



May 4, 2021

Air Permits Program
Attn: Permit Intake Clerk
Alaska Department of Environmental Conservation
555 Cordova Street
Anchorage, AK 99501

**Re: Title V Permit Renewal Application Amendment
Hecla Greens Creek Mining Company, Hecla Greens Creek Mine
Permit No. AQ0302TVP03**

Dear Sir/Madam:

Hecla Greens Creek Mining Company (HGCMC) is currently operating the Hecla Greens Creek Mine under Title V Permit No. AQ0302TVP03, which expires on June 13, 2021. Pursuant to Condition 81, HGCMC submitted an application for renewal in October 2020 in accordance with the requirements of 18 AAC 50.326 and 40 CFR 71.5. The application was submitted no sooner than December 13, 2019 and no later than December 13, 2020 as required.

HGCMC is herein providing an amendment to the application pursuant to 40 CFR 71.5(b).

If you have any questions with this application, please feel free to call (907-790-8473) or email (cwallace@hecla-mining.com).

Sincerely,

A handwritten signature in blue ink that reads "Christopher Wallace". The signature is fluid and cursive, with the first name and last name clearly distinguishable.

Christopher Wallace
Permitting and Environmental Compliance Coordinator

Encl: Title V Permit Renewal Application Amendment

Cc: EPA Region 10, Mail Stop: OAW-150, 1200 Sixth Avenue, Suite 155, Seattle, WA 98101
Jeanette Brena, Boreal Environmental Services (jbrena@boreal-services.com)



Hecla Greens Creek Mine Title V Renewal Application Amendment

Prepared for:
Hecla Greens Creek Mining Company

May 2021



Hecla Greens Creek Mine

Title V Renewal Application Amendment

Prepared for:

Hecla Greens Creek Mining Company

PO Box 32199

Juneau, AK 99803-2199

Prepared by:

Boreal Environmental Services

PO Box 240167

Anchorage, AK 99524





Attachment A

Title V Operating Permit Application Forms

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FORM A1-R
Stationary Source Supplemental Information or Application Revision

Permit Number: AQ302TVP04A

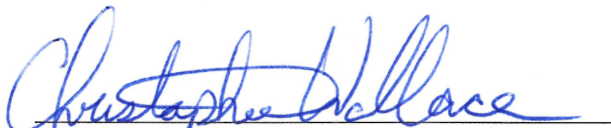
Permit Contact:	Name	Christopher Wallace
	Title	Permitting and Environmental Compliance Coordinator
	Mailing Address Line 1	P.O. Box 32199
	Mailing Address Line 2	Juneau, AK 99803-2199
	Phone Number	907-790-8473
	Email	cwallace@hecla-mining.com
Brief Description of Supplemental Information or Application Revision: Hecla Greens Creek Mining Company (HGCMC) requested in the October 2020 Title V renewal application that EU ID 6 (a 266 hp Sullair Model 900 Air Compressor) be removed from the Title V permit since it was going to be decommissioned. HGCMC has now decided to leave that emission unit in the renewal permit and has attached the following information as part of the application amendment: • Form B – Updated emission unit listing with the addition of EU ID 6 • Form B2 – Emission unit detail for EU ID 6 • Form D1 – Emission unit summary of emissions for EU ID 6 • Form D2 – Updated stationary source emission summary with the addition of EU ID 6 • Form E3 – Title V condition change request associated with EU ID 6 The updated spreadsheet for the stationary source emission unit inventory and potential to emit is also attached.		

Statement of Certification:

Based on information and belief formed after reasonable inquiry, I certify that the statements and information in and attached to this document are true, accurate, and complete.

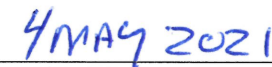
Christopher Wallace

Name of Responsible Official


Signature (blue ink)

Permitting and Environmental Compliance Coordinator

Title


Date

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FORM B
Emission Unit Listing For This Application

Permit Number: AQ0302TVP04A

EMISSION UNIT LISTING: New, Modified, Previously Unpermitted, Replaced, Deleted					
Emission Unit ID Number	Emission Unit Name	Brief Emission Unit Description	Rating/Size	Construction Date	Notes
Emission Units To Be ADDED By This Application (New, Previously Unpermitted, or Replacement)					
21	Well McLain Boiler LW-02	Diesel Fired Boiler	1.7 MMBtu/hr	2019	
22	Perkins Engine	Diesel Fired Engine	13.1 hp	2019	
23	John Deere Engine / Godwin Pump	Diesel Fired Pump Engine	99 hp	2010	
24	John Deere Engine / Godwin Pump	Diesel Fired Pump Engine	300 hp	2008	
Emission Units To Be MODIFIED By This Application					
Emission Units To Be DELETED By This Application					
N/A	Sodium Cyanide Usage	Sodium Cyanide Usage	N/A	1989	

FORM B
Emission Unit Listing For This Application

SIGNIFICANT EMISSION UNIT LISTING: Title V permitted emission units that have not been modified				
Emission Unit ID Number	Emission Unit Name	Brief Emission Unit Description	Rating/Size	Construction Date
1	Ruston Engine Serial No. IH9763	Diesel Fired Engine	2,200 kW	1989
2	Ruston Engine Serial No. IH9796	Diesel Fired Engine	2,200 kW	1989
3	Ruston Engine Serial No. IH9795	Diesel Fired Engine	2,200 kW	1989
4	Caterpillar 3516B Engine Serial No. 1HZ01050	Diesel Fired Engine	1,825 kW	1997
5	Volcano Boiler Serial No. W-1063	Diesel Fired Boiler	2.5 MMBtu/hr	1989
6	Sullair Model 900 Air Compressor	Diesel Fired Compressor	266 hp	2001
7	Sag Mill (Crusher)	Crusher	600 hp	1989
8	Ball Mill (Crusher)	Crusher	900 hp	1989
9	Conveyor Drop Points	Conveyor Drop Points	2,300 tpd	1989
18	Caterpillar 3516B Engine Serial No. 1HZ01013	Diesel Fired Engine	1,825 kW	1999
19	Solar Taurus 60-T7300S Turbine Serial No. 0605T	Diesel Fired Turbine	5,045 kW	2001
20	Cleaver Brooks Boiler	Diesel Fired Boiler	4.5 MMBtu/hr	2010

FORM B
Emission Unit Listing For This Application

INSIGNIFICANT EMISSION UNIT LISTING: Insignificant Title V permitted emission units that have not been modified				
Emission Unit Name	Brief Emission Unit Description	Rating/Size	Construction Date	Basis for Insignificant Status
N/A	Loading Tailings & Concentrate to Haul Trucks	2,300 tpd	1989	18 AAC 50.326(e)
N/A	Unloading Ore	2,300 tpd	1989	18 AAC 50.326(e)
N/A	Misc. Surface Activities (Unpaved Roads)	N/A	1978	18 AAC 50.326(e) – not a listed source
N/A	920 Batch Plant - Sand Transfer	1,130 tpd	1989	18 AAC 50.326(e)
N/A	920 Batch Plant - Cement Storage Silo Unloading	60 tpd	1989	18 AAC 50.326(e)
N/A	920 Batch Plant - Weigh Hopper Loading	1,190 tpd	1989	18 AAC 50.326(e)
N/A	920 Batch Plant - Mixer Loading	1,250 tpd	1989	18 AAC 50.326(e)
N/A	860 Shotcrete Plant - Aggregate Transfer	2 tpd	Unknown	18 AAC 50.326(e)
N/A	860 Shotcrete Plant - Sand Transfer	4 tpd	Unknown	18 AAC 50.326(e)
N/A	860 Shotcrete Plant - Weigh Hopper Loading	6 tpd	Unknown	18 AAC 50.326(e)
N/A	860 Shotcrete Plant - Mixer Loading (Central)	7 tpd	Unknown	18 AAC 50.326(e)
N/A	675 Underground Batch Plant - Truck Loading	7 tpd	Unknown	18 AAC 50.326(e)
N/A	675 Underground Paste Plant - Weigh Hopper Loading	660 tpd	Unknown	18 AAC 50.326(e)
N/A	675 Underground Paste Plant - Mixer Loading (Cent.)	740 tpd	Unknown	18 AAC 50.326(e)
N/A	Lime Storage Tank	2 tpd	1989	18 AAC 50.326(e)
N/A	1350 Mine Exhaust Adit	N/A	1978	18 AAC 50.326(e)
N/A	Modine Heater WH-01	0.1 MMBtu/hr	Unknown	18 AAC 50.326(g)(7)
N/A	Modine Heater WH-01	0.145 MMBtu/hr	Unknown	18 AAC 50.326(g)(7)
N/A	Modine Heater UH-109	0.1 MMBtu/hr	Unknown	18 AAC 50.326(g)(7)
N/A	Patriot Furnace CS-12	0.097 MMBtu/hr	2014	18 AAC 50.326(g)(7)
N/A	OMNI (Econo) Heater	0.5 MMBtu/hr	2013	18 AAC 50.326(e)
N/A	Portable Heater	0.2 MMBtu/hr	Unknown	18 AAC 50.326(g)(7)
N/A	Dewalt Portable Heater	0.19 MMBtu/hr	Unknown	18 AAC 50.326(g)(7)
N/A	Dayton Portable Heater	0.17 MMBtu/hr	Unknown	18 AAC 50.326(g)(7)
N/A	Portable Heater	0.5 MMBtu/hr	Unknown	18 AAC 50.326(g)(7)
N/A	Portable Heater	0.5 MMBtu/hr	Unknown	18 AAC 50.326(g)(7)
N/A	Portable Heater	0.5 MMBtu/hr	Unknown	18 AAC 50.326(g)(7)
N/A	Portable Heater	0.5 MMBtu/hr	Unknown	18 AAC 50.326(g)(7)
N/A	Assay Furnace Outlet	NA	2007	18 AAC 50.326(e)
N/A	Diesel Storage Tank - 920 Powerhouse FT-01	60,000 gal	1989	18 AAC 50.326(e)
N/A	Diesel Storage Tank - 920 Powerhouse FT-04	48,000 gal	2001	18 AAC 50.326(e)
N/A	Diesel Storage Tank - 920 Powerhouse FT-05	48,000 gal	2001	18 AAC 50.326(e)
N/A	Diesel Storage Tank - 920 Ore Pad Grizzly FT-10	500 gal	Unknown	18 AAC 50.326(g)(3)
N/A	Diesel Storage Tank - 920 Warehouse FT-17	500 gal	Unknown	18 AAC 50.326(g)(3)
N/A	Diesel Storage Tank - 920 Powerhouse FT-44	660 gal	Unknown	18 AAC 50.326(g)(3)
N/A	Diesel Storage Tank - 920 Powerhouse FT-45	660 gal	Unknown	18 AAC 50.326(g)(3)
N/A	Diesel Storage Tank - Mill Cleaner Bldg FT-51	500 gal	Unknown	18 AAC 50.326(g)(3)
N/A	Diesel Storage Tank - Tails Press Heater FT-52	440 gal	2014	18 AAC 50.326(g)(3)
N/A	Used Oil Storage Tank - 920 Powerhouse TK-02	5,000 gal	Unknown	18 AAC 50.326(g)(3)
N/A	Used Oil Storage Tank - 920 Powerhouse TK-03	1,000 gal	1996	18 AAC 50.326(g)(3)
N/A	Engine Oil Storage Tank - 920 Maint. Shop TK-13	5,000 gal	1989	18 AAC 50.326(f)(82)
N/A	Hydraulic Oil Storage Tank - 920 Maint. Shop TK-14	5,000 gal	Unknown	18 AAC 50.326(f)(82)
N/A	Used Oil Storage Tank - HI/920 (portable) TK-121	1,100 gal	Unknown	18 AAC 50.326(g)(3)
N/A	Used Oil Storage Tank - HI/920 (portable) TK-122	1,100 gal	Unknown	18 AAC 50.326(g)(3)
N/A	Diesel Storage Tank - 860 Lab Building FT-03	2,000 gal	Unknown	18 AAC 50.326(g)(3)
N/A	Diesel Storage Tank - 860 Safety Building FT-16	500 gal	Unknown	18 AAC 50.326(g)(3)
N/A	Diesel Storage Tank - 860 Core Shed FT-28	550 gal	2006	18 AAC 50.326(g)(3)
N/A	Diesel Storage Tank - Pond 23 FT-204	500 gal	2008	18 AAC 50.326(g)(3)
N/A	Jet A Storage Tank - 860 Helipad (summer)	5,800 gal	Unknown	18 AAC 50.326(g)(3)

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FORM B2**Emission Unit Detail Form - Internal Combustion Equipment (Engines and Turbines)**

Permit Number: AQ0302TVP04A

1.	Emission Unit ID Number // Operating Scenario	6 / Base Operating Scenario
2.	Date installation/construction commenced ¹	2001
3.	Date installed	2001
4.	Emission Unit serial number	004-134772
5.	Special control requirements? [if yes, describe]	N/A
6.	Manufacturer and model number	Sullair Air Compressor, Model 900
7.	Type of combustion device	Air Compressor
8.	Rated design capacity (horsepower rating for engines)	266 hp @ 1800rpm
9.	Rated design capacity (heat input, MMBtu/hr rating for turbines)	N/A
10.	If used for power generation, electrical output (kW)	N/A

- ¹. See page 2 of the Form B instructions regarding installation/construction date and consult regulations under 40 C.F.R. 60 (NSPS) and 40 C.F.R. 63 (NESHAP) for applicability dates, e.g.,
- NSPS Subparts IIII and JJJJ, and NESHAP Subpart ZZZZ for engines, and
- NSPS Subparts GG and KKKK, and NESHAP Subpart YYYYY for turbines.
Note that other regulations may apply in addition to the regulations cited.

11. Fuel usage: [for EACH fuel, enter]:

Fuel	Maximum hourly firing rate (specify units)
Diesel	6 gal/hr

12.	Describe any specific modifications to the emission unit that must be addressed in the permit: N/A
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FORM B2**Emission Unit Detail Form - Internal Combustion Equipment (Engines and Turbines)**

Applicable Requirements Specific to Emission Unit (*attach additional sheets as needed. Form B Supplement - Emission Unit-Specific Applicable Requirements*):

Permit and Condition Number	Applicable Requirement Citation¹	Parameter/ Pollutant	Limit/Standard/Requirement	Currently in Compliance?	Monitoring, Recordkeeping and Reporting Methods Used to Demonstrate Compliance
TVP03-Cond 1-4	18 AAC 50.055(a)(1)	Visible Emissions Standard	20% averaged over any six consecutive minutes	Yes	Conduct Method 9 observations - unit qualifies for reduced annual monitoring frequency. Results recorded and reporting.
TVP03-Cond 5-7	18 AAC 50.055(b)(1)	Particulate Matter Emissions Standard	0.05 grains per cubic foot of exhaust gas corrected to standard conditions over three hours	Yes	Conduct Method 9 observations - unit qualifies for reduced annual monitoring frequency; particulate matter monitoring is only triggered if smoke is observed and visible emissions exceed threshold. Results recorded and reported.
TVP03-Cond 8	18 AAC 50.055(c)	Sulfur Compound Emissions Standard	500 ppm averaged over three hours	Yes	Limit the sulfur content of the fuel; results recorded and reported per Condition 14.
TVP03-Cond 9 (MSS01-Cond 4)	18 AAC 50.040(j)(4), 50.326(j)(4)	SO ₂ Limit to Avoid PSD	40 tons per 12-months	Yes	Limit the sulfur content of the fuel; results recorded and reported per Condition 14.
TVP03-Cond 14 (MSS01-Cond 9)	18 AAC 50.040(j)(4), 50.326(j)(4)	Fuel Sulfur Requirements to Protect Ambient Air	0.08% S by weight annual average; 0.1% S by weight at any time	Yes	Limit the sulfur content of the fuel; results recorded and reported.
TVP03-Cond 31	18 AAC 50.040(j); 18 AAC 50.326(j); 40 CFR 63.1-15	NESHAP Subpart A	Comply with the general requirements of 40 CFR 63 Subpart A	Yes	HGCMC understands the general provisions of the NESHAP Subpart A and complies as required.
TVP03-Cond 32-37	18 AAC 50.040(c)(23) & (i); 18 AAC 50.326(j); 40 CFR 63.6590(a)	NESHAP Subpart ZZZZ	Work practice standards	Yes	Oil changes are conducted as required. Records and reports are prepared as required. Verified through records check.

¹ Citations must be specific. Include sub-paragraph level detail [e.g. 18 AAC 50.055(a)(1), or 40 C.F.R. 60.332(a)(2).]

FORM B2

Emission Unit Detail Form - Internal Combustion Equipment (Engines and Turbines)

Non-applicable Requirements Specific to Emission Unit (*attach additional sheets as needed. Form B Supplement - Emission Unit-Specific Permit Shield Request*):

Non-Applicable Requirements ¹	Reason for non-applicability and citation/basis
40 CFR 60 Subpart IIII	Unit has not been constucted, reconstructed, or modified after the applicability date.

¹ Citations must be specific. Include sub-paragraph level detail [e.g. 18 AAC 50.055(a)(1), or 40 C.F.R. 60.332(a)(2).]

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FORM D1

Emission Unit Summary of Emissions

Permit Number: AQ0302TVP04A

1.	Emission Unit ID Number	6
2.	Emissions Unit description	Sulliar Model 900 Air Compressor
3.	Operating Scenario ID number	Base Operating Scenario
4.	Is this a significant or insignificant unit? (If insignificant, provide basis for insignificance)	Significant - insignificant per 18 AAC 50.326(e), however, unit is subject to a Title I and federal requirement

5. Emission control devices:

Control Device ID(s) from Form Series C
N/A

6. Pollutants/Emissions:

Pollutant Name	Expected Actual Annual Emissions ¹ (after controls/ limitations) (tons/year)	Potential Annual Emissions (before controls/limitations) (tons/year)	Potential Annual Emissions (after controls/limitations) (tons/year)
NO _x	0.03	36.12	36.12
CO	0.007	7.78	7.78
PM-10	0.002	2.56	2.56
SO ₂	0.00002	1.87	40.0 (combined)
VOC	0.003	2.88	2.88
CO ₂ e	1.22	1,334.27	1,334.27
(List individual HAPs)	*see spreadsheet	*see spreadsheet	*see spreadsheet

¹ For significant emission units. For insignificant emission units, expected actual annual emissions are only required if the unit is an insignificant unit on an emission rate basis under 18 AAC 50.326(e) and potential annual emissions exceed 80% of the thresholds in 18 AAC 50.326(e)(1-15).

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FORM D2

AQ0302TVP04A

1.	Applicable Emission Unit IDs (list)	1, 2, 3, 4, 5, 6, 7, 8, 9, 18, 19, 20, 21, 22, 23, 24
2.	Applicable Operating Scenario ID number	Base Operating Scenario

3. Pollutants/Emissions:

[illegible]

FORM D2

AQ0302TVP04A

Pollutants/Emissions:

[illegible]

¹ For insignificant emission units, expected actual annual emissions are only required if the unit is an insignificant unit on an emission rate basis under 18 AAC 50.326(e) and potential annual emissions exceed 80% of the thresholds in 18 AAC 50.326(e)(1-15)

FORM E3
Title V Condition Change Request

Permit Number: AQ0304TVP04A

Title V Permit Information (*attach additional sheets as needed*):

Current Title V Operating Permit Condition Number	Type of change (revise or remove)	Reason for change	Requested Alaska Title V Operating Permit Condition
TVP03 Cond 1-7	Revise	EU ID 6 has actual emissions less than the significant emission unit thresholds in 18 AAC 50.326(e), therefore, compliance with the visible emissions and particulate matter emissions standards should consist of an annual compliance certification with the emissions standard based on reasonable inquiry similar to that required for EU IDs 5 and 20.	1.3 For EU IDs 5, 6, and 20, monitoring shall consist of an annual compliance certification with the opacity standard in accordance with Condition 16.4. 5.3 For EU IDs 5, 6, and 20, monitoring shall consist of an annual compliance certification with the particulate matter standard in accordance with Condition 16.4.

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Attachment B

Emissions Spreadsheet

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Table 1. Emission Unit Inventory
Hecla Greens Creek Mining Company - Hecla Greens Creek Mine

