitation events (Rico et.al 2008). The purpose of the Project is to increase stability of the TSF. It has been designed to have more stable embankments and accommodate extreme weather events. Analysis was completed for 100-year rainfall event based on past precipitation and a probable maximum precipitation event. The 100-year storm modeled was for 6.35 inches of rainfall in a 24-hour period. Probable maximum precipitation (PMP) was also modeled for the dam design and was estimated at 28.5 inches of rainfall in a 24-hour period.

The analysis exercise also considered the impact that climate change would have on the hydrologic response of the basin. When determining the PMP depth, the potential effects of climate change was considered. An atmosphere that is subject to warmer weather may be more susceptible to an increase in atmospheric moisture; however, the relationship between a warming climate and the dynamics of a storm is not known. An increase in temperature may affect the frequency or intensity of a storm, but the evidence that has been gathered does not show a significant trend in data regarding PMP depth. Climate change should not be considered when estimating the rainfall depths for PMP events (WMO 2009, Section 1.1.1). Similar climate change conclusions were recently discussed in the report “Site-Specific Probable Maximum Precipitation Study for Tittabawassee River Basin, Michigan Final Report” by Applied Weather Associates (AWA). This analysis exercise selected the runoff from the 24-hour PMP event as the basis for design of Keetac Phase 2. That is, Phase 2 is designed to store all runoff generated from a 24-hour PMP event (including wave run-up) until water can be safely discharged.

Water within the TSF would be discharged in a controlled manner to Reservoir No. 6, which has designed outfalls to accommodate emergency events and maintain the integrity of the TSF. The stability of the TSF is monitored and reported to the DNR in accordance with the Dam Safety Permit. The TSF design is progressively updated to accommodate anticipated operational needs, and to accommodate the updated knowledge base including anticipated climatic conditions.

Extreme rainfall can also impact the soil and ground surface integrity, shifting or altering existing construction materials. Along with flooding, landslides can also pose a high construction risk. In addition to being a hazard to workers, they can block roads and cause construction delays. Soils may become loosened by rains and can co-occur with more intense rainfall events.

Alternatively, water stress may have some impacts on the Project due to the decreased snowfall in the winter leading to more dust. The Project can adapt to increase and extend dust control measures as identified in the Fugitive Dust Emission and Control Plan. Roadside fires could increase under dry conditions during operations if vehicles are close to dry vegetation. Additionally, a fire in the area could cause a hazardous working environment due to unhealthy air quality conditions. Extreme heat can similarly cause hazardous working conditions and fatigue. These hazards may influence operating costs due to increased maintenance, safety measures, and other expenditures.

Closure and Post Closure Interactions

The TSF is not planned for closure until the end of life of the mine (mining at Keetac is currently permitted through 2036 but has stated reserves well beyond). Some portions of the TSF could be progressively reclaimed prior to that, and land areas would be seeded and vegetated with native species as appropriate for the TSF conditions to minimize erosion, and for safe maintenance. Closure of the TSF would be managed according to the reclamation and closure procedures outlined in the Dam Safety Permit, Permit to Mine, and Minnesota Rules 6130.4100. Additionally, best practices, stakeholder input, any requirements in the NPDES permit for cessation, and current conditions at the time of closure would be incorporated. The current dam safety permit requires perpetual maintenance on all components to ensure integrity of all structures. Prior to the ultimate termination of the dam, a review by the DNR would be conducted to establish any perpetual activities necessary and financial responsibility is adequate by the owner.

Post-mining land uses and a detailed closure plan would be presented to the DNR for approval two years prior to deactivation. The permitted post-closure plan framework states within three years after deactivation or within a longer period that may be reasonable, the surface water will be drained via a channel cut through the Stage 2 Interior Dike draining water safely to the Stage 2 Exterior. The Stage 2 Interior would be vegetated for dust control, wildlife habitat or other purposes permitted by the DNR. Where necessary, the TSF would be shaped and contoured to ensure proper drainage in a manner that would not adversely affect structural stability of the drainage channel or result in erosion. All closure and reclamation procedures would adhere to Minnesota Rules and take necessary input from industry best practices, stakeholder engagement, and current conditions at time of closure.

Long-term climatic conditions, watershed restoration, and vegetation responses would be considered in reclamation planning. Site conditions and needs would be monitored in post closure.

b. For each Resource Category in the table below: Describe how the Project's proposed activities and how the Project's design will interact with those climate trends. Describe proposed adaptations to address the Project effects identified.

The Project has been designed with consideration for potential climate change impacts and trends. Table 7.1 outlines the key resource categories that may be affected by climate change and how the Project's design and proposed activities would interact with and adapt to these climate trends.

Table 7.1: Proposed Climate Adaptation

Resource Category	Climate Considerations (as identified in 7a)	Project Information (what features of resource category addresses vulnerabilities of/due to climate and climate trend)	Adaptations (effect on the feature)
Project Design	Increase in annual precipitation Reduction in snow cover	Dams and dikes height relative to potential increased rainfall / extreme events. Possible increase in tailings exposure throughout the winter.	Dams and dikes have enhanced designs to improve overall structural integrity. Dams, dikes, and seepage control / water management infrastructure is designed with future precipitation trends in mind. Increase/extend the dust control measures outlined in the Fugitive Dust Emission and Control Plan. Separate coarse and fine tailings would allow for more strategic deposition with respect to fugitive emissions.
Land Use	Increased temperatures and precipitation	Conversion of open space to tailings storage would result in loss of wetlands and associated flood storage within proposed Project footprint. Loss of vegetated areas may increase stormwater runoff.	Wetland mitigation measures would include use of surplus credits from the Palisade Wetland Mitigation Site. Stormwater management practices would be implemented as identified in the Stormwater Pollution and Prevention Plan.
Water Resources	Addressed in Section 12	Addressed in Section 12	Addressed in Section 12
Contamination/ Hazardous Materials/Wastes	Not applicable	Not applicable	Not applicable
Fish, wildlife, plant communities, and sensitive ecological resources (rare features)	Addressed in Section 14	Addressed in Section 14	Addressed in Section 14

8. Cover types: Estimate the acreage of the site with each of the following cover types before and after development:

Table 8.1 provides detail of the cover types for the Stage 2 Exterior, separation and/or dewatering infrastructure and pipeline, temporary impact areas, and permanent impact areas, using cover type data sourced from the National Land Cover Database (NLCD). The Stage 2 Exterior is currently being filled with tails and converted to barren land. An additional 1,200.6 acres within the Stage 2 Exterior, which is composed of anthropogenically disturbed land, would be categorized as barren lands as tails continue to be pumped into the area. The separation and/or dewatering infrastructure and pipeline would convert 37 acres to impervious surfaces. The footprint for the dams, dikes, and supporting roads would convert 536.6 acres to barren land. Temporary construction areas outside of wetlands would be restored to pre-construction conditions. Tree clearing and grubbing would occur in temporary workspaces prior to construction. Forested and shrub/scrub land cover types in temporary construction areas would be reseeded, resulting in 62.9 acres of herbaceous land cover. Figure 8.1 illustrates the existing NLCD land cover types.

Table 8.1: Existing and Proposed Cover Types for the TSF

Cover Types	National Land Cover Data Classifications	Before (acres)	After (acres)
Wetlands and shallow lakes (<2 meters deep)*	Emergent Herbaceous Wetlands	133.7	2.2
	Woody Wetlands	461.8	14.7
Deep lakes (>2 meters deep)	Open Water	420.3	0.5
Wooded/forest	Deciduous Forest	433.2	0
	Evergreen Forest	4.6	0
	Mixed Forest	115.8	0
Rivers/streams	N/A	0	0
Brush/grasslands	Shrub/Scrub	225.2	0
	Herbaceous	58.0	62.9
Cropland	N/A	0	0
Livestock rangeland/pastureland	N/A	0	0
Lawn/landscaping	N/A	0	0
Green infrastructure TOTAL	N/A	0	0
Impervious surface	N/A	0	37.0
Developed or barren land	Developed, Low Intensity	1.9	0.8
	Developed, Medium Intensity	0.2	0.2
	Developed, Open Space	2.6	1.6
	Barren Land	1,077.3	2,814.5
Other (none)	N/A	0	0
TOTAL		2,934.4	2,934.4

* The NLCD data is remotely sensed at a 30-meter spatial resolution wetland acreages may vary from field delineated acreages, as shown in Table 12.6. Table 8.1 includes acreages for the conversion of wetlands in the Stage 2 Exterior that is currently being filled with tails, as well as the Project Area.

Table 8.2 details proposed green infrastructure that would be incorporated. For the proposed Project, green infrastructure would not be applicable.

Table 8.2: Existing and Proposed Green Infrastructure

Green Infrastructure	Before (acreage)	After (acreage)
Constructed infiltration systems (infiltration basins/ infiltration trenches/ rainwater gardens/ bioretention areas without underdrains/ swales with impermeable check dams)	0	0
Constructed tree trenches and tree boxes	0	0
Constructed wetlands	0	0
Constructed green roofs	0	0
Constructed permeable pavements	0	0
Other (describe)	0	0
TOTAL	0	0

Table 8.3 details proposed canopy cover changes. Approximately 1,015.3 acres of the Project Area are estimated to be covered by canopy according to the NLCD. In the construction phase, all trees within the Project Area will be removed. No additional tree planting is anticipated.

Table 8.3: Existing and Proposed Canopy Cover

Trees	Percent	Number
Percent tree canopy removed, or number of mature trees removed during development	100%	1,015.3
Number of new trees planted	0	0

9. Permits and approvals required: List all known local, state and federal permits, approvals, certifications and financial assistance for the Project. Include modifications of any existing permits, governmental review of plans and all direct and indirect forms of public financial assistance including bond guarantees, Tax Increment Financing and infrastructure. *All these final decisions are prohibited until all appropriate environmental review has been completed. See Minnesota Rules, Chapter 4410.3100.*

Table 9.1 lists the local, state, and federal permits, approvals, and certifications for the Project.

Table 9.1: Applicable Regulatory Authorities and Required Permits

Unit of Government	Type of Application	Status
U.S. Army Corps of Engineers (USACE)	Clean Water Act Section 404 Individual Permit	To be applied for
	Section 7 Endangered Species Act Consultation with the U.S. Fish & Wildlife Service	Consultation led by the USACE
	National Historic Preservation Act Section 106 Determination for Historic Properties	Consultation led by the USACE
U.S. Fish and Wildlife Service	Federal Endangered Species Permits	Coordination led by USACE
Minnesota Department of Natural Resources (DNR)	Permit to Mine Amendment	Expires in 2048 An amended Permit to Mine will be required prior to starting Project work.
	Dam Safety Permit	Permit No. 2022-0721 To be amended
	Public Waters Work Permit	To be applied for, if needed
	Wetland Replacement Plan for Wetland Conservation Act	To be applied for

Unit of Government	Type of Application	Status
	Burning Permit (land clearing)	To be applied for, if needed
	Takings Permit (for Endangered or Threatened Species)	Coordination with DNR
Minnesota Pollution Control Agency	Air Emissions Permit (Prevention of Significant Deterioration/Title V Air Permit)	Permit No. 13700063-102 To be amended, if needed
	Clean Water Act Section 401 Water Quality Certification	To be applied for
	National Pollutant Discharge Elimination System (NPDES)/State Disposal System (SDS) Permit for Industrial Wastewater Discharge and Storm Water Discharge for Industrial Activity—Tailings Basin	Permit No. MN0055948 Pending reissuance
	Storage Tank Permits (fuel tanks)	Not required, Keetac is under MN Rules Chapter 7151
	Hazardous Waste Generator License	Keetac is a small quantity generator and complies with U.S. Environmental Protection Agency's (USEPA's) and Minnesota Pollution Control Agency's (MPCA's) waste management rules
City of Hibbing	Building Permit	To be applied for, if needed
	Shoreland Alteration Permit for construction in a shoreland management district	To be applied for, if needed
	Rezoning, Zoning Variance or Conditional Use Permit (CUP)	To be applied for in sections zoned as open space in the TSF
City of Nashwauk	Zoning Permit	To be applied for, if needed (Section 17.2 local ordinance)
Itasca County	Septic Permit	To be applied for, meeting the requirements of MN Statute 7080
	Extractive Use Permit/CUP	To be applied for, if needed (Section 3.13.1-3.13.11 local ordinance) Per Section 3.13 CUP is required if there is a residence within 1,000 feet of an extractive use operation
	Shoreland Alteration Permit for the movement of more than 10 cubic yards of material on steep slopes or within shore/bluff impact zones or 50 cubic yards or greater outside abovementioned zones.	To be applied for, if needed

10. Land Use:

a. Describe:

- i. Existing land use of the site as well as areas adjacent to and near the site, including parks and open space, cemeteries, trails, prime or unique farmlands.

Existing Conditions

The Project is located on the border of St. Louis and Itasca Counties, south of Highway 169 East in Minnesota. The cities of Hibbing and Nashwauk are partially located within the Project Area boundary, and the city of Keewatin is located approximately two miles north of the Project Area. The mine and associated process facility is located within the city of Keewatin; however, the Project Area is located outside the city's jurisdiction.

Land within and surrounding the Project Area is privately owned by U. S. Steel, as shown on Figure 6.2 (Itasca County Parcel Information System 2023; St. Louis County Land Explorer 2018).

The Project Area does not contain any known cemeteries, trails, or publicly designated open space.

Recreational areas in the vicinity of the Project Area include the O'Brien Reservoir Recreation Area, the Mesabi Trail, and various snowmobile trails (including the Lawron Trail), as shown on Figure 10.1.

The Project area is entirely within the 1855 Ceded Territory, which was created by the 1855 Treaty of Washington. In this treaty the Mississippi, Pillager, and Lake Winibigoshish Bands of Ojibwe ceded the lands contained within the Ceded Territory to the United States Government. Among others the Treaty created the Mille Lacs Reservation and Leech Lake Reservation, the latter being approximately 80 miles west of the Project site. The location of the Project Area within the 1855 boundary is shown in Figure 10.2.

The O'Brien Reservoir Recreation Area encompasses approximately 192 acres and is owned by the City of Keewatin. The O'Brien Reservoir Recreation Area is located approximately 3 miles northwest of the Project Area, and includes a DNR boat ramp, a fishing dock, and a public beach.

The Mesabi Trail is a paved recreational trail, currently under construction, that would stretch nearly 165 miles along the length of the Mesabi Range from Grand Rapids to Ely, Minnesota when completed. Currently, over 135 miles of trail have been constructed. A section of the Mesabi Trail is located approximately two miles from the Project Area, beginning in Nashwauk, and extending eastward past O'Brien Lake to the City of Keewatin. From Keewatin, the trail extends along Trunk Highway 169 (TH 169) for three miles, north to Kelly Lake, and east to the City of Hibbing.

Minnesota snowmobile trails border the Project Area to the south, east, and west. The Lawron Trail is located approximately one mile to the west of the Project Area and extends south from Highway 169 for five miles to the Itasca #1 Greenway Trail. The Itasca #1 Greenway is situated approximately two miles to the south of the Project Area. It extends southeast from the Lawron Trail for two miles and connects with the Chisholm/Side Lake/Hibbing Spur. The Chisholm/Side Lake/Hibbing Spur runs north-to-south and is located approximately 0.5 mile from the Project Area. It extends seven miles along the eastern side of the Project Area and continues to Highway 169, where it continues east of Keewatin.

Minnesota's iron ore deposits are concentrated in the northeastern "Iron Range," encompassing the Vermilion, Mesabi, and Cuyuna Ranges. The Project Area is located within the Mesabi Range, which extends from near Grand Rapids, Minnesota to Birch Lake, Minnesota. The Keetac Mine is a conglomeration of taconite mine pits established in the early 1900s and is now the third largest mine in the Iron Range. The existing TSF has been in operation and development since the 1960s and has undergone numerous modifications as tailings are deposited and its perimeter walls are raised, as stated in the Project Description.

The Project Area encompasses several key components: the existing Stage 2 Exterior of the TSF, planned dam and dike construction areas to the southwest and adjacent to the Stage 2 Exterior, an area near an unnamed road on the northwest side of the TSF, approximately 13 acres of forested land adjacent to the road, the separation and/or dewatering infrastructure, and supporting infrastructure footprints. In addition to deposited tails, the Stage 2 Exterior contains previously disturbed areas that facilitated the creation of incidental wetlands. Initial disturbance of Stage 2 Exterior began in the 1980s with construction of perimeter dams and deposition of tailings up to 20 feet deep, continuing until the year 2000. Beginning in 2022, some additional enhancement work and tailings deposition was restarted in Stage 2 Exterior as part of Phase 1 enhancements (Section 1.3).

The areas immediately southwest and adjacent to the Stage 2 Exterior are composed of forest, wetlands, and water bodies. The area south of the Stage 2 Exterior was previously disturbed for construction of the perimeter of the TSF, which has resulted in the creation of incidental wetlands. Several waterbodies surround the TSF, including Reservoir No. 2, Reservoir 2 North, Reservoir No. 6, Hay Lake, Swan Lake, Hay Creek, and Swan River.

The area within the TSF has been the site of historic logging and mining activities since the early 20th century. Disturbance from these activities have facilitated the creation of primarily shallow marsh, deep marsh, wet/sedge meadow, and alder thicket wetland types. The National Land Cover Database classifies most of the

land use within the Stage 2 Exterior area of the Project Area. Dominant land cover types included barren land (54 percent), with some woody wetlands (17 percent) and scrub shrub (8 percent) and deciduous forest (8 percent). A wetland delineation was conducted in November 2021. The report provides photographic documentation of these wetlands and the land cover at that time. Land use classification within the Stage 2 Exterior portion of the Project Area is shown in Section 8 – Cover Types, Table 8.1 (USGS 2016).

Farmland classifications are shown in Table 10.1. Approximately 85.4 percent of the Project Area is Not Prime Farmland (596.5 acres). Approximately 9.6 percent (66.7 acres) of the Project Area is classified as Farmland of Statewide Importance (does not meet Prime Farmland characteristics but is important for agricultural production), 3.1 percent (21.8 acres) is classified as Prime Farmland if Drained (meets Prime Farmland characteristics except depth to seasonal high water table and are suitable for drainage). The remaining 1.9 percent (13.3 acres) are Prime Farmland (prime characteristics for agricultural production).

Table 10.1: Farmland Classification Within the Project Area

Farmland Classification	Permanent Impacts			Temporary Construction Impacts	Total Acres
	Dam/Dike Construction	Permanent Access Road	Pipeline and Separation and/or Dewatering Infrastructure		
Not Prime Farmland	451.1	38.8	39.9	66.7	596.5
Farmland of Statewide Importance	38.2	7.9	0.0	20.6	66.7
Prime Farmland If Drained	17.3	2.2	0.0	2.4	21.9
All Areas Are Prime Farmland	9.8	1.9	1.7	0.0	13.3
Total acres*	516.4	50.6	41.5	89.8	698.3

**Total acreages may not reflect sum of farmland classification types due to rounding.*

- ii. **Plans. Describe planned land use as identified in comprehensive plan (if available) and any other applicable plan for land use, water, or resources management by a local, regional, state, or federal agency.**

The Project Area straddles the City of Hibbing (Saint Louis County), Nashwauk City, and Lone Pine Township (Itasca County) (Figure 10.3).

The City of Hibbing adopted its current comprehensive plan December 19, 2018. The Hibbing comprehensive plan identifies community goals, visions, and land use and zoning maps with designated associated zones. The city lists mining as one of the top two industries employing Hibbing workers. The existing land use regulations (Section 11.05) of the Ordinance identifies both mineral exploration and gravel pits as permitted uses within the I-2 zoning district. While most of the Project Area is zoned I-2, a permitted use, there are small portions that traverse the mine that have a designation of O (Open Space), O-1 (Open Space), A-R (Agricultural-Rural Residential), and R-R (Rural Residential). Rezoning, and/or a comprehensive plan Amendment may be necessary to align the zoning with the future land use maps found within the comprehensive plan.

The City of Nashwauk adopted its current comprehensive plan October 2014. The plan itself describes its current land use, and desired future conditions. The proposed land use map is comprised of three land use areas: mining, industrial park (heavy, moderate, light industrial, business park, commercial, and timber), and multi-use (residential, multi-family, cluster, retail, schools, parks and light commercial). The intent of the designations is to guide community development decisions and ensure land use and development occur in harmony. As stated in the plan, Nashwauk is looking to preserve tradition and embrace progress. The zoning map itself designates the Project Area as M-3, or Heavy Industrial Mining. This aligns with the intent of the comprehensive plan and zoning map.

The Itasca County Comprehensive Land Use Plan was adopted May 23, 2000, with updates on April 9, 2013. The intent of the comprehensive plan is to guide the county's land use activities over a 20-year period. The comprehensive plan, includes a mining objective, which states: "Support the continuation and expansion of the mining industry." Methods identified to provide this support include establishing a mining industrial zone, with multiple overlay districts that prioritize mining. In addition, the plan states to "designate adjacent lands necessary for processing minerals and storing overburden, lean ore, tailings and other mining activities." The plan focuses on cooperative partnerships, cooperative planning, and facilitating the process to ensure successful outcomes. Identified within the zoning map, this Project is zoned for an Industrial designation. Within the Industrial Zoning District, Mining and associated activities are considered a permitted use.

The St. Louis County's comprehensive future land use plan does not include the Project Area.

Overall, the Project Area is included within two One Watershed One Plan boundaries: the Upper Mississippi-Grand Rapids and the St. Louis River. While the Upper Mississippi-Grand Rapids is currently in the planning stage (initiating the effort in 2022), St. Louis does have an approved Comprehensive Watershed Management Plan. The approved plan is broken up and prioritized based off planning areas. The Project Area is identified within the St. Louis River North planning area (Swan River Watershed). This planning area includes the headwaters of the St. Louis and Sand Rivers, East and West Swan Rivers, East and West Two Rivers and the Embarrass River. The planning area is classified by both active and historic mining operations. Identified priority issues within this area include surface water quality degradation (related to impairments of aquatic life); drinking water quality and quantity threats; impacts to watershed health from urbanization, development and road expansion; altered hydrology leading to channel instability, excess sedimentation and loss of water storage; forest fragmentation and loss impacting habitat and water resources. The 10-year goals for the St. Louis River North planning area focus on reducing bacteria, chlorides, and other pollutants in surface waters; protecting drinking water; implementing stormwater management and low impact development; improving stream connectivity and habitat; restoring wetlands and shorelines; and protecting privately owned forests.

Future land use of the Project Area will be important given the proximity of the Project Area to the city of Keewatin. Any evaluation of potential future land use would consider the goals and objectives of the cities of Keewatin, Nashwauk, and Hibbing, the township of Lone Pine, and Itasca and St. Louis counties.

iii. Zoning, including special districts or overlays such as shoreland, floodplain, wild and scenic rivers, critical area, agricultural preserves, etc.

The state's Shoreland Management Rules, specifically Minnesota Rules, part 6120.3300, subp. 12, indicate that taconite mining within shoreland is a permitted use provided the provisions of the Mineland Reclamation Act are satisfied. The state Mineland Reclamation Rules, which implement that Act, states that shorelands are avoidance areas for mining and that mining will only be allowed within shorelands when there is no feasible and prudent alternative (Minnesota Rules, part 6130.1300, subp. B (2008)). In addition, Minnesota Rules 6130.1000 requires that all mining sites must incorporate setbacks or separations needed to comply with local land use regulations and requirements of other appropriate authorities. Finally, state Water Law (Minnesota Statute 103F.221, subd. 5 (1990)) allows municipalities, including counties, to adopt shoreland controls that are stricter than state standards.

Several local units of government have regulatory authority within the proposed Project vicinity, including the City of Nashwauk, the City of Hibbing, Itasca County, and St. Louis County. The City of Nashwauk does not have a shoreland zoning ordinance. Language stated in Section 15b.1 of the local zoning ordinance states that the Heavy Industrial and Mining District "shall not be used in any shoreland district, except water filled mining pits." When applying for zoning permits with the City of Nashwauk, the shoreland district rules would be discussed.

Within St. Louis County, the entirety of the Project lies within the regulated boundary of the City of Hibbing. These shoreland management districts are based on zoning ordinance information from the respective

governments. The City of Hibbing's Shoreland Ordinance designates shoreland zones within 1,000 feet and 300 feet of the ordinary high water level (OHW) of lakes and streams, respectively. A shoreland alteration permit is required from the City of Hibbing for any grading/filling or excavation within the Shoreland Overlay District established under the city zoning ordinance.

Itasca County classifies certain public waterbodies by use. Within, and immediately downstream of the Project Area, several waterbodies have been assigned Natural Environment (NE) or Tributary classifications, as shown in Table 10.2. NE waterbodies are often shallow lakes with limited capacities for assimilating the impacts of development and recreational use. They often have adjacent lands with substantial constraints for development such as high water tables, exposed bedrock, and soils unsuitable for septic systems. These waterbodies do not typically have much existing development or recreational use.

Itasca County designates shoreland overlay districts in its zoning ordinance for county public waters to implement the current shoreland standards described in Minnesota Rules, Chapter 6120 for lakes and streams identified in the DNR Public Waters Inventory (PWI). These shoreland zones are designated within 1,000 feet and 300 feet of the OHW of lakes and streams, respectively. Within shorelands, the county zoning ordinance requires a 200-foot setback for mining-related activities. A zoning variance request may be required for portions of the Project Area that are unable to meet the 200-foot setback requirement. Itasca County Zoning Ordinance Article 5 – Shoreland Overlay Districts defines specific lake classifications and zoning provisions enacted by the county (see Table 10.2).

Table 10.2: Water-Related Land Use Management District Impacts

Name	LGU Jurisdiction	LGU Classification	DNR PWI Status	Proposed Zoning Impacts
Hay Creek	Itasca County	Tributary	Public Water Stream	A portion of the Project Area is within a shoreland impact zone.
West Swan River	City of Hibbing	R-R, A-1, O-1, A-R	Public Water Stream	No shoreland zoning impacts anticipated.
O'Brien Diversion Channel	Itasca County	Tributary	Public Water Stream	No shoreland zoning impacts anticipated.
Welcome Creek	City of Keewatin	No shoreland zoning	Public Water Stream	No shoreland zoning impacts anticipated.
Reservoir No. 2	Itasca County	Not Listed	31103900	A portion of the Project Area is within a shoreland impact zone.
Reservoir No. 6	Itasca County	Not Listed	31122900	A portion of the Project Area is within a shoreland impact zone.
Reservoir 2 North	Itasca County	Not Listed	31122800	A portion of the Project Area is within a shoreland impact zone.

- iv. If any critical facilities (i.e. facilities necessary for public health and safety, those storing hazardous materials, or those with housing occupants who may be insufficiently mobile) are proposed in floodplain areas and other areas identified as at risk for localized flooding, describe the risk potential considering changing precipitation and event intensity.**

No critical facilities are proposed to be constructed within floodplain areas or areas identified as at risk for localized flooding.

- b. Discuss the Project's compatibility with nearby land uses, zoning, and plans listed in Item 10a above concentrating on implications for environmental effects.**

The proposed Project appears to align with the identified goals found within each community's comprehensive plan, as they relate to mining. Rezoning requests may be needed to align the existing zoning designation and shoreland management areas identified in the zoning ordinances of each applicable local government unit.

c. Identify measures incorporated into the proposed Project to mitigate any potential incompatibility as discussed in Item 10b above and any risk potential.

Impacts to waterbodies within shoreland management areas would be mitigated or prevented through use of erosion control measures and BMPs, and minimization of the duration of impacts, as required by applicable permits.

The following mitigation measures, described in Table 10.3, would be implemented to reclaim land impacted throughout the Project.

Table 10.3: Tailings Basin Reclamation Mitigation

Mining Impact	Description	Reclamation Mitigation Practice
Erosion/sedimentation	Bare soil and sloped ground at TSF or haul roads increase erosion and sedimentation potential.	- Temporary vegetation of inactive areas - Regrading - Revegetation - Mulching - Dust control
Wetland impacts	Direct wetland losses resulting from the Project.	- Minimize watershed modifications - Creation of wetlands within revegetated TSF - Mitigation of unavoidable impacts
Changes in vegetation cover types	Removal of existing vegetation during construction.	- Revegetation - Vegetation/land use approval
Wildlife	Loss of wildlife habitat resulting from changes in cover types. Potential barriers to travel in steep-sloped areas created by mining.	- Revegetation - Regrading
Changes in surface water quality and quantity	Increase in runoff (and potential increase in pollutant transport in runoff) due to exposed, compacted soils and steep slopes.	- SWPPP - Revegetation - Regrading - Mulching
Changes in ground water quality and quantity	The Project is not expected to have an increase in overall potential for seepage of process water into groundwater. The total volume of ponded water would remain the same as current conditions. Furthermore, the dams in contact with ponded water would include a seepage reduction feature intended to limit seepage through the dam. Additionally, the project proposes adding additional thickeners to recycle more water in the tailings prior to discharge.	- Use of an engineered seepage reduction feature is projected to minimize seepage rate and total seepage volume. - Monitoring plan in development
Air quality (dust)	Bare soil increases wind transport of soil particles.	- Watering or dust suppressant treatment of exposed soil to minimize dust - Temporary vegetation in inactive areas

Mining Impact	Description	Reclamation Mitigation Practice
		Revegetation of exposed soils

As stated in Minnesota Rules, part 6130.2200, altered watersheds would be returned to pre-mining conditions when possible. Vegetation establishment would be initiated within the first growing season after an area, according to the Permit to Mine, is no longer scheduled to be disturbed or used in a manner that would interfere with the establishment and maintenance of vegetation.

The Project's existing SWPPP and the Spill Control and Countermeasure Plan (SPCC) plans incorporate several measures and best management practices (BMPs) that align with the goals outlined in the St. Louis River Watershed Management Plan including:

- Use of settling ponds and basins to treat stormwater runoff and reduce sediment loads before discharge, which aligns with the goal of reducing pollutants like sediment to address surface water quality degradation.
- Secondary containment for all outdoor aboveground storage tanks to prevent spills of fuel oil, lube oil, etc. from contaminating stormwater runoff. This aligns with the goals of protecting surface and drinking water quality.
- Covering and containing hazardous and non-hazardous waste storage areas to prevent exposure to stormwater, which supports goals of protecting surface and drinking water quality.
- Diverting stormwater and railcar deluge water away from surface waters and into settling basins for treatment, supporting the goal of reducing pollutant loads to surface waters.
- Managing mine stockpiles to minimize erosion through measures like establishing vegetation, maintaining perimeter berms, sloping benches inward, and limiting lift heights/slope angles. This aligns with goals of reducing sedimentation and erosion to protect surface water quality.
- Conducting regular facility inspections, preventative maintenance, good housekeeping practices, spill prevention and response procedures, and employee training to proactively identify and address potential stormwater contamination issues. These measures broadly support the plan's water quality protection and pollution prevention goals.
- Keetac's NPDES permits incorporate requirements related to the downstream wild rice sulfate impairments, further tying the facility's water management to the St Louis River Watershed plan's goals.

In addition to the SWPPP and SPCC plans, the Project includes wetland mitigation measures that further contribute to meeting the watershed management goals. These measures include minimizing watershed modifications and creating new wetlands within the revegetated TSF, thus supporting and maintaining water storage capacity, reducing sedimentation, and improving water quality. The new wetlands would also provide valuable habitat for wildlife, offsetting some of the impacts of forest fragmentation and loss in the planning area.

Through the implementation of the SWPPP, SPCC plans, and wetland mitigation measures, the Project would actively work towards meeting the 10-year goals set forth in the St. Louis River Watershed Management Plan. These efforts would contribute towards ultimately supporting the overall health and sustainability of the watershed.

11. Geology, soils and topography/landforms:

- Geology - Describe the geology underlying the Project Area and identify and map any susceptible geologic features such as sinkholes, shallow limestone formations, unconfined/shallow aquifers, or karst conditions. Discuss any limitations of these features for**

the Project and any effects the Project could have on these features. Identify any Project designs or mitigation measures to address effects to geologic features.

The Project Area is located within the late Cenomanian Age Coleraine Formation, which is characterized by conglomerate, lignite, sandstone, and shale. Regional maps of depth-to-bedrock show that most of the Project Area contains soils for which depth to bedrock is approximately 275 feet (Minnesota Natural Resources Atlas 2023).

The perimeter dike embankment is underlain by a dense, Quaternary Period (less than 2.6 million years old), matrix-dominated, red clayey till, deposited by the St. Louis sub lobe, which is generally less than 10 feet thick (Jennings and Reynolds 2005). These young Quaternary sediments were deposited on top of the Mesozoic Coleraine Formation (600 million years old), consisting of conglomerate, lignite, sandstone, and shale, and Precambrian Period (1.6 to 1.7 billion years old) granite, quartzite, iron formation, argillite, and gabbro (Jirsa et al. 2011; Winter 1973).

There are no unique geological features that have received state or federal protection within the Project Area.

Based on review of the U.S. Geological Survey (USGS) Quaternary Faults and Folds database, no faults were active in the Quaternary Period near the Project Area, and no earthquakes have been recorded in the region (USGS 2022a; Chandler 1994). Based on the tectonic history of the region and the absence of active faults and significant earthquakes, seismic activity in the Project Area is unlikely.

Mineral Resources

The Project Area does not overlap with any active mineral operations (USGS 2011; Esri 2021; USGS 2022b). U. S. Steel has surface and mineral rights in the Project Area. As shown on Figure 11.1, the closest active mining area, aside from the Keetac Mine, is the Cleveland-Cliffs Hibbing Taconite Pit, which is located approximately seven miles northeast of the Project Area.

Paleontology

The Cenomanian (Upper Cretaceous) Coleraine Formation contains numerous fossils from the Western Interior Seaway and its shores, including fossilized teleost fish scales, shark teeth, clams, snails, and crocodile parts (Minnesota Geological Survey undated). As such, the Project may encounter paleontological resources.

Construction Impacts and Mitigation

No unique geological features that have received state or federal protection would be disturbed by the Project. Project construction would result in permanent impacts to topography through the buildup of the dams and dikes. Direct permanent impacts would result from raising the Stage 2 Exterior basin. Topsoil would be removed for construction and for temporary construction areas, but the underlying geology would not be impacted by the Project. Construction of a permanent access road, and grading or leveling of land in temporary construction areas are required to create safe and level equipment staging, site access, and preparation areas. These impacts would occur over the course of approximately two years. No mitigation activities are proposed for the geological resources since no unique geological features would be impacted by the Project. Additionally, no impacts to mineral resources are expected.

Operations Impacts and Mitigation

Operational impacts to topography, bedrock, or surface geology would include the continued deposition of tailings into the Stage 2 Exterior. Deposition would cover the existing geological features with tailings over time. Ultimately reaching a height of approximately 1,580 feet at the end of mine life, creating a plateau-like feature in the landscape. No other impacts to topography, bedrock, or surface geology would occur during operations.

There is minimal risk of earthquake-related impacts on the dam, dikes, separation and/or dewatering infrastructure, and access roads or other infrastructure during operations due to the limited potential for large,

seismically induced ground movements. Any potential risks to bedrock or surface geology would be mitigated by accepted dam construction industry specifications and adherence to DNR dam safety permit design requirements, as well as routine safety monitoring and analysis. Further, the Dam Safety Permit requires annual monitoring reports and submittal of an operation and maintenance plan.

- b. Soils and topography - Describe the soils on the site, giving NRCS (SCS) classifications and descriptions, including limitations of soils. Describe topography, any special site conditions relating to erosion potential, soil stability or other soils limitations, such as steep slopes, highly permeable soils. Provide estimated volume and acreage of soil excavation and/or grading. Discuss impacts from Project activities (distinguish between construction and operational activities) related to soils and topography. Identify measures during and after Project construction to address soil limitations including stabilization, soil corrections or other measures. Erosion/sedimentation control related to stormwater runoff should be addressed in response to Item 12.b.ii.**

The sections below detail soils and topography associated with the Project Area. Table 11.1 below provides soil characteristics within the Project Area.

Table 11.1: Soil Characteristics Within the Project Area

Soil Map Unit Symbol	Soil Map Unit Name	Hydric Rating	Drainage Class	Hydrologic Soil Group	Soil Erodibility Factor (K)	Acres
TSF Perimeter						
B28B	Buhl loam, 1 to 5 percent slopes	No	Somewhat poorly drained	C/D	0.27	38.2
A1B	Eagleview and Menahga soils, 1 to 8 percent slopes	No	Somewhat excessively drained	A	0.02	88.1
A1C	Eagleview and Menahga soils, 3 to 15 percent slopes	No	Somewhat excessively drained	A	0.02	0.8
549	Greenwood-Greenwood, ponded, complex, 0 to 1 percent slopes	Yes	Very poorly drained	A/D	0	7.5
619	Keewatin silt loam	No	Somewhat poorly drained	D	0.39	17.3
B27A	McQuade-Buhl complex, 0 to 3 percent slopes	Yes	Poorly drained	C/D	0.27	25.4
B33A	McQuade-Fayal, depressional, complex, 0 to 2 percent slopes	Yes	Poorly drained	C/D	0.27	18.1
797	Mooselake and Lupton soils, 0 to 1 percent slopes	Yes	Very poorly drained	A/D	0	6.7
622B	Nashwauk fine sandy loam, 1 to 10 percent slopes	No	Moderately well drained	D	0.40	9.8
B67A	Rifle soils, Hibbing catena, 0 to 1 percent slopes	Yes	Very poorly drained	A/D	0	0.8
995	Seelyeville-Seelyeville, ponded, complex, 0 to 1 percent slopes	Yes	Very poorly drained	A/D	0	1.4
1050	Tailings basin	Unranked	Unknown	Unknown	0	72.4

Soil Map Unit Symbol	Soil Map Unit Name	Hydric Rating	Drainage Class	Hydrologic Soil Group	Soil Erodibility Factor (K)	Acres
1003B	Udorthents, loamy (cut and fill land)	No	Well drained	Unknown	0	59.1
1043C	Udorthents, nearly level to rolling	No	Well drained	A	0.43	82.9
Pipeline and Separation and/or Dewatering Infrastructure						
A1B	Eagleview and Menahga soils, 1 to 8 percent slopes	No	Somewhat excessively drained	A	0.02	9.6
622B	Nashwauk fine sandy loam, 1 to 10 percent slopes	No	Moderately well drained	D	0.40	1.6
1043C	Udorthents, nearly level to rolling	No	Well drained	A	0.43	29.9
Permanent Access Road						
B28B	Buhl loam, 1 to 5 percent slopes	No	Somewhat poorly drained	C/D	0.27	7.9
A1B	Eagleview and Menahga soils, 1 to 8 percent slopes	No	Somewhat excessively drained	A	0.02	7.8
549	Greenwood-Greenwood, ponded, complex, 0 to 1 percent slopes	Yes	Very poorly drained	A/D	0	1.4
619	Keewatin silt loam	No	Somewhat poorly drained	D	0.39	2.2
B27A	McQuade-Buhl complex, 0 to 3 percent slopes	Yes	Poorly drained	C/D	0.27	4.6
B33A	McQuade-Fayal, depressional, complex, 0 to 2 percent slopes	Yes	Poorly drained	C/D	0.27	3.2
797	Mooselake and Lupton soils, 0 to 1 percent slopes	Yes	Very poorly drained	A/D	0	1.2
622B	Nashwauk fine sandy loam, 1 to 10 percent slopes	No	Moderately well drained	D	0.40	1.9
B67A	Rifle soils, Hibbing catena, 0 to 1 percent slopes	Yes	Very poorly drained	A/D	0	0.8
995	Seelyeville-Seelyeville, ponded, complex, 0 to 1 percent slopes	Yes	Very poorly drained	A/D	0	0.2
1050	Tailings basin	Un-ranked	Unknown	Unknown	0	2.0
1003B	Udorthents, loamy (cut and fill land)	No	Well drained	Unknown	0	8.3
1043C	Udorthents, nearly level to rolling	No	Well drained	A	0.43	1.8
Temporary Construction Impacts						
B28B	Buhl loam, 1 to 5 percent slopes	No	Somewhat poorly drained	C/D	0.27	20.6

Soil Map Unit Symbol	Soil Map Unit Name	Hydric Rating	Drainage Class	Hydrologic Soil Group	Soil Erodibility Factor (K)	Acres
A1B	Eagleview and Menahga soils, 1 to 8 percent slopes	No	Somewhat excessively drained	A	0.02	10.6
619	Keewatin silt loam	No	Somewhat poorly drained	D	0.39	2.4
B27A	McQuade-Buhl complex, 0 to 3 percent slopes	Yes	Poorly drained	C/D	0.27	24.3
1050	Tailings basin	Un-ranked	Unknown	Unknown	0	1.5
1043C	Udorthents, nearly level to rolling	No	Well drained	A	0.43	5.5

General Soil Composition

The Project Area occurs in the Land Resource Region K: Northern Lake States Forest and Forage Region. Within this region, the Project Area is entirely within Major Land Resource Area (MLRA) 57: Northern Minnesota Gray Drift. This MLRA is characterized by a complex pattern of end moraines; ground moraines; outwash plains; drumlins; small, isolated lake plains; and drainages associated with Wisconsin-age gray calcareous drift of the Des Moines and Wadena Lobes. The dominant soil orders are Alfisols, Entisols, and Histosols with a frigid temperature regime, an aquic or udic moisture regime, and mixed or smectic mineralogy. These soils are generally very deep and generally sandy to loamy textures (USDA NRCS 2022).

Soil mapping units and characteristics within the Project Area were identified using the USGS Soil Survey Geographic (SSURGO) database, as shown in Table 11.1 and on Figure 11.2 (USDA NRCS 2023).

The soil erodibility factor quantifies susceptibility of soil particle detachment by water (K value). Soils high in clay content are resistant to detachment and have lower K values (about 0.05 to 0.15), with coarse textured soils having a higher K value (about 0.05 to 0.20), and silty loam soils in between producing moderate runoff (MSU 2002). The western portion of the Project Area ranges in soil erodibility from low (0.0) to moderately high (0.43). The eastern portion of the Project Area has a lower erodibility of approximately 0.27.

The hydric rating classifies whether a soil is hydric based on conditions of saturation, flooding, or ponding during the growing season. The drainage class identifies natural drainage conditions based on frequency and duration of wet periods. Hydrologic Soil Groups A, B, C, and D (as well as dual classes A/D, B/D, and C/D) are used to classify soils by runoff potential and correspond to soils with low, moderately low, moderately high, and high runoff potential (Ross et al. 2018). Hydrologic Soil Groups are assigned based on similar physical and runoff characteristics. Most of the western portion of the Project Area (generally portions of the Project Area within the Hay Creek watershed) is classified as Group A, soils of deep, well drained, or gravelly sands with high infiltration and low runoff rates, with a small amount of Group D, soils with very slow infiltration rates and high runoff potential on the southern side of the Stage 2 Exterior. The eastern half of the Project Area (generally within the Upper West Swan River Watershed) is classified as Group C/D, soils with a very slow infiltration rate due to a high water table, with a slow infiltration rate when drained.

Topography in the Project Area is relatively flat due to the grinding actions of the St. Louis glacial sublobe, which occurred approximately 14,000 years ago during the Pleistocene epoch. Elevations in the Project Area range from approximately 1,440 to 1,460 feet above mean sea level (AMSL) (USGS 2022c).

Construction Impacts and Mitigation

Soils in the Project Area could be compacted, eroded, or contaminated during the construction of the Project. During construction, approximately 225,000 cubic yards or less of soil would be excavated/graded.

Temporary construction areas would be cleared of trees and graded to establish level workspaces for construction equipment and materials. Soil impacts in these areas would include compaction due to heavy machinery use and construction-related traffic, erosion due to exposure to stormwater from vegetation removal, and potential contamination from equipment leaks or spills of petroleum-based products, coolants, or antifreeze.

Earth disturbance of one acre or more requires a construction stormwater permit issued by the MPCA and the development of a SWPPP. A SWPPP would be prepared that would identify potential pollutant discharges associated with construction activities and describe prevention techniques to minimize the risk of non-point source pollution, erosion, and sedimentation, as well as spill response plans. Dikes and dams would be constructed from coarse tailings and would be periodically seeded to establish vegetative cover. Stormwater runoff would be managed in compliance with the SWPPP and applicable BMPs. Implementation of the practices outlined in the SPCC (as well as stormwater BMPs, would avoid or minimize risks and impacts of soil contamination). Additionally, the Dam Safety Permit (2022-0721) requires that erosion control measures be installed in accordance with the *Minnesota Stormwater Manual* by the MPCA prior to Project commencement and maintained throughout the Project. The Dam Safety Permit also requires that all exposed soils must be stabilized as soon as possible and no later than 72 hours after completion of the Project.

Soil compaction would be reduced by keeping construction staging areas to the minimum amount required for safe and efficient construction work and having specified machinery paths. Timber matting or other stabilization materials would be placed in wetlands and wet areas during construction.

Following their use, temporary construction areas would be tilled and supplemented with organic material that was stripped prior to construction as appropriate to mitigate compaction. Exposed soils would be stabilized, seeded, and monitored until they reach 70 percent vegetative cover, as required by the MPCA construction stormwater permits, to prevent soil erosion and sediment runoff from construction work areas. Ultimately, the areas would be required to meet standards within the Permit to Mine (i.e., 90 percent vegetative cover). The Dam Safety Permit requires that topsoil be used to re-dress disturbed soil areas and native plant species be used for revegetation of disturbed areas when possible.

Operations Impacts and Mitigation

Within the Stage 2 Exterior, any soils that were not previously affected by tailings deposition would be permanently impacted through the continued deposition of tailings. Soils would be permanently inundated with water and tailings.

Impacts to soils outside of the Stage 2 Exterior during operations would be limited to sporadic and temporary disturbance during maintenance activities in discrete locations. If excavation is required during maintenance activities, soils would be restored upon completion. Compaction would be minimized by limiting traffic and machinery access to previously established roadways. There is a potential for soil contamination from equipment leaks or spills of petroleum-based products, coolants or antifreeze. Implementation of the practices outlined in the SPCC, as well as applicable stormwater BMPs, would avoid or minimize risks and impacts of spills and any other operational impacts on soils. Slopes of the dikes and dams would be maintained consistent with the current practice in the Stage 2 Interior – inspected regularly for erosion, repaired (and maintained as needed), and vegetated periodically to reduce erosion due to stormwater runoff. Stormwater runoff would be managed in accordance with the SWPPP. Soil erosion from slope runoff would be mitigated through the deposition of coarse tails or planting of vegetative cover.

12. Water Resources:

a. Describe surface water and groundwater features on or near the site in a.i. and a.ii. below.

- i. **Surface water - lakes, streams, wetlands, intermittent channels, and county/judicial ditches. Include any special designations such as public waters, shoreland classification and floodway/floodplain, trout stream/lake, wildlife lakes, migratory waterfowl feeding/resting lake, and outstanding resource value water. Include the presence of aquatic invasive species and the water quality impairments or special designations listed on the current MPCA 303d Impaired Waters List that are within 1 mile of the Project. Include DNR PWI number(s), if any.**

The Project Area is divided between the Upper Mississippi Region and the Great Lakes Region watersheds. Most of the Project Area is in the Upper Mississippi Region, HUC 02 (07). It drains to the southwest, ultimately to the Mississippi River (via Reservoir No. 2, O'Brien, Little O'Brien, and Swan Lake to Swan River). The eastern edge of the Project Area drains to the Great Lake Region, HUC 02 (04), to the southeast, ultimately to Lake Superior (via West Swan River to the St. Louis River) (USGS 2023).

The Project Area watersheds are further broken down into the following subregions:

- HUC 02 (07) – The Upper Mississippi Region is approximately 190,000 square miles and stretches from Minnesota in the North to Kentucky in the South, and from Indiana to South Dakota.
 - HUC 04 (0701) – Mississippi Headwaters subregion is approximately 20,200 square miles and includes the Mississippi River Basin above its confluence with the St. Croix River, excluding the Minnesota River Basin.
 - HUC 06 (070101) – Mississippi Headwaters Basin encompasses approximately 11,700 square miles and includes the Mississippi River Basin above Blanchard Dam (in Royalton, MN).
- HUC 02 (04) Great Lakes Region is approximately 238,000 square miles and incorporates all the great lakes reaching from Minnesota to Maine.
 - HUC 04 (0401) – The Western Lake Superior subregion encompasses approximately 2,260 square miles and includes the drainage into Lake Superior from the Ontario-Minnesota international boundary to and including the Montreal River Basin.
 - HUC 06 (040102) – St. Louis Basin is approximately 796 square miles and includes the Mississippi River Basin above its confluence with the St. Croix River, excluding the Minnesota River Basin.

The DNR has delineated Minnesota into a set of 81 Major Watersheds (8-digit HUCs). The Project Area is located within the Lake Superior St. Louis River (Major Watershed 3, HUC 04010201) and Mississippi River Grand Rapids (Major Watershed 9, HUC 07010103) (MNDNR undated). While they provide a guide to the extent of the watershed, they do not accurately reflect the current boundary conditions.

Based on field observations and review of topology, there is a mapping error in the DNR HUC watershed boundary separating the Lake Superior St. Louis River and Mississippi River Grand Rapids on the eastern side of the TSF. The current watershed boundary follows the outer limit of all historical TSF features, whereas the DNR HUC watershed boundary excludes a portion of the existing Stage 2 Exterior. This portion of the TSF had been used for tailings disposal approximately in the 1980s, and the landscape has not been significantly altered since that time, so watershed flow regimes are likely to have stayed the same since then. Figure 12.1 depicts a more accurate alignment of the current watershed boundary as compared to the HUC boundary.

Waterbodies

Lakes/Reservoirs

There are five lakes/reservoirs located in, or immediately downstream of, the Project Area, including: Reservoir 2 North, Reservoir No. 6, Reservoir No. 2, Hay Lake, and Swan Lake (Table 12.1). Lakes/reservoirs within the Project vicinity downstream of the Project area are shown on Figure 12.2. O'Brien Lake and Little O'Brien Lake are in the vicinity, however, they are not downstream of the TSF.

Table 12.1: Lakes/Reservoirs Downstream of the Project Area

Lake	DNR Lake/Stream ID	Watershed Size (acre)	Lake Area (acre)	Major Inflow	Outlet
Reservoir 2 North	31122800	333.39	60.47	Welcome Creek	Drainage Ditch to Reservoir No. 2
Reservoir No. 6	31122900	749.04	171.57	Outer Tailings Basin Second Stage Pond	Plant Make-up and Drainage Ditch between Reservoir 2 North and Reservoir No. 2
Reservoir No. 2	31103900	1,234.51	418.75	Drainage Ditch from Reservoir 2 North	O'Brien Diversion Channel
Hay Lake	31003700	309.70	38.83	Hay Creek	Hay Creek
Swan Lake	31006702	7,365.09	2,143.72	Hay Creek	Upper Swan River

Source: MNDNR 2023

Reservoir 2 North

Reservoir 2 North is a roughly 60-acre basin located south of TH 169 and immediately adjacent to the northwest corner of the TSF. It receives inflows from the City of Keewatin stormwater flows and Welcome Creek, which flows south of Welcome Lake near the main Keetac plant in the City of Keewatin (MNDNR 2010). Reservoir 2 North outlets to a non-regulated drainage ditch that connects to Reservoir No. 6 and Reservoir No. 2. Reservoir 2 North is included in the mining area, as defined under the current mining area.

Reservoir No. 6

Reservoir No. 6 is an approximately 172-acre basin located downstream of Reservoir 2 North and upstream of Reservoir No. 2. Reservoir No. 6 receives surface water from the TSF. It serves as the main source of water for the Keetac Processing Plant (MNDNR 2010). Reservoir No. 6 connects to a drainage ditch located between Reservoir No. 2 and Reservoir 2 North (SD 005 of Permit No. MN0055948). Water flows between Reservoir No. 6 and Reservoir No. 2 via the drainage ditch are dependent on the water levels in Reservoir No. 6 (MNDNR 2010).

If water levels become too low in Reservoir No. 6, water can be pumped from Reservoir No. 2 into Reservoir No. 6 to provide make-up water for the plant. Additionally, if water levels become too high in Reservoir No. 6 there is an emergency overflow from Reservoir No. 6 to Reservoir No. 2. Reservoir No. 6 is part of the Keetac operational process and is a public water regulated by the DNR.

Reservoir No. 2

Reservoir No. 2 is an approximately 419-acre basin that receives inflows from Reservoir 2 North and Reservoir No. 6 via a non-regulated drainage ditch. Reservoir No. 2 also receives wastewater flows from the combined Wastewater Treatment Plant (WWTP) of the Cities of Nashwauk and Keewatin, while also serving as the routine discharge and emergency overflow route for Reservoir No. 6 (MNDNR 2010). Reservoir No. 2 outlets to the O'Brien Diversion Channel.

Hay Lake

Hay Lake is an approximately 39-acre basin located along Hay Creek, downstream of the confluence of Hay Creek and the O'Brien Diversion Channel, and 3.5 miles upstream of Swan Lake. Inflows and outflows are via Hay Creek. Per the MPCA and 2010 FEIS (MNDNR 2010), Hay Lake is a wild rice-producing waterbody (Barr 2009).

Swan Lake

Swan Lake is an approximately 2,144-acre basin that receives inflow from 6 sources: Oxhide Creek, Pickerel Creek, O'Brien Creek downstream of TH 169, Hay Creek, Hart Creek, and Lebron Creek. The portion of O'Brien Creek upstream of O'Brien Lake (north of TH 169) is diverted into the O'Brien Diversion Channel and routed into Hay Creek, which then flows into Swan Lake. Per the MPCA and 2010 FEIS, Swan Lake is also a wild rice-producing waterbody (Barr 2009).

Stream

There are five streams located downstream of the TSF with potential to be impacted by the Project, including: Hay Creek, Swan River, West Swan River, the O'Brien Diversion Channel, and Welcome Creek. Table 12.2 describes the five streams nearest to the Project Area, as shown on Figure 12.2.

Table 12.2: Streams Downstream of the Project Area

Stream	Public Waters Inventory ID	Flow Regime	Stream Length (mi)	Inflow
Hay Creek	Public Water Stream	Perennial	8.5	O'Brien Diversion Channel (Receives inflows from Reservoir 4 and Reservoir No. 2)
Swan River	Public Water Stream	Perennial	87.07	Hay Creek
West Swan River	Public Water Stream	Perennial	41.74	Potential groundwater seepage from TSF
O'Brien Diversion Channel	Public Water Stream	Perennial	11.11	O'Brien Creek (Reservoir 4) and Reservoir No. 2
Welcome Creek	Public Water Stream	Perennial	1.5	Welcome Creek Weir

Source: 2010 and MNDNR 2024

Hay Creek

Hay Creek runs south from the existing TSF. Though National Hydrography Dataset (NHD) and PWI data depict that Hay Creek begins within the existing TSF, the landscape is historically affected from the existing Stage 2 Exterior embankments, as well as old borrow pits adjacent to the embankment. Wetlands and waterbodies within the Project's dam/dike footprint were delineated in August of 2021. In the field delineation, the stream features in the Project Area mapped in the NHD and PWI as Hay Creek were characterized as shallow marsh wetlands that formed in depressions resultant from previous anthropogenic disturbance (construction of the TSF) rather than a stream channel or identifiable waterway. The delineation results were field-verified during a site visit with the DNR and USACE and were confirmed by the DNR via a wetland determination (a Minnesota Wetland Conservation Act Notice of Decision) in August 2023, and by the USACE in a January 2024 Approved Jurisdictional Determination.

Hay Creek flows southwest from the headwaters for approximately 3.5 miles where the O'Brien Diversion Channel flows into Hay Creek. The creek then continues south for 1.5 miles where it enters Hay Lake. The creek exits Hay Lake and then flows southwest for an additional 3.5 miles into the southeast corner of Swan Lake (FEIS 2010). Some datasets, including the DNR PWI, label Hay Creek as Swan River beginning at its headwaters. This review classifies Hay Creek as the watercourse that extends from south of the TSF (and south of the Project Area) to the southeast corner of Swan Lake.

Swan River

Swan River begins at Swan Lake and exits the southwest corner of the lake before flowing south, eventually discharging into the Mississippi River (MNDNR 2010). Per the MPCA and 2010 MNDNR, Swan River is a wild rice-producing waterbody (Barr 2009).

West Swan River

West Swan River's headwaters begin at Kelly Lake, northeast of the Project Area near the Keetac Processing Plant. It flows along the east side of the TSF perimeter before eventually ending at its confluence with the East Swan River, approximately 12 miles southeast of the TSF.

O'Brien Diversion Channel

The Hanna Mining Company created the O'Brien Diversion Channel in approximately 1978. It receives dewatering flows from the west mine pits, O'Brien Creek, Reservoir 4, and the plant process water that is discharged ultimately through Reservoir No. 2. The O'Brien Diversion Channel flows into Hay Creek, which eventually flows into Swan Lake (MNDNR 2010).

Welcome Creek

The headwaters of Welcome Creek begin at the Welcome Creek weir (SD002 of Permit No. MN 0031879). Welcome Creek starts approximately one mile south of the Keetac Processing Plant and flows south to its outlet into Reservoir 2 North. Between its headwaters and discharge into Reservoir 2 North, additional flows from the City of Keewatin storm sewer system occur. Over time, Welcome Creek has been straightened and has experienced changes in watershed boundaries due to previous mining activities (MNDNR 2010).

Water Quality

Where available, water quality data were retrieved from the MPCA Lakes and Stream water quality dashboard (v. 1.0.4) for the water bodies located in or immediately downstream of the Project Area and with potential to be impacted by the Project.

Table 12.3 below presents water quality and trophic status data for lakes and reservoirs in the Project Area, based on a 10-year average of summer samples from 2005 to 2021. The Trophic State Index (TSI) is used to assess the nutrient richness of these water bodies, ranging from oligotrophic (clear, low in nutrients) to hypereutrophic (green, very high nutrient levels).

Among the five lakes/reservoirs in the Project Area, limited water quality data were available only for Hay Lake, and Swan Lake (Table 12.3). Based on data averaged over 10 years, from 2005 to 2014, the lakes showed varying trophic statuses, ranging from mesotrophic (i.e., moderately clear) to eutrophic (i.e., green). Hay Lake is classified as eutrophic, indicating high nutrient levels. Swan Lake is classified as mesotrophic, suggesting moderate nutrient levels and intermediate water quality conditions. While Hay Lake had relatively high total phosphorus concentrations (830 ppb), consistent with its eutrophic status, Swan Lake, by comparison, had appreciably lower phosphorus levels (17 ppb), consistent with its mesotrophic status and indicative of overall acceptable water quality conditions. Water transparency was found to be comparatively higher in Swan Lake at 4 meters, compared to Hay Lake (1 meter) indicating better water quality conditions in the two mesotrophic lakes.

Hay Lake has the highest TSI value of 81, falling above the expected range of 38 to 53 for lakes in the same ecoregion. This high TSI confirms its eutrophic status and suggests that Hay Lake is nutrient-rich compared to other lakes in the region. Swan Lake has TSI values of 44, which fall within the expected range for the ecoregion.

Although Swan Lake has good clarity and recreational use it is reported to be impaired based on mercury concentrations in fish tissue.

Table 12.3: Water Quality and Trophic Status for Lakes and Reservoirs in the Project Area Based on a 10-Year Average of All Summer Samples

Lakes	Identification No.	Water Transparency (m)	Chlorophyll a (ppb)	Total Phosphorus (ppb)	Trophic Status	Overall Trophic Status Index	Expected TSI Range in the Same Ecoregion
Reservoir 2 North*	07010103-576	n/a	n/a	n/a	n/a	n/a	n/a
Reservoir No. 2*	07010103-580	n/a	n/a	n/a	n/a	n/a	n/a
Reservoir No. 6	07010103-578	n/a	n/a	n/a	n/a	n/a	n/a
Hay Lake	31-0037-00	1	n/a	830	Eutrophic	81	38–53
Swan Lake	31-0067-02	4	5	18	Mesotrophic	44	38–53

*Water chemistry values are based on data collected from 2005–2014 and TSI values are calculated based on data collected from 2008–2017.

Two streams downstream of the Project Area were surveyed in 2015 for various water quality parameters, including nitrogen, total phosphorus, total suspended solids (TSS), ammonia, dissolved oxygen, and pH (Table 12.4). Additionally, fish and invertebrate communities were sampled to obtain Index of Biotic Integrity (IBI) scores that would be indicative of overall ecological integrity in the streams. No data were available for West Swan River and Welcome Creek.

Total phosphorus and nitrogen concentrations at all streams were relatively low, indicating low nutrient pollution from sources such as wastewater discharges or development and therefore a reduced risk of eutrophication. Dissolved oxygen levels were relatively high in Hay Creek (8.51 mg/L) indicating well-oxygenated conditions. Based on the IBI scores, Hay Creek is classified as ‘good’ and ‘fair’ for fish and invertebrate community structure, respectively, suggesting that this stream has a relatively healthy aquatic ecosystem that could be affected by temporary, indirect impacts from construction activities, such as increased turbidity and localized sedimentation due to vegetation clearing and other construction activities. These impacts, however, are planned to be mitigated through the implementation of erosion control measures and BMPs and therefore, are not expected to cause any substantial impacts to the water quality. Like Hay Creek, Swan River has a ‘good’ and ‘fair’ rating based on fish and invertebrate IBIs, respectively. This stream, however, is classified as impaired based on mercury concentrations in sampled fish tissue and sulfate impairment affecting wild rice production.

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.

Impaired and Infested Waters

States are required to inventory water quality standards and submit a list of impaired and threatened waters every two years to the USEPA, per Clean Water Act Section 303(d). There are no infested waterbodies within five miles of the Project Area (MNDNR 2022a). Impaired waterbodies within five miles downstream of the Project Area are shown in Table 12.5 (MPCA 2024).

Table 12.5: Impaired Waterbodies Within 5 Miles Downstream of Project Area

Waterbody	Public Waters Inventory ID	Impairment	TMDL
Swan River	07010103-753	Mercury Sulfate	E. coli, Aquatic consumption— mercury in fish tissue N/A
Swan Lake (Main Basin)	31-0067-02	Mercury	Aquatic consumption— mercury in fish tissue
Swan Lake (West Bay)	31-0067-01	Mercury	N/A
Swan Lake (Southwest Bay)	31-0067-03	Sulfate, Mercury	N/A
Hay Lake	31-0037-00	Sulfate	N/A

Ecologically Significant Waterbodies

There are no trout streams or lakes, designated wildlife lakes, migratory waterfowl feeding/resting lakes, or outstanding resource value waters located in, or immediately downstream of, the Project Area.

Floodplains

According to the Federal Emergency Management Agency Flood Plain Map Service Center, there are no mapped floodplains within or in the vicinity of the Project Area (FEMA 2021). Flooding frequency in the vicinity of the Project Area is derived from the Natural Resource Conservation Service SSURGO database, which provides an estimate of the likelihood of flooding each year, based on a soil's likelihood to be inundated by surface water from overflowing streams or from adjacent slopes (Figure 7.10). The flooding frequency classifications range from non (no reasonable possibility of flooding) to very frequent (more than 50 percent chance of flooding in all months in any year). West Swan River and Hay Creek (outside of the Project Area) experience "frequent" flooding indicating that there is more than a 50 percent chance of flooding in any year, but less than a 50 percent chance of flooding in all months in any year (USDA NRCS 2023).

If unmapped floodplains are present in the Project Area, they could be impacted by soil compaction. Impacts associated with compaction and mitigation measures that would be implemented to minimize such impacts are identified in Section 11b-Soils.

Shoreland classifications are discussed in Table 10.2 – Shoreland Zoning Classifications within Section 10 – Land Use.

Wetlands

Formal field-focused wetland and waterbody delineations were conducted to identify the extent and characteristics of aquatic resources situated in the Project Area. Based on the delineations, the following wetland/water types were identified in the Project Area: deep water, shallow marsh, deep marsh, fresh (wet) meadow, coniferous bogs, shrub-carr, alder thicket, and hardwood swamp. Wetlands were identified and mapped in accordance with the Routine On-Site Determination Method as specified in the 1987 USACE Wetlands Delineation Manual and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0) (USACE 1987, 2012). Delineated jurisdictional wetlands and waters within the permanent and temporary impact footprints are shown on Figure 12.3 (parts 1-4).

Wetlands and waterbodies within the Stage 2 Exterior were delineated in May of 2021. The resulting Wetland Assessment and Delineation was submitted to the DNR in July 2021 to demonstrate that most of the wetlands in the TSF should be considered “incidental wetlands” and not regulated under the Minnesota Wetland Conservation Act (WCA). According to Minnesota Rules 8420.0930, Subp. 1,

Impacts to wetlands that the landowner can demonstrate, to the satisfaction of the local government unit, were created by pits, stockpiles, or tailing basins, and by actions the purpose of which was not to create the wetland according to part 8420.0105, subpart 2, Item D, are not regulated under this chapter.

Later in July 2021, a WCA Notice of Decision (NOD) was issued by the DNR that approved the incidental status of 237.09 acres within the Stage 2 Exterior of the TSF, confirming that these wetlands were not regulated under WCA. Additional evidence to support the incidental status of 322.10 acres of wetlands within the TSF was submitted following the July 2021 NOD. These 322.10 acres were deemed incidental in a January 2022 NOD, leaving 127.31 acres of regulated wetlands within the Stage 2 Exterior. In a September 2022 NOD, the DNR approved the use of 127.31 surplus credits from the previously approved Palisade Project (Bank Service Area 5). As all wetlands within the Stage 2 Exterior have been deemed incidental or mitigated for, they are not included in this discussion of existing wetlands or in subsequent wetland impact discussions.

Wetlands and waterbodies within the Project’s dam/dike footprint were delineated in August of 2021. Wetlands and waterbodies within the temporary construction areas, the pipeline footprint, and the separation and/or dewatering infrastructure footprint were delineated in August of 2023. On August 11, 2023, the DNR issued a formal wetland determination (a Minnesota Wetland Conservation Act Notice of Decision) for the dam/dike footprint that was delineated in August of 2021. A revised wetland delineation report was submitted to the DNR for jurisdictional review in October of 2023. The revised delineation report included the original 2021 dam/dike footprint (2021 Study Area), as well as the pipeline footprint, the separation facility footprint, temporary workspace footprints, and minor augmentations to the dam/dike footprint (2023 Study Area). At the time of EAW submission to the DNR, the DNR has not made a determination regarding the jurisdictional status of additional wetland and waterbody features included in the revised delineation report. Figure 12-4 depicts the spatial extent of the portion of the Project Area for which the jurisdictional determination has been completed (364.8 acres) and the portion of the Project Area for which the jurisdictional extent of wetland and waterbody features remains under review (333.5 acres).

Table 12.6 below provides acreages of all WCA-jurisdictional wetlands in the Project Area (including areas for which a determination has been made and areas that are currently under review by the DNR). These acreages exclude incidental wetlands (which totaled 71.12 acres).

Minnesota’s WCA does not regulate impacts to “incidental” wetlands. Incidental wetlands are defined as “...wetlands that the landowner can demonstrate, to the satisfaction of the local government unit, were created by pits, stockpiles, or tailings basins, and by actions the purpose of which was not to create the wetland...” (M.R. 8420.0930, Subp. 1). In addition, incidental wetlands are further defined in M.R. 8420.0105, Subp. 2.D. as follows:

This chapter does not regulate impacts to incidental wetlands. "Incidental wetlands" are wetland areas that the landowner can demonstrate, to the satisfaction of the local government unit, were created in nonwetland areas solely by actions, the purpose of which was not to create the wetland. Incidental wetlands include drainage ditches, impoundments, or excavations constructed in nonwetlands solely for the purpose of effluent treatment, containment of waste material, storm water retention or detention, drainage, soil and water conservation practices, and water quality improvements and not as part of a wetland replacement process that may, over time, take on wetland characteristics.

Some delineated wetlands, detailed in the delineation reports, were created by grading, excavating, or the tailings basin, or for drainage purposes and therefore, may be considered “incidental.” These wetlands are excluded from Figure 12.3 (parts 1-4) and Table 12.6 and were not included in the impact analysis for the Project.

Table 12.6: Field Delineated Potentially Direct WCA-Regulated Wetlands Impacts Within Project Area**

Wetland Type	Proposed Stage 2 Exterior Dam and Dike Footprints (Permanent Impact; acres)	Permanent Access Road (acres)	Separation and/or Dewatering Infrastructure and Pipeline (Permanent Impact; acres)	Temporary Construction Areas (acres)	Total (acres)
Alder Thicket	11.01	3.44	0.00	0.00	14.45
Coniferous Bog	8.25	1.84	0.00	0.00	10.09
Deep Marsh	6.69	0.32	0.06	2.17	9.25
Deep Water	21.88	4.75	0.00	0.00	26.63
Fresh (wet) Meadow	0.78	0.16	1.08	0.11	2.14
Hardwood Swamp	0.74	0.96	0.00	1.07	2.77
Shallow Marsh	26.26	2.73	0.15	2.80	31.95
Shrub-carr	4.95	1.41	0.00	3.60	9.95
Total	80.55	15.62	1.30	9.75	107.22

***If wetland type sums don't match totals exactly, it is due to rounding in GIS.*

**Wetland acreages in Table 12.6 reflect only the field delineated acreages in the proposed Stage 2 Exterior dams and dikes, access road, separation infrastructure, and temporary construction acres.*

Indirect wetland analyses were performed by Barr and 0.58 acre of wetlands are expected to be impacted by Project activities. Additionally, 0.39 acre of wetlands will be indirectly impacted temporarily and 0.19 acre of indirect impacts will come from access road construction. Temporary impacts to wetlands would take place in under 6 months. The wetland types that would be indirectly impacted are fresh (wet) meadow and hardwood swamp, as shown in Table 12.7.

Table 12.7: Field Delineated Potentially Indirect WCA-Regulated Wetland Impacts Within Project Area*^

Wetland Type	Proposed Stage 2 Exterior Dam and Dike Footprints (Indirect Impact; acres)	Permanent Access Road (Indirect impact; acres)	Separation and/or Dewatering Infrastructure and Pipeline (Indirect Impact; acres)	Temporary Construction Areas (Indirect Impact; acres)	Total (acres)
Alder Thicket	0.00	0.0	0.00	0.00	0.00
Coniferous Bog	0.00	0.0	0.00	0.00	0.00
Deep Marsh	0.00	0.0	0.00	0.00	0.00
Deep Water	0.00	0.0	0.00	0.00	0.00
Fresh (wet) Meadow	0.00	0.08	0.00	0.00	0.08
Hardwood Swamp	0.00	0.11	0.00	0.39	0.50
Shallow Marsh	0.00	0.0	0.00	0.00	0.00
Shrub-carr	0.00	0.0	0.00	0.00	0.00
Total	0.00	0.19	0.00	0.39	0.58

**If wetland type sums don't match totals exactly, it is due to rounding in GIS.*

Based on information with the wetland delineation reports, wetlands within the Project Area have overall wetland functional assessment ratings ranging from high to low based on an abbreviated version of the *Minnesota Routine Assessment Method for Evaluating Wetland Functions, Version 3.4*. These include evaluation of vegetative diversity, outlet configuration, upland condition, wildlife habitat, and public value.

- ii. **Groundwater – aquifers, springs, seeps. Include: 1) depth to groundwater; 2) if Project is within a MDH wellhead protection area; 3) identification of any on-site and/or nearby wells, including unique numbers and well logs if available. If there are no wells known on-site or nearby, explain the methodology used to determine this.**

The Project Area overlies several groundwater aquifers including the Cretaceous Bedrock Aquifer, the Biwabik Iron Formation Aquifer, the Quaternary water-table aquifer, and the Quaternary buried artesian aquifer.

The Quaternary water-table aquifer is an unconfined surficial aquifer consisting of unconsolidated sediments while the Quaternary buried artesian aquifer is a confined aquifer underlying a layer of low-permeability material, known as an aquitard (MNDNR 2021).

The Cretaceous bedrock aquifer consists of sandstone layers interbedded with thick layers of shale. The Cretaceous Aquifer is located near the ground surface, with finished wells in the area ranging generally from 7 to 1,437 feet in depth. Aquifer recharge mainly occurs through infiltration and precipitation through overlying drift.

Wells in vicinity to the Project Area have been completed within the Quaternary water-table aquifer and Quaternary buried artesian aquifer with observed static water levels generally ranging from 3 to 20 feet below ground surface (bgs) for the Quaternary water-table aquifer and 20 to 35 feet bgs in the Quaternary buried-artesian aquifer (Minnesota Department of Health 2025). The Biwabik Iron Formation Aquifer is a sedimentary bedrock aquifer composed of iron-rich chert (Adolphson et al., 1981). Drinking water for the City of Keewatin is sourced from the Biwabik Iron Formation Aquifer via two municipal wells located to the north and upgradient of the TSF (Well Nos. 1 and 3).

There are no springs or seeps within the Project Area.

- 1) Depth to groundwater: Shallow groundwater at the Project Area is estimated to be approximately 3 to 30 feet below ground surface, according to a review of available Minnesota Department of Health well logs in the area.
- 2) Project location in relation to MDH wellhead protection area: The Project Area is not located within any wellhead protection areas and the nearest Wellhead Protection Areas (Keewatin and Keetac) are situated northwest and up gradient of the Project Area.
- 3) Identification of on-site and/or nearby wells:
 - On-Site Wells:
 - There are no active water monitoring wells within or adjacent to the Project Area.
 - Some historical wells (referred to as MW-1, MW-11 and MW-12) were located at the south-west boundary of the Stage 2 Exterior. A Groundwater Sensitivity analysis performed in support of the Project Phase I Wetland Conservation Act Wetland Replacement Plan (WRP) found that groundwater quality adjacent to the TSF was within acceptable ranges when compared to the applicable standards (Barr 2022). The DNR decision document agreed with this conclusion. U. S. Steel is developing a groundwater monitoring plan to address a condition of the DNR WCA Decision document.

- U. S. Steel maintains internal geotechnical monitoring (instrument) wells within the existing TSF to monitor conditions related to the structural integrity of the TSF. Additional instrument wells would be installed to continue monitoring the stability of the TSF.
- Nearby Wells: A review of the Minnesota Well Index and the USGS National Water Information System Mapper indicates that two domestic wells exist within 0.5 mile of the Project Area, shown on Figure 12.5. The closest domestic well to the Project Area is 0.3 miles to the east. Several historical ‘other wells’ are located near the Project Area. These other wells are abandoned and used for non-potable purposes.

The methodology used to determine the presence of on-site and nearby wells included a review of the Minnesota Well Index and the USGS National Water Information System Mapper.

b. Describe effects from Project activities on water resources and measures to minimize or mitigate the effects in Item b.i. through Item b.iv. below.

i. Wastewater - For each of the following, describe the sources, quantities and composition of all sanitary, municipal/domestic and industrial wastewater produced or treated at the site.

The monitoring parameters in the facility’s industrial wastewater, which is discharged through NPDES Permit No. MN0055948 outfall SD-005, include sulfate, pH, flow, specific conductance, selenium, mercury, dissolved iron and, suspended solids. Levels of mercury and other heavy metals are relatively low based on historical monitoring. The average discharge volume recorded during 2024 was 4.7 million gallons per day (MGD). The design of the water retention dam includes a seepage reduction feature along the upstream face of the dam to lower the phreatic surface and limit seepage through the dam. The seepage reduction feature would consist of either a linear low-density polyethylene (LLDPE) geomembrane or an inclined mechanically placed soil-cement blanket consisting of a mixture of coarse tailings and cement. In addition to the design features of the dam, the project proposes to add additional thickeners as part of the classification system allowing for the recycling of more water to the plant prior to tailings disposal.

- 1) If the wastewater discharge is to a publicly owned treatment facility, identify any pretreatment measures and the ability of the facility to handle the added water and waste loadings, including any effects on, or required expansion of, municipal wastewater infrastructure.**

The facility does not discharge any wastewater to a publicly owned treatment facility.

- 2) If the wastewater discharge is to a subsurface sewage treatment system (SSTS), describe the system used, the design flow, and suitability of site conditions for such a system. If septic systems are part of the Project, describe the availability of septage disposal options within the region to handle the ongoing amounts generated as a result of the Project. Consider the effects of current Minnesota climate trends and anticipated changes in rainfall frequency, intensity and amount with this discussion.**

There are no SSTSs on-site.

- 3) If the wastewater discharge is to surface water, identify the wastewater treatment methods and identify discharge points and proposed effluent limitations to mitigate impacts. Discuss any effects to surface or groundwater from wastewater discharges, taking into consideration how current Minnesota climate trends and anticipated climate change in the general location of the Project may influence the effects.**

Water from the TSF flows into Reservoir No. 6 where it could be pumped for use in process, or flow into Reservoir 2 North that has the permitting outfall: SD005 (Figure 12.8). From SD005, water flows to Reservoir No. 2, the O'Brien Diversion Channel, Hay Creek, Hay Lake and Swan Lake. Discharges are subject to NPDES permit limits that are based on water quality standards. The NPDES Permit No. MN0055948 is in the process of reissuance. The draft NPDES/SDS permit is currently on public notice (July 8 – September 8, 2025) and contains a compliance schedule for U.S Steel to attain compliance with the final sulfate effluent limits. This permit reissuance actions include updating sulfate compliance schedules.

To minimize impacts, the process facility employs several mitigation measures:

- Use of recirculating wet scrubber and lime treatment to remove sulfate (prior to discharge into the TSF)
- Oil/water separators to remove oil (prior to discharge into the TSF)
- Settling ponds to remove suspended solids prior to discharge
- Compliance with NPDES permit limits

The State of Minnesota has been experiencing a warming trend, with warmer winter lows and summer highs, and more frequent extreme precipitation events (MNDNR 2024). These trends are expected to continue in the coming decades because of climate change (MPCA 2017, 2023). Climate change in Northern Minnesota, characterized by increased precipitation, heavy rainfall events, warmer temperatures, and altered evaporation rates, could substantially influence the Keetac facility's wastewater management. These changes may lead to higher wastewater volumes, increased erosion and contaminant loads, altered water balance in the TSF, and challenges in meeting NPDES discharge limits. Additionally, the timing and quantity of runoff and stream flows could affect the receiving waters' capacity to assimilate wastewater, while warmer temperatures and changes in hydrology and water chemistry could potentially exacerbate mercury methylation and sulfide formation downstream. To mitigate these impacts, the facility may need to adjust its treatment systems, holding reservoir capacities, settling pond maintenance, and the timing and volume of discharges to match the changing conditions.

ii. Stormwater - Describe changes in surface hydrology resulting from change of land cover.

Describe the routes and receiving water bodies for runoff from the Project site (major downstream water bodies as well as the immediate receiving waters). Discuss environmental effects from stormwater discharges on receiving waters post-construction including how the Project will affect runoff volume, discharge rate and change in pollutants. Consider the effects of current Minnesota climate trends and anticipated changes in rainfall frequency, intensity and amount with this discussion. For projects requiring NPDES/SDS construction stormwater permit coverage, state the total number of acres that will be disturbed by the Project and describe the SWPPP, including specific BMPs to address soil erosion and sedimentation during and after Project construction. Discuss permanent stormwater management plans, including methods of achieving volume reduction to restore or maintain the natural hydrology of the site using green infrastructure practices or other stormwater management practices. Identify any receiving waters that have construction-related water impairments or are classified as special as defined in the Construction Stormwater permit. Describe additional requirements for special and/or impaired waters.

Changes in surface hydrology resulting from change of land cover:

The construction of the Project would require vegetation clearing and earthworks, which would have a localized impact on the natural surface hydrology and drainage patterns within its footprint. For example, site preparation for the separation facility would have engineered stormwater design, and construction of dams and dikes would introduce additional slope to areas that are currently low relief. Precipitation falling within the Stage 2 Exterior would continue to be retained within the basin, as part of the ponded water. The exterior slopes of the dikes/dams themselves could generate some runoff; however, much of the rainfall that falls on the embankments is expected to infiltrate. Any surface runoff would be managed through the SWPPP to prevent erosion and downstream impacts.

Routes and receiving water bodies for runoff from the Project site:

The Upper West Swan River and Hay Creek watershed boundary runs along the eastern crest of the existing Stage 2 Exterior berm (Figure 12.1). The Project has been designed to maintain the same preexisting crest alignment as the dikes are elevated, so stormwater runoff would continue to flow to the same watersheds as it did pre-construction (Figure 12.6). Therefore, even though construction of the dikes will encroach into the Upper West Swan watershed, the Project's dikes will not change the watershed boundary.

Currently, process water (not slurry) is discharged into the historic Stage 1 impoundment when an East tailings pipeline needs to be drained. This water drains to the south-east corner of the impoundment and then flows south into the Stage 2 Exterior via culvert under a road and the existing berm. As described below, the Stage 2 Exterior basin outflows into Reservoir No. 6 (a process water waterbody) which has a permitted outfall that is part of the Mississippi River watershed.

The Project would raise the dikes around Stage 2 Exterior and the culvert currently allowing water from the historic Stage 1 impoundment area would need to be removed. U. S. Steel would cease discharging all process water into the historic Stage 1 impoundment, so any new water would be rainfed. Rainwater from the Stage 1 impoundment would then naturally flow to the east and into the Upper West Swan River watershed similar to pre-mining conditions. The changes to the watershed boundary as a result of the Project are shown in Figure 12.7.

Construction of the Project and this change in rainwater runoff flow into the Upper West Swan would result in a net increase in catchment for the Great Lakes watershed of 669.9 acres. The catchment for the Hay Creek watershed (part of the Mississippi River watershed) would be reduced by an equivalent amount. However, the loss of water to the Mississippi would be negligible given the proportion of the watershed that this represents; it would be partially offset by process water remaining within the TSF, including the additional water added through ongoing tailings deposition, and because the removed area was flowing into Reservoir No. 6 which is used for mine process water as discussed below.

The Stage 2 Exterior basin is designed to be a closed system with no direct discharges to surface waters. Runoff from within the basin would be directed to the interior pond and ultimately to Reservoir No. 6 via a decant structure. This allows for settling of suspended tailings particles before the water is released.

The only potential routes for basin water to reach downstream water bodies are through the existing permitted outfall from Reservoir No. 6 via Reservoir No. 2 North - SD005 (culvert outfall) and into Reservoir No. 2, as shown on Figure 12.8. The outfall is monitored and has specific discharge limits and requirements set in the facility's NPDES/SDS permit.

From Reservoir No. 2, the flow path to downstream waters includes the O'Brien Diversion Ditch, Hay Creek, Hay Lake and Swan Lake. Swan Lake is the culminating receiving water body for the Project site, located several miles downstream, and ultimately discharges into the Mississippi River.

Environmental effects from stormwater discharges on receiving waters post-construction:

The Project's alteration of natural runoff patterns has the potential to have a minor change to flows to downstream water bodies compared to pre-construction conditions. There would be some change to the Upper West Swan and Hay Creek watershed boundaries as noted in the *Routes and receiving water bodies for runoff from the Project site* section above. This may result in a small increase in flow to the Upper West Swan.

To manage the increased runoff rates and volumes from the exterior slopes of the new dikes/dams, the SWPPP would implement several BMPs outlined in the existing plan. These include installation of silt fence, routine inspections of site conditions and stormwater runoff to identify any issues or maintenance needs. Erosion would be prevented on dike/dam slopes through the deposition of coarse tails or planting of vegetative cover, with slopes maintained and inspected regularly.

The Project may have minor impacts on flow variability of the waterbodies in the system because of the loss of wetlands within the Project footprint, but within the greater context of the watershed, ecological function and ecosystem services are unlikely to be altered.

To address the potential impacts of climate change on stormwater management, the SWPPP would be updated to include provisions for more frequent site inspections, especially during snowmelt and precipitation runoff events. As outlined in the SWPPP, the plan would be reviewed at least annually and modified as necessary to reflect any changes in site conditions, monitoring results, or regulatory requirements.

NPDES/SDS construction stormwater permit requirements:

The need for an NPDES/SDS construction stormwater permit is triggered by the proposed land disturbance exceeding the one-acre threshold. For this Project, approximately 608.6 acres would be permanently impacted and 89.8 acres would be temporarily impacted. A total of approximately 225,000 cubic yards of soil is expected to be excavated or graded, representing a substantial disturbance footprint. The construction stormwater permit for this Project was obtained in April 2024.

An important component of the construction stormwater permit is the development and implementation of a construction phase SWPPP. Its purpose is to identify all potential sources of stormwater pollution from the construction activities and prescribe appropriate BMPs to minimize erosion, sedimentation and other impacts.

Specific elements that would be addressed in the construction SWPPP include:

- Detailed erosion and sediment control plans showing the locations and types of BMPs to be installed, such as silt fences, check dams, sediment basins, inlet protection, etc. The Dam Safety Permit also has explicit requirements for erosion control measures to be installed and maintained in accordance with the *Minnesota Stormwater Manual*.
- Procedures for stabilizing exposed soils during and after construction, including temporary and permanent seeding, mulching, erosion control blankets, etc. The Dam Safety Permit requires all exposed soils to be stabilized within 72 hours of completion.
- Pollution prevention measures for activities such as vehicle fueling and maintenance, concrete washout, storage of hazardous materials, etc. This includes having adequate spill kits on-site and training personnel on their use.
- Inspection and maintenance schedules for all BMPs to ensure they remain effective over time. This will involve more frequent inspections than the routine industrial SWPPP due to the active nature of construction.
- Corrective action procedures to address any failures or deficiencies identified during inspections.

- Documentation and recordkeeping requirements, including site maps, BMP specifications, inspection reports, corrective actions, etc.

Overall, the construction SWPPP represents a comprehensive plan that is tailored to the specific conditions and risks associated with the Stage 2 Exterior basin construction. Its effective implementation would prevent substantial adverse impacts to downstream receiving waters during the active disturbance phase.

NPDES/SDS industrial stormwater requirements:

Facilities in certain industries that store materials, waste, or equipment outdoors are subject to industrial stormwater regulations administered by the MPCA. Approximately 6,000 acres of the TSF contain industrial activities or significant materials that may come in contact with stormwater. The primary Standard Industrial Classification (SIC) code which applies to operations at Keetac is 1011- Iron Ores, but the ancillary activities primarily taking place at the TSF include outdoor storage of significant materials, dust or particulate-generating processes, and wastewater treatment and solid waste management. Keetac currently operates under two NPDES permits that contain stormwater conditions/requirements— NPDES/SDS Permit MN0031879 governs water discharged from the plant and mining activities, while NPDES/SDS Permit MN0055948 governs water discharged from the TSF. After construction of the Stage 2 Exterior basin is completed, stormwater management would transition to the post-construction or operational phase. At this point the construction SWPPP would no longer be applicable, and stormwater would be managed under Keetac’s updated industrial SWPPP as part of the NPDES/SDS Permit. Permit reissuance for MN0055948 is in progress and will include industrial stormwater requirements.

Permanent stormwater management plans:

The existing SWPPP already outlines a range of stormwater control measures and BMPs that will continue to be implemented. These include good housekeeping practices, preventative maintenance, employee training, and spill prevention and response procedures. The SWPPP also includes regular inspections of the site to identify any issues or maintenance needs.

In the long-term, temporary construction areas and the slopes of the completed portions of the dam and dikes would return to vegetated cover, which would help to stabilize soils and reduce erosion potential. The detention effect of the interior basin pond would serve as a primary BMP for capturing and slowly releasing runoff from the Stage 2 Exterior. This detention would allow for settling of suspended tailings particles and help to regulate discharge rates to Reservoir No. 6 and downstream waters. Regular maintenance, including removal of accumulated sediments back to the TSF deposition areas would help sustain its stormwater treatment function over time.

Operations of the TSF will not be changed by the Project construction. Therefore, changes to water quality post-construction are not anticipated. No change to the overall watershed health scores is anticipated because of the operation of the TSF.

As with the construction phase SWPPP, the post-construction stormwater management plan would be periodically reviewed and updated to reflect any changes in site conditions, regulatory requirements, or climate patterns.

Receiving waters with construction-related impairments or special classification:

Hay Lake and the southwest bay of Swan Lake are identified as impaired waters for wild rice sulfate but do not have any construction-related impairments or special classifications. Active construction stormwater management activities are unlikely to impact the impairment of the receiving waters. It is anticipated there would be no material change in water quality from the no action alternative.

In addition to the wild rice sulfate impairment, Swan Lake is also listed as impaired for mercury in fish tissue. This impairment is not directly related to construction activities but is still relevant for the facility's overall stormwater management and NPDES/SDS permit compliance. Discharges from the Keetac site will continue to be monitored in accordance with permit requirements.

Additional requirements for special and/or impaired waters:

Keetac's NPDES/SDS permits are subject to the requirements of the Statewide Mercury TMDL due to the mercury impairment in Swan Lake. The TMDL allows for a wasteload allocation of 4 kg/year of mercury for the Northeast Region of Minnesota, which includes the Keetac site. However, the TMDL does not include any specific stormwater control requirements related to industrial discharges.

For the wild rice sulfate impairment in Hay Lake and the southwest bay of Swan Lake, a permit reissuance is in progress and will include updated compliance schedules for sulfate. Average sulfate concentration in the discharge from the tailings basin (SD 005) which flows to Hay Lake is 120 mg/L in 2024. The standard is 10 mg/L.

While the existing SWPPP does not outline any specific stormwater control measures or BMPs related to mercury or sulfate discharges, it does include general measures for minimizing pollutant loading in stormwater runoff, as follows:

- Regular inspections of the site to identify any issues or maintenance needs.
- Implementation of spill prevention and response procedures.
- Employee training on stormwater pollution prevention.
- Ongoing maintenance of stormwater control structures and equipment.

The above measures will help reduce the potential for mercury and sulfate loading from the site. The SWPPP will be reviewed and updated annually to reflect any changes in regulatory requirements or site conditions. If additional mercury or sulfate control measures are deemed necessary based on monitoring results or regulatory changes, they will be incorporated into an updated SWPPP at that time.

- iii. Water appropriation - Describe if the Project proposes to appropriate surface or groundwater (including dewatering). Describe the source, quantity, duration, use and purpose of the water use and if a DNR water appropriation permit is required. Describe any well abandonment. If connecting to an existing municipal water supply, identify the wells to be used as a water source and any effects on, or required expansion of, municipal water infrastructure. Discuss environmental effects from water appropriation, including an assessment of the water resources available for appropriation. Discuss how the proposed water use is resilient in the event of changes in total precipitation, large precipitation events, drought, increased temperatures, variable surface water flows and elevations, and longer growing seasons. Identify any measures to avoid, minimize, or mitigate environmental effects from the water appropriation. Describe contingency plans should the appropriation volume increase beyond infrastructure capacity or water supply for the Project diminish in quantity or quality, such as reuse of water, connections with another water source, or emergency connections.**

The proposed Project will not require water appropriation.

iv. Surface Waters

- a) Wetlands - Describe any anticipated physical effects or alterations to wetland features such as draining, filling, permanent inundation, dredging and vegetative removal. Discuss direct and indirect environmental effects from physical modification of wetlands,**

including the anticipated effects that any proposed wetland alterations may have to the host watershed, taking into consideration how current Minnesota climate trends and anticipated climate change in the general location of the Project may influence the effects. Identify measures to avoid (e.g., available alternatives that were considered), minimize, or mitigate environmental effects to wetlands. Discuss whether any required compensatory wetland mitigation for unavoidable wetland impacts will occur in the same minor or major watershed and identify those probable locations.

Construction Impacts and Mitigation

Construction of the Project would result in both permanent and temporary impacts to potentially WCA-regulated wetlands. Temporary impacts would take place in under six months. Wetland acreages in Tables 12.6 and 12.7 represent Project-related impacts except those listed for pipeline construction, as pipeline construction would occur aboveground and would not impact existing WCA-regulated wetlands. As mentioned previously, the DNR had not made a determination regarding the jurisdictional status of wetlands and waterbodies mapped during the August 2023 delineations (i.e., those included in the Project Area). Thus, the pending determination may require updates, which would affect both impact and mitigation acreages. The Project would permanently impact 80.55 acres of WCA-regulated wetlands because of dam and dike work, and 15.62 acres of WCA-regulated wetlands for the construction of the permanent access road. The access road is also expected to indirectly impact 0.19 acre of WCA-regulated wetlands. Construction of the separation and/or dewatering infrastructure would permanently impact 1.30 acres of WCA-regulated wetlands. In total, 97.47 acres of WCA-regulated wetlands would be permanently and directly impacted with an additional 0.19 acre of indirect impacts. The Project would temporarily impact 9.75 acres of WCA-regulated wetlands because of equipment staging and temporary site access. Temporary construction areas are also anticipated to indirectly impact 0.39 acre of wetlands.

Construction of the pipeline would occur above 0.25 acre of wetlands but would result in no permanent or temporary impacts. The pipeline would be placed on wooden blocks several feet above the ground. The blocks would be placed outside of wetlands. Construction of the pipeline would occur along the footprint of the existing access road and the newly constructed permanent access road. Wetlands within the dam and dike footprint (and associated permanent access road) would be permanently filled using clay and coarse tails during construction. Impacts resulting from the construction of the separation and/or dewatering infrastructure, dam, dike, and permanent access road would be mitigated for through the credits available at U. S. Steel's Palisade Mitigation Wetland Site and purchase of mitigation credits, discussed further below.

Wetlands that are not proposed to be permanently or temporarily impacted by the Project would be protected using sediment and erosion control methods and best practices to prevent sediment or other contaminants from entering the wetlands. To minimize impacts to WCA-regulated wetlands, the Project has been designed to avoid wetlands where possible. Where the removal of trees or shrubby vegetation occurs within wetlands, U. S. Steel would use the least intrusive method possible to clear the corridor. Hand-cutting of vegetation would be conducted, where possible, to avoid and minimize impacts on streams and/or wetlands. There would be no change in contours or redirection of water flow, and the amount of spoil from foundation installation and structure placement would be minimal. Mats would be used for construction equipment to travel over wetlands, as appropriate. Staging activities would avoid wetlands to the greatest extent feasible. PFO/PSS wetlands would be cleared of trees and shrubs during the winter season and would be permanently converted to PEM/PSS wetlands over time.

Where tree clearing within wetlands in temporary workspaces is necessary, forested wetlands would be permanently converted to scrub shrub or emergent wetlands after construction. Wetlands, particularly forested wetlands, provide ecological functions, such as peak flood flow reduction, nutrient and sediment capture, filtration of pollutants to adjacent waterbodies, and diversity of habitat. The conversion of forested wetlands would reduce or eliminate some of these functions. Required tree removal adjacent to waterbodies would reduce riparian buffer functions, such as stream bank stabilization and erosion control, nutrient and sediment

filtration, floodwater storage and peak flow reduction, and water temperature modification from shading. Vegetation within temporary workspaces would be allowed to return after construction is complete, which would provide some filtration stabilization to help protect waterbodies from pollutants.

To compensate for the loss of WCA-regulated wetlands, U. S. Steel would use available surplus wetland mitigation credits at a 1-to-1 mitigation ratio from the Palisade Wetland Mitigation Site, which is located within the same watershed as the Project Area (Major Watershed 9, HUC 07010103). Since wetland mitigation would take place within the same HUC 08 watershed as the Project, no substantial effects to the host watershed are anticipated. As of April 2024, this Project specific wetland mitigation site contained approximately 79 acres of fresh wet sedge credits available for use as surplus wetland credits and approximately 10 shrub-carr credits available for use as surplus wetland credits. A credit release request was submitted to the USACE and the DNR in April of 2024. After the 2024 and 2025 growing season, another credit release request would likely be created for the inclusion of more in-kind credits.

Operations Impacts and Mitigation

Operational impacts to wetlands in the Project Area were evaluated through wetland delineation and functional assessment studies conducted in 2021 and 2023 following guidance for evaluation of wetland functions from the *Minnesota Routine Assessment Method for Evaluating Wetland Functions, Version 3.4*. Field functional assessments allow for an evaluation of potential direct and indirect impacts from Project development based on a series of metrics that include but are not limited to topographic settings, vegetative diversity, wildlife habitat and human disturbance factors (e.g., roads stockpiles, mine pits, soil removal). Ratings for each metric result in an overall classification of the wetland as 'high quality' (characterized by a high diversity of native plant species and little to no disturbance), 'medium quality' (dominated by native or non-native species with variable species diversity and variable disturbance) and 'low quality' (characterized by low species diversity, high non-native cover and high levels of disturbance).

Results of an abbreviated function assessment on each of the 55 wetlands delineated in 2021 showed that 13 wetlands were rated as high quality, 31 as medium quality and 11 as low quality. A similar assessment conducted on 50 additional wetlands that were delineated in 2023 showed that 5 of the 50 delineated wetlands were rated as high quality, 24 as medium quality, and 21 as low quality. The difference in the number of high and medium quality wetlands between the two years was attributed to the relatively higher level of disturbance observed in the 2023 survey area compared to the 2021 survey area. Based on these results and attribution of low-quality wetlands to mining operations, it can be concluded that approximately 30 percent of wetlands are directly or indirectly impacted because of operations in the Project Area. A revised delineation to include the 2023 delineation was submitted in October 2023 to the USACE and DNR. USACE completed their jurisdictional review of delineated wetlands in January 2024. A jurisdictional decision from the DNR is pending.

During operations, the TSF is managed under its SWPPP. There are no newly proposed sources of discharge and the TSF would operate in the same way that it operated prior to the construction of the Project. Therefore, no additional impacts are anticipated to wetlands during operations.

Hydrology monitoring data, collected as part of the wetland monitoring plan, would be evaluated to determine if adverse impacts are occurring resulting from the Project. Criteria for identifying impacts include changes in wetland hydrology criteria, reduction in wetland size, shifts in wetland community type, and decreased vegetation quality. Other factors, including wetland delineations, precipitation, and local climate trends would also be considered. If adverse impacts are found, they will be documented in annual reports submitted to USACE and DNR.

b) Other surface waters- Describe any anticipated physical effects or alterations to surface water features (lakes, streams, ponds, intermittent channels, county/judicial ditches) such as draining, filling, permanent inundation, dredging, diking, stream diversion, impoundment, aquatic plant removal and riparian alteration. Discuss direct and indirect

environmental effects from physical modification of water features, taking into consideration how current Minnesota climate trends and anticipated climate change in the general location of the Project may influence the effects. Identify measures to avoid, minimize, or mitigate environmental effects to surface water features, including in-water BMPs that are proposed to avoid or minimize turbidity/sedimentation while physically altering the water features. Discuss how the Project will change the number or type of watercraft on any water body, including current and projected watercraft usage.

Construction Impacts and Mitigation

Lakes/Reservoirs

Reservoir 2 North

A tailings pipeline that transports tailings from the processing plant to the separation and/or dewatering infrastructure is proposed to be placed on the west side of Reservoir 2 North, an impoundment of Welcome Creek. Approximately 0.8 mile of pipeline would be constructed upgradient of Reservoir 2 North. The pipeline would run along existing infrastructure corridor and would be above ground on raised blocks. Therefore, there would not be notable ground disturbing activities associated with the installation of the pipeline. At its nearest point, the pipeline would be over 100 feet from the shoreline, with dense vegetation separating the construction impact area from the reservoir. Erosion control measures and BMPs would be implemented downgradient of land disturbing activities to mitigate these impacts in accordance with the SWPPP. As a result, construction-related impacts to Reservoir 2 North would not be substantial.

Reservoir No. 6

The proposed separation and/or dewatering infrastructure would be constructed on the north of Reservoir No. 6 and tailings pipelines running along the north side to the separation and/or dewatering infrastructure, and west side to the TSF would be laid above ground on blocks along existing infrastructure corridors. Reservoir No. 6 could potentially be impacted by erosion and sedimentation from laying the pipeline, but erosion control measures and BMPs would be implemented downgradient of land disturbing activities to mitigate these impacts in accordance with the SWPPP. Construction of the separation and/or dewatering infrastructure would take place on the west side of a private access road separating it from the reservoir; substantial construction-related impacts would not be expected.

A water retention dam with a seepage reduction feature would be constructed between the Stage 2 Exterior Pond and Reservoir No. 6. A gravity reinforced concrete drop decant structure would be designed to include bulkheads and a sluice/roller gate to control the basin pond elevation, and gravity would convey water into the downstream polishing pond prior to returning to the plant (Figure 6.6). The proposed dam would permanently impact 38.7 acres of Reservoir No. 6 and approximately 5,242 linear feet of shoreline. These impacts would be mitigated or prevented through use of erosion control measures and BMPs, such as a floating silt curtain, and minimization of the duration of impacts. Temporary, indirect impacts on water quality, such as increased turbidity and localized sedimentation, could occur during construction because of vegetation clearing and other construction activities around and within the waterbody. The construction of the water retention dam would result in some minor impacts to Reservoir No. 6 due to placement of fill.

Flows into Reservoir No. 6 are likely to be different as a result of the project given the design features, removal of flows from Stage 1, and ongoing tailings deposition into the Stage 2 Exterior.

Reservoir No. 6 is used for mine process makeup and is an impoundment of Welcome Creek.

Reservoir No. 2

Reservoir No. 2, an impoundment of Welcome Creek, through impacts to Reservoir No. 6, may be impacted during construction of the proposed dam between Reservoir No. 6 and the Stage 2 Exterior Pond. Temporary, indirect impacts on water quality, such as increased turbidity and localized sedimentation, could occur during

construction because of vegetation clearing and other construction activities around and within the waterbody. These impacts would be mitigated or prevented through use of erosion control measures and BMPs, and minimization of the duration of impacts. No substantial impacts to Reservoir No. 2 are anticipated during construction.

Hay Lake

Hay Lake, through impacts to Hay Creek watershed (discussed below), may be impacted during construction. Temporary, indirect impacts on water quality, such as increased turbidity and localized sedimentation, could occur during construction because of vegetation clearing other construction activities upstream of the waterbody. These impacts would be mitigated or prevented through use of erosion control measures and BMPs, and minimization of the duration of impacts. No substantial impacts to Hay Lake are anticipated during construction.

Swan Lake

Swan Lake would not experience any direct discharges from the Project and as a result, is not anticipated to be substantially impact the construction of the Project.

Streams

Hay Creek

The Project Area is within the Hay Creek Watershed; however, there is no defined stream in the Project Area. Refer to section 12.a.i *Streams, Hay Creek* above for more detail. Construction of the Stage 2 Exterior dike would extend into the Hay Creek watershed, but the stream channel would not be directly affected. Approximately 466.06 acres of the 37,255-acre Hay Creek watershed would be permanently constructed on and impacted (1.3 percent of the total watershed) and approximately 43.3 acres of the Hay Creek watershed would be temporarily impacted (0.1 percent of the total watershed).

Construction of the dike would mostly retain the current watershed boundaries, so while the gradient within the Project Area would be altered (e.g. steeper slopes on the dike), the watershed acreage for Hay Creek above the confluence with O'Brien Diversion Channel (Ditch) would remain the same.

Water downstream of the confluence of the O'Brien Diversion Channel (Ditch) may experience a negligible change in flow as a result in the loss watershed area. As shown on Figure 12.7 and discussed in section 12.b.ii *Routes and receiving water bodies for runoff from the Project site*, construction of the Project would result in stormwater from the historic Stage 1 area flowing into the Upper West Swan River watershed. Currently, water in Stage 1 (including pumped process water) flows into the Stage 2 Exterior, then into Reservoir No. 6 where it is used for process water or eventually flows into O'Brien Diversion Channel (Ditch) and into Hay Creek. Impacts on flow are expected to be negligible because water coming from Stage 1 currently includes process water that is occasionally flushed (as needed in winter operations) into Stage 1 area, and flushing would no longer be needed once the Project is implemented, so that process water would remain within the TSF watershed. Only stormwater runoff in the Stage 1 Area would change from the Hay Creek watershed to the Upper West Swan River watershed. The loss of this stormwater would be expected to be offset through the additional water added to the Stage 2 Exterior through thickening of tailings. Thickening of tailings prior to discharge reduces the water loss to void space.

Temporary, indirect impacts on water quality, such as increased turbidity and localized sedimentation, could occur during construction because of vegetation clearing and other construction activities in the headwaters. These impacts would be mitigated or prevented through use of erosion control measures and BMPs, and minimization of the duration of impacts, as required by applicable permits.

Swan River

Swan River receives inflows from Hay Creek, impacts to which are discussed above. The construction footprint within the Hay Creek watershed reflects less than 1.2 percent of the watershed for Swan River at the confluence with Hay Creek.

Temporary, indirect impacts on water quality, such as increased turbidity and localized sedimentation, could occur during construction because of vegetation clearing other construction activities around and within the Hay Creek watershed. These impacts would be mitigated or prevented through use of erosion control measures and BMPs, and minimization of the duration of impacts.

West Swan River

The West Swan River is located to the east of the TSF and would not be directly impacted by construction of the Project.

Construction of the dike would retain the majority of the current watershed boundaries, so while the gradient within the Project Area would be altered (e.g. steeper slopes on the dike), the watershed for the Upper West Swan would largely remain unchanged where the dikes are. However, as shown on Figure 12.7 and discussed in section 12.b.ii *Routes and receiving water bodies for runoff from the Project site*, construction of the Project would result in stormwater from the historic Stage 1 area flowing into the Upper West Swan River watershed instead of the Stage 2 Exterior. Construction of the Project and this change in rainwater runoff flow into the Upper West Swan would result in a net increase in catchment of 669.9 acres.

Temporary, indirect impacts on water quality, such as increased turbidity and localized sedimentation, could occur during construction because of vegetation clearing and other construction activities in the headwaters. These impacts would be mitigated or prevented through use of erosion control measures and BMPs, and minimization of the duration of impacts, as required by applicable permits.

While it is possible that there would be some groundwater interaction between the West Swan River and the TSF, surface level construction activities are not expected to have a substantial impact on the flow of the river.

O'Brien Diversion Channel

The O'Brien Diversion Channel receives inflows from Reservoir No. 2, which may be impacted by construction activities occurring in and around Reservoir No. 6. As discussed in the Hay Creek section above, flows into O'Brien Diversion Channel may experience a negligible change as a result of stormwater from the historical Stage 1 area changing to flow into the Upper West Swan River watershed.

Flows to the O'Brien Diversion Channel are not anticipated to be substantially affected by upstream construction, and any temporary sedimentation impact in Reservoir No. 6 would not be expected to reach the O'Brien Diversion Channel. Impacts to O'Brien Diversion Channel are not anticipated during construction.

Welcome Creek

Welcome Creek outlets into Reservoir 2 North (upstream of the TSF). Some project infrastructure (pipeline) would be constructed along an existing road corridor that already crosses Welcome Creek.

Temporary, indirect impacts on water quality, such as increased turbidity and localized sedimentation, could occur during construction along the existing road; however, these impacts would be mitigated or prevented through use of erosion control measures and BMPs, and minimization of the duration of impacts.

Welcome Creek would not receive direct discharge from areas affected by the Project, and as a result, no substantial construction impacts are anticipated.

Operations Impacts and Mitigation

Following impacts during construction, general operations of the Project would be consistent with existing operations at the TSF. There are no proposed water appropriations, or new discharges, and the overall water balance and/or water quality at the TSF is not expected to change from pre-existing conditions. Therefore, no substantial impacts are anticipated on any lake or stream during operation of the Project. A water quality and quantity monitoring plan would be developed for DNR approval in accordance with the requirement of the previous WCA Decision document for phase 1 of the Project.

13. Contamination/Hazardous Materials/Wastes:

- a. **Pre-Project site conditions - Describe existing contamination or potential environmental hazardson or near the Project site such as soil or ground water contamination, abandoned dumps, closed landfills, existing or abandoned storage tanks, and hazardous liquid or gas pipelines. Discuss any potential environmental effects from pre-Project site conditions that would be caused or exacerbated by Project construction and operation. Identify measures to avoid, minimize or mitigate adverse effects from existing contamination or potential environmental hazards. Include development of a Contingency Plan or Response Action Plan.**

The MPCA's What's in My Neighborhood contamination database identifies potentially contaminated or historical contamination sites, and environmentally permitted sites within 0.5 mile of the Project Area, as shown in Table 13.1 and on Figure 13.1 (MPCA 2023). The status indicates if the site is active or inactive. Inactive sites are those in which the activity that the MPCA was interested in no longer exists. This could mean a closed leak site, or a permit is no longer in force. Within 0.5 mile of the Project, there are 3 active projects. The active projects are sites that the MPCA has interest in, meaning there is an ongoing investigation into a potential leak or there is an active permit. The active projects within 0.5 miles of the Project are all permitted projects (Figure 13.1). The water quality and stormwater sites within the Project Area are Keetac's construction stormwater and NPDES/SDS permits. There are no pre-Project site conditions that would be caused or exacerbated by Project construction and operation. Therefore, measures to avoid, minimize, or mitigate effects from existing contamination or potential environmental hazards are not proposed.

Table 13.1: MPCA Permitted Facilities, Contamination, and Leak Sites Within 0.5 Mile of the Project Area

MPCA Program(s)	Site Name	MPCA ID(s)	Status	Industry Classification
Hazardous Waste	Deane Morrow Trucking Inc	84898	Inactive	Specialized Freight (except Used Goods) Trucking, Local
Aboveground Tanks; Air Quality; Construction Stormwater; Hazardous Waste; Wastewater, Industrial SDS Permit	ERP Iron Ore LLC - Plant 1	126163	Active	Iron Ore Mining
Construction Stormwater; Industrial Stormwater; Solid Waste, Permitted Solid Waste Facility; Wastewater	General Waste and Recycling LLC	99174	Active	Recyclable Material Merchant Wholesalers
Aboveground Tanks; Hazardous Waste, Minimal quantity generator; Industrial Stormwater	Olsons Body Shop	5091	Active	Used Car Dealers; All Other Automotive Repair and Maintenance
Underground Tanks	Ron Peterson	109686	Inactive	N/A
Investigation and Cleanup	Keewatin Dump Site	185474	Inactive	N/A
Leak Site	Keewatin Taconite former Natl Steel Pellet	LS0016602	Closed	N/A

- b. Project-related generation/storage of solid wastes - Describe solid wastes generated/stored during construction and/or operation of the project. Indicate method of disposal. Discuss potential environmental effects from solid waste handling, storage and disposal. Identify measures to avoid, minimize or mitigate adverse effects from the generation/storage of solidwaste including source reduction and recycling.**

Solid and hazardous waste that could be produced during Project construction and the proposed disposal methods are listed in Table 13.2. The Project would not generate wastes during operation. Therefore, measures to avoid, minimize, or mitigate effects from the generation/storage of solid wastes during operations are not proposed.

Table 13.2: Potential Solid and Hazardous Wastes Within the Project Boundary

Source	Disposal Method
Construction	Trucked to landfill
Scrap metal	Removed for recycling
Demolition/Industrial Waste	Trucked to landfill
Waste tires	Removed for recycling
Vehicle batteries	Removed for recycling
Used oil/oil filters	Removed for recycling
Antifreeze	Removed for recycling
Electronics	Removed for recycling
Fluorescent and HID lamps	Removed for recycling
Lithium and nickel cadmium batteries	Removed for recycling
Mercury switches and bulk mercury-containing equipment	Sent to waste facility
Aerosol cans	Sent to waste facility
Solvents	Sent to waste facility

- c. Project-related use/storage of hazardous materials - Describe chemicals/hazardous materials used/stored during construction and/or operation of the project including method of storage. Indicate the number, location and size of any new above or below ground tanks to store petroleum or other materials. Indicate the number, location, size and age of existing tanks on the property that the project will use. Discuss potential environmental effects from accidental spill or release of hazardous materials. Identify measures to avoid, minimize or mitigate adverse effects from the use/storage of chemicals/hazardous materials including source reduction and recycling. Include development of a spill prevention plan.**

Hazardous materials used and stored on-site for Project construction would include diesel fuel storage within the separation and/or dewatering infrastructure (for fueling haul trucks), other hazardous materials would be limited to fuels (diesel/gasoline), lubricant (engine oil), or coolant for equipment/vehicle maintenance. Potential environmental impacts resulting from an accidental spill or release of these hazardous materials may contaminate soil or surface water, and may have deleterious impacts on plants, insects, and animals. Spills would be avoided and mitigated with the implementation of BMPs, such as secondary containment and sediment protections around wetlands and waterbodies. Specific BMPs are detailed in the SPCC.

Within the Project Area, potential contaminants associated with future operations would include fuels (diesel/gasoline), lubricants (engine oil), and coolant and antifreeze for use in equipment and vehicle fueling and maintenance. Potential contaminants or hazardous materials at the TSF are managed as required by the SPCC,

which provides plans and requirements for the storage of petroleum products and the containment and cleanup of spills. The SPCC is updated every 3 years and is certified by a licensed professional engineer.

The Project would have a maintenance facility for trucks, as well as a fuel storage facility, associated with the separation and and/or dewatering infrastructure (Figure 6.6). The maintenance facility would likely be a two-bay small facility used only for preventative maintenance and small repairs. The second bay would be used for fueling purposes.

- d. **Project-related generation/storage of hazardous wastes - Describe hazardous wastes generated/stored during construction and/or operation of the project. Indicate method of disposal. Discuss potential environmental effects from hazardous waste handling, storage, and disposal. Identify measures to avoid, minimize or mitigate adverse effects from the generation/storage of hazardous waste including source reduction and recycling.**

The Project would not generate or require storage of hazardous wastes during construction or operation.

14. Fish, wildlife, plant communities, and sensitive ecological resources (rare features):

- a. **Describe fish and wildlife resources as well as habitats and vegetation on or in near the site.**

Existing Wildlife

Wildlife, including mammals, birds, fish, reptiles/amphibians, and invertebrates, may be present within the Project Area. Table 14.1 includes non-protected species with potential to occur.

Table 14.1: Non-Protected Wildlife Species with Potential to Occur Within the Project Area

	Common Name	Scientific Name
Mammals	Beaver	<i>Castor canadensis</i>
	Black Bear	<i>Ursus americanus</i>
	Bobcat	<i>Lynx rufus</i>
	Coyote	<i>Canis latrans</i>
	Fisher	<i>Pekania pennanti</i>
	Mink	<i>Neovison vison</i>
	Pine Marten	<i>Martes martes</i>
	Red Fox	<i>Vulpes vulpes</i>
	Red Squirrel	<i>Tamiasciurus hudsonicus</i>
	Snowshoe Hare	<i>Lepus americanus</i>
	White-Tailed Deer	<i>Odocoileus virginianus</i>
Birds	Belted Kingfisher	<i>Megasceryle alcyon</i>
	Common Snipe	<i>Gallinago gallinago</i>
	Great Blue Heron	<i>Ardea herodias</i>
	Killdeer	<i>Charadrius vociferus</i>
	Peregrine Falcon	<i>Falco peregrinus</i>
	Ruffed Grouse	<i>Bonasa umbellus</i>
	Sharp-tailed Grouse	<i>Tympanuchus phasianellus</i>
	Swamp Sparrow	<i>Melospiza georgiana</i>

	Common Name	Scientific Name
Fish	Bluegill	<i>Lepomis macrochirus</i>
	Black Crappie	<i>Pomoxis nigromaculatus</i>
	Largemouth Bass	<i>Micropterus salmoides</i>
	Northern Pike	<i>Esox lucius</i>
	Rock Bass	<i>Ambloplites rupestris</i>
	Walleye	<i>Sander vitreus</i>
Reptiles/Amphibians	Bullfrog	<i>Lithobates catesbeianus</i>
	Common Garter Snake	<i>Thamnophis spp.</i>
	Gray Treefrog	<i>Dryophytes versicolor</i>
	Northern Leopard Frog	<i>Lithobates pipiens</i>
	Painted Turtle	<i>Chrysemys picta</i>
	Redbelly Snake	<i>Storeria occipitomaculata</i>
	Snapping Turtle	<i>Chelydra serpentina</i>
Invertebrates	Dark Fishing Spider	<i>Dolomedess pp.</i>
	Tricolored Bumblebee	<i>Bombus ternarius</i>

Source: MNDNR 2010

Existing Vegetation Conditions

North America is divided into ecoregions of similar environmental characteristics that contribute to the natural vegetation in the area, such as geology, vegetation, climate, soils, land use, wildlife, and hydrology (USEPA 2023). The Project Area occurs in the Northern Lakes and Forests Level III Ecoregion of the United States (USEPA 2013). The Northern Lakes and Forests ecoregion is characterized by its humid continental climate (warm summers and severe winters) with no marked dry season. Vegetation is dominated by coniferous and northern hardwood forests (maple, birch, spruce, fir, and pine) with black spruce, tamarack, and northern white cedar in wetter and cooler areas. This region also has widespread wetlands.

Within Minnesota, four provinces have been defined based on the major climate zones, native vegetation, and biomes. Within the provinces, sections and subsections are defined by glacial deposit origins, regional elevation, plant distribution, and regional climate. Under Minnesota's Ecological Classification System, the ecoregion corresponds to the Northern Superior Uplands section of the Laurentian Mixed Forest Province (MNDNR undated).

The Project Area is located within the Nashwauk Uplands Subsection (212Lc), with medium-to-coarse textured soils, forest communities of white pine, red pine, balsam fir, white spruce, and aspen-birch. Historically, this region was comprised of red and white pine forests, with aspen, paper birch, spruce, and balsam fir. Logging in the late 1800s and early 1900s left forests dominated by quaking aspen and paper birch, with jack pine present in droughty and exposed bedrock and sandy outwash areas (MNDNR undated). Peatlands and wet forests are present within broader upland forest areas. Additionally, the Stage 2 Exterior was anthropogenically disturbed prior to TSF development.

Existing Aquatics

There are five lakes and five streams in or immediately downstream of the Project Area, as shown in Tables 14.2 and 14.3. These waterbodies are home to a variety of fish species (MNDNR 2010). The DNR prepares Lake Management Plans for lakes that are actively managed for fishing and recreational activity. Each plan provides a summary of the fish population assessments conducted on the lake, fisheries management information such as

stocking reports, historical background, and future management plans. Of the lakes evaluated in this assessment, lake management plans were available for Swan Lake. In the absence of a lake management plan, information about the fisheries resources, aquatic habitat, and recreational uses for the other lakes are limited. As a result, the discussion of potential impacts to these lakes is general. However, based on similarities between some of the lakes and on other sources of information available, reasonable inferences can be made on fish resources and aquatic habitat.

Five lakes occur downstream of the Project Area: Swan Lake, Hay Lake, Reservoir No. 2, Reservoir 2 North, and Reservoir No. 6. Their distances from the Project Area are shown in Table 14.2. Descriptions of these waterbodies can be found in Item 12. The lakes are home to littoral, benthic, and pelagic species, such as walleye, northern pike, black crappie, pumpkinseed, rock bass, yellow perch, white sucker, brown bullhead, bluegill, and largemouth bass (MNDR 2010).

Table 14.2: Lake Distances from the Project Area

Lake	Distance from Project Area (miles)
Hay Lake	3.4
Reservoir No. 6	0
Reservoir No. 2	0
Reservoir 2 North	0
Swan Lake	4.1

Five streams occur downstream of the Project Area: Hay Creek, Swan River, West Swan River, the O'Brien Diversion Channel, and Welcome Creek. Their distances from the Project Area are shown in Table 14.3. Descriptions of these streams can be found in Item 12. These streams contain fish, such as largemouth bass, northern pike, black crappie, pumpkin seed, yellow perch, and rock bass (MNDNR 2010).

Table 14.3: Stream Distances from the Project Area

Stream	Distance from Project Area (miles)
Hay Creek	0
O'Brien Diversion Channel	0.4
Swan River	6.6
Welcome Creek	0
West Swan River	0

- b. Describe rare features such as state-listed (endangered, threatened or special concern) species, native plant communities, Minnesota Biological Survey Sites of Biodiversity Significance, and other sensitive ecological resources on or within proximity to the site. Provide the license agreement number (LA-1051) and/or correspondence number (MCE2023-00649) from which the data were obtained and attach the Natural Heritage Review letter from the DNR. Indicate if any additional habitat or species survey work has been conducted within the site and describe the results.**

The Minnesota DNR completed a NHIS review under MCE 2023-00649 (Appendix C). According to the DNR, state-listed plant species with the potential habitat in and documented near the Project Area are shown in Table 14.4.

Table 14.4: State-listed Plant Species with Potential Habitat in and Documented near the Project Area

Common Name	Scientific Name	State Status ^a	Federal Status
Tuberclad Rein Orchid	<i>Platanthera flava</i> var. <i>herbiola</i>	T	No Status
St. Lawrence Grapefern	<i>Botrychium rugulosum</i>	SC	No Status

Source: MN NHIS 2024

^a State Status Codes: T = threatened; SC = Special Concern

In July of 2022, a rare plant survey was conducted in the proposed dam/dike footprint. No state-listed threatened or endangered species were identified during the survey, however a species of special concern, *Botrychium (Sceptridium) rugulosum* was found (Barr 2022). In November of 2023, the DNR provided concurrence based on their review of the 2022 rare plant survey and determined that no state-listed threatened or endangered species were likely to be in the dam/dike footprint, and that a take permit would not be warranted. In April of 2024, U. S. Steel requested concurrence from the DNR to confirm that no additional rare plant surveys are warranted in all other portions of the Project Area. DNR determined that an additional field survey is needed. The additional survey would be conducted from late June to early July in 2026.

The USFWS protects special species on the federal level under the Endangered Species Act. To assess the potential for federally listed species to occur in the Project Area, an Information for Planning and Consultation review was conducted. Table 14.5 lists federal and state-listed species with potential to occur in the Project Area.

Table 14.5: Federal and State-Listed Species with Potential to Occur in the Project Area

Common Name	Scientific Name	State Status ^a	Federal Status ^b	Suitable Habitat in the Project Area	Habitat Description in Minnesota
Canada Lynx	<i>Lynx canadensis</i>	none	LT	Yes	Canada Lynx are primarily found in the Arrowhead region of Minnesota. They travel and hunt between patches of boreal and mixed conifer-hardwood forest. They particularly favor boreal forests that have a high-density of snowshoe hare. Den sites that offer thermal cover such as large areas with downed logs and woody debris are preferred.
Gray Wolf	<i>Canus lupus</i>	D	LT	Yes	Although this species prefers large areas of contiguous forest, they are habitat generalists, therefore they are dependent on prey availability (e.g. deer and hare) rather than land cover. Their den sites are typically located near the core of their territories and are surrounded by upland trees and close to lowland shrubs. Dens may vary from a dug-out burrow, a hollow log, to an overturned tree.
Monarch Butterfly	<i>Danaus plexippus</i>	none	PT	Yes	Preferred habitats include fields, meadows, parks, and other open areas where milkweed, native plants, and breeding season nectar sources are located.
Northern Long-eared Bat	<i>Myotis septentrionalis</i>	SC	LE	Yes	This species overwinters in natural caves or mines and spends the rest of the year in forested habitats. Preferred sites consist of minimal airflow, high humidity levels, and constant temperatures. In the summer, NLEB occupy any dead or live tree with cavities or crevices greater than 3 inches diameter. They tend to roost and forage in wooded habitats with a variety of densities and canopy closures and seem to travel in intact forest with sparse to medium vegetation density. However, they may travel and forage in areas with adjacent wetlands and agricultural areas.
Suckley's Cuckoo Bumble Bee	<i>Bombus suckleyi</i>	none	PE	Yes	This species has been found in various habitat types including prairies, grasslands, meadows, woodlands, boreal forests, urban areas, and agricultural areas. The Suckley's Cuckoo Bumble Bee relies on other <i>Bombus</i> species to rear their young and they are dependent on other species' colonies for survival.
Tricolored Bat	<i>Permyotis subflavus</i>	SC	PE	Yes	In general, this species prefers mesic hardwood forest, fire dependent forest, and subterranean habitats. In the winter, these bats occupy mines, tunnels, and caves where airflow is minimal, the temperature and humidity are constant. In the summer, the bats roost in trees, and some even in their winter hibernaculum. They forage over water and avoid open fields and deep woods.

^a State Status Codes: D = delisted; SC = special concern

^b Federal Status Codes: LE = listed endangered; LT = listed threatened; PE = proposed endangered; PT = proposed threatened

Source: MN NHIS 2024; MNDNR 2018a, b; MNDNR 2024a, b, c, d

There are no native plant communities within the Project Area. The nearest native plant community is 4.9 miles south of the Project Area.

The Project Area is not included in the Minnesota Biological Survey area. In general, northeastern Minnesota has areas of outstanding, high, and moderate biodiversity significance (MNDNR 2014).

Wild rice (*Zizania palustris*) an important aquatic plant found throughout Minnesota, providing food for waterfowl, as well as cultural and economic benefits to many Minnesotans is present in three waterbodies downstream of the Project Area – Swan Lake, Swan River, and Hay Lake. These are shown in Figure 14.1.

A wild rice and stream survey conducted by MNDNR in 2009 found approximately three acres of wild rice in medium to abundant density in Hay Lake; the crop appeared severely damaged and likely not harvestable. In Hay Creek, wild rice was found to be abundant at the outlet of Hay Lake becoming increasingly sparse and unhealthy further downstream except for a moderately dense 200-foot section between 0.6 and 0.8 mile downstream of the lake. Based on survey results wild rice health in this area is likely affected by increased water levels and elevated sulfate concentrations in the lake.

- c. **Discuss how the identified fish, wildlife, plant communities, rare features and ecosystems may be affected by the project including how current Minnesota climate trends and anticipated climate change in the general location of the project may influence the effects. Include a discussion on introduction and spread of invasive species from the project construction and operation. Separately discuss effects to be known threatened and endangered species.**

Wildlife

Project construction would cause both temporary and permanent loss of habitat. This loss of habitat, along with the noise of construction, could potentially drive species from the area. The disturbance of soil may increase erosion, which could further deteriorate habitat. For common wildlife species, impacts to populations would be expected to be minor. Tree clearing would result in a loss of forested habitat, causing a loss of nesting habitat for some migratory birds, which could result in impacts to populations at a local level.

Additionally, construction vehicles could introduce invasive species through either introduced materials or attachment to vehicles and workers. Mortality or injury could also occur to individual animals impacted by unintended vehicle strikes.

Potential Impacts to Federal listed Species

Canada lynx. If Canada lynx were to occur in the Project Area, potential effects could include temporary noise and/or physical disturbance of habitat from construction activities. As a result, disturbance may prompt lynx to vacate the area for a short period. However, because the lynx is a highly mobile species that may disperse long distances (movements can be greater than 60 miles) (Mowat et al. 1999), lynx may move away from the local area of disturbance for a short period and may begin using the area again shortly after cessation of activities. Apart from the construction of the separation and/or dewatering infrastructure, the Project largely represents augmentation and continued operation of an existing operating TSF. Therefore, construction is unlikely to impede lynx movement and displace individuals.

Studies demonstrate that lynx may tolerate daily human use and presence in an area (Mowat et al. 1999). As the Project Area is near an already existing mine and contains a TSF which are disturbed, it is unlikely that Project operations would result in a major impact on lynx. Along with the patchy nature of suitable lynx habitat in the Project Area, the prevalence of similar habitat in adjacent areas, the mobility of lynx, and their large home ranges, impacts to lynx or lynx populations are not expected.

Gray wolf. Noise or physical disturbance because of Project construction may prompt wolves to vacate the area for a short period. However, because the wolf is a mobile species, it is anticipated that any wolf would move away from the local area of disturbance and may begin using the space again shortly after cessation of activities. Apart from the construction of the separation and/or dewatering infrastructure, the Project largely represents augmentation and continued operation of an existing operating TSF. Therefore, construction is unlikely to impede wolf movement and displace individuals. If it does, the impact would be minimal and temporary.

Humans and human activities are the primary cause of wolf mortality, vehicle collision being a primary source. Although driving alert during operation would be advised when transporting throughout the area (e.g., maintenance activities), it is unlikely that a wolf would be harmed by a vehicular traffic due to their infrequent occurrence in the Project Area, the continued disturbance of the Project Area, and lack of collisions in the past. Project operations could have a minor effect on wolves through increased disturbance that would result in wolves avoiding the Project Area; however, this effect is expected to be minor because the Project Area has been and continues to be disturbed.

Monarch butterfly. The Project may temporarily impact habitat, including nectar-bearing wildflowers, on which adult monarch butterflies might feed. Project construction activities also create an opportunity for introducing and spreading noxious weeds and invasive plant species within the Project Area. Noxious weeds and invasive plants can outcompete native forbs that provide food and/or sources for egg laying for the monarch butterfly. Weed control measures and treatment methods may be incorporated into the Project to reduce the threat of introducing or spreading noxious weeds and invasive plant species within the Project Area. With the proposed mitigation measures, construction would not jeopardize the continued existence of the species.

Visual or physical disturbances from the physical presence of people, maintenance activities, and moving vehicles may impact the monarch butterfly. The disturbance could cause individuals to move from resting/nectaring locations or alter the flight paths of adults. However, given the amount of available habitat adjacent to the Project Area, operations would not jeopardize the continued existence of the monarch butterfly.

Northern long-eared bat. Project impacts could occur if construction activities were to displace roosting or foraging bats from nearby habitats due to increased noise and human activity in the area. Bats would likely move to surrounding undeveloped treed areas surrounding the Project Area. There are large, forested habitats in the vicinity of the Project Area, along with small patches of trees along riparian corridors, which could provide suitable roosting trees. To minimize impacts to the NLEB, all tree clearing would occur outside of roosting season (which extends from April 14 to November 1).

During operations, human activity, noise, and vibration from operations may occasionally disturb NLEB habitat and nearby roosting sites. However, this effect is expected to be minor as the Project Area is already disturbed.

Tricolored bat. Impacts could occur if construction activities were to displace roosting or foraging bats from nearby habitat due to increased noise and human activity in the area. Bats would likely move to surrounding undeveloped treed areas surrounding the Project Area. There are large, forested habitats in the vicinity of the Project Area, along with small patches of trees along riparian corridors which could provide potentially suitable roosting trees. To minimize impacts to the tricolored bats, all tree clearing would occur outside of roosting season (which extends from April 14 to November 1).

During operations, human activity, noise, and vibration from operation activities may occasionally disturb tricolored bats habitat and nearby roosting sites. However, this impact is expected to be minor as the Project Area is disturbed. Therefore, operation would not jeopardize the continued existence of the tricolored bat.

Suckley's Cuckoo Bumble Bee. Impacts to the Suckley's Cuckoo Bumble Bee would be similar to those of the Monarch Butterfly as construction activities would temporarily remove flowering plants that the bees rely on for nectar and pollen. Project Construction could introduce invasive species and noxious weeds that could outcompete native species and reduce forage. Ground disturbances during construction may remove the nests of

other *Bombus* species that the Suckley's Cuckoo Bumble Bee rely on. Weed control measures and treatments may be incorporated into the Project to reduce the spread of invasive species and reduce impacts. There is suitable habitat within the vicinity of the Project Area and nests may relocate outside of the Project Area. Construction would not jeopardize the continued existence of the species Suckley's Cuckoo Bumble Bee.

During operations, the physical presence of people, maintenance activities, and moving vehicles may impact the Suckley's Cuckoo Bumble Bee. The bee may alter flight paths and change foraging patterns in response to the disturbance. Suitable habitat is found within the vicinity of the Project Area and the Project operations would not jeopardize the continued existence of the Suckley's Cuckoo Bumble Bee.

State-listed Species

The 2022 survey did not result in observations of state-listed plant species within the surveyed area (the dam/dike footprint), thus impacts to state-listed are not expected within this area. Surveys are proposed to occur in 2026 in areas that have not been previously surveyed.

Aquatic Species

Construction of the proposed dam would directly impact Reservoir No. 6, both temporarily and permanently. Construction activities have the potential to adversely impact fish populations through loss of habitat and the spawning area along the eastern side of the reservoir, where dam construction would occur. The construction in the waterbody could cause an increase in turbidity through the disturbance and introduction of sediment, which can reduce gill function, degrade spawning beds, and decrease lake productivity (MPCA 2008). The connected lakes and streams could be indirectly affected during construction of the proposed dam because of temporary increase in turbidity downstream of Reservoir No. 6.

The Hay Creek watershed would also be directly impacted as construction would likely cause the loss of habitat at the headwaters of the creek. Relative to the total watershed, the impacted area would be small. This could also cause a temporary increase in turbidity that could negatively affect fish downstream.

General operations of the Project would be consistent with existing operations at the TSF. There are no proposed water appropriations, or new discharges, and the overall water balance or water quality at the TSF is not expected to change from pre-existing conditions.

Vegetation

Project construction would require vegetation clearing in both temporary and permanent impact areas, which would result in an overall loss of vegetated areas. Any potential impacts to vegetation during operations would be limited to potential localized dust cover, or vegetation maintenance to keep rights-of-way and work areas clear and safe.

Invasive Species

It is possible that construction vehicles could introduce invasive species through either introduced materials or attachment to vehicles and workers.

Minnesota Climate Trend

The Project would have a direct and unavoidable impact on vegetation and less mobile species within the Project Area. Increased activity at the Project Area may further deter some wildlife species from the site.

The climate within the Project Area is projected to become warmer and wetter. This could help minimize dust at the site, could offset the impact of the relatively small loss in watershed to downstream flows.

Closer planning will consider climate trends in determining appropriate seed mixes and revegetation planning.

Overall, the effects of the Project are unlikely to be exacerbated by climate change.

- d. Identify measures that will be taken to avoid, minimize, or mitigate the adverse effects to fish, wildlife, plant communities, ecosystems, and sensitive ecological resources.**

Wildlife

All vegetation clearing (including tree clearing) would occur in the winter to avoid the nesting bird and roosting bat seasons.

Impacts to habitats would be mitigated for by the replanting of vegetation in temporary construction areas. To mitigate for potential increases in erosion, soil control devices would be installed, and topsoil conservation methods would be implemented. In addition, accidental spills of oil or mechanical fluid could negatively impact species in the Project Area. Any spilled fluids would be cleaned up and a containment/prevention plan would be implemented. To minimize impacts to bats, all tree clearing would occur outside of roosting season (which extends from April 14 to November 1).

Vehicle collisions with wildlife can be mitigated with alert driving.

Aquatic Species

Changes in turbidity due to construction activities would likely be temporary and would decrease again once construction ceases. Additionally, a silt curtain would be installed to protect the western portion of the reservoir. The eastern portion of the reservoir, where permanent impacts would occur, would be stacked with rock prior to the placement of tailings to minimize potential impacts to aquatic habitats and water quality.

By implementing erosion control measures, impacts would not substantially impact water quality downstream of Reservoir No. 6.

Vegetation and Invasive Species

Upon construction completion, temporary construction areas would be returned to pre-construction contours to the extent practicable. Temporary erosion control measures would be implemented during construction and disturbed areas would be seeded with a native seed mix and/or would return to a permanent vegetated state naturally.

The spread of invasive species could be prevented or minimized by inspecting vehicles, clothing, and equipment before moving to new sites. In addition, sourcing vehicles and equipment locally could minimize the likelihood of introduction. Vehicles used for Project construction would be existing Keetac facility equipment. Additionally, the added material used in the construction would be sourced locally to prevent the introduction of invasive species.

Per the conditions of the Project's Dam Safety Permit (No. 2022-0721), all equipment used must be free of prohibited invasive species and aquatic plants prior to being transported into or within the state and placed into state waters. All applicable conditions pertaining to equipment would be adhered to. Minnesota Rules Chapter 6130 requires the reclamation of mined lands following completion of mining activities. Reclamation requirements include re-establishment of vegetation in areas disturbed by mining activities.

Wild rice

Any potential impact on wild rice would be associated with changes to water conditions. The Project is not anticipated to affect the overall water balance or water quality at the TSF. Downstream waterbodies are not expected to experience substantial change from pre-existing conditions.

15. Historic properties:

Describe any historic structures, archaeological sites, and/or traditional cultural properties on or near the site. Include: 1) historic designations, 2) known artifact areas, and 3) architectural features. Attach letter received from the State Historic Preservation Office (SHPO). Discuss any

anticipated effects to historic properties during project construction and operation. Identify measures that will be taken to avoid, minimize, or mitigate adverse effects to historic properties.

U. S. Steel sponsored a Cultural Resource Literature Review (In Situ, 2021) to inform this phase in 2021. In June 2025, U. S. Steel reviewed the Minnesota Statewide Historic Inventory Portal (MnSHIP) and Office of the State Archaeologist Portal (OSA) public maps to note any additions to these databases since 2021, with focus on areas proposed for direct impacts. No cultural resources surveys have been conducted for the Project.

No archaeological sites, historic structures, or historic districts are located within the project area. One archaeological site has been identified east of the Project boundary, and has not been evaluated for inclusion on the National Register of Historic Places (NRHP). The TSF has not been identified as historical property that has been evaluated for eligibility for under the NRHP.

Operations would not impact the archaeological site or any other known archaeological or historic structure sites since all operational activities would occur within the interior portion of the dams and dikes.

Since no archaeological sites, historic structures, or historic districts are within the project area, no impacts to such resources are anticipated during Project construction or operations. Accordingly, no avoidance, minimization, or mitigation of effects are expected. Although unanticipated finds are unlikely given land use history within the phase construction footprint, the inadvertent discovery of heretofore unknown cultural resources or human remains is possible. In the event of inadvertent discovery of a cultural resource, U. S. Steel would adhere to state and federal requirements to identify cultural resources, assess Project impacts, and develop treatment plans to avoid, minimize, or mitigate adverse impacts to such resources. Should human remains be identified, U. S. Steel would advise the applicable county sheriff and the Office of the State the OSA, in accordance with the Private Cemeteries Act (MS 307.08). This coordination is consistent with the (expired) 2012 Programmatic Agreement.

16. Visual: Describe any scenic views or vistas on or near the project site. Describe any project-related visual effects such as vapor plumes or glare from intense lights. Discuss the potential visual effects from the project. Identify any measures to avoid, minimize, or mitigate visual effects.

The visual assessment uses above mean sea level (AMSL) to be consistent with the digital elevation model (DEM) analysis documented in the 2010 Final EIS. The Project Area is located approximately 0.75 mile south of Trunk Highway 169. The Stage 2 Interior dike crest ranges between 1,553 and 1,580 feet AMSL. The Stage 2 Exterior dike crest is currently approximately 1,470 feet AMSL in the south and west, and approximately 1,500 feet AMSL in the east. The perimeter dikes do not extend to the north of the TSF because the natural topography is higher in this area and provides a natural barrier for tailings.

Topography within the TSF generally slopes downhill in the southern, western, and eastern portions of the site, and slightly upward in the north. The entire Project Area is surrounded with forested vegetation. Currently, the TSF is visible from Highway 169, the City of Keewatin, and several surrounding residences. From these vantage points, the TSF appears as a large man-made hill with vegetated (grassy) slopes. The TSF has been present at this location and slowly growing since the 1960s. The area has an extensive mining history and several other mine related areas (pits, waste rock stockpiles, TSFs) exist throughout the iron range.

Construction Impacts and Mitigation

Due to the vegetative buffer around the Project Area and the presence of the existing TSF, visual impacts during the construction period are not anticipated. The construction of the separation and/or dewatering infrastructure is not anticipated to impact the general aesthetic of the area. As such, mitigation is not proposed.

Operations Impacts and Mitigation

A DEM analysis was completed as part of the 2010 Final EIS to evaluate visual impacts to the surrounding landscape. In 2010, the Stage 2 Interior dike stood at approximately 1,530 feet in height with an annual elevation increase of approximately 2.7 feet per year and an anticipated final height of 1,612 feet by 2036. The 2010 visual impacts analysis modeled visual impacts to locations surrounding the TSF at the final height of the 2010 project (1,612 feet). Locations evaluated for visual impacts in the 2010 Final EIS included: the northwest and west shore of Swan Lake; north and south points in the City of Nashwauk; the northwest, northeast, southwest, and southeast corners of the City of Keewatin; the intersection of Old Highway 169 and Highway 169; and points around Kelly Lake along West Swan River (Figure 16.1). The DEM evaluated whether the TSF would be visible from these locations using 1,554 and 1,612 feet as reference heights for the TSF and using a worst-case scenario methodology that disregarded vegetative and other visual buffers, which accounted solely for elevation in assessing the visual impact (MNDNR 2010).

The Project would raise the elevation of the Stage 2 Exterior dike by approximately 70 to 110 feet, which would be 5 feet less than the final Stage 2 Interior height, at approximately 1,580 feet. Since Stage 2 Exterior is immediately adjacent to the Stage 2 Interior, and the 2010 visual effects analysis included visual impacts from elevations higher than what are proposed for this Project, the results from that study provide a conservative estimate of the visual effects of the Project and are listed below in Table 16.1 (MNDNR 2010).

Table 16.1: 2010 FEIS Visual Impacts Analysis

Location	TSF Elevation (feet AMSL)	Approximate Distance from TSF (miles)	Visible (Yes/No)
NW Keewatin	1,554	2.9	Yes
	1,612		Yes
South Kelly Lake Development	1,554	3.4	Yes
	1,612		Yes
Southeast Keewatin	1,554	2.1	No
	1,612		Yes
Central Kelly Lake Development	1,554	3.6	No
	1,612		No
Intersection of Old Highway 169 and Highway 169	1,554	2.1	No
	1,612		No
Hull Rust Mine View	1,554	7.2	No
	1,612		No
Northeast Keewatin	1,554	2.5	No
	1,612		No
North Kelly Lake Development	1,554	4.3	No
	1,612		No
North Nashwauk	1,554	5.8	No
	1,612		No
Swan Lake (northwest shore)	1,554	7.6	No
	1,612		No
South Nashwauk	1,554	5.6	No
	1,612		No

Location	TSF Elevation (feet AMSL)	Approximate Distance from TSF (miles)	Visible (Yes/No)
SW Keewatin	1,554	2.7	No
	1,612		No
Swan Lake (west central shore)	1,554	8.0	No
	1,612		No

Based on the visual impacts analysis, the TSF is visible at its current elevations from the northwestern portion of the City of Keewatin and the South Kelly Lake Development. The TSF would also be visible in southeastern portions of the City of Keewatin at the assessed height of 1,612 feet (the Project would not reach this height).

The Project would progressively increase the elevation of the Stage 2 Exterior by 70 to 110 feet over the course of 40 years to the ultimate height of 1,580 feet. A comparison of the planned Stage 2 Exterior height to the existing Stage 2 Interior is shown in Table 16.2.

Table 16.2: Current, Authorized, and Proposed Elevations of Stage 2 Interior and Exterior

Perimeter	Current Height (feet)	Increase (feet)	Authorized Final Height (feet)	Proposed Project Height (feet)	Increase (feet)
Stage 2 Interior	1,553 and 1,580	5 - 77	1,585	1,585	0
Stage 2 Exterior	1,470 feet in the south and west to 1,500 feet in the east	10	1,470 – 1,510	1,580	70 - 110

During operations, tailings would continue to be deposited into the Stage 2 Exterior, which would only be visible from locations where the TSF is already visible. It may become visible in southeast Keewatin as it reaches the proposed height of 1,580 feet; however, the proposed height is lower than the height assessed in the 2010 Final EIS which concluded no significant impact. As a result, no major operational impacts to visual resources are anticipated. Upon closure, the TSF would be reclaimed, which would involve further revegetation and consideration for safety, land use and aesthetics.

17. Air

- a. **Stationary source emissions - Describe the type, sources, quantities and compositions of any emissions from stationary sources such as boilers or exhaust stacks. Include any hazardous air pollutants, criteria pollutants. Discuss effects to air quality including any sensitive receptors, human health or applicable regulatory criteria. Include a discussion of any methods used to assess the project's effect on air quality and the results of that assessment. Identify pollution control equipment and other measures that will be taken to avoid, minimize, or mitigate adverse effects from stationary source emissions.**

The Project would use mobile generators for lighting nighttime work. The Project would not have any other stationary source emissions; no mitigation is proposed to offset emissions from the use of the mobile generators. It is anticipated there would be a reduction in exposed beach areas due to changes in deposition of tails, and wind velocities across exposed areas would be reduced during operations resulting in fewer fugitive dust emissions.

- b. **Vehicle emissions - Describe the effect of the project's traffic generation on air emissions. Discuss the project's vehicle-related emissions effect on air quality. Identify measures (e.g., traffic operational improvements, diesel idling minimization plan) that will be taken to minimize or mitigate vehicle-related emissions.**

Air quality impacts from vehicle emissions are expected for this Project from vehicular traffic, construction equipment, logging equipment, coarse tailings haul trucks and water trucks. Approximately 10 employees are anticipated to be hired for the construction of the Project. This would nominally increase the number of vehicle-related emissions in the area. Project emissions from construction equipment would be minimal. Construction equipment would be operated on an as-needed basis, and efforts would be made to maintain the equipment in accordance with the manufacturer's recommendations to minimize equipment emissions. Excavation equipment, vehicles, and other mobile sources may be powered by ultralow sulfur diesel or gasoline engines that are sources of combustion-related emissions, including the criteria pollutants (NO_x, CO, VOCs, SO₂, PM₁₀, and PM_{2.5}) and a minimal number of Hazardous Air Pollutants (HAPs).

Project emissions from operations would be generated by the 24-hour operation of four haul trucks, a water truck, and mobile generators used to provide portable lighting.

U. S. Steel would encourage carpooling and efficient construction time to limit emissions. Haul trucks and other construction equipment would be maintained to avoid additional emissions.

- c. Dust and odors - Describe sources, characteristics, duration, quantities, and intensity of dust and odors generated during project construction and operation. (Fugitive dust may be discussed under item 17a). Discuss the effect of dust and odors in the vicinity of the project including nearby sensitive receptors and quality of life. Identify measures that will be taken to minimize or mitigate the effects of dust and odors.**

Fugitive dust emissions from wind erosion and material movement caused by land clearing and excavation activities would also likely result from construction activities. The amount of fugitive dust generated would depend on multiple factors, including the duration and type of construction activity, moisture content and nature of material that would be disturbed, wind speed and frequency of precipitation, and the area of disturbance. Fugitive dust emissions during construction and operation would be controlled by water application, dust suppressant application, access road maintenance, and by limiting vehicular and equipment speeds on access roads and in the right-of-way. Fugitive dust control measures are discussed in U. S. Steel's Fugitive Dust Plan which would be updated to reflect actions to minimize fugitive dust from dam construction, including but not limited to the addition of water on haul roads utilized by the haul trucks and reclamation of inactive areas. The deposition of the coarse tails via haul truck is not likely to be a source of fugitive emissions as the coarse tailings are high in moisture content.

18. Greenhouse Gas (GHG) Emissions/Carbon Footprint

- a. GHG Quantification: For all proposed projects, provide quantification and discussion of project GHG emissions. Include additional rows in the tables as necessary to provide project-specific emission sources. Describe the methods used to quantify emissions. If calculation methods are not readily available to quantify GHG emissions for a source, describe the process used to come to that conclusion and any GHG emission sources not included in the total calculation.**

Greenhouse gas emissions associated with the Project consist of direct emissions from mobile equipment used during construction, land use changes, and from the haul trucks used to deposit coarse tails during operation. The separation and tailings dewatering infrastructure would generate indirect scope 2 emissions from electricity use.

Emissions were calculated for on-road and off-road equipment proposed to be used in both the construction and operations. Off-road vehicles used for construction would be excavators, loaders, graders, haul trucks, and a water truck. This equipment utilizes AQMD's *Off-road Mobile Source Emission Factors* to determine emission rates for criteria pollutants and GHGs. Expected engine loads were applied to more accurately represent the emissions associated with the Project. On-road vehicles used during construction and operations would be trucks

used for transportation of workers. Four trucks were used to calculate the emissions for construction with an assumed driving distance of 100 miles per day and averaging 20 miles per gallon.

Equipment needed for the construction phase would be logging equipment used in vegetation clearing, and mobile generators used to provide nighttime lighting (assumed 12 hours per day). The logging equipment was assumed to be 8 gasoline powered chainsaws using 3 gallons per day, and 3 large feller bunchers using 90 gallons of fuel per day. This equipment utilizes fuel usage and 40 CFR Part 98 Subpart C's tables C-1 and C-2 to determine GHG emissions (40 CFR § 98).

During operation, five 150-ton haul trucks would carry coarse tailings from the separation and/or dewatering infrastructure and deposit them along the TSF, with a sixth not running and on standby. A water truck would be used during operation to suppress dust in summer months (assumed six months of operation).

Scope 2 emissions would be generated from the operation of the separation and tailings dewatering infrastructure. A list of equipment associated with Project operations was used to estimate power demand. U.S. eGrid emission factors were used to convert that electric demand to emissions (USEPA 2024).

The construction of the separation and tailings dewatering infrastructure, dams and dikes, and other permanent infrastructure would permanently alter existing land cover including forests, wetlands, and shrub/scrub areas (Table 8.1 and Figure 8.1). The alteration of these land types would remove a carbon sink. Land cover is based on the NLCD (refer to section 8). Emission factors for the GHG emissions from land use conversion are based on the values found in the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC 2024).

Emissions of CO₂ from developed areas are calculated based on IPCC 19R V4 Ch02 Generic Methods Table 2.2. CO₂ is generated from burning litter and dead wood when clearing the land for development. Emission factors are given in total carbon, which has to be converted to CO₂ by multiplying the molecular weight of CO₂ (44) and dividing by the molecular weight of elemental carbon (12). The amount of litter and dead wood depends on land type, so each type of land developed by the Project was attributed to one of the available Emission Factors and multiplied by acreage to find total carbon cleared. IPCC recommends annualizing construction emissions evenly over a 20-year period.

It is assumed that methane emissions would result from anaerobic digestion of carbon stored in the existing Stage 2 Exterior tailings area as this area becomes more flooded and covered with tailings. The emission factor selected is from IPCC 19R V4 Ch07 Wetlands Table 7.15 for Cool Temperate areas and are given in units of kg CH₄ per hectare per year. The emission factor was multiplied by the area of flooded land (covered by tailings) to determine total annual emission value, which is multiplied by 20 (years) to determine the emissions of methane over the same 20-year period as the CO₂ emissions from clearing the land (per IPCC). Note that this is a conservative approach to methane emissions given the Stage 2 Exterior is already impacted by tailings and deposition of additional tailings may suppress the anaerobic digestion of any residual carbon in the footprint compared to "flooding" that the emissions factor assumes (the majority of the Stage 2 Exterior is mapped as barren land per Figure 8.1).

The following tables provide estimations GHG generated by the construction and operations of the Project (Tables 18.1 and 18.2). The values in Table 18.2 are reported as short tons of CO₂e emissions per year of operation and include the annualized emissions from table 18.1 because those annualized emissions would be occurring during both construction and operational periods. All emissions reported in both tables follow the general methods from Minnesota's 2024 EAW *Climate Guidance*, such as including IPCC 4th Assessment report GWPs, sources required to be included, and all applicable GHGs. Other specific resources were utilized in calculating these emissions and are noted in the tables.

Table 18.1: Estimated Construction Emissions

Scope	Type of Emission	Emission Sub-Type	Project-Related CO ₂ e Emissions (tons/year)	Calculation Method(s)
Scope 1	Combustion	Diesel non-road Equipment	3,559	AQMD <i>Off-road Mobile Source Emission Factors</i>
Scope 1	Combustion	Logging Equipment	1,198	Fuel usage and 40 CFR Part 98 Subpart C Emission Factors.
Scope 1	Combustion	Passenger Vehicles	71	Fuel usage and 40 CFR Part 98 Subpart C Emission Factors.
Scope 1	Land Use Change	Conversion	4,413	Represents one year of annualized emissions over 20 years from IPCC Guidelines for National Greenhouse Gas Inventories (2019)
TOTAL			9,241	

Table 18.2: Operational Emissions

Scope	Type of Emission	Emission Sub-type	Existing facility CO ₂ e Emissions (tons/year)	Project-related CO ₂ e Emissions (tons/year)	Total CO ₂ e Emissions (tons/year)	Calculation method(s)
Scope 1	Combustion	Mobile Equipment		71		Fuel usage and 40 CFR Part 98 Subpart C Emission Factors.
Scope 1	Combustion	Non-Road Diesel Equipment		9,790		AQMD <i>Off-road Mobile Source Emission Factors</i>
Scope 2	Off-Site Electricity	Grid-based		45,931		eGRID EFs from MROW area.
Scope 1	Ongoing Land Use	Conversion		4,413		Represents one year of annualized emissions over 20 years from IPCC Guidelines for National Greenhouse Gas Inventories (2019))
Scope 1	Annualized Construction Emissions	Combustion Emissions		178		Annualized emissions over 20 years.
TOTAL				60,383		

b. GHG Assessment**i. Describe any mitigation considered to reduce the project's GHG emissions.**

The project design reduced unnecessary vegetation clearing. Vehicles would be maintained for efficiency and equipment would be running only as needed. No other mitigation measures related to GHG emissions is proposed. U. S. Steel.

ii. Describe and quantify reductions from selected mitigation, if proposed to reduce the project's GHG emissions. Explain why the selected mitigation was preferred.

No additional mitigation measures are proposed.

- iii. **Quantify the proposed projects predicted net lifetime GHG emissions (total tons/#of years) and how those predicted emissions may affect achievement of the Minnesota Next Generation Energy Act (MNGEA) goals and/or other more stringent state or local GHG reduction goals.**

MNGEA requires a statewide 80 percent reduction of greenhouse gas emissions by 2050. The closest interim goal is a 30 percent reduction by 2025. The 2023 biennial greenhouse gas emissions report inventoried state emissions from 2005 to 2020. This report found that GHG emissions declined 23 percent from 2005-2020, and the state is on track to reduce GHG emissions by 2050.

A total of 4,828 tons of GHG emissions from construction equipment would be produced. Additionally, 4,413 tons of GHG would be produced from the land use conversion in the first year. The overall anticipated GHG emissions from construction would be 9,241 tons.

Following construction, the Project is expected to generate 60,383 tons/ year of GHG from operational activities. The 2020 estimate of CO₂e for the state of Minnesota was 137,238,222 tons (MPCA 2023). The 9,241 tons generated by construction and land conversion are 0.01 percent of CO₂e emissions that were emitted in Minnesota in 2020. The 60,883 tons/year generated by operations are 0.045 percent of Minnesota's total state emissions in 2020. While the Project does introduce some additional sources of GHG, these would be partially offset by the reduction in activity at the Stage 2 Interior.

19. Noise

Describe sources, characteristics, duration, quantities, and intensity of noise generated during project construction and operation. Discuss the effect of noise in the vicinity of the project including

1) existing noise levels/sources in the area, 2) nearby sensitive receptors, 3) conformance to state noise standards, and 4) quality of life. Identify measures that will be taken to minimize or mitigate the effects of noise.

Existing Conditions

Mining activities have been occurring at the project location for over 50 years. Long time residents may be accustomed to the sounds caused by normal mining activities within the general area.

Existing Noise Sensitive Areas (NSAs) are located mainly to the east of the Project Area along Highway 73 and North Leighton Road. The NSAs comprise single family residences. The nearest NSA to the Project Area is a single residence located on Karkas Road, approximately 0.18 miles east of the Project Area. An additional NSA is located on Townline Road, approximately 0.25 miles east/northeast of the Project Area. The majority of NSAs are located farther away from the Project Area along Highway 73 and North Leighton Road. Table 19.1 provides a summary of the existing NSAs and the approximate distance to and direction from the Project Area.

Table 19.1: Existing NSAs

NSA	Distance (miles/feet)—Direction from Closest Portion of the Project Area	Distance(miles/feet)—Direction from Farthest Portion of the Project Area
Karkas Road	0.18/950—East	4.17/22,000—Southwest
Townline Road	0.25/1,320—East/Northeast	4.36/23,000—Southwest
Highway 73	0.72/3,800—Southeast	3.79 20,000—Northwest
North Leighton Road	0.76/4,000—East	4.55/24,000—West/Southwest

U. S. Steel would comply with the noise requirements outlined in its air emissions permit. The State of Minnesota recognizes the MPCA as the authority to regulate noise disturbance through the implementation of local noise ordinances (MPCA 2015). The current Minnesota noise standards are in Minnesota Administrative Rules, Part

7030.0040, Subpart 2. Maximum allowable sound levels for various land use categories are provided in Table 19.2.

Table 19.2: Minnesota Noise Standards

Noise Area Classification	Daytime		Nighttime	
	L10 (dBA)	L50 (dBA)	L10 (dBA)	L50 (dBA)
1 (Residential)	65	60	55	50
2 (Retail, commercial, recreational)	70	65	70	65
3 (Industrial and agricultural)	80	75	80	75

Source: Minnesota Rules 7030.0040, Subpart 2 (2003)

The state standard evaluates noise via L_{10} and L_{50} sound levels. These parameters represent the sound levels that are exceeded 10 percent and 50 percent of the time, respectively. The L_{50} is often considered comparable to the L_{eq} (equivalent sound level), which is a more widely recognized parameter. Additionally, construction noise is typically measured with the L_{eq} parameter.

Construction Impacts and Mitigation

Table 19.3 provides anticipated noise levels that would be associated with the Project's construction activities.

Table 19.3: Noise Levels of Typical Mine Equipment

Equipment	Maximum Noise Level at 50 feet (dBA)
Chainsaw	85
Skidder (Grapple)	85
Excavator	85
Backhoe	78
Dozer	82
Trucks	77

Source: FHWA 2006

Notably, construction of the dams and dikes would occur over a large area, and construction-related noise levels impacting any NSA would be a function of distance. As such, no existing residence would be exposed to the same sound levels over an extended period, as construction would occur progressively in stages around the TSF. Table 19.4 details construction equipment sound levels operating at maximum throttle at the reference distance of 50 feet, as well as the calculated sound levels at various distances from the nearest Project boundary to the identified NSA areas. The calculated sound levels were determined by utilizing the procedures found in the International Organization for Standardization standard ISO-9613-2. This standard provides the method to extrapolate sound levels from a known reference distance (in this case 50 feet) to a more distant location by considering the additional distance to the receiver (i.e., the 6 dBA reduction with every doubling of distance) plus the additional reduction due to the absorption of sound by the atmosphere, which over large distances is significant.

Exhaust noise from diesel engines that power the equipment is usually the predominant source of construction equipment noise. The Project would ensure that functional mufflers are installed on all diesel-powered equipment. Table 19.5 presents the calculated sound levels for all notable noise generating equipment, when equipment is operating at the farthest Project Area boundary line from the same NSAs.

Table 19.4: Construction Noise Levels at NSAS Closest to the Project Area (dBA)

Equipment	Construction Noise Levels (dBA)				
	50 feet	Karkas Road 950 feet	Townline Road 1,320 feet	Highway 73 3,800 feet	North Leighton Road 4,000 feet
Chainsaw	85	59	55	44	44
Skidder (Grapple)	85	59	55	44	44
Excavator	85	59	55	44	44
Backhoe	78	52	48	37	37
Dozer	82	56	52	41	41
Trucks	77	51	47	36	36

Table 19.5: Construction Noise Levels at NSAS Farthest from the Project Area (dBA)

Equipment	Construction Noise Levels (dBA)				
	50 feet	Karkas Road 22,000 feet	Townline Road 23,000 feet	Highway 73 20,000 feet	North Leighton Road 24,000 feet
Chainsaw	85	17	16	19	15
Skidder (Grapple)	85	17	16	19	15
Excavator	85	17	16	19	15
Backhoe	78	10	9	12	8
Dozer	82	14	13	16	12
Trucks	77	9	8	11	7

Construction sound levels at the closest NSA would be expected to be below the Minnesota Noise Standard during daytime hours, even when equipment is in operation in portions of the Project Area that are situated closest to the NSA. The noise limits may be exceeded during nighttime hours at the 2 nearest NSAs when multiple machines are operating, and when that equipment is operated in portions of the Project Area that are situated closest to the NSA. Construction noise levels at the remaining NSAs, and especially the NSA areas along Highway 73 and North Leighton Road, would be below the noise standard during both daytime and nighttime hours.

Operations Impacts and Mitigation

Noise levels following completion of Project construction are anticipated to be less than noise levels during the active construction phase, however, there would be ongoing use of haul trucks and mobile equipment twenty-four hours a day, seven days a week, (24/7) to support the staged construction of the dikes and dams. The current operations intermittently extend 24/7, so this could be seen as a change in noise to NSAs. No additional operational noise impacts are anticipated from Project operations, no mitigation is proposed.

The separation and/or dewatering infrastructure would be located on the western side of the Project Area. Noise generated by pumps and equipment associated with the infrastructure would be inside and the distance from receptors would minimize impacts.

20. Transportation

- a. **Describe traffic-related aspects of project construction and operation. Include: 1) existing and proposed additional parking spaces, 2) estimated total average daily traffic generated, 3) estimated maximum peak hour traffic generated and time of occurrence, 4) indicate source of**

trip generation rates used in the estimates, and 5) availability of transit and/or other alternativetransportation modes.

Roads

The Project Area would be accessed via existing roadways to Keetac (public and private roads), and specifically around the Stage 2 Exterior dikes and dams via the permanent access road that would be constructed as part of the Project. There is an existing private road adjacent to where the separation and/or dewatering infrastructure would be built which would be used for construction access to that site.

Construction activities associated with the Project may result in short-term impacts to transportation infrastructure and traffic. The traffic volume along roads close to the TSF entrances could briefly increase due to the movement of construction equipment and materials. Temporary road closures during construction are not anticipated and any impacts on local traffic during construction would be temporary and minor.

Railroads

No increased use of railroads is anticipated for the construction or continued operation of the Project; therefore, no impacts are anticipated.

Airports

No increased use of the airport is anticipated for the construction or continued operation of the Project; therefore, no impacts are anticipated.

- b. Discuss the effect on traffic congestion on affected roads and describe any traffic improvementsnecessary. The analysis must discuss the project's impact on the regional transportation system.*If the peak hour traffic generated exceeds 250 vehicles or the total daily trips exceeds 2,500, a traffic impact study must be prepared as part of the EAW. Use the format and procedures described in the Minnesota Department of Transportation's Access Management Manual, Chapter 5 (available at: <http://www.dot.state.mn.us/accessmanagement/resources.html>) or a similar local guidance,***

The Project does not anticipate measurable effect on traffic congestion on roads accessing Keetac mine or TSF, therefore no traffic improvements are necessary.

- c. Identify measures that will be taken to minimize or mitigate project-related transportation effects.**

Roads

Road functions would be restored after construction including, but not specifically limited to, repair of any unlikely but possible damage to the road surface caused by construction, and removal and restoration of access points installed to facilitate ingress/egress to the construction workspace. Construction impacts to roads and public road users are not anticipated to be substantial.

No long-term impacts are expected on roads used to access the Project Area. U. S. Steel would also mitigate and restore any temporary road impacts that may result from the Project maintenance or other ongoing operational activities that occur through regular operation of the TSF.

Railroads

No increased use of railroads is anticipated for the construction or continued operation of the TSF; therefore, no impacts are expected, and mitigation isn't warranted.

Airports

No increased use of the airport is anticipated for the construction or continued operation of the TSF; therefore, no impacts are expected, and mitigation isn't warranted.

21. Cumulative potential effects: (Preparers can leave this item blank if cumulative potential effects are addressed under the applicable EAW Items)

a. Describe the geographic scales and timeframes of the project-related environmental effects that could combine with other environmental effects resulting in cumulative potential effects.

The overall geographic scale for assessing cumulative potential effects of the Project includes the Mississippi River - Grand Rapids / Hay Creek watershed, which encompasses the tailing separation and/or dewatering infrastructure and 88 percent of the Stage 2 Exterior dikes and dams; and the Lake Superior - St. Louis / Upper West Swan River HUC 12 watershed, which contains the rest of the TSF, dikes and dams on the east edge of the Project Area.

Potential effects include a temporary timeframe effect during construction from 2025-2028, staged cessation of tailings deposition into Stage 2 Interior Basin part of the tailings basin with subsequent reclamation activities, and an operation impact timeframe while tailing processing and deposition continue over the approved mine lifespan (2048), potentially spanning to 2063, as described in Section 6a.

Environmental effects from the proposed project are listed below and discussed in detail within the relevant topic areas of the EAW, avoidance, minimization, and mitigation measures are also discussed within each topic.

b. Describe any reasonably foreseeable future projects (for which a basis of expectation has been laid) that may interact with environmental effects of the proposed project within the geographic scales and timeframes identified above.

Staff from local government units including the cities of Hibbing, Nashwauk, Itasca County, the North St. Louis Watershed District, and the Itasca Soil and Water Conservation District were contacted to inquire about current planned projects within the same geographic area and timeframe as the proposed project. No reasonably foreseeable future projects for which a basis of expectation has been laid were identified at the time of publication.

c. Discuss the nature of the cumulative potential effects and summarize any other available information relevant to determining whether there is potential for significant environmental effects due to these cumulative effects.

There are no reasonably foreseeable future projects for which an expectation has been laid that could combine with the environmental effects from the proposed project within the same geographic scales and timeframe of the proposed project to create potential effects greater than those from the proposed project.

Land Use and Human Settlement

The primary long-term impacts of the Project stem from the permanent land type modification of 608.6 acres, resulting in habitat loss. Temporary impacts would occur on an additional 89.8 acres for staging and site access during construction. These impacts, represent an incremental augmentation of the existing disturbed area rather than introduction of new impacts to an undisturbed landscape. Mitigation measures, such as progressive reclamation of temporary impact areas, compliance with construction permit requirements, and the use of timber matting or other stabilization methods to minimize impacts on wetlands, would help to reduce the Project's overall environmental footprint.

The TSF would extend slightly beyond the mining area by approximately 700 feet to the east and 500 feet to the west. This represents a relatively small incremental augmentation in the context of the existing mine operations,

with over 95 percent of the surrounding landcover remaining unaffected. The Project is not expected to impact nearby residential, commercial, or recreational areas, as it is located within an industrial mining site.

The project would contribute incremental losses of forests and wetlands at a localized scale. The Project would not introduce substantially new stressors or impact types, and the conversion of additional landcover represents a continuation of established land use impacts considering the existing level of disturbance associated with the long-term, ongoing mining operations, , which is partially offset by initiation of reclamation activities in the Stage 2 Interior Basin part of the tailings facility. Given the industrial nature of the existing land use, the limited extent of new permanent and temporary impacts, and the proposed mitigation measures, the Project is not anticipated to substantially alter land use patterns or human settlement in the region.

Visual

Visual analysis indicates that while the 70-to-110-foot increase in TSF height from this Project may make it visible from some new vantage points in southeast Keewatin, this represents an incremental change rather than introduction of a new visual impact. The surrounding area has an established mining/industrial landscape with existing tailings piles and waste rock piles visible. The proposed increase falls within the maximum height evaluated in prior studies which previously found no significant impacts. Given the context of it expanding an existing visual condition in this mining district, Other than reclamation and re-vegetation plans upon closure would further minimize long-term aesthetic impacts.

Air Quality

Air quality impacts would be temporary and localized during the construction phase from sources like fugitive dust, vehicle emissions, and construction equipment. Impacts on receptors within .25 miles are expected to be minimal and typical of an industrial construction site with proper dust suppression and engine maintenance practices. During operations, the expanded TSF footprint may generate some incremental fugitive dust compared to existing conditions as activities in the Stage Interior Basin are phased out, this represents an incremental change consistent with the area's longstanding mining and tailings management activities. Minimal degradation of air quality and no exceedances of NAAQS are anticipated from the Project's emissions sources. Mitigation through the implementation of BMPs such as those outlined in U. S. Steel's Fugitive Dust Plan, should minimize the air quality impacts given the Project's context within an established mining/industrial area.

Noise

Impact of noise levels associated with construction activities is expected to be temporary and offset by existing noise levels generated from ongoing operations, including the phase-out of the Stage 2 Interior Basin. Operations stemming from the Project are not expected to increase existing noise levels to any substantial degree.

Transportation

Transportation impacts would be limited to a temporary increase in road traffic volumes around the Project Area during the construction phase from worker commutes and equipment/material deliveries. These impacts are expected to be minor and short-lived, with no road closures anticipated. No impacts to rail or air transportation are expected, as the Project will not require increased use of these modes during construction or operations. The Project's transportation effects represent a localized short-term impact consistent with typical construction activities. With mitigation practices like road maintenance and traffic management, impacts to the local or regional transportation network are anticipated to be minimal from this Project, which is accessed via existing private roads serving the established mining activities in the area.

Contamination and Hazardous Waste

The Project's construction phase would generate some solid wastes like scrap metal, demolition debris, and oil/antifreeze from equipment maintenance, etc., that would be stored properly in containers and transported to

appropriate disposal or recycling facilities off-site per regulations. Any hazardous wastes like solvents or lead acid batteries would also be packaged for proper off-site disposal. During operations, the potential for contamination exists from fuel/oil use and storage on-site; these substances would be managed in accordance with the site's SPCC plan to prevent releases and mitigate any incidental spills. Given the Project's relatively small scale, adherence to hazardous materials handling protocols, and the absence of any major contaminated sites in the area, impacts related to contamination or hazardous waste releases are not anticipated. The risks are typical of a construction/industrial operation and would be managed through BMPs that include secondary containment, worker training, and emergency response procedures as outlined in the SPCC plan.

Geology

While the vertical augmentation of the TSF by up to 110 feet would represent a permanent topographic modification over the existing condition, this impact occurs within the context of an area that has experienced extensive topographic disturbance from decades of large-scale mining activity. The underlying geology and soils have been previously impacted, with no state or federally protected geological features present in the Project Area. The primary permanent impact is modification of the existing man-made topography created by previous tailings deposition in the TSF. Some temporary grading impacts may occur during construction for access roads and staging areas; these are minor alterations to an already disturbed industrial landscape. Given the absence of sensitive geological resources and the Project's context as an incremental augmentation of existing large-scale industrial disturbance, impacts to geological resources are anticipated to be minimal. Standard mitigation practices for dam construction, safety monitoring, and stormwater management are proposed that would ensure topographic changes are properly controlled.

Soils

Within the expanded TSF area, soils would be permanently impacted as they are inundated and covered by the deposition of tailings over the life of the Project. However, this represents an incremental augmentation of existing impacts, as soils in the current TSF area have already experienced similar disturbance. During construction, temporary soil impacts like compaction from heavy equipment, erosion from vegetation clearing, and potential contamination from leaks/spills are possible in staging and work areas. These temporary impacts would be mitigated through BMPs outlined in the SWPPP, SPCC, and other permit requirements. This includes practices like silt fencing, stabilization with matting, dust control, vegetation reseeding, and proper material storage/handling. Given the currently disturbed nature of the site and with proposed mitigation measures, impacts to soil resources are anticipated to be minimal beyond the permanent conversion within the expanded tailings footprint itself. Operational soil impacts outside the TSF are expected to be minor and infrequent, related to maintenance activities.

Groundwater

The Project would increase the overall potential for seepage of process water into the groundwater system. This impact is expected to be minimal due to the offsetting effect of using a finer tailings mixture that would act as a less porous barrier compared to the coarser tailings currently in place. While some continued seepage into groundwater is anticipated as an ongoing condition, the use of less porous tailings is projected to result in negligible increases in seepage rates or total volumes despite the larger basin size and higher water content of the tailings. The installation of new monitoring wells would allow for an evaluation of any unforeseen changes to seepage conditions and groundwater quality that may arise during operations versus the current established baseline. With proper management practices already in place, minor impacts to groundwater resources are expected from the incremental augmentation of tailings disposal activities. The draft NPDES/SDS permit on public notice addresses seepage to groundwater by requiring a "Functional Equivalent Evaluation". The purpose of this evaluation is to better understand the potential effects of seepage from the tailings basin. Additional water quality monitoring is required in nearby surface waters as well as in the tailings basin for the evaluation.

Floodplains

There are no mapped floodplains within or in the vicinity of the Project Area. If unmapped floodplains are present in the Project Area, they could be impacted by soil compaction; however, given that the site is currently disturbed because of ongoing operations, effects are expected to be minimal to floodplains because of the Project.

Watersheds

Construction of the expanded TSF and associated infrastructure would permanently convert approximately 554 acres of forested and wetland areas to barren land/impervious surfaces across the two watersheds. This loss of vegetative cover, hydrologic storage capacity from wetlands, and increased impervious areas could incrementally impact factors like hydrology, habitat, and water quality at the watershed scale. The projected changes constitute less than two percent of the total land cover in the Mississippi River watershed and less than seven percent in the Lake Superior watershed. When viewed in the context of the watersheds' overall extents, these localized impacts are expected to result in negligible changes to the aggregated metrics that determine overall watershed health scores. The Project's impacts, though notable at the immediate site level, represent an incremental augmentation of existing large-scale industrial disturbance rather than introduction of new stressors to an undisturbed landscape. With proper mitigation practices like stormwater management and wetland restoration/offsets, watershed impacts are anticipated to be minimal from this Project.

Wetlands

The construction of the proposed Project would lead to both permanent and temporary impacts on WCA-regulated wetlands. Direct permanent WCA-regulated impacts, totaling 97.47 acres, would result from dam and dike work, as well as the construction of a permanent access road and separation and/or dewatering infrastructure. Indirect permanent wetland impacts would total 0.19 acre. Temporary impacts, affecting 9.75 acres directly and 0.39 acre indirectly, would be caused by equipment staging and temporary site access. Where tree clearing within wetlands is necessary, forested wetlands would be permanently converted to scrub shrub or emergent wetlands, leading to a reduction or elimination of some ecological functions, such as peak flood flow reduction, nutrient and sediment capture, and habitat diversity. To mitigate these impacts, the Project has been designed to avoid wetlands where possible, and BMPs would be employed to minimize disturbance. Additionally, U. S. Steel would use available surplus mitigation credits at a 1-to-1 ratio from the Palisade Wetland Mitigation Site to compensate for the loss of regulated wetlands. During the operational phase, the TSF would be managed under its existing SWPPP, and no additional impacts on wetlands are anticipated. Considering the proposed mitigation measures, including wetland avoidance, minimization of impacts, and the use of surplus wetland credits, the impacts of the Project on wetlands are not expected to be substantial.

Waterbodies

The construction of the proposed water retention dam would result in direct, permanent impacts to Reservoir No. 6, including the loss of 38.7 acres of surface area and 5,242 linear feet of shoreline. The loss of a substantial portion of this reservoir is notable. Several other waterbodies in the Project Area, such as Reservoir 2 North, Reservoir No. 2, Hay Lake, Hay Creek, and Swan River, could potentially experience temporary, indirect impacts on water quality, such as increased turbidity and localized sedimentation, during construction activities. These impacts would be mitigated through the implementation of erosion control measures, BMPs, and minimization of the duration of disturbance. Additionally, adhering to the requirements of the modified NPDES/SDS permits (which regulate water treatment and disposal systems and require monitoring of various water quality parameters, including sulfate), would mitigate impacts. During the operational phase, the Project is not expected to substantially alter the overall water balance or water quality at the TSF compared to pre-existing conditions especially considering the proposed mitigation measures and the regulatory requirements for

water quality monitoring, the impacts of the Project on waterbodies is not expected to be substantially different than existing conditions.

Vegetation

The construction of the proposed Project would involve the clearing of vegetation within both temporary and permanent impact areas, resulting in a loss of forested, herbaceous, and wetland habitats. However, the Project is not anticipated to impact any federal or state-listed plant species. Upon completion of construction, temporary impact areas would be restored to pre-construction contours, and erosion control measures would be implemented. These areas would be seeded with native seed mixes or allowed to naturally revegetate. Additionally, the Project would adhere to the conditions of the Dam Safety Permit, ensuring that all equipment is free of prohibited invasive species and aquatic plants before being transported into the Project Area. During the operational phase, potential impacts to vegetation would be limited to localized dust accumulation and routine maintenance of rights-of-way and work areas. Furthermore, Minnesota Rules Chapter 6130 requires the reclamation of mined lands, which includes the re-establishment of vegetation in disturbed areas. Considering the proposed mitigation measures and the regulatory requirements for reclamation, the impacts of the Project on vegetation are not expected to be substantial.

Wildlife

The construction and operation of the proposed Project are expected to result in minimal impacts on most of the wildlife species analyzed, including the Canada lynx, gray wolf, monarch butterfly, northern long-eared bat, and tricolored bat. The Canada lynx and gray wolf are unlikely to be substantially affected due to their mobility and the availability of adjacent habitats, while the monarch butterfly is expected to find suitable habitats nearby. The implementation of tree clearing restrictions during the roosting season would help minimize impacts on the northern long-eared bat and tricolored bat. However, migratory birds may face impacts, particularly due to the permanent loss of some forested nesting habitat, which could have long-term effects on their local populations. Although preconstruction surveys and nest buffers would be implemented to reduce these impacts, the loss of nesting habitat remains a concern. To further mitigate the potential impacts on migratory birds, U. S. Steel would prioritize the implementation of the proposed mitigation measures and consider additional measures, such as habitat restoration or compensation, to ensure the long-term conservation of these species within the Project Area and its surroundings. Additionally, all vegetation clearing (including tree clearing) would occur in the winter.

Aquatic Species

The construction of the proposed dam would directly impact Reservoir No. 6, both temporarily and permanently, potentially affecting fish populations and aquatic habitats. The loss of habitat and spawning areas along the eastern side of the reservoir, as well as increased turbidity due to sediment disturbance, could adversely impact aquatic species. However, these impacts would be mitigated by replanting aquatic plants and creating suitable environments for the re-establishment of native species on the western side of the reservoir. Additionally, a silt curtain would be installed to protect the western portion of the reservoir, and the eastern portion, where permanent impacts would occur, would be stacked with rock to minimize potential impacts on aquatic habitats and water quality. The Hay Creek watershed would also be directly impacted, with the loss of habitat at the headwaters of the creek, but the impacted area would be relatively small compared to the total watershed. Construction vehicles could potentially introduce terrestrial invasive species to the banks of affected waterbodies; this risk would be mitigated by inspecting vehicles, clothing, and equipment before any interaction with the water and sourcing construction materials locally. During the operational phase, no substantial impacts on aquatic species are anticipated, as there are no proposed water appropriations or new discharges, and the overall water balance and water quality at the TSF are not expected to change from pre-existing conditions. Considering the proposed mitigation measures and the limited scope of impacts relative to the overall watershed, the impacts of the Project on aquatic species are not expected to be substantial.

Cultural Resources

The construction of the proposed Project could potentially impact one known cultural resource site, which is located within the Project's Direct APE. The site, which has an undetermined eligibility for listing on the NRHP, is situated in a temporary impact area where staging activities could occur. To mitigate potential impacts, the Project plans to avoid the site by implementing a 200-foot avoidance buffer. If avoidance is not possible, U. S. Steel would be required to consult with the parties listed in the Programmatic Agreement, and additional investigations may be necessary to determine the site's eligibility for NRHP listing. If the site is found to be eligible and adversely affected, a Phase III data recovery investigation would be conducted to resolve the adverse effects. Additionally, archaeological monitoring during construction in areas near the cultural site and the implementation of a terrestrial post-review discoveries plan would help reduce potential impacts on any previously undiscovered archaeological resources encountered during construction. While it is possible that an undiscovered archaeological site could be impacted during construction, state and federal requirements for identifying, assessing, and mitigating impacts on cultural resources would limit the extent, scale, and magnitude of any such impacts. Considering the proposed mitigation measures and regulatory requirements, the impacts of the Project on cultural resources are not expected to be substantial

22. Other potential environmental effects:

If the Project may cause any additional environmental effects not addressed by Items 1 to 19, describe the effects here, discuss the how the environment will be affected, and identify measures that will be taken to minimize and mitigate these effects.

The Project is not anticipated to cause any additional environmental effects beyond those discussed in items 1 to 19.

RGU CERTIFICATION. *(The Environmental Quality Board will only accept **SIGNED** Environmental Assessment Worksheets for public notice in the EQB Monitor.)*

I hereby certify that:

- The information contained in this document is accurate and complete to the best of my knowledge.
- The EAW describes the complete Project; there are no other projects, stages or components other than those described in this document, which are related to the Project as connected actions or phased actions, as defined at Minnesota Rules, parts 4410.0200, subparts 9c and 60, respectively.
- Copies of this EAW are being sent to the entire EQB distribution list.

Signature s/s Becky Horton

Date August 25, 2025

Title Project Manger

REFERENCES

7. Climate Adaptation and Resilience

- Adolphson, D. G., Ruhl, J. F., and Wolf, R. J. 1981. Designation of Principal Water-Supply Aquifers in Minnesota. United States Geological Survey. Accessed: March 2025. Retrieved from: <https://pubs.usgs.gov/wri/1981/0051/report.pdf>
- Dai, Aiguo. 2012. Palmer Drought Severity Index. Accessed: December 2023. Retrieved from: <https://climatedataguide.ucar.edu/climate-data/palmer-drought-severity-index-pdsi>
- Federal Emergency Management Agency (FEMA). 2021. FEMA Flood Map Service Center. Accessed: May 2023. Retrieved from: <https://msc.fema.gov/portal/search?AddressQuery=keewatin%2C%20mn#searchresultsanchor>
- First Street Foundation. 2023. Risk Factor. Accessed: May 2023. Retrieved from: <https://firststreet.org/risk-factor/>
- GEI Consultants. 2023. Keetac Tailings Basin Dam Break Analysis Report. 178 pp. Accessed: March 2023.
- Intergovernmental Panel on Climate Change (IPCC). 2021. IPCC WGI Interactive Atlas: Regional Analysis. Accessed: May 2023. Retrieved from: <https://interactive-atlas.ipcc.ch/regional-information#eyJ0eXBlljoiQVRMQVMiLCJjb21tb25zlp7ImxhdCI6NDk0MTIzNiwiG5nljotMzcwMDY2MSwiem9vbSI6MywicHJvail6IkVQU0c6NTQwMzAiLCJtb2RlljoiY29tcGxldGVfYXR5YXNldCI6IkNNSVA2IiwidmFyaWFibGUiOiJwcnNuliwidmFsdWVUeXBlljoiQU5PTUFWSlismhhdGNoaW5nljoiU0lNUExFliwicmVnaW9uU2V0ljoYXl2IiwidmFzZWxpbmUiOiJwcmVJbmR1c3RyaWFsliwicmVnaW9uc1NlbGVjdGVkljpbXX0sInBsb3QiOjoiYWN0aXZlVGFiljoicGx1bWUilCjYXNrljoibm9uZSI6InNjYXR0ZXJlZlJlZlFnljpuZlF0dGVyWVZhcil6bnVsbCwic2hvd2luZyI6ZmFsc2V9fQ==>
- Minnesota Climate & Health Program. 2018. Planning for Climate & Health Impacts in Northeast Minnesota Emergency Management Considerations for HSEM Region 2. Accessed: December 2023. Retrieved from: https://www.health.state.mn.us/communities/environment/climate/docs/hsem_region2.pdf
- Minnesota Department of Health (MDH). 2025. Minnesota Well Index. Accessed March 2025. Retrieved from: <https://mnwellindex.web.health.state.mn.us/>
- Minnesota Department of Natural Resources (MNDNR). 2021. Groundwater Atlas User Guide. Accessed: March 2025. Retrieved from: https://files.dnr.state.mn.us/waters/groundwater_section/mapping/groundwater-atlas-user-guide.pdf
- Minnesota Department of Natural Resources (MNDNR). 2023. Climate Trends. Accessed: May 2023. Retrieved from: https://www.dnr.state.mn.us/climate/climate_change_info/climate-trends.html
- Minnesota Department of Natural Resources (MNDNR). 2024. Minnesota Climate Explorer. Accessed: December 2023. Retrieved from: <https://arcgis.dnr.state.mn.us/climateexplorer/main/historical>
- Minnesota Pollution Control Agency (MPCA). 2023. Climate Change Impacts. Accessed: May 2023. Retrieved from: <https://www.pca.state.mn.us/air-water-land-climate/climate-change-impacts>
- Rico, M., G. Benito, and A. Diez-Herrero. 2008. Floods from tailings dam failures. *Journal of hazardous materials*, 154(1-3), 79-87. Accessed: May 2023. Retrieved from: [51-rico-et-al-2008-reported-tailings-dam-failures-a-review-of-the-european-incidents-in-the-worldwide-context_0.pdf](51-rico-et-al-2008-reported-tailings-dam-failures-a-review-of-the-european-incidents-in-the-worldwide-context_0.pdf) (savetheboundarywaters.org)
- University of Minnesota. 2024. University of Minnesota Climate Adaptation Partnership. Accessed: March 2024. Retrieved from: <https://climate.umn.edu/>

10. Land Use

Barr Engineering. November 2021. Wetland Delineation and Functional Assessment Report: Keetac Exterior Tailings Basin Prepared for U. S. Steel – Keetac. Accessed: August 2023.

Itasca County Parcel Information Land System. 2023. Accessed: August 2023. Retrieved from: <https://parcelinfo.com/main.php?county=itasca>

Minnesota Administrative Rules. 2008. Part 6130.1300. AVOIDANCE AREAS FOR MINING, Subpart B. Accessed: March 2024. Retrieved from: <https://www.revisor.mn.gov/rules/6130.1300/>

Minnesota Administrative Rules. 2008. Part 6130.3600. VEGETATION REQUIREMENTS. Subpart 4, Item B. Accessed: March 2024. Retrieved from: <https://www.revisor.mn.gov/rules/6130/full>

Minnesota Administrative Rules. 1990. Part 103F.221. Municipal Shoreland Management. Subpart 5. Accessed: March 2024. Retrieved from: <https://www.revisor.mn.gov/statutes/cite/103F.221>

Minnesota Administrative Rules. 2008. Part 6130.2200. MANAGEMENT OF RUNOFF. Accessed: March 2024. Retrieved from: <https://www.revisor.mn.gov/rules/6130.2200/>

Minnesota Administrative Rules. 2008. Part 6130.4100. DEACTIVATION AND RELEASE. Accessed: March 2023. Retrieved from: <https://www.revisor.mn.gov/rules/6130.4100/>

Minnesota Administrative Rules. 2008. Part 6130.3000. DESIGN, CONSTRUCTION, AND OPERATION OF TAILINGS BASINS. Accessed: March 2024. Retrieved from: <https://www.revisor.mn.gov/rules/6130.3000/>

Minnesota Administrative Rules. 2008. Part 6130.3700. AIR POLLUTION. Accessed: March 2024. Retrieved from: <https://www.revisor.mn.gov/rules/6130.3700/>

Minnesota Administrative Rules. 2008. Part 6120.3300. ZONING PROVISIONS. Subpart 12. Accessed: March 2024. Retrieved from: <https://www.revisor.mn.gov/rules/6120.3300/>

Minnesota Pollution Control Agency (MPCA). 2011. NPDES/SDS Permit No. MN0031879 for United States Steel – Minnesota Ore Operations – Keetac Mining Findings of Fact and Conclusions of Law and Order. Accessed: July 2023. Retrieved from: <https://waterlegacy.org/wp-content/uploads/2020/07/MPCA-Findings-Keetac-Permits-Citizens-Board-Nov.-15-2011.pdf>

Saint Louis County Minnesota. 2018. County Land Explorer. Accessed: August 2023. Retrieved from: <https://www.stlouiscountymn.gov/departments-a-z/planning-development/enterprise-gis/county-land-explorer>

U.S. Geological Survey (USGS). 2016. USA National Land Cover Database Land Cover. Accessed: August 2023. Retrieved from: <https://www.usgs.gov/node/279743>

11. Geology, Soils, and Topography

Chandler, V.W. 1994. Minnesota at a Glance: Earthquakes in Minnesota: Minnesota Geological Survey; revised by V.W. Chandler, 2020. Accessed: May 2023. Retrieved from: <https://cse.umn.edu/mgs/earthquakes>

Environmental Systems Research Institute (Esri). 2021. World Imagery (MapServer). Accessed: May 2023. Retrieved from: https://services.arcgisonline.com/ArcGIS/rest/services/World_Imagery/MapServer

Jennings, C. E., and W. K. Reynolds. 2005. M-164 Surficial geology of the Mesabi Iron Range, Minnesota. Minnesota Geological Survey. Accessed: May 2023. Retrieved from the University of Minnesota Digital Conservancy, <https://hdl.handle.net/11299/58160>

Jirsa, M. A., T. J. Boerboom, V. W. Chandler, J. H. Mossler, A. C. Runkel, and D. R. Setterholm. 2011. S-21 Geologic Map of Minnesota-Bedrock Geology. Minnesota Geological Survey. Accessed: May 2023. Retrieved from: University of Minnesota Digital Conservancy, <https://hdl.handle.net/11299/101466>.

Michigan State University (MSU). 2002. Institute of Water Research Online Soil Erosion Assessment Tool. Accessed: July 2023. Retrieved from: <http://www.iwr.msu.edu/rusle/kfactor.htm>

- Minnesota Geological Survey. Undated. Mesozoic Geology. Accessed: May 2023. Retrieved from: <https://cse.umn.edu/mgs/mesozoic-geology>
- Minnesota Natural Resources Atlas. 2023. Depth to Bedrock. Accessed: May 2023. Retrieved from: <https://mnatlas.org/gis-tool/>
- Ross, C. W., L. Prihodko, J. Y. Anchang, S. S. Kumar, W. Ji, and N. P. Hanan. 2018. Global Hydrologic Soil Groups (HYSOGs250m) for Curve Number-Based Runoff Modeling. ORNL DAAC, Oak Ridge, Tennessee, USA. Accessed: July 2023. Retrieved from: https://daac.ornl.gov/SOILS/guides/Global_Hydrologic_Soil_Group.html
- U.S. Department of Agriculture and Natural Resources Conservation Service (USDA NRCS). 2022. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture, Agriculture Handbook 296. Accessed: May 2023. Retrieved from: www.nrcs.usda.gov/sites/default/files/2022-10/AgHandbook296_text_low-res.pdf
- U.S. Department of Agriculture and Natural Resources Conservation Service (USDA NRCS). 2023. Soil Survey Staff. Web Soil Survey. Accessed: May 2023. Retrieved from: <http://websoilsurvey.nrcs.usda.gov/>
- U.S. Geological Survey (USGS). 2011. Mineral Resources Data System (MRDS). Accessed: May 2023. Retrieved from: <https://mrdata.usgs.gov/mrds/map-graded.html#search-results>
- U.S. Geological Survey (USGS). 2022a. Quaternary Fault and Fold Database. Accessed: May 2023. Retrieved from: <https://usgs.maps.arcgis.com/apps/webappviewer/index.html?id=5a6038b3a1684561a9b0aadf88412fcf>
- U.S. Geological Survey (USGS). 2022b. Keewatin Quadrangle. Accessed: May 2023. Retrieved from: <https://ngmdb.usgs.gov/topoview/viewer/#11/47.4032/-93.1225>
- U.S. Geological Survey (USGS). 2022c. Silica Quadrangle. Accessed: May 2023. Retrieved from: <https://ngmdb.usgs.gov/topoview/viewer/#11/47.4032/-93.1225>
- Winter, T.C. 1973. Hydrogeology of Glacial Drift, Mesabi Iron Range, Northeastern Minnesota. Accessed: May 2023. Retrieved from: <https://pubs.usgs.gov/wsp/2029a/report.pdf>

12. Water Resources

- Adolphson, D. G., Ruhl, J. F., and Wolf, R. J. 1981. Designation of Principal Water-Supply Aquifers in Minnesota. United States Geological Survey. Accessed: March 2025. Retrieved from: <https://pubs.usgs.gov/wri/1981/0051/report.pdf>
- Barr Engineering (Barr). 2009. Average sulfate concentrations and confidence intervals for Hay Lake and Swan Lake. Technical Memorandum. November 9, 2009. 4 pp. Accessed: March 2024.
- Barr Engineering (Barr). 2022. Keetac Tailings Basin Expansion Groundwater Sensitivity Assessment. April 8, 2022. Accessed: March 2025.
- Barr Engineering (Barr). 2024. Wetland Replacement Plan Prepared for United States Steel Corporations Minnesota Ore Operation - Keetac. Accessed: November 2024.
- Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. Jamestown, ND: Northern Prairie Wildlife Research Center Home Page. (Version 04DEC98). Retrieved from: <http://www.npwrc.usgs.gov/resource/1998/classwet/classwet.htm>
- Federal Emergency Management Agency (FEMA). 2021. FEMA Flood Map Service Center. Retrieved from <https://msc.fema.gov/portal/search?AddressQuery=keewatin%2C%20mn#searchresultsanchor>
- Minnesota Board of Water and Soil Resources (MN BWSR). 2019. WCA Program Guidance and Information: WCA Exemptions Guidance and Policy. Accessed: August 2023. Retrieved from: <https://bwsr.state.mn.us/wca-program-guidance-and-information>

- Minnesota Department of Health (MDH). 20253. Minnesota Well Index. Accessed: March 2025y 2023. Retrieved from: <https://www.health.state.mn.us/communities/environment/water/mwi/index.html>
- Minnesota Department of Natural Resources (MNDNR). 2010. U. S. Steel Keetac Taconite Mine Expansion Project Final Environmental Impact Statement. Accessed: May 2023. Retrieved from: https://files.dnr.state.mn.us/input/environmentalreview/keetac/final_eis/keetac_mine_expansion_feis.pdf
- Minnesota Department of Natural Resources (MNDNR). 2021. Groundwater Atlas User Guide. Accessed: March 2025. Retrieved from: https://files.dnr.state.mn.us/waters/groundwater_section/mapping/groundwater-atlas-user-guide.pdf
- Minnesota Department of Natural Resources (MNDNR). 2022a. Infested Waters List. Accessed: August 2023. Retrieved from: <https://www.dnr.state.mn.us/invasives/ais/infested.html>
- Minnesota Department of Natural Resources (MNDNR). 2022b. Lakes – Designated Wildlife. Accessed: April 2024. Retrieved from: https://mnatlas.org/resources/?id=k_0011
- Minnesota Department of Natural Resources (MNDNR). 2022c. Migratory Waterfowl – Feeding & Resting. Accessed: April 2024. Retrieved from: https://mnatlas.org/resources/?id=k_0020
- Minnesota Department of Natural Resources (MNDNR). 2023. Watersheds – DNR Level 9. Accessed: March 2024. Retrieved from: https://mnatlas.org/resources/?id=k_0066.
- Minnesota Department of Natural Resources (MNDNR). 2024. Climate Trends. Accessed: April 2024. Retrieved from: https://www.dnr.state.mn.us/climate/climate_change_info/climate-trends.html
- Minnesota Department of Natural Resources (MNDNR). Undated. Hydrography Standard: Watersheds. Accessed: August 2023. Retrieved from: https://www.mngeo.state.mn.us/committee/hydro/HUC_Names_official.html#HUC6
- Minnesota Pollution Control Agency (MPCA). 2017. Adapting to Climate Change in Minnesota. 2017 Report of the Interagency Climate Adaptation Team. Accessed: April 2024. Retrieved from: <https://www.pca.state.mn.us/sites/default/files/p-gen4-07c.pdf>
- Minnesota Pollution Control Agency (MPCA). 20242a. 20242 Impaired Waters List. Accessed: August 2023February 2025. Retrieved from: <https://www.pca.state.mn.us/air-water-land-climate/minnesotas-impaired-waters-list>
- Minnesota Pollution Control Agency (MPCA). 2022b. Outstanding Resource Value Waters. Accessed: April 2024. Retrieved from: <https://www.arcgis.com/apps/webappviewer/index.html?id=8358fe79d8e14403a28fe3451aa7f48b>
- Minnesota Pollution Control Agency (MPCA). 2023. Climate Change Impacts. Accessed: April 2024. Retrieved from: <https://www.pca.state.mn.us/air-water-land-climate/climate-change-impacts>
- U.S. Army Corps of Engineers (USACE). 1987. Corps of Engineers Wetlands Delineation Manual. Environmental Laboratory. U.S. Army Engineer Waterways Experiment Station: Technical Report Y-87-1. Accessed: March 2024. Retrieved from: https://www.mvs.usace.army.mil/Portals/54/docs/fusrap/Admin_Records/NORCO/NCountySites_01.06_0110_a.pdf
- U.S. Army Corps of Engineers (USACE). 2012. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0). Wetlands Regulatory Assistance Program. Accessed: March 2024. Retrieved from: <https://www.mvp.usace.army.mil/Portals/57/docs/regulatory/Website%20Organization/Northcentral%20and%20Northeast%20Regional%20Supplement.pdf>
- U.S. Department of Agriculture, Natural Resources Conservation Service (USDA NRCS). 2023. Soil Survey Staff. Web Soil Survey. Accessed: May 2023. Retrieved from: <http://websoilsurvey.nrcs.usda.gov/>

U.S. Fish and Wildlife Service (USFWS). 2011. National Wetlands Inventory. Accessed: August 2023. Retrieved from: <https://www.fws.gov/program/national-wetlands-inventory>

U.S. Geological Survey (USGS). 2023. Boundary Descriptions and Names of Regions, Subregions, Accounting Units and Cataloging Units from the 1987 USGS Water-Supply Paper 2294. Accessed: July 2023. Retrieved from: https://water.usgs.gov/GIS/huc_name.html

13. Contamination and Hazardous Waste

Minnesota Pollution Control Agency (MPCA). 2023. What's in My Neighborhood. Accessed: May 2023. Retrieved from: <https://www.pca.state.mn.us/about-mPCA/whats-in-my-neighborhood>

14. Fish, Wildlife, and Plant Communities

Barr Engineering (Barr). 2022. Sensitive Botanical Species Survey Report – 2022 Tailings Basin Project. Accessed: December 2023.

Fon du Lac Band of Lake Superior Chippewa. N.d. Wild Rice Lake Restoration. Accessed: June 2025. Retrieved from: https://www.fdlband.org/services/resource_management/environmental_programs/water/other_projects.php#:~:text=Wild%20Rice%20Lake%20Restoration,images%20above%20for%20larger%20version

Minnesota Administrative Rules. 2008. Part 6212.1800 GENERAL RESTRICTIONS FOR PERMITS TO POSSESS THREATENED AND ENDANGERED SPECIES. Accessed: March 2024. Retrieved from: <https://www.revisor.mn.gov/rules/6212.1800/>

Minnesota Administrative Rules. 2008. Part 6134.0150 PURPOSE AND SCOPE. Accessed: March 2024. Retrieved from: <https://www.revisor.mn.gov/rules/6134.0150/>

Minnesota Department of Natural Resources (MNDNR). 2009 8.Hay Lake/Hay Creek Wild Rice and Stream Conditions Survey. Natural Wild Rice in Minnesota: A Wild Rice Study submitted to the Minnesota Legislature by the Minnesota DNR. September 15, 2009. Accessed: March 2024 February 2025. Retrieved from: https://files.dnr.state.mn.us/aboutdnr/reports/legislative/20080215_wildricestudy.pdf

Minnesota Department of Natural Resources (MNDNR). 2010. U. S. Steel Keetac Taconite Mine Expansion Project Final Environmental Impact Statement. Accessed: May 2023. Retrieved from: https://files.dnr.state.mn.us/input/environmentalreview/keetac/final_eis/keetac_mine_expansion_feis.pdf

Minnesota Department of Natural Resources (MNDNR). 2014. Areas of Biodiversity Significance in Minnesota. Accessed: August 2023. Retrieved from: https://files.dnr.state.mn.us/eco/mcbs/maps/areas_of_biodiversity_significance.pdf

Minnesota Department of Natural Resources (MNDNR). 2018a. Accessed: March 2024. Retrieved from: Lynx canadensis: Canada Lynx | Rare Species Guide | Minnesota DNR (state.mn.us)

Minnesota Department of Natural Resources (MNDNR). 2023. Clean In Clean Out. Accessed: May 2023. Retrieved from: Clean In Clean Out | Minnesota DNR (state.mn.us)

Minnesota Department of Natural Resources (MNDNR). 2024a. Minnesota Conservation Explorer (MCE). Accessed: March 2024

Minnesota Department of Natural Resources (MNDNR). 2024b. Rare Species Guide: Gray Wolf. Accessed: March 2024. Retrieved from: Canis lupus: Gray Wolf | Rare Species Guide | Minnesota DNR (state.mn.us)

Minnesota Department of Natural Resources (MNDNR). 2024c. Accessed: March 2024. Retrieved from: Monarch Butterfly | Minnesota DNR (state.mn.us)

- Minnesota Department of Natural Resources (MNDNR). n.d. Ecological Classification System. Accessed: August 2023. Retrieved from: <https://www.dnr.state.mn.us/ecs/index.html>
- Minnesota Natural Heritage Information System (MN NHIS). 2024. Correspondence # MCE 2023-00649. Accessed: March 2024.
- Minnesota Pollution Control Agency (MPCA). 2008. Turbidity: Description, Impact on Water Quality, Sources, Measures. Accessed: May 2023. Retrieved from: Turbidity: Description, Impact on Water Quality, Sources, Measures (state.mn.us)
- Minnesota Statutes. 2023. 84.0895 PROTECTION OF THREATENED AND ENDANGERED SPECIES. Accessed: March 2024. Retrieved from: <https://www.revisor.mn.gov/statutes/cite/84.0895>
- Mowat, G.; K. G. Poole; and M. O'Donoghue. 1999. Ecology of lynx in northern Canada and Alaska Chapter 9. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. p. 265-306. Accessed: August 2023. Retrieved from: https://www.fs.usda.gov/rm/pubs/rmrs_gtr030/rmrs_gtr030_265_306.pdf
- U.S. Environmental Protection Agency (USEPA). 2013. Level III Ecoregions of the Continental United States. Accessed: August 2023. Retrieved from: <https://www.epa.gov/eco-research/level-iii-and-iv-ecoregions-continental-united-states>
- U.S. Environmental Protection Agency (USEPA). 2023. Ecoregions. Accessed: August 2023. Retrieved from: <https://www.epa.gov/eco-research/ecoregions>
- U.S. Department of Agriculture (USDA). 2010. USDA Partnering for Wild Rice Restoration in Wisconsin. Accessed: June 2025. Retrieved from: <https://www.usda.gov/about-usda/news/blog/usda-partnering-wild-rice-restoration-wisconsin>
- U.S. Department of Agriculture (USDA). 2004. Wild Rice Seeding Guidelines. Accessed: June 2025. Retrieved from: <https://efotg.sc.egov.usda.gov/references/Delete/2016-8-13/WildRiceJobsheet.pdf>
- 15. Historic Properties**
- Barr Engineering. 2008. Cultural Resources Work Plan for the Proposed Keetac Project near Keewatin, St. Louis, and Itasca Counties, Minnesota.
- Barr Engineering. 2009. Phase I and Phase II Cultural Resources Investigations for the Proposed Keetac Project near Keewatin, St. Louis and Itasca Counties, Minnesota.
- Code of Federal Regulations. Accessed: April 2024. Retrieved from: <https://www.ecfr.gov/current/title-36/chapter-VIII/part-800?toc=1>
- Minnesota Department of Administration State Historic Preservation Office (SHPO). Minnesota Statewide Historic Inventory Portal (MnSHIP). Accessed: April 2024. Retrieved from: <https://mnship.gisdata.mn.gov>
- Minnesota Department of Administration State Historic Preservation Office (SHPO). Office of the State Archaeologist (OSA) Portal. Accessed: April 2024. Retrieved from: <https://osaportal.gisdata.mn.gov/>
- Minnesota Department of Natural Resources (MNDNR). 2010. U. S. Steel Keetac Taconite Mine Expansion Project Final Environmental Impact Statement. Accessed: May 2023. Retrieved from: https://files.dnr.state.mn.us/input/environmentalreview/keetac/final_eis/keetac_mine_expansion_feis.pdf
- United States Code, 2012. Supplement 2, Title 54- National Park Service and Related Programs §306108. Accessed: April 2024. Retrieved from: <https://www.govinfo.gov/content/pkg/USCODE-2014-title54/pdf/USCODE-2014-title54.pdf>

16. Visual

Minnesota Department of Natural Resources (MNDNR). 2010. U. S. Steel Keetac Taconite Mine Expansion Project Final Environmental Impact Statement. Accessed: May 2023. Retrieved from: https://files.dnr.state.mn.us/input/environmentalreview/keetac/final_eis/keetac_mine_expansion_feis.pdf

18. Greenhouse Gas (GHG) Emissions/Carbon Footprint

Code of Federal Regulation (CFR) Part 98 Subpart C Emission Factors. 2024. Accessed: April 2024. Retrieved from: <https://www.ecfr.gov/current/title-40/chapter-I/subchapter-C/part-98/subpart-C?toc=1>

Minnesota Next Generation Energy Goals (MNGEA). 2024. Minnesota Statute §61.216H.02.01. Utilities: Greenhouse Gas Emissions: Greenhouse Gas Emissions Control: Greenhouse gas emissions-reduction goal. Accessed: April 2024. Retrieved from: <https://www.revisor.mn.gov/laws/2023/0/60/laws.12.61.0#laws.12.61.0>

Minnesota Pollution Control Agency (MPCA). 2023. Climate change trends and data. Accessed: April 2024. Retrieved from: <https://www.pca.state.mn.us/air-water-land-climate/climate-change-trends-and-data>

South Coast Air Quality Management District (AQMD). 2024. Off-road Mobile Source Emission Factors. Accessed: April 2024. Retrieved from: <https://www.aqmd.gov/home/rules-compliance/ceqa/air-quality-analysis-handbook/off-road-mobile-source-emission-factors>

The Intergovernmental Panel on Climate Change (IPCC). 2024. 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Accessed: April 2024. Retrieved from: <https://www.ipcc.ch/report/2019-refinement-to-the-2006-ipcc-guidelines-for-national-greenhouse-gas-inventories/>

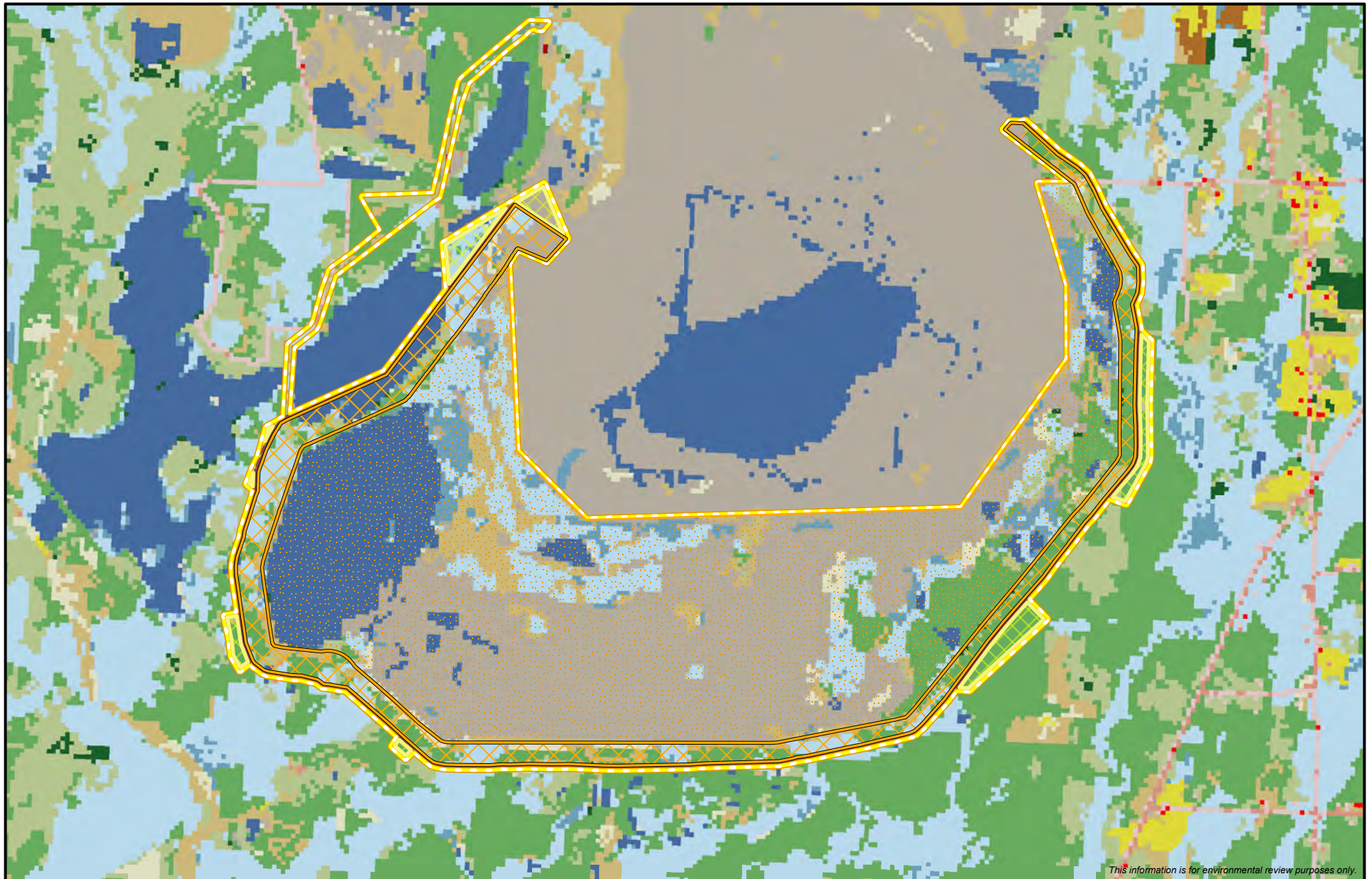
U.S. Environmental Protection Agency (USEPA). 2024. Emissions & Generation Resource Integrated Database (eGRID). Accessed: April 2024. Retrieved from: <https://www.epa.gov/egrid>

19. Noise

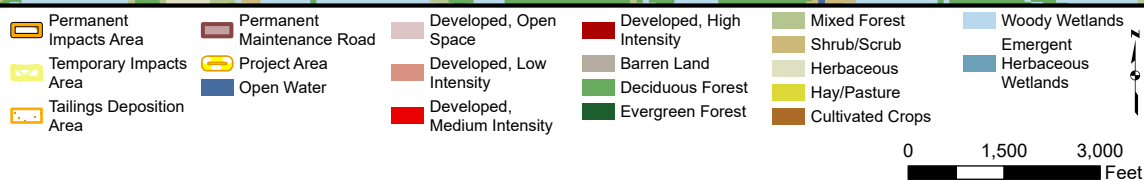
Federal Highway Administration (FHWA). 2006. FHWA Highway Construction Noise Handbook. U.S. Department of Transportation. Accessed: March 2024. Retrieved from: [google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwiZzb2J7-eFAxXJCNkGHYqrC5QQFnoECCEQAQ&url=https%3A%2F%2Frosap.nhtl.bts.gov%2Fview%2Fdot%2F8837%2Fdot_8837_DS1.pdf%3F%2520&usg=AOvVaw0qJodt3MKhtqqnLkXsSa3E&opi=89978449](https://www.fhwa.dot.gov/transportation_noise/handbook/2006/2006FHWA_HCNH.pdf)

Minnesota Administrative Rules. 2003. Part 7030.0040, Subpart 2. Accessed: March 2024. Retrieved from: <https://www.revisor.mn.gov/rules/7030.0040/>

Minnesota Pollution Control Agency (MPCA). 2015. A Guide to Noise Control in Minnesota. Accessed: August 2023. Retrieved from: <https://www.pca.state.mn.us/sites/default/files/p-gen6-01.pdf>



This information is for environmental review purposes only.



NLCD Landcover **Keetac TSF Project** United States Steel Keewatin, MN

