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## MEMORANDUM

**TO: Tom Moe; U. S. Steel Minntac**  
**FROM: Michael Johnson, PE & Kristoffer Langlie, PE; Liesch Associates**  
**DATE: July 3, 2012**  
**RE: U. S. Steel Minntac Subwatershed and Stream Information**

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Liesch Associates has completed this technical memorandum for U. S. Steel to provide potential stream impact information as a result of the proposed U. S. Steel Minntac (Minntac) Mine Extension. The Minnesota Department of Natural Resources and U. S. Steel provided Liesch a list of streams/subwatersheds to evaluate within the confines of the Minntac mining operation. The areas evaluated were streams/subwatersheds that were either previously impacted by past mining, are slated to be impacted within the existing Permit-to-Mine (PTM) boundary via active mining, or have the potential to be impacted by the proposed mine extension. The streams/subwatersheds included:

- McQuade/Kinney Creek – Tributary 1 (M1);
- Kinross Creek – Tributary 1 (K1), Tributary 2 (K2) & Tributary 3 (K3);
- West Branch of the West Two River – Tributary 1 (W1), Tributary 2 (W2) & Tributary 3 (W3);
- East Branch of the West Two River (Mt. Iron) – Tributary 1 (MI1);
- Parkville Creek – Tributary 1 (P1), Tributary 2 (P2), Tributary 3 (P3), & total Parkville Creek drainage area upstream of the study point (including the area drained by the mainstem (P4)).
- East Two River – Tributary 1 (E1)

The southern boundary for the drainage area of each stream was determined to be the proposed mining extension limit. Each stream subwatershed was then delineated upstream of the southern boundary of the proposed extension based off pre-mining/USGS contours. Figure 1 presents the locations of the delineated subwatershed boundaries, along with the current extent of mining within the subwatershed boundaries where the mine face has not reached the current PTM, the existing PTM limits, and the proposed extension limits.

The stream contributing area and stream segment channel length were then determined and are summarized within Table 1 for four classifications:

- pre-mining
- already impacted by past mining (current extent of mining)
- to be impacted by existing PTM
- to be impacted by proposed extension of PTM

To establish Average Annual Runoff Flow Rates (AARFR), a Generalized Mean Annual Runoff (GMAR) value of 9.5 inches per year was selected for the study area based on data published in *SIR*

2009-5250 - *Techniques for Estimating the Magnitude and Frequency of Peak Flows on Small Streams in Minnesota Based on Data through Water Year 2005 (USGS, 2009)*. This value was then utilized with the contributing area and applied to the following calculation:

$$AARFR(CFS) = CntrbArea(ac) \times \frac{43,560sf}{1ac} \times 9.5in(GMAR) \times \frac{1ft}{12in} \times \frac{1yr}{365d} \times \frac{1d}{1440min} \times \frac{1min}{60s}$$

The results of the Average Annual Runoff Flow Rates are included with Table 1. The majority of the reduction in runoff flow rates have occurred as a result of past mining, and all of the runoff flow rates from the study areas were reduced by 0.25 CFS or less as a result of the proposed extension of the PTM.

**Table 1: Subwatershed and Stream Information**  
**U. S. Steel - Minntac**

# Minntac West Pit

Evaluation of Past, Present and Proposed Impacts to Watersheds

		Watershed Contributing Area				Stream segment channel length				Average Annual Runoff Flow Rate			
		Pre-mining (ac)	Already Impacted by Past Mining (ac)	To be Impacted by Current PTM (ac)	To be Impacted by Proposed Extension (ac)	Pre-mining (ft)	Already Impacted by past mining (ft)	To be Impacted by Current PTM (ft)	To be Impacted by Proposed Extension (ft)	Pre-mining (cfs)	Already Impacted by Past Mining (cfs)	To be Impacted by Current PTM (cfs)	To be Impacted by Proposed Extension (cfs)
McQuade Ck (aka Kinney Creek)	Trib 1	2,657	2,513	62	82	17,983	17,983	0 <sup>1</sup>	0 <sup>1</sup>	2.91	2.75	0.07	0.09
						N/A - USACOE determined no streams present within proposed progression area, wetland area only.							
Kinross Creek	Trib 1	50	10	11	29					0.05	0.01	0.01	0.03
	Trib 2	220	99	29	92					0.24	0.11	0.03	0.10
	Trib 3	606	600	0	6					0.66	0.66	0.00	0.01
West Branch -	Trib 1	47	0	0	47					0.05	0.00	0.00	0.05
West Two River	Trib 2	638	490	139	9					0.70	0.54	0.15	0.01
	Trib 3	293	58	235	0					0.32	0.06	0.26	0.00
East Branch - (Mt. Iron)	Trib 1	3,032	3,032	0	0					3.32	3.32	0.00	0.00
West Two River (incl some East Pit)													

<sup>1</sup> The USACE has indicated that the MN DNR 24k Stream Segments shown in the M1 Subwatershed feeding Yates Lake may have been streams at one time, but would no longer be considered Jurisdictional under existing USACOE regulations.

# Minntac East Pit

Evaluation of Past, Present and Proposed Impacts to Watersheds

		Watershed Contributing Area			Stream segment channel length			Average Annual Runoff Flow Rate		
		Pre-mining (ac)	Already Impacted by Past Mining (ac)	To be Impacted by Proposed Extension (ac)	Pre-mining (ft)	Already Impacted by Past Mining (ft)	To be Impacted by Proposed Extension (ft)	Pre-mining (cfs)	Already Impacted by Past Mining (cfs)	To be Impacted by Proposed Extension (cfs)
Parkville Creek	Trib 1	460	360	100	4,706	4,706 <sup>3</sup>	0	0.50	0.39	0.11
	Trib 2	165	145	20	3,447	3,447 <sup>3</sup>	0	0.18	0.16	0.02
	Trib 3	338	338	0	4,452	4,452	0	0.37	0.37	0.00
	Main	1,685	1,600	85	17,208	13,206	4,002	1.84	1.75	0.09
TOTAL Parkville Ck <sup>2</sup>		2,648	2,443	205	29,813	25,811	4,002	2.90	2.67	0.22
East Two River	Trib 1	331	331	0	1,329	1,329	0	0.36	0.36	0.00

<sup>2</sup> TOTAL Parkville Creek subwatershed represents information from Tributaries 1 (P1), 2 (P2), and 3 (P3), along with one other area (P4) shown on Figure 1 which represent the main reach of Parkville Creek.

<sup>3</sup> The USACOE has indicated that the MN DNR 24k Stream Segments shown in the P1 & P2 Subwatersheds may have been streams at one time, but would no longer be considered Jurisdictional under existing USACOE regulations.



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