ID	Emission Unit Name	Emission Unit Description	Fuel Type	Fuel Consumption	Maximum Capacity	Maximum Operation	2019 Actual Operations
Significant Emission Units							
1	Ruston Engine Serial No. IH9763	Diesel Fired Engine	Diesel	153.65 gal/hr	2,200 kW	8,760 hr/yr	4,906 hr/yr
2	Ruston Engine Serial No. IH9796	Diesel Fired Engine	Diesel	153.20 gal/hr	2,200 kW	8,760 hr/yr	5,827 hr/yr
3	Ruston Engine Serial No. IH9795	Diesel Fired Engine	Diesel	152.84 gal/hr	2,200 kW	8,760 hr/yr	4,966 hr/yr
4	Caterpillar 3516B Engine Serial No. 1HZ01050	Diesel Fired Engine	Diesel	114.34 gal/hr	1,825 kW	8,760 hr/yr	831 hr/yr
18	Caterpillar 3516B Engine Serial No. 1HZ01013	Diesel Fired Engine	Diesel	114.34 gal/hr	1,825 kW	8,760 hr/yr	1,732 hr/yr
19	Solar Taurus 60-T7300S Turbine Serial No. 0605T	Diesel Fired Turbine	Diesel	421.40 gal/hr	5,045 kW	8,760 hr/yr	7,987 hr/yr
5	Volcano Boiler Serial No. W-1063	Diesel Fired Boiler	Diesel	10.80 gal/hr	2.5 MMBtu/hr	8,760 hr/yr	7,015 hr/yr
6	Sullair Model 900 Air Compressor	Diesel Fired Compressor	Diesel	6.00 gal/hr	266 hp	8,760 hr/yr	8 hr/yr
7	Sag Mill (Crusher)	Crusher - Fugitive	NA	0 gal/hr	2,300 tpd	8,760 hr/yr	8,760 hr/yr
8	Ball Mill (Crusher)	Crusher - Fugitive	NA	0 gal/hr	2,300 tpd	8,760 hr/yr	8,760 hr/yr
9	Conveyor Drop Points	Conveyor - Fugitive	NA	0 gal/hr	2,300 tpd	8,760 hr/yr	8,760 hr/yr
20	Cleaver Brooks Boiler	Diesel Fired Boiler	Diesel	32.10 gal/hr	4.5 MMBtu/hr	8,760 hr/yr	2,354 hr/yr
21	Weil McLain Boiler LW-02	Diesel Fired Boiler	Diesel	14.20 gal/hr	1.7 MMBtu/hr	8,760 hr/yr	8,760 hr/yr
22	Perkins Engine	Diesel Fired Engine	Diesel	0.80 gal/hr	13.1 hp	8,760 hr/yr	8,760 hr/yr
23	John Deere Engine - PP-205 - Emergency 8" Godwin Pump	Diesel Fired Pump Engine	Diesel	5.80 gal/hr	99 hp	500 hr/yr	1 hr/yr
24	Caterpillar Engine - PP-204 - Emergency 16" Godwin Pump	Diesel Fired Pump Engine	Diesel	15.10 gal/hr	300 hp	500 hr/yr	39 hr/yr
Insignificant Emission Units							
NA	Loading Tailings & Concentrate to Haul Trucks	Loading - Fugitive	NA	0 gal/hr	2,300 tpd	8,760 hr/yr	8,760 hr/yr
NA	Unloading Ore	Unloading - Fugitive	NA	0 gal/hr	2,300 tpd	8,760 hr/yr	8,760 hr/yr
NA	Misc. Surface Activities (Unpaved Roads)	Roads - Fugitive	NA	0 gal/hr	NA	8,760 hr/yr	8,760 hr/yr
NA	920 Batch Plant - Sand Transfer	Concrete Batching - Fugitive	NA	0 gal/hr	1,130 tpd tails	8,760 hr/yr	8,760 hr/yr
NA	920 Batch Plant - Cement Storage Silo Unloading	Concrete Batching - Fugitive	NA	0 gal/hr	60 tpd cement	8,760 hr/yr	8,760 hr/yr
NA	920 Batch Plant - Weigh Hopper Loading	Concrete Batching - Fugitive	NA	0 gal/hr	1,190 tpd tails & cem.	8,760 hr/yr	8,760 hr/yr
NA	920 Batch Plant - Mixer Loading	Concrete Batching - Fugitive	NA	0 gal/hr	1,250 tpd concrete	8,760 hr/yr	8,760 hr/yr
NA	860 Shotcrete Plant - Aggregate Transfer	Concrete Batching - Fugitive	NA	0 gal/hr	2 tpd aggregate	8,760 hr/yr	8,760 hr/yr
NA	860 Shotcrete Plant - Sand Transfer	Concrete Batching - Fugitive	NA	0 gal/hr	4 tpd sand	8,760 hr/yr	8,760 hr/yr
NA	860 Shotcrete Plant - Weigh Hopper Loading	Concrete Batching - Fugitive	NA	0 gal/hr	6 tpd sand & aggr.	8,760 hr/yr	8,760 hr/yr
NA	860 Shotcrete Plant - Mixer Loading (Central)	Concrete Batching - Fugitive	NA	0 gal/hr	7 tpd concrete	8,760 hr/yr	8,760 hr/yr
NA	675 Underground Batch Plant - Truck Loading	Concrete Batching - Fugitive	NA	0 gal/hr	7 tpd concrete	8,760 hr/yr	8,760 hr/yr
NA	675 Underground Paste Plant - Weigh Hopper Loading	Concrete Batching - Fugitive	NA	0 gal/hr	660 tpd tails & cem.	8,760 hr/yr	8,760 hr/yr
NA	675 Underground Paste Plant - Mixer Loading (Central)	Concrete Batching - Fugitive	NA	0 gal/hr	740 tpd concrete paste	8,760 hr/yr	8,760 hr/yr
NA	Lime Storage Tank	Storage Tank	NA	0 gal/hr	2 tpd	8,760 hr/yr	8,760 hr/yr
NA	1350 Mine Exhaust Adit	Exhaust Adit	NA	0 gal/hr	NA	8,760 hr/yr	8,760 hr/yr
NA	Modine Heater WH-01	Diesel Fired Heater	Diesel	0.85 gal/hr	0.100 MMBtu/hr	8,760 hr/yr	8,760 hr/yr
NA	Modine Heater WH-01	Diesel Fired Heater	Diesel	1.25 gal/hr	0.145 MMBtu/hr	8,760 hr/yr	8,760 hr/yr
NA	Modine Heater UH-109	Diesel Fired Heater	Diesel	0.85 gal/hr	0.100 MMBtu/hr	8,760 hr/yr	8,760 hr/yr
NA	Patriot Furnace CS-12	Diesel Fired Heater	Diesel	0.75 gal/hr	0.097 MMBtu/hr	8,760 hr/yr	8,760 hr/yr
NA	OMNI (Econo) Heater	Used Oil Heater	Used Oil	3.40 gal/hr	0.500 MMBtu/hr	8,760 hr/yr	8,760 hr/yr
NA	Portable Heater	Diesel Fired Heater	Diesel	1.40 gal/hr	0.200 MMBtu/hr	8,760 hr/yr	8,760 hr/yr
NA	Dewalt Portable Heater	Diesel Fired Heater	Diesel	1.46 gal/hr	0.190 MMBtu/hr	8,760 hr/yr	8,760 hr/yr

Table 1. Emission Unit Inventory
Hecla Greens Creek Mining Company - Hecla Greens Creek Mine

ID	Emission Unit Name	Emission Unit Description	Fuel Type	Fuel Consumption	Maximum Capacity	Maximum Operation	2019 Actual Operations
NA	Dayton Portable Heater	Diesel Fired Heater	Diesel	1.30 gal/hr	0.170 MMBtu/hr	8,760 hr/yr	8,760 hr/yr
NA	Portable Heater	Diesel Fired Heater	Diesel	2.50 gal/hr	0.500 MMBtu/hr	8,760 hr/yr	8,760 hr/yr
NA	Portable Heater	Diesel Fired Heater	Diesel	2.50 gal/hr	0.500 MMBtu/hr	8,760 hr/yr	8,760 hr/yr
NA	Portable Heater	Diesel Fired Heater	Diesel	2.50 gal/hr	0.500 MMBtu/hr	8,760 hr/yr	8,760 hr/yr
NA	Portable Heater	Diesel Fired Heater	Diesel	2.50 gal/hr	0.500 MMBtu/hr	8,760 hr/yr	8,760 hr/yr
NA	Assay Furnace Outlet	Furnace Outlet - Fugitive	NA	0 gal/hr	NA	8,760 hr/yr	8,760 hr/yr
NA	Diesel Storage Tank - 920 Powerhouse FT-01	Storage Tank	NA	0 gal/hr	60,000 gal	8,760 hr/yr	8,760 hr/yr
NA	Diesel Storage Tank - 920 Powerhouse FT-04	Storage Tank	NA	0 gal/hr	48,000 gal	8,760 hr/yr	8,760 hr/yr
NA	Diesel Storage Tank - 920 Powerhouse FT-05	Storage Tank	NA	0 gal/hr	48,000 gal	8,760 hr/yr	8,760 hr/yr
NA	Diesel Storage Tank - 920 Ore Pad Grizzly FT-10	Storage Tank	NA	0 gal/hr	500 gal	8,760 hr/yr	8,760 hr/yr
NA	Diesel Storage Tank - 920 Warehouse FT-17	Storage Tank	NA	0 gal/hr	500 gal	8,760 hr/yr	8,760 hr/yr
NA	Diesel Storage Tank - 920 Powerhouse FT-44	Storage Tank	NA	0 gal/hr	660 gal	8,760 hr/yr	8,760 hr/yr
NA	Diesel Storage Tank - 920 Powerhouse FT-45	Storage Tank	NA	0 gal/hr	660 gal	8,760 hr/yr	8,760 hr/yr
NA	Diesel Storage Tank - Mill Cleaner Bldg FT-51	Storage Tank	NA	0 gal/hr	500 gal	8,760 hr/yr	8,760 hr/yr
NA	Diesel Storage Tank - Tails Press Heater FT-52	Storage Tank	NA	0 gal/hr	440 gal	8,760 hr/yr	8,760 hr/yr
NA	Lube Oil Storage Tank - 920 Powerhouse TK-02	Storage Tank	NA	0 gal/hr	5,000 gal	8,760 hr/yr	8,760 hr/yr
NA	Used Oil Storage Tank - 920 Powerhouse TK-03	Storage Tank	NA	0 gal/hr	1,000 gal	8,760 hr/yr	8,760 hr/yr
NA	Engine Oil Storage Tank - 920 Maint. Shop TK-13	Storage Tank	NA	0 gal/hr	5,000 gal	8,760 hr/yr	8,760 hr/yr
NA	Hydraulic Oil Storage Tank - 920 Maint. Shop TK-14	Storage Tank	NA	0 gal/hr	5,000 gal	8,760 hr/yr	8,760 hr/yr
NA	Used Oil Storage Tank - HI/920 (portable) TK-121	Storage Tank	NA	0 gal/hr	1,100 gal	8,760 hr/yr	8,760 hr/yr
NA	Used Oil Storage Tank - HI/920 (portable) TK-122	Storage Tank	NA	0 gal/hr	1,100 gal	8,760 hr/yr	8,760 hr/yr
NA	Diesel Storage Tank - 860 Lab Building FT-03	Storage Tank	NA	0 gal/hr	2,000 gal	8,760 hr/yr	8,760 hr/yr
NA	Diesel Storage Tank - 860 Safety Building FT-16	Storage Tank	NA	0 gal/hr	500 gal	8,760 hr/yr	8,760 hr/yr
NA	Diesel Storage Tank - 860 Core Shed FT-28	Storage Tank	NA	0 gal/hr	550 gal	8,760 hr/yr	8,760 hr/yr
NA	Diesel Storage Tank - Pond 23 FT-204	Storage Tank	NA	0 gal/hr	500 gal	8,760 hr/yr	8,760 hr/yr
NA	Jet A Storage Tank - 860 Helipad (summer)	Storage Tank	NA	0 gal/hr	5,800 gal	8,760 hr/yr	8,760 hr/yr

Note: (1) Expected emissions calculated from actual 2019 hours of operation when available; otherwise, used 8760 hours per year.

Table 2. Emissions Summary
Hecla Greens Creek Mining Company - Hecla Greens Creek Mine

	NO_x Emissions	CO Emissions	PM-10 Emissions	PM-2.5 Emissions	SO₂ Emissions	VOC Emissions	HAP Emissions	CO₂e Emissions
Unlimited Annual Emissions								
Significant Emission Units	1016.9 tpy	76.7 tpy	16.7 tpy	16.5 tpy	365.4 tpy	54.2 tpy	1.0 tpy	110,630.8 tpy
Insignificant Emission Units	2.4 tpy	0.5 tpy	3.9 tpy	3.5 tpy	6.6 tpy	0.1 tpy	0.2 tpy	2,509.7 tpy
Total	1,019.3 tpy	77.2 tpy	21.8 tpy	19.9 tpy	372.0 tpy	54.3 tpy	1.2 tpy	113,140.4 tpy
Limited Annual Emissions								
Significant Emission Units	579.4 tpy	127.0 tpy	16.7 tpy	16.5 tpy	65.3 tpy	54.2 tpy	1.0 tpy	110,630.8 tpy
Insignificant Emission Units	2.4 tpy	0.5 tpy	3.9 tpy	3.5 tpy	1.9 tpy	0.1 tpy	0.2 tpy	2,509.7 tpy
Total	581.8 tpy	127.5 tpy	20.6 tpy	19.9 tpy	67.2 tpy	54.3 tpy	1.2 tpy	113,140.4 tpy
Expected Actual Annual Emissions								
Significant Emission Units	518.9 tpy	35.1 tpy	9.9 tpy	9.7 tpy	0.5 tpy	8.1 tpy	0.5 tpy	64,646.0 tpy
Insignificant Emission Units	2.4 tpy	0.5 tpy	3.9 tpy	3.5 tpy	1.1 tpy	0.1 tpy	0.2 tpy	2,509.7 tpy
Total	521.2 tpy	35.6 tpy	13.8 tpy	13.2 tpy	1.7 tpy	8.2 tpy	0.7 tpy	67,155.7 tpy

Note: (1) PM-10 and PM-2.5 emissions exclude road fugitives for an unlisted source; refer to Tables 5 and 6 for details.

Table 3. Oxides of Nitrogen (NO_x) Emissions
Hecla Greens Creek Mining Company - Hecla Greens Creek Mine

ID	Emission Unit Description	Reference	Emission Factor	Maximum Throughput	Unlimited NOx Emissions	Limited NOx Emissions	Expected NOx Emissions
Significant Emission Units							
1	Ruston Engine Serial No. IH9763	2018 Source Test	42.6 lb/hr	2,200 kW	186.588 tpy	535.700 tpy	104.498 tpy
2	Ruston Engine Serial No. IH9796	2018 Source Test	58.1 lb/hr	2,200 kW	254.478 tpy		169.274 tpy
3	Ruston Engine Serial No. IH9795	2018 Source Test	54.4 lb/hr	2,200 kW	238.272 tpy		135.075 tpy
4	Caterpillar 3516B Engine Serial No. 1HZ01050	2018 Source Test	21.4 lb/hr	1,825 kW	93.732 tpy		8.892 tpy
18	Caterpillar 3516B Engine Serial No. 1HZ01013	2018 Source Test	27.5 lb/hr	1,825 kW	120.450 tpy		23.815 tpy
19	Solar Taurus 60-T7300S Turbine Serial No. 0605T	2018 Source Test	18.2 lb/hr	5,045 kW	79.716 tpy		72.682 tpy
5	Volcano Boiler Serial No. W-1063	AP-42 Table 1.3-1	0.02 lb/gal	2.5 MMBtu/hr	0.946 tpy	0.946 tpy	0.758 tpy
6	Sullair Model 900 Air Compressor	AP-42 Table 3.3-1	0.031 lb/hp-hr	266 hp	36.117 tpy	36.117 tpy	0.033 tpy
7	Sag Mill (Crusher)	NA	0	2,300 tpd	0 tpy	0 tpy	0 tpy
8	Ball Mill (Crusher)	NA	0	2,300 tpd	0 tpy	0 tpy	0 tpy
9	Conveyor Drop Points	NA	0	2,300 tpd	0 tpy	0 tpy	0 tpy
20	Cleaver Brooks Boiler	AP-42 Table 1.3-1	0.02 lb/gal	4.5 MMBtu/hr	2.812 tpy	2.812 tpy	0.756 tpy
21	Weil McLain Boiler LW-02	AP-42 Table 1.3-1	0.02 lb/gal	1.7 MMBtu/hr	1.244 tpy	1.244 tpy	1.244 tpy
22	Perkins Engine	AP-42 Table 3.3-1	0.031 lb/hp-hr	13 hp	1.779 tpy	1.779 tpy	1.779 tpy
23	John Deere Engine - PP-205 - Emergency 8" Godwin Pump	Tier 3 ⁽¹⁾	4.156 g/hp-hr	99 hp	0.227 tpy	0.227 tpy	4.5E-04 tpy
24	Caterpillar Engine - PP-204 - Emergency 16" Godwin Pump	Tier 3 ⁽¹⁾	3.563 lb/hp-hr	300 hp	0.589 tpy	0.589 tpy	0.046 tpy
Subtotal					1,016.9 tpy	579.4 tpy	518.9 tpy
Insignificant Emission Units							
NA	Loading Tailings & Concentrate to Haul Trucks	NA	0	2,300 tpd	0 tpy	0 tpy	0 tpy
NA	Unloading Ore	NA	0	2,300 tpd	0 tpy	0 tpy	0 tpy
NA	Misc. Surface Activities (Unpaved Roads)	NA	0	NA	0 tpy	0 tpy	0 tpy
NA	920 Batch Plant - Sand Transfer	NA	0	1,130 tpd tails	0 tpy	0 tpy	0 tpy
NA	920 Batch Plant - Cement Storage Silo Unloading	NA	0	60 tpd cement	0 tpy	0 tpy	0 tpy
NA	920 Batch Plant - Weigh Hopper Loading	NA	0	1,190 tpd tails & cem.	0 tpy	0 tpy	0 tpy
NA	920 Batch Plant - Mixer Loading	NA	0	1,250 tpd concrete	0 tpy	0 tpy	0 tpy
NA	860 Shotcrete Plant - Aggregate Transfer	NA	0	2 tpd aggregate	0 tpy	0 tpy	0 tpy
NA	860 Shotcrete Plant - Sand Transfer	NA	0	4 tpd sand	0 tpy	0 tpy	0 tpy
NA	860 Shotcrete Plant - Weigh Hopper Loading	NA	0	6 tpd sand & aggr.	0 tpy	0 tpy	0 tpy
NA	860 Shotcrete Plant - Mixer Loading (Central)	NA	0	7 tpd concrete	0 tpy	0 tpy	0 tpy
NA	675 Underground Batch Plant - Truck Loading	NA	0	7 tpd concrete	0 tpy	0 tpy	0 tpy
NA	675 Underground Paste Plant - Weigh Hopper Loading	NA	0	660 tpd tails & cem.	0 tpy	0 tpy	0 tpy
NA	675 Underground Paste Plant - Mixer Loading (Central)	NA	0	740 tpd concrete paste	0 tpy	0 tpy	0 tpy
NA	Lime Storage Tank	NA	0	2 tpd	0 tpy	0 tpy	0 tpy
NA	1350 Mine Exhaust Adit	NA	0	NA	0 tpy	0 tpy	0 tpy
NA	Modine Heater WH-01	AP-42 Table 1.3-1	0.02 lb/gal	0.100 MMBtu/hr	0.074 tpy	0.074 tpy	0.074 tpy
NA	Modine Heater WH-01	AP-42 Table 1.3-1	0.02 lb/gal	0.145 MMBtu/hr	0.110 tpy	0.110 tpy	0.110 tpy
NA	Modine Heater UH-109	AP-42 Table 1.3-1	0.02 lb/gal	0.100 MMBtu/hr	0.074 tpy	0.074 tpy	0.074 tpy
NA	Patriot Furnace CS-12	AP-42 Table 1.3-1	0.02 lb/gal	0.097 MMBtu/hr	0.066 tpy	0.066 tpy	0.066 tpy
NA	OMNI (Econo) Heater	AP-42 Table 1.3-1	0.055 lb/gal	0.500 MMBtu/hr	0.819 tpy	0.819 tpy	0.819 tpy
NA	Portable Heater	AP-42 Table 1.3-1	0.02 lb/gal	0.200 MMBtu/hr	0.123 tpy	0.123 tpy	0.123 tpy

Table 3. Oxides of Nitrogen (NO_x) Emissions
Hecla Greens Creek Mining Company - Hecla Greens Creek Mine

ID	Emission Unit Description	Reference	Emission Factor	Maximum Throughput	Unlimited NOx Emissions	Limited NOx Emissions	Expected NOx Emissions
NA	Dewalt Portable Heater	AP-42 Table 1.3-1	0.02 lb/gal	0.190 MMBtu/hr	0.128 tpy	0.128 tpy	0.128 tpy
NA	Dayton Portable Heater	AP-42 Table 1.3-1	0.02 lb/gal	0.170 MMBtu/hr	0.114 tpy	0.114 tpy	0.114 tpy
NA	Portable Heater	AP-42 Table 1.3-1	0.02 lb/gal	0.500 MMBtu/hr	0.219 tpy	0.219 tpy	0.219 tpy
NA	Portable Heater	AP-42 Table 1.3-1	0.02 lb/gal	0.500 MMBtu/hr	0.219 tpy	0.219 tpy	0.219 tpy
NA	Portable Heater	AP-42 Table 1.3-1	0.02 lb/gal	0.500 MMBtu/hr	0.219 tpy	0.219 tpy	0.219 tpy
NA	Portable Heater	AP-42 Table 1.3-1	0.02 lb/gal	0.500 MMBtu/hr	0.219 tpy	0.219 tpy	0.219 tpy
NA	Assay Furnace Outlet	NA	0	NA	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Powerhouse FT-01	NA	0	60,000 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Powerhouse FT-04	NA	0	48,000 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Powerhouse FT-05	NA	0	48,000 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Ore Pad Grizzly FT-10	NA	0	500 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Warehouse FT-17	NA	0	500 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Powerhouse FT-44	NA	0	660 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Powerhouse FT-45	NA	0	660 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - Mill Cleaner Bldg FT-51	NA	0	500 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - Tails Press Heater FT-52	NA	0	440 gal	0 tpy	0 tpy	0 tpy
NA	Lube Oil Storage Tank - 920 Powerhouse TK-02	NA	0	5,000 gal	0 tpy	0 tpy	0 tpy
NA	Used Oil Storage Tank - 920 Powerhouse TK-03	NA	0	1,000 gal	0 tpy	0 tpy	0 tpy
NA	Engine Oil Storage Tank - 920 Maint. Shop TK-13	NA	0	5,000 gal	0 tpy	0 tpy	0 tpy
NA	Hydraulic Oil Storage Tank - 920 Maint. Shop TK-14	NA	0	5,000 gal	0 tpy	0 tpy	0 tpy
NA	Used Oil Storage Tank - HI/920 (portable) TK-121	NA	0	1,100 gal	0 tpy	0 tpy	0 tpy
NA	Used Oil Storage Tank - HI/920 (portable) TK-122	NA	0	1,100 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 860 Lab Building FT-03	NA	0	2,000 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 860 Safety Building FT-16	NA	0	500 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 860 Core Shed FT-28	NA	0	550 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - Pond 23 FT-204	NA	0	500 gal	0 tpy	0 tpy	0 tpy
NA	Jet A Storage Tank - 860 Helipad (summer)	NA	0	5,800 gal	0 tpy	0 tpy	0 tpy
Subtotal					2.4 tpy	2.4 tpy	2.4 tpy
Total NOx Emissions					1,019.3 tpy	581.8 tpy	521.2 tpy

Note: (1) For Tier 3 emission factors, NHHC+NOx is 95% NOx and 5% VOC. A buffer of 1.25 was applied to all Tier 3 emission factors.

Table 4. Carbon Monoxide (CO) Emissions
Hecla Greens Creek Mining Company - Hecla Greens Creek Mine

ID	Emission Unit Description	Reference	Emission Factor	Maximum Throughput	Unlimited CO Emissions	Limited CO Emissions	Expected CO Emissions
Significant Emission Units							
1	Ruston Engine Serial No. IH9763	2018 Source Test	3.17 lb/hr	2,200 kW	13.885 tpy	100.000 tpy	7.776 tpy
2	Ruston Engine Serial No. IH9796	2018 Source Test	4.41 lb/hr	2,200 kW	19.316 tpy		12.849 tpy
3	Ruston Engine Serial No. IH9795	2018 Source Test	3.77 lb/hr	2,200 kW	16.513 tpy		9.361 tpy
4	Caterpillar 3516B Engine Serial No. 1HZ01050	2018 Source Test	1.53 lb/hr	1,825 kW	6.701 tpy		0.636 tpy
18	Caterpillar 3516B Engine Serial No. 1HZ01013	2018 Source Test	1.88 lb/hr	1,825 kW	8.234 tpy	8.234 tpy	1.628 tpy
19	Solar Taurus 60-T7300S Turbine Serial No. 0605T	2018 Source Test	0.43 lb/hr	5,045 kW	1.883 tpy	1.883 tpy	1.717 tpy
5	Volcano Boiler Serial No. W-1063	AP-42 Table 1.3-1	0.005 lb/gal	2.5 MMBtu/hr	0.237 tpy	0.237 tpy	0.189 tpy
6	Sullair Model 900 Air Compressor	AP-42 Table 3.3-1	0.00668 lb/hp-hr	266 hp	7.783 tpy	7.783 tpy	0.007 tpy
7	Sag Mill (Crusher)	NA	0	2,300 tpd	0 tpy	0 tpy	0 tpy
8	Ball Mill (Crusher)	NA	0	2,300 tpd	0 tpy	0 tpy	0 tpy
9	Conveyor Drop Points	NA	0	2,300 tpd	0 tpy	0 tpy	0 tpy
20	Cleaver Brooks Boiler	AP-42 Table 1.3-1	0.005 lb/gal	4.5 MMBtu/hr	0.703 tpy	0.703 tpy	0.189 tpy
21	Weil McLain Boiler LW-02	AP-42 Table 1.3-1	0.005 lb/gal	1.7 MMBtu/hr	0.311 tpy	0.311 tpy	0.311 tpy
22	Perkins Engine	AP-42 Table 3.3-1	0.00668 lb/hp-hr	13 hp	0.383 tpy	0.383 tpy	0.383 tpy
23	John Deere Engine - PP-205 - Emergency 8" Godwin Pump	Tier 3 ⁽¹⁾	4.625 g/hp-hr	99 hp	0.252 tpy	0.252 tpy	0.001 tpy
24	Caterpillar Engine - PP-204 - Emergency 16" Godwin Pump	Tier 3 ⁽¹⁾	3.250 g/hp-hr	300 hp	0.537 tpy	0.537 tpy	0.042 tpy
Subtotal					76.7 tpy	127.0 tpy	35.1 tpy
Insignificant Emission Units							
NA	Loading Tailings & Concentrate to Haul Trucks	NA	0	2,300 tpd	0 tpy	0 tpy	0 tpy
NA	Unloading Ore	NA	0	2,300 tpd	0 tpy	0 tpy	0 tpy
NA	Misc. Surface Activities (Unpaved Roads)	NA	0	NA	0 tpy	0 tpy	0 tpy
NA	920 Batch Plant - Sand Transfer	NA	0	1,130 tpd tails	0 tpy	0 tpy	0 tpy
NA	920 Batch Plant - Cement Storage Silo Unloading	NA	0	60 tpd cement	0 tpy	0 tpy	0 tpy
NA	920 Batch Plant - Weigh Hopper Loading	NA	0	1,190 tpd tails & cem.	0 tpy	0 tpy	0 tpy
NA	920 Batch Plant - Mixer Loading	NA	0	1,250 tpd concrete	0 tpy	0 tpy	0 tpy
NA	860 Shotcrete Plant - Aggregate Transfer	NA	0	2 tpd aggregate	0 tpy	0 tpy	0 tpy
NA	860 Shotcrete Plant - Sand Transfer	NA	0	4 tpd sand	0 tpy	0 tpy	0 tpy
NA	860 Shotcrete Plant - Weigh Hopper Loading	NA	0	6 tpd sand & aggr.	0 tpy	0 tpy	0 tpy
NA	860 Shotcrete Plant - Mixer Loading (Central)	NA	0	7 tpd concrete	0 tpy	0 tpy	0 tpy
NA	675 Underground Batch Plant - Truck Loading	NA	0	7 tpd concrete	0 tpy	0 tpy	0 tpy
NA	675 Underground Paste Plant - Weigh Hopper Loading	NA	0	660 tpd tails & cem.	0 tpy	0 tpy	0 tpy
NA	675 Underground Paste Plant - Mixer Loading (Central)	NA	0	740 tpd concrete paste	0 tpy	0 tpy	0 tpy
NA	Lime Storage Tank	NA	0	2 tpd	0 tpy	0 tpy	0 tpy
NA	1350 Mine Exhaust Adit	NA	0	NA	0 tpy	0 tpy	0 tpy
NA	Modine Heater WH-01	AP-42 Table 1.3-1	0.005 lb/gal	0.100 MMBtu/hr	0.019 tpy	0.019 tpy	0.019 tpy
NA	Modine Heater WH-01	AP-42 Table 1.3-1	0.005 lb/gal	0.145 MMBtu/hr	0.027 tpy	0.027 tpy	0.027 tpy
NA	Modine Heater UH-109	AP-42 Table 1.3-1	0.005 lb/gal	0.100 MMBtu/hr	0.019 tpy	0.019 tpy	0.019 tpy
NA	Patriot Furnace CS-12	AP-42 Table 1.3-1	0.005 lb/gal	0.097 MMBtu/hr	0.016 tpy	0.016 tpy	0.016 tpy
NA	OMNI (Econo) Heater	AP-42 Table 1.3-1	0.005 lb/gal	0.500 MMBtu/hr	0.074 tpy	0.074 tpy	0.074 tpy
NA	Portable Heater	AP-42 Table 1.3-1	0.005 lb/gal	0.200 MMBtu/hr	0.031 tpy	0.031 tpy	0.031 tpy

Table 4. Carbon Monoxide (CO) Emissions
Hecla Greens Creek Mining Company - Hecla Greens Creek Mine

ID	Emission Unit Description	Reference	Emission Factor	Maximum Throughput	Unlimited CO Emissions	Limited CO Emissions	Expected CO Emissions
NA	Dewalt Portable Heater	AP-42 Table 1.3-1	0.005 lb/gal	0.190 MMBtu/hr	0.032 tpy	0.032 tpy	0.032 tpy
NA	Dayton Portable Heater	AP-42 Table 1.3-1	0.005 lb/gal	0.170 MMBtu/hr	0.028 tpy	0.028 tpy	0.028 tpy
NA	Portable Heater	AP-42 Table 1.3-1	0.005 lb/gal	0.500 MMBtu/hr	0.055 tpy	0.055 tpy	0.055 tpy
NA	Portable Heater	AP-42 Table 1.3-1	0.005 lb/gal	0.500 MMBtu/hr	0.055 tpy	0.055 tpy	0.055 tpy
NA	Portable Heater	AP-42 Table 1.3-1	0.005 lb/gal	0.500 MMBtu/hr	0.055 tpy	0.055 tpy	0.055 tpy
NA	Portable Heater	AP-42 Table 1.3-1	0.005 lb/gal	0.500 MMBtu/hr	0.055 tpy	0.055 tpy	0.055 tpy
NA	Assay Furnace Outlet	NA	0	NA	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Powerhouse FT-01	NA	0	60,000 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Powerhouse FT-04	NA	0	48,000 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Powerhouse FT-05	NA	0	48,000 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Ore Pad Grizzly FT-10	NA	0	500 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Warehouse FT-17	NA	0	500 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Powerhouse FT-44	NA	0	660 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Powerhouse FT-45	NA	0	660 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - Mill Cleaner Bldg FT-51	NA	0	500 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - Tails Press Heater FT-52	NA	0	440 gal	0 tpy	0 tpy	0 tpy
NA	Lube Oil Storage Tank - 920 Powerhouse TK-02	NA	0	5,000 gal	0 tpy	0 tpy	0 tpy
NA	Used Oil Storage Tank - 920 Powerhouse TK-03	NA	0	1,000 gal	0 tpy	0 tpy	0 tpy
NA	Engine Oil Storage Tank - 920 Maint. Shop TK-13	NA	0	5,000 gal	0 tpy	0 tpy	0 tpy
NA	Hydraulic Oil Storage Tank - 920 Maint. Shop TK-14	NA	0	5,000 gal	0 tpy	0 tpy	0 tpy
NA	Used Oil Storage Tank - HI/920 (portable) TK-121	NA	0	1,100 gal	0 tpy	0 tpy	0 tpy
NA	Used Oil Storage Tank - HI/920 (portable) TK-122	NA	0	1,100 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 860 Lab Building FT-03	NA	0	2,000 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 860 Safety Building FT-16	NA	0	500 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 860 Core Shed FT-28	NA	0	550 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - Pond 23 FT-204	NA	0	500 gal	0 tpy	0 tpy	0 tpy
NA	Jet A Storage Tank - 860 Helipad (summer)	NA	0	5,800 gal	0 tpy	0 tpy	0 tpy
Subtotal					0.5 tpy	0.5 tpy	0.5 tpy
Total CO Emissions					77.2 tpy	127.5 tpy	35.6 tpy

Note: (1) A buffer of 1.25 was applied to all Tier 3 emission factors.

Table 5. Particulate Matter (PM-10) Emissions
Hecla Greens Creek Mining Company - Hecla Greens Creek Mine

ID	Emission Unit Description	Reference	Emission Factor	Maximum Throughput	Unlimited PM-10 Emissions	Limited PM-10 Emissions	Expected PM-10 Emissions
Significant Emission Units							
1	Ruston Engine Serial No. IH9763	2008 Source Test	0.5550 lb/hr	2,200 kW	2.431 tpy	2.431 tpy	1.361 tpy
2	Ruston Engine Serial No. IH9796	2008 Source Test	0.5550 lb/hr	2,200 kW	2.431 tpy	2.431 tpy	1.617 tpy
3	Ruston Engine Serial No. IH9795	2008 Source Test	0.5550 lb/hr	2,200 kW	2.431 tpy	2.431 tpy	1.378 tpy
4	Caterpillar 3516B Engine Serial No. 1HZ01050	2008 Source Test	0.1080 lb/hr	1,825 kW	0.473 tpy	0.473 tpy	0.045 tpy
18	Caterpillar 3516B Engine Serial No. 1HZ01013	2008 Source Test	0.1080 lb/hr	1,825 kW	0.473 tpy	0.473 tpy	0.094 tpy
19	Solar Taurus 60-T7300S Turbine Serial No. 0605T	2018 Source Test	0.9300 lb/hr	5,045 kW	4.073 tpy	4.073 tpy	3.714 tpy
5	Volcano Boiler Serial No. W-1063	AP-42 Table 1.3-6	0.0010 lb/gal	2.5 MMBtu/hr	0.047 tpy	0.047 tpy	0.038 tpy
6	Sullair Model 900 Air Compressor	AP-42 Table 3.3-1	0.0022 lb/hp-hr	266 hp	2.563 tpy	2.563 tpy	0.002 tpy
7	Sag Mill (Crusher)	AP-42 Table 11.24-2 ⁽¹⁾	0.0016 lb/ton	2,300 tpd	0.672 tpy	0.672 tpy	0.672 tpy
8	Ball Mill (Crusher)	AP-42 Table 11.24-2 ⁽¹⁾	0.0016 lb/ton	2,300 tpd	0.672 tpy	0.672 tpy	0.672 tpy
9	Conveyor Drop Points	AP-42 Sec 13.2.4-3 ⁽²⁾	0.000142 lb/ton	2,300 tpd	0.060 tpy	0.060 tpy	0.060 tpy
20	Cleaver Brooks Boiler	AP-42 Table 1.3-6	0.0010 lb/gal	4.5 MMBtu/hr	0.141 tpy	0.141 tpy	0.038 tpy
21	Weil McLain Boiler LW-02	AP-42 Table 1.3-6	0.0010 lb/gal	1.7 MMBtu/hr	0.062 tpy	0.062 tpy	0.062 tpy
22	Perkins Engine	AP-42 Table 3.3-1	0.0022 lb/hp-hr	13 hp	0.126 tpy	0.126 tpy	0.126 tpy
23	John Deere Engine - PP-205 - Emergency 8" Godwin Pump	Tier 3 ⁽³⁾	0.375 g/hp-hr	99 hp	0.020 tpy	0.020 tpy	4.1E-05 tpy
24	Caterpillar Engine - PP-204 - Emergency 16" Godwin Pump	Tier 3 ⁽³⁾	0.1875 g/hp-hr	300 hp	0.031 tpy	0.031 tpy	0.002 tpy
Subtotal					16.7 tpy	16.7 tpy	9.9 tpy
Insignificant Emission Units							
NA	Loading Tailings & Concentrate to Haul Trucks	AP-42 Sec 13.2.4-3 ⁽⁴⁾	0.000515 lb/ton	2,300 tpd	0.216 tpy	0.216 tpy	0.216 tpy
NA	Unloading Ore	AP-42 Sec 13.2.4-3 ⁽⁴⁾	0.000515 lb/ton	2,300 tpd	0.216 tpy	0.216 tpy	0.216 tpy
NA	Misc. Surface Activities (Unpaved Roads)	AP-42 Sec 13.2.2 ⁽⁵⁾	See Table 11	NA	35.210 tpy	35.210 tpy	35.210 tpy
NA	920 Batch Plant - Sand Transfer	AP-42 Table 11.12-2	0.00099 lb/ton	1,130 tpd tails	0.204 tpy	0.204 tpy	0.204 tpy
NA	920 Batch Plant - Cement Storage Silo Unloading	AP-42 Table 11.12-2	0.00034 lb/ton	60 tpd cement	0.004 tpy	0.004 tpy	0.004 tpy
NA	920 Batch Plant - Weigh Hopper Loading	AP-42 Table 11.12-2	0.00280 lb/ton	1,190 tpd tails & cem.	0.608 tpy	0.608 tpy	0.608 tpy
NA	920 Batch Plant - Mixer Loading	AP-42 Table 11.12-2	0.00550 lb/ton	1,250 tpd concrete	1.255 tpy	1.255 tpy	1.255 tpy
NA	860 Shotcrete Plant - Aggregate Transfer	AP-42 Table 11.12-2	0.00330 lb/ton	2 tpd aggregate	0.001 tpy	0.001 tpy	0.001 tpy
NA	860 Shotcrete Plant - Sand Transfer	AP-42 Table 11.12-2	0.00099 lb/ton	4 tpd sand	0.001 tpy	0.001 tpy	0.001 tpy
NA	860 Shotcrete Plant - Weigh Hopper Loading	AP-42 Table 11.12-2	0.00280 lb/ton	6 tpd sand & aggr.	0.003 tpy	0.003 tpy	0.003 tpy
NA	860 Shotcrete Plant - Mixer Loading (Central)	AP-42 Table 11.12-2	0.00550 lb/ton	7 tpd concrete	0.007 tpy	0.007 tpy	0.007 tpy
NA	675 Underground Batch Plant - Truck Loading	AP-42 Table 11.12-2	0.02630 lb/ton	7 tpd concrete	0.034 tpy	0.034 tpy	0.034 tpy
NA	675 Underground Paste Plant - Weigh Hopper Loading	AP-42 Table 11.12-2	0.00280 lb/ton	660 tpd tails & cem.	0.337 tpy	0.337 tpy	0.337 tpy
NA	675 Underground Paste Plant - Mixer Loading (Central)	AP-42 Table 11.12-2	0.00550 lb/ton	740 tpd concrete paste	0.743 tpy	0.743 tpy	0.743 tpy
NA	Lime Storage Tank	AP-42 Table 11.12-2	0.00034 lb/ton	2 tpd	0.0001 tpy	0.0001 tpy	1.2E-04 tpy
NA	1350 Mine Exhaust Adit	NA	0	NA	0 tpy	0 tpy	0 tpy
NA	Modine Heater WH-01	AP-42 Table 1.3-6	0.0010 lb/gal	0.100 MMBtu/hr	0.004 tpy	0.004 tpy	0.004 tpy
NA	Modine Heater WH-01	AP-42 Table 1.3-6	0.0010 lb/gal	0.145 MMBtu/hr	0.005 tpy	0.005 tpy	0.005 tpy
NA	Modine Heater UH-109	AP-42 Table 1.3-6	0.0010 lb/gal	0.100 MMBtu/hr	0.004 tpy	0.004 tpy	0.004 tpy
NA	Patriot Furnace CS-12	AP-42 Table 1.3-6	0.0010 lb/gal	0.097 MMBtu/hr	0.003 tpy	0.003 tpy	0.003 tpy
NA	OMNI (Econo) Heater	AP-42 Table 1.3-1, 2	0.0093 lb/gal	0.500 MMBtu/hr	0.139 tpy	0.139 tpy	0.139 tpy
NA	Portable Heater	AP-42 Table 1.3-6	0.0010 lb/gal	0.200 MMBtu/hr	0.006 tpy	0.006 tpy	0.006 tpy

Table 5. Particulate Matter (PM-10) Emissions
Hecla Greens Creek Mining Company - Hecla Greens Creek Mine

ID	Emission Unit Description	Reference	Emission Factor	Maximum Throughput	Unlimited PM-10 Emissions	Limited PM-10 Emissions	Expected PM-10 Emissions
NA	Dewalt Portable Heater	AP-42 Table 1.3-6	0.0010 lb/gal	0.190 MMBtu/hr	0.006 tpy	0.006 tpy	0.006 tpy
NA	Dayton Portable Heater	AP-42 Table 1.3-6	0.0010 lb/gal	0.170 MMBtu/hr	0.006 tpy	0.006 tpy	0.006 tpy
NA	Portable Heater	AP-42 Table 1.3-6	0.0010 lb/gal	0.500 MMBtu/hr	0.011 tpy	0.011 tpy	0.011 tpy
NA	Portable Heater	AP-42 Table 1.3-6	0.0010 lb/gal	0.500 MMBtu/hr	0.011 tpy	0.011 tpy	0.011 tpy
NA	Portable Heater	AP-42 Table 1.3-6	0.0010 lb/gal	0.500 MMBtu/hr	0.011 tpy	0.011 tpy	0.011 tpy
NA	Portable Heater	AP-42 Table 1.3-6	0.0010 lb/gal	0.500 MMBtu/hr	0.011 tpy	0.011 tpy	0.011 tpy
NA	Assay Furnace Outlet	Scoping Stack Test	0.0080 lb/hr	NA	0.035 tpy	0.035 tpy	0.035 tpy
NA	Diesel Storage Tank - 920 Powerhouse FT-01	NA	0	60,000 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Powerhouse FT-04	NA	0	48,000 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Powerhouse FT-05	NA	0	48,000 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Ore Pad Grizzly FT-10	NA	0	500 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Warehouse FT-17	NA	0	500 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Powerhouse FT-44	NA	0	660 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Powerhouse FT-45	NA	0	660 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - Mill Cleaner Bldg FT-51	NA	0	500 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - Tails Press Heater FT-52	NA	0	440 gal	0 tpy	0 tpy	0 tpy
NA	Lube Oil Storage Tank - 920 Powerhouse TK-02	NA	0	5,000 gal	0 tpy	0 tpy	0 tpy
NA	Used Oil Storage Tank - 920 Powerhouse TK-03	NA	0	1,000 gal	0 tpy	0 tpy	0 tpy
NA	Engine Oil Storage Tank - 920 Maint. Shop TK-13	NA	0	5,000 gal	0 tpy	0 tpy	0 tpy
NA	Hydraulic Oil Storage Tank - 920 Maint. Shop TK-14	NA	0	5,000 gal	0 tpy	0 tpy	0 tpy
NA	Used Oil Storage Tank - HI/920 (portable) TK-121	NA	0	1,100 gal	0 tpy	0 tpy	0 tpy
NA	Used Oil Storage Tank - HI/920 (portable) TK-122	NA	0	1,100 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 860 Lab Building FT-03	NA	0	2,000 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 860 Safety Building FT-16	NA	0	500 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 860 Core Shed FT-28	NA	0	550 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - Pond 23 FT-204	NA	0	500 gal	0 tpy	0 tpy	0 tpy
NA	Jet A Storage Tank - 860 Helipad (summer)	NA	0	5,800 gal	0 tpy	0 tpy	0 tpy
Subtotal					39.1 tpy	39.1 tpy	39.1 tpy
Total PM-10 Emissions					55.8 tpy	55.8 tpy	49.0 tpy
Total PM-10 Emissions (w/o road fugitives)					20.6 tpy	20.6 tpy	13.8 tpy

- Notes:
- (1) Approximately 99 percent reduction for wet material grinding per AP-42 Section 11.24.2.
 - (2) Conveyor Drop Point Emission Factor and Inputs ($E = k(0.0032) * [(U/5)^{1.3}/(M/2)^{1.4}]$):
 - k = 0.35 for particles less than 10 um
 - U = 1.3 mph for enclosed transfer
 - M = 2.5% for ore moisture
 - (3) A buffer of 1.25 was applied to all Tier 3 emission factors.
 - (4) Truck Loading and Unloading Ore Emission Factor and Inputs ($E = k(0.0032) * [(U/5)^{1.3}/(M/2)^{1.4}]$):
 - k = 0.35 for particles less than 10 um
 - U = 3.5 mph from meteorological data
 - M = 2.5% for ore moisture
 - (5) See Table 11 for detailed PM emission factors for Misc. Service Activities.

Table 6. Particulate Matter (PM-2.5) Emissions
Hecla Greens Creek Mining Company - Hecla Greens Creek Mine

ID	Emission Unit Description	Reference	Emission Factor	Maximum Throughput	Unlimited PM-2.5 Emissions	Limited PM-2.5 Emissions	Expected PM-2.5 Emissions
Significant Emission Units							
1	Ruston Engine Serial No. IH9763	2008 Source Test	0.5550 lb/hr	2,200 kW	2.431 tpy	2.431 tpy	1.361 tpy
2	Ruston Engine Serial No. IH9796	2008 Source Test	0.5550 lb/hr	2,200 kW	2.431 tpy	2.431 tpy	1.617 tpy
3	Ruston Engine Serial No. IH9795	2008 Source Test	0.5550 lb/hr	2,200 kW	2.431 tpy	2.431 tpy	1.378 tpy
4	Caterpillar 3516B Engine Serial No. 1HZ01050	2008 Source Test	0.1080 lb/hr	1,825 kW	0.473 tpy	0.473 tpy	0.045 tpy
18	Caterpillar 3516B Engine Serial No. 1HZ01013	2008 Source Test	0.1080 lb/hr	1,825 kW	0.473 tpy	0.473 tpy	0.094 tpy
19	Solar Taurus 60-T7300S Turbine Serial No. 0605T	2018 Source Test	0.9300 lb/hr	5,045 kW	4.073 tpy	4.073 tpy	3.714 tpy
5	Volcano Boiler Serial No. W-1063	AP-42 Table 1.3-6	0.00025 lb/gal	2.5 MMBtu/hr	0.012 tpy	0.012 tpy	0.009 tpy
6	Sullair Model 900 Air Compressor	AP-42 Table 3.3-1	0.0022 lb/hp-hr	266 hp	2.563 tpy	2.563 tpy	0.002 tpy
7	Sag Mill (Crusher)	AP-42 Table 11.24-2 ⁽¹⁾	0.0016 lb/ton	2,300 tpd	0.672 tpy	0.672 tpy	0.672 tpy
8	Ball Mill (Crusher)	AP-42 Table 11.24-2 ⁽¹⁾	0.0016 lb/ton	2,300 tpd	0.672 tpy	0.672 tpy	0.672 tpy
9	Conveyor Drop Points	AP-42 Sec 13.2.4-3 ⁽²⁾	0.000022 lb/ton	2,300 tpd	0.009 tpy	0.009 tpy	0.009 tpy
20	Cleaver Brooks Boiler	AP-42 Table 1.3-6	0.00025 lb/gal	4.5 MMBtu/hr	0.035 tpy	0.035 tpy	0.002 tpy
21	Weil McLain Boiler LW-02	AP-42 Table 1.3-6	0.00025 lb/gal	1.7 MMBtu/hr	0.016 tpy	0.016 tpy	0.016 tpy
22	Perkins Engine	AP-42 Table 3.3-1	0.0022 lb/hp-hr	13 hp	0.126 tpy	0.126 tpy	0.126 tpy
23	John Deere Engine - PP-205 - Emergency 8" Godwin Pump	Tier 3 ⁽³⁾	0.375 g/hp-hr	99 hp	0.020 tpy	0.020 tpy	4.1E-05 tpy
24	Caterpillar Engine - PP-204 - Emergency 16" Godwin Pump	Tier 3 ⁽³⁾	0.1875 g/hp-hr	300 hp	0.031 tpy	0.031 tpy	0.002 tpy
Subtotal					16.5 tpy	16.5 tpy	9.7 tpy
Insignificant Emission Units							
NA	Loading Tailings & Concentrate to Haul Trucks	AP-42 Sec 13.2.4-3 ⁽⁴⁾	0.000078 lb/ton	2,300 tpd	0.033 tpy	0.033 tpy	0.033 tpy
NA	Unloading Ore	AP-42 Sec 13.2.4-3 ⁽⁴⁾	0.000078 lb/ton	2,300 tpd	0.033 tpy	0.033 tpy	0.033 tpy
NA	Misc. Surface Activities (Unpaved Roads)	AP-42 Sec 13.2.2 ⁽⁵⁾	See Table 11	NA	3.521 tpy	3.521 tpy	3.521 tpy
NA	920 Batch Plant - Sand Transfer	AP-42 Table 11.12-2	0.00099 lb/ton	1,130 tpd tails	0.204 tpy	0.204 tpy	0.204 tpy
NA	920 Batch Plant - Cement Storage Silo Unloading	AP-42 Table 11.12-2	0.00034 lb/ton	60 tpd cement	0.004 tpy	0.004 tpy	0.004 tpy
NA	920 Batch Plant - Weigh Hopper Loading	AP-42 Table 11.12-2	0.00280 lb/ton	1,190 tpd tails & cem.	0.608 tpy	0.608 tpy	0.608 tpy
NA	920 Batch Plant - Mixer Loading	AP-42 Table 11.12-2	0.00550 lb/ton	1,250 tpd concrete	1.255 tpy	1.255 tpy	1.255 tpy
NA	860 Shotcrete Plant - Aggregate Transfer	AP-42 Table 11.12-2	0.00330 lb/ton	2 tpd aggregate	0.001 tpy	0.001 tpy	0.001 tpy
NA	860 Shotcrete Plant - Sand Transfer	AP-42 Table 11.12-2	0.00099 lb/ton	4 tpd sand	0.001 tpy	0.001 tpy	0.001 tpy
NA	860 Shotcrete Plant - Weigh Hopper Loading	AP-42 Table 11.12-2	0.00280 lb/ton	6 tpd sand & aggr.	0.003 tpy	0.003 tpy	0.003 tpy
NA	860 Shotcrete Plant - Mixer Loading (Central)	AP-42 Table 11.12-2	0.00550 lb/ton	7 tpd concrete	0.007 tpy	0.007 tpy	0.007 tpy
NA	675 Underground Batch Plant - Truck Loading	AP-42 Table 11.12-2	0.02630 lb/ton	7 tpd concrete	0.034 tpy	0.034 tpy	0.034 tpy
NA	675 Underground Paste Plant - Weigh Hopper Loading	AP-42 Table 11.12-2	0.00280 lb/ton	660 tpd tails & cem.	0.337 tpy	0.337 tpy	0.337 tpy
NA	675 Underground Paste Plant - Mixer Loading (Central)	AP-42 Table 11.12-2	0.00550 lb/ton	740 tpd concrete paste	0.743 tpy	0.743 tpy	0.743 tpy
NA	Lime Storage Tank	AP-42 Table 11.12-2	0.00034 lb/ton	2 tpd	0.0001 tpy	0.0001 tpy	1.2E-04 tpy
NA	1350 Mine Exhaust Adit	NA	0	NA	0 tpy	0 tpy	0 tpy
NA	Modine Heater WH-01	AP-42 Table 1.3-6	0.00025 lb/gal	0.100 MMBtu/hr	0.001 tpy	0.001 tpy	0.001 tpy
NA	Modine Heater WH-01	AP-42 Table 1.3-6	0.00025 lb/gal	0.145 MMBtu/hr	0.001 tpy	0.001 tpy	0.001 tpy
NA	Modine Heater UH-109	AP-42 Table 1.3-6	0.00025 lb/gal	0.100 MMBtu/hr	0.001 tpy	0.001 tpy	0.001 tpy
NA	Patriot Furnace CS-12	AP-42 Table 1.3-6	0.00025 lb/gal	0.097 MMBtu/hr	0.001 tpy	0.001 tpy	0.001 tpy
NA	OMNI (Econo) Heater	AP-42 Table 1.3-1, 2	0.00932 lb/gal	0.500 MMBtu/hr	0.139 tpy	0.139 tpy	0.139 tpy
NA	Portable Heater	AP-42 Table 1.3-6	0.00025 lb/gal	0.200 MMBtu/hr	0.002 tpy	0.002 tpy	0.002 tpy

Table 6. Particulate Matter (PM-2.5) Emissions
Hecla Greens Creek Mining Company - Hecla Greens Creek Mine

ID	Emission Unit Description	Reference	Emission Factor	Maximum Throughput	Unlimited PM-2.5 Emissions	Limited PM-2.5 Emissions	Expected PM-2.5 Emissions
NA	Dewalt Portable Heater	AP-42 Table 1.3-6	0.00025 lb/gal	0.190 MMBtu/hr	0.002 tpy	0.002 tpy	0.002 tpy
NA	Dayton Portable Heater	AP-42 Table 1.3-6	0.00025 lb/gal	0.170 MMBtu/hr	0.001 tpy	0.001 tpy	0.001 tpy
NA	Portable Heater	AP-42 Table 1.3-6	0.00025 lb/gal	0.500 MMBtu/hr	0.003 tpy	0.003 tpy	0.003 tpy
NA	Portable Heater	AP-42 Table 1.3-6	0.00025 lb/gal	0.500 MMBtu/hr	0.003 tpy	0.003 tpy	0.003 tpy
NA	Portable Heater	AP-42 Table 1.3-6	0.00025 lb/gal	0.500 MMBtu/hr	0.003 tpy	0.003 tpy	0.003 tpy
NA	Portable Heater	AP-42 Table 1.3-6	0.00025 lb/gal	0.500 MMBtu/hr	0.003 tpy	0.003 tpy	0.003 tpy
NA	Assay Furnace Outlet	Scoping Stack Test	0.0080 lb/hr	NA	0.035 tpy	0.035 tpy	0.035 tpy
NA	Diesel Storage Tank - 920 Powerhouse FT-01	NA	0	60,000 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Powerhouse FT-04	NA	0	48,000 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Powerhouse FT-05	NA	0	48,000 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Ore Pad Grizzly FT-10	NA	0	500 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Warehouse FT-17	NA	0	500 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Powerhouse FT-44	NA	0	660 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Powerhouse FT-45	NA	0	660 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - Mill Cleaner Bldg FT-51	NA	0	500 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - Tails Press Heater FT-52	NA	0	440 gal	0 tpy	0 tpy	0 tpy
NA	Lube Oil Storage Tank - 920 Powerhouse TK-02	NA	0	5,000 gal	0 tpy	0 tpy	0 tpy
NA	Used Oil Storage Tank - 920 Powerhouse TK-03	NA	0	1,000 gal	0 tpy	0 tpy	0 tpy
NA	Engine Oil Storage Tank - 920 Maint. Shop TK-13	NA	0	5,000 gal	0 tpy	0 tpy	0 tpy
NA	Hydraulic Oil Storage Tank - 920 Maint. Shop TK-14	NA	0	5,000 gal	0 tpy	0 tpy	0 tpy
NA	Used Oil Storage Tank - HI/920 (portable) TK-121	NA	0	1,100 gal	0 tpy	0 tpy	0 tpy
NA	Used Oil Storage Tank - HI/920 (portable) TK-122	NA	0	1,100 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 860 Lab Building FT-03	NA	0	2,000 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 860 Safety Building FT-16	NA	0	500 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 860 Core Shed FT-28	NA	0	550 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - Pond 23 FT-204	NA	0	500 gal	0 tpy	0 tpy	0 tpy
NA	Jet A Storage Tank - 860 Helipad (summer)	NA	0	5,800 gal	0 tpy	0 tpy	0 tpy
Subtotal					7.0 tpy	7.0 tpy	7.0 tpy
Total PM-10 Emissions					23.4 tpy	23.4 tpy	16.7 tpy
Total PM-2.5 Emissions (w/o road fugitives)					19.9 tpy	19.9 tpy	13.2 tpy

- Notes:
- (1) Approximately 99 percent reduction for wet material grinding per AP-42 Section 11.24.2.
 - (2) Conveyor Drop Point Emission Factor and Inputs ($E = k(0.0032) * [(U/5)^{1.3}/(M/2)^{1.4}]$):
 - k = 0.053 for particles less than 2.5 um
 - U = 1.3 mph for enclosed transfer
 - M = 2.5% for ore moisture
 - (3) A buffer of 1.25 was applied to all Tier 3 emission factors.
 - (4) Truck Loading and Unloading Ore Emission Factor and Inputs ($E = k(0.0032) * [(U/5)^{1.3}/(M/2)^{1.4}]$):
 - k = 0.053 for particles less than 2.5 um
 - U = 3.5 mph from meteorological data
 - M = 2.5% for ore moisture
 - (5) See Table 11 for detailed PM emission factors for Misc. Service Activities.

Table 7. Sulfur Dioxide (SO₂) Emissions
Hecla Greens Creek Mining Company - Hecla Greens Creek Mine

ID	Emission Unit Description	Reference	Emission Factor	Maximum Throughput	Unlimited SO ₂ Emissions	Limited SO ₂ Emissions	Expected SO ₂ Emissions
Significant Emission Units							
1	Ruston Engine Serial No. IH9763	Mass B. w/ 0.08% S	1.745 lb/hr	2,200 kW	47.781 tpy	7.645 tpy	0.059 tpy
2	Ruston Engine Serial No. IH9796	Mass B. w/ 0.08% S	1.740 lb/hr	2,200 kW	47.641 tpy	7.623 tpy	0.070 tpy
3	Ruston Engine Serial No. IH9795	Mass B. w/ 0.08% S	1.736 lb/hr	2,200 kW	47.530 tpy	7.605 tpy	0.059 tpy
4	Caterpillar 3516B Engine Serial No. 1HZ01050	Mass B. w/ 0.08% S	1.299 lb/hr	1,825 kW	35.557 tpy	40.000 tpy	0.007 tpy
18	Caterpillar 3516B Engine Serial No. 1HZ01013	Mass B. w/ 0.08% S	1.299 lb/hr	1,825 kW	35.557 tpy		0.015 tpy
19	Solar Taurus 60-T7300S Turbine Serial No. 0605T	Mass B. w/ 0.08% S	4.787 lb/hr	5,045 kW	131.047 tpy		0.263 tpy
5	Volcano Boiler Serial No. W-1063	Mass B. w/ 0.08% S	0.123 lb/hr	2.5 MMBtu/hr	3.359 tpy		0.006 tpy
6	Sullair Model 900 Air Compressor	Mass B. w/ 0.08% S	0.068 lb/hr	266 hp	1.866 tpy		2.3E-05 tpy
7	Sag Mill (Crusher)	NA	0	2,300 tpd	0 tpy	0 tpy	0 tpy
8	Ball Mill (Crusher)	NA	0	2,300 tpd	0 tpy	0 tpy	0 tpy
9	Conveyor Drop Points	NA	0	2,300 tpd	0 tpy	0 tpy	0 tpy
20	Cleaver Brooks Boiler	Mass B. w/ 0.08% S	0.365 lb/hr	4.5 MMBtu/hr	9.982 tpy	1.597 tpy	0.001 tpy
21	Weil McLain Boiler LW-02	Mass B. w/ 0.08% S	0.161 lb/hr	1.7 MMBtu/hr	4.416 tpy	0.707 tpy	0.061 tpy
22	Perkins Engine	Mass B. w/ 0.08% S	0.009 lb/hr	13 hp	0.249 tpy	0.040 tpy	0.003 tpy
23	John Deere Engine - PP-205 - Emergency 8" Godwin Pump	Mass B. w/ 0.08% S	0.066 lb/hr	99 hp	0.103 tpy	0.016 tpy	2.8E-06 tpy
24	Caterpillar Engine - PP-204 - Emergency 16" Godwin Pump	Mass B. w/ 0.08% S	0.172 lb/hr	300 hp	0.268 tpy	0.043 tpy	2.9E-04 tpy
Subtotal					365.4 tpy	65.3 tpy	0.5 tpy
Insignificant Emission Units							
NA	Loading Tailings & Concentrate to Haul Trucks	NA	0	2,300 tpd	0 tpy	0 tpy	0 tpy
NA	Unloading Ore	NA	0	2,300 tpd	0 tpy	0 tpy	0 tpy
NA	Misc. Surface Activities (Unpaved Roads)	NA	0	NA	0 tpy	0 tpy	0 tpy
NA	920 Batch Plant - Sand Transfer	NA	0	1,130 tpd tails	0 tpy	0 tpy	0 tpy
NA	920 Batch Plant - Cement Storage Silo Unloading	NA	0	60 tpd cement	0 tpy	0 tpy	0 tpy
NA	920 Batch Plant - Weigh Hopper Loading	NA	0	1,190 tpd tails & cem.	0 tpy	0 tpy	0 tpy
NA	920 Batch Plant - Mixer Loading	NA	0	1,250 tpd concrete	0 tpy	0 tpy	0 tpy
NA	860 Shotcrete Plant - Aggregate Transfer	NA	0	2 tpd aggregate	0 tpy	0 tpy	0 tpy
NA	860 Shotcrete Plant - Sand Transfer	NA	0	4 tpd sand	0 tpy	0 tpy	0 tpy
NA	860 Shotcrete Plant - Weigh Hopper Loading	NA	0	6 tpd sand & aggr.	0 tpy	0 tpy	0 tpy
NA	860 Shotcrete Plant - Mixer Loading (Central)	NA	0	7 tpd concrete	0 tpy	0 tpy	0 tpy
NA	675 Underground Batch Plant - Truck Loading	NA	0	7 tpd concrete	0 tpy	0 tpy	0 tpy
NA	675 Underground Paste Plant - Weigh Hopper Loading	NA	0	660 tpd tails & cem.	0 tpy	0 tpy	0 tpy
NA	675 Underground Paste Plant - Mixer Loading (Central)	NA	0	740 tpd concrete paste	0 tpy	0 tpy	0 tpy
NA	Lime Storage Tank	NA	0	2 tpd	0 tpy	0 tpy	0 tpy
NA	1350 Mine Exhaust Adit	NA	0	NA	0 tpy	0 tpy	0 tpy
NA	Modine Heater WH-01	Mass B. w/ 0.08% S	0.010 lb/hr	0.100 MMBtu/hr	0.264 tpy	0.042 tpy	0.004 tpy
NA	Modine Heater WH-01	Mass B. w/ 0.08% S	0.014 lb/hr	0.145 MMBtu/hr	0.389 tpy	0.062 tpy	0.005 tpy
NA	Modine Heater UH-109	Mass B. w/ 0.08% S	0.010 lb/hr	0.100 MMBtu/hr	0.264 tpy	0.042 tpy	0.004 tpy
NA	Patriot Furnace CS-12	Mass B. w/ 0.08% S	0.009 lb/hr	0.097 MMBtu/hr	0.233 tpy	0.037 tpy	0.003 tpy
NA	OMNI (Econo) Heater	Mass B. w/ 0.5% S	0.241 lb/hr	0.500 MMBtu/hr	1.057 tpy	1.057 tpy	1.057 tpy
NA	Portable Heater	Mass B. w/ 0.08% S	0.016 lb/hr	0.200 MMBtu/hr	0.435 tpy	0.070 tpy	0.006 tpy

Table 7. Sulfur Dioxide (SO₂) Emissions
Hecla Greens Creek Mining Company - Hecla Greens Creek Mine

ID	Emission Unit Description	Reference	Emission Factor	Maximum Throughput	Unlimited SO ₂ Emissions	Limited SO ₂ Emissions	Expected SO ₂ Emissions
NA	Dewalt Portable Heater	Mass B. w/ 0.08% S	0.017 lb/hr	0.190 MMBtu/hr	0.454 tpy	0.073 tpy	0.006 tpy
NA	Dayton Portable Heater	Mass B. w/ 0.08% S	0.015 lb/hr	0.170 MMBtu/hr	0.404 tpy	0.065 tpy	0.006 tpy
NA	Portable Heater	Mass B. w/ 0.08% S	0.028 lb/hr	0.500 MMBtu/hr	0.777 tpy	0.124 tpy	0.011 tpy
NA	Portable Heater	Mass B. w/ 0.08% S	0.028 lb/hr	0.500 MMBtu/hr	0.777 tpy	0.124 tpy	0.011 tpy
NA	Portable Heater	Mass B. w/ 0.08% S	0.028 lb/hr	0.500 MMBtu/hr	0.777 tpy	0.124 tpy	0.011 tpy
NA	Portable Heater	Mass B. w/ 0.08% S	0.028 lb/hr	0.500 MMBtu/hr	0.777 tpy	0.124 tpy	0.011 tpy
NA	Assay Furnace Outlet	NA	0	NA	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Powerhouse FT-01	NA	0	60,000 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Powerhouse FT-04	NA	0	48,000 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Powerhouse FT-05	NA	0	48,000 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Ore Pad Grizzly FT-10	NA	0	500 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Warehouse FT-17	NA	0	500 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Powerhouse FT-44	NA	0	660 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Powerhouse FT-45	NA	0	660 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - Mill Cleaner Bldg FT-51	NA	0	500 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - Tails Press Heater FT-52	NA	0	440 gal	0 tpy	0 tpy	0 tpy
NA	Lube Oil Storage Tank - 920 Powerhouse TK-02	NA	0	5,000 gal	0 tpy	0 tpy	0 tpy
NA	Used Oil Storage Tank - 920 Powerhouse TK-03	NA	0	1,000 gal	0 tpy	0 tpy	0 tpy
NA	Engine Oil Storage Tank - 920 Maint. Shop TK-13	NA	0	5,000 gal	0 tpy	0 tpy	0 tpy
NA	Hydraulic Oil Storage Tank - 920 Maint. Shop TK-14	NA	0	5,000 gal	0 tpy	0 tpy	0 tpy
NA	Used Oil Storage Tank - HI/920 (portable) TK-121	NA	0	1,100 gal	0 tpy	0 tpy	0 tpy
NA	Used Oil Storage Tank - HI/920 (portable) TK-122	NA	0	1,100 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 860 Lab Building FT-03	NA	0	2,000 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 860 Safety Building FT-16	NA	0	500 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 860 Core Shed FT-28	NA	0	550 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - Pond 23 FT-204	NA	0	500 gal	0 tpy	0 tpy	0 tpy
NA	Jet A Storage Tank - 860 Helipad (summer)	NA	0	5,800 gal	0 tpy	0 tpy	0 tpy
Subtotal					6.6 tpy	1.9 tpy	1.1 tpy
Total SO₂ Emissions					372.0 tpy	67.2 tpy	1.7 tpy

Notes:

- (1) Fuel density is 7.1 lb/gal for diesel.
- (2) For unlimited emissions, calculations use the maximum fuel sulfur content of diesel by specification (0.5 percent by weight).
- (3) For limited emissions, calculations use the permitted fuel sulfur content of diesel fuel (0.08 percent by