Appendix G
Human Health Risk Assessment Information

CONTENTS

TABLES:

See also Figure 4.7.8.1 for a map of Receptor Locations.

TABLE Appendix G.1 - LOCATIONS AND EXPOSURE SCENARIOS EVALUATED IN THE HHRA
Exposure Scenario Analyzed at Each Location

Basic Exposure Scenario	Resident	Resident	Farmer	Why was receptor located here?	Notes
Fish Consumption scenario assessed	Recrea-tional	High	Recrea-tional		
Location (Receptor) #					
3	X			Potential Future Land Use	
4	X			Potential Future Land Use	
6	X			Current Nursing Home Location (Hibbing)	
7	X			Potential Future Land Use	
10	X			Current Day Care Location (Hibbing)	
11	X			Potential Future Land Use	
12	X			Current School Location (Keewatin)	
13	X			Potential Future Land Use	
14	X			Potential Future Land Use	
15	X			Potential Future Land Use	
18	X			Potential Future Land Use	
1		X		Potential Future Land Use	Assumed to Fish at Horsehead Lake
8		X		Potential Future Land Use	Assumed to Fish at Kelly Lake
17		X		Current School Location (Nashwauk), Assumed to Fish at O'Brien Lake	
21		X		Potential Future Land Use	Assumed to Fish at Swan Lake
22		X		Current Residential Location	Assumed to Fish at Coons Lake
2			X	Potential Future Land Use	
5			X	Potential Future Land Use	
9			X	Potential Future Land Use	
16			X	Potential Future Land Use	
19			X	Potential Future Land Use	
20			X	Potential Future Land Use	

No 'Farmer' 'High' fish consumption pathway is analyzed because the combination of consumption assumptions in that case would result in an excessive calorie diet

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TABLE Appendix G.2 – EXPOSURE ASSUMPTIONS SUMMARY[1, 2,3]

Residential Parameter (Adult)	**Adult MEI (Maximum Exposed Individual)**	**Adult MCTE (Maximum Central Tendency)**
Body Weight	71.8 pounds	71.8 pounds
Exposure Duration (years at the location)	70 years	12 years
Exposure Frequency (days per year)	365 days per year	226 days per year
Exposure Time (hours per day)	24 hours per day	1.5 hours per day (outside)
Inhalation Rate	0.83 cubic meters per hour (m3/hr)	0.63 m3/hr
Eggs - % exposed	100 percent (%)	100%
Vegetables - % exposed	100%	25%
Chicken - % exposed	100%	100%
Soil - % exposed	100%	100%
Farmer Parameter (Adult)	**Adult MEI**	**Adult MCTE**
Body Weight	71.8 pounds	71.8 pounds
Exposure Duration (years at the location)	70 years	12 years
Exposure Frequency (days per year)	365 days per year	226 days per year
Exposure Time (hours per day)	24 hours per day	1.5 hours per day (outside)
Inhalation Rate	0.83 m3/hr	0.63 m3/hr
Eggs - % exposed	100%	25%
Vegetables - % exposed	100%	25%
Chicken - % exposed	100%	25%
Soil - % exposed	100%	100%
Beef - % exposed	100%	25%
Pork - % exposed	100%	25%
Fish - % exposed	100%	25%
Fish Consumption – - Recreational Level - High Level	 0.4 pounds/week 3 pounds/week	 0.4 pounds/week 3 pounds/week
Milk - % exposed	100%	25%

[1]% exposed means the % exposed to emissions from the assessed scenario (current facility, proposed project, etc.). If a food item is not listed the exposure is -0-. % exposed is equal to the % of the listed food item assumed to be home grown.

[2]See report for a full list of detailed exposure assumptions. Some exposures included in the analysis are not included above.

[3]See Chapter 4.7.8 for information on MCTE and MEI.

The following tables present quantitative results of the various HHSRA analyses. Data has been rounded to 1 significant digit in most cases. Results for values at or above guidelines are listed to 2 significant digits. See Sections 4.7.8 and 5.14.1 for discussion of these data.

Results in the following tables are presented by location/receptor #. See Figure 4.7.8.1 for a map of these locations. See also Tables G.1 and G.2 for information on the type of receptor and exposure scenarios analyzed.

Table Appendix G.3 - SUMMARY OF RESULTS – EXISTING PERMITTED FACILITY

Location (Recep-tor) #	MEI Exposure Cancer Risk	MCTE Exposure Cancer Risk	Risk Driver Information at Maximums – Cancer	MEI Exposure Non-Cancer Hazard Index	MCTE Exposure Non-Cancer Hazard Index	Lake (for high level fish consumption)
FISHER - Residential exposure with/high level fish consumption						
8	**1.8 E-5**	0.03 E-5	Dioxins/Furans; PAHs; Arsenic Fish Pathway	0.1	0.04	Kelly
21	0.8 E-5	0.009 E-5		0.05	0.004	Swan
1	0.5 E-5	0.009 E-5		0.1	0.01	Horsehead
17	0.3 E-5	0.004 E-5		0.08	0.004	O-Brien
22	0.01 E-5	0.003 E-5		0.02	0.005	Coons
FARMER – Farmer exposure with/recreational level fish consumption						
9	**2.5 E-5** **Overall Maximum MEI**	0.07 E-5 Overall Maximum MCTE	Dioxins/Furans; Arsenic; Milk pathway	0.2	0.06	
16	**1.5 E-5**	0.05 E-5		0.2	0.05	
2	0.95 E-5	0.03 E-5		0.1	0.03	
19	0.5 E-5	0.02 E-5		0.07	0.02	
5	0.4 E-5	0.01 E-5		0.06	0.01	
20	0.2 E-5	0.005 E-5		0.03	0.003	

Table Appendix G.3 - SUMMARY OF RESULTS – EXISTING PERMITTED FACILITY (continued)

Location (Recep-tor) #	MEI Exposure Cancer Risk	MCTE Exposure Cancer Risk	Risk Driver Information at Maximums – Cancer	MEI Exposure Non-Cancer Hazard Index	MCTE Exposure Non-Cancer Hazard Index	Lake (for high level fish consumption)
RESIDENT – Residential exposure with/recreational level fish consumption						
13	**1.4 E-5**	0.06 E-5	Arsenic; Dioxins/Furans Produce pathway	0.2 Overall Maximum MEI	0.1	
14	**1.0 E-5**	0.04 E-5		0.2	0.2 Overall Maximum MCTE	
15	0.9 E-5	0.04 E-5		0.2	0.09	
4	0.5 E-5	0.01 E-5		0.1	0.08	
7	0.4 E-5	0.01 E-5		0.1	0.06	
12	0.4 E-5	0.01 E-5		0.08	0.04	
3	0.4 E-5	0.01 E-5		0.07	0.03	
10	0.4 E-5	0.007 E-5		0.04	0.01	
18	0.3 E-5	0.009 E-5		0.05	0.02	
6	0.3 E-5	0.006 E-5		0.04	0.009	
11	0.2 E-5	0.004 E-5		0.03	0.009	
*Guide-line**	*1 E-5*	*1 E-5*	*NA*	*1*	*1*	*NA*

*Guidelines:
1 E-5 = 1 in 100,000 – for carcinogens
Hazard Index (HI) of 1.0 for non-carcinogens

Data Source: Appendix B: February 2009 HHSRA
See Chapter 4.7.8 for information on MCTE and MEI Exposure Scenarios MEI=Maximally Exposed Individual; MCTE=Maximum Central Tendency Exposure

Note - Results listed represent the worst case for the exposure scenario assessed at that receptor; the lake used for high level fishers is noted.

Table Appendix G.4 - SUMMARY OF RESULTS – PROPOSED PROJECT ALONE

Loc ation (Recep-tor) #	MEI Exposure Cancer Risk	MCTE Exposure Cancer Risk	Risk Driver Information at Maximums – Cancer	MEI Exposure Non-Cancer Hazard Index	MCTE Exposure Non-Cancer Hazard Index	Lake Assessed for High level fish consumption
FISHER – Residential Exposure with/high level fish consumption						
8	0.3 E-5	0.003 E-5		0.5 MMREM	0.02	Kelly
21	0.1 E-5	0.002 E-5		0.2 MMREM	0.002	Swan
1	0.09 E-5	0.0009 E-5		0.1 MMREM	0.0009	Horsehead
17	0.06 E-5	0.0006 E-5		0.08 MMREM	0.002	O-Brien
22	0.02 E-5	0.0002 E-5		0.08 MMREM	0.002	Coons
FARMER – Farmer exposure with/recreational level fish consumption						
9	0.4 E-5 Overall Maximum MEI	0.01 E-5 Overall Maximum MCTE	Dioxins/Furans; Arsenic; Milk pathway	0.09	0.03	
2	0.2 E-5	0.004 E-5		0.05	0.01	
5	0.08 E-5	0.002 E-5		0.03	0.005	
16	0.2 E-5	0.007 E-5		0.07	0.02	
19	0.08 E-5	0.002 E-5		0.04	0.007	
20	0.03 E-5	0.0007 E-5		0.02	0.002	

Table Appendix G.4 - SUMMARY OF RESULTS – PROPOSED PROJECT ALONE (continued)

Location (Recep-tor) #	MEI Cancer Risk	MCTE Cancer Risk	Risk Driver Information at Maximums – Cancer	MEI Non-Cancer Hazard Index	MCTE Non-Cancer Hazard Index	Lake Assessed for High level fish consumption
RESIDENT – Residential exposure with/recreational level fish consumption						
14	0.2 E-5	0.005 E-5		0.1	0.02	
4	0.1 E-5	0.002 E-5		0.07	0.04 Overall Maximum MCTE	
13	0.09 E-5	0.002 E-5		0.07	0.03	
7	0.08 E-5	0.002 E-5		0.06	0.03	
15	0.07 E-5	0.002 E-5		0.05	0.02	
10	0.06 E-5	0.001 E-5		0.03	0.006	
12	0.06 E-5	0.001 E-5		0.04	0.02	
3	0.05 E-5	0.001 E-5		0.03	0.01	
6	0.05 E-5	0.0009 E-5		0.02	0.004	
18	0.04 E-5	0.0008 E-5		0.03	0.009	
11	0.03 E-5	0.0005 E-5		0.02	0.004	
*Guide-line**	*1 E-5*	*1 E-5*	*NA*	*1*	*1*	*NA*

*Guidelines:
1 E-5 = 1 in 100,000 – for carcinogens
Hazard Index (HI) of 1.0 for non-carcinogens

Data Source: Appendix B: February 2009 HHSRA
See Chapter 4.7.8 for information on MCTE and MEI Exposure Scenarios MEI=Maximally Exposed Individual; MCTE=Maximum Central Tendency Exposure

Note - Results listed represent the worst case for the exposure scenario assessed at that receptor; the lake used for high level fishers is noted.

Table Appendix G.5 - SUMMARY OF RESULTS – POST PROJECT TOTAL FACILITY

Location (Recep-tor) #	MEI Cancer Risk	MCTE Cancer Risk	Risk Driver Information at Maximums – Cancer	MEINon-Cancer Hazard Index	MCTENon-Cancer Hazard Index	Lake Assessed for High Level fish consumption
FISHER – Residential exposure with/high level fish consumption						
8	**2.1 E-5**	0.03 E-5	Dioxins/Furans; PAHs; Arsenic Fish Pathway	0.5 MMREM	0.05	Kelly
21	0.9 E-5	0.01 E-5		0.2 MMREM	0.006	Swan
1	0.6 E-5	0.01 E-5		0.1 MMREM	0.02	Horsehead
17	0.4 E-5	0.005 E-5		0.08 MMREM	0.007	O'Brien
22	0.02 E-5	0.003 E-5		0.08 MMREM	0.007	Coons
FARMER - Farmer exposure with/recreational level fish consumption						
9	**3.0 E-5 Overall Maximum for maximum exposure**	0.09 E-5 Overall Maximum for typical exposure	Dioxins/Furans; Arsenic; Milk pathway	0.3	0.09	
16	**1.8 E-5**	0.06 E-5		0.2	0.07	
2	**1.1 E-5**	0.04 E-5		0.2	0.04	
19	0.6 E-5	0.02 E-5		0.1	0.02	
5	0.5 E-5	0.02 E-5		0.09	0.02	
20	0.2 E-5	0.005 E-5		0.04	0.004	

Table Appendix G.5 - SUMMARY OF RESULTS – POST PROJECT TOTAL FACILITY (continued)

Location (Recep-tor) #	MEI Cancer Risk	MCTE Cancer Risk	Risk Driver Information at Maximums – Cancer	MEI Non-Cancer Hazard Index	MCTE Non-Cancer Hazard Index	Notes
RESIDENT - Residential exposure with/recreational level fish consumption						
13	**1.5 E-5**	0.06 E-5	Arsenic; Dioxins/Furans Inhalation pathway	0.3	0.2	
14	**1.2 E-5**	0.04 E-5		0.3 Overall Maximum MEI	0.2 Overall Maximum MCTE	
15	**0.99 E-5**	0.04 E-5		0.2	0.1	
4	0.6 E-5	0.02 E-5		0.2	0.1	
7	0.5 E-5	0.01 E-5		0.2	0.09	
12	0.5 E-5	0.01 E-5		0.1	0.06	
3	0.4 E-5	0.01 E-5		0.1	0.05	
10	0.4 E-5	0.008 E-5		0.07	0.02	
6	0.4 E-5	0.007 E-5		0.06	0.01	
18	0.3 E-5	0.009 E-5		0.08	0.03	
11	0.2 E-5	0.005 E-5		0.05	0.01	
*Guide-line**	*1 E-5*	*1 E-5*	*NA*	*1*	*1*	*NA*

*Guidelines:
1 E-5 = 1 in 100,000 – for carcinogens
Hazard Index (HI) of 1.0 for non-carcinogens

Data Source: Appendix B: February 2009 HHSRA
See Chapter 4.7.8 for information on MCTE and MEI Exposure Scenarios
MEI=Maximally Exposed Individual; MCTE=Maximum Central Tendency Exposure

Note - Results listed represent the worst case for the exposure scenario assessed at that receptor; the lake used for high level fishers is noted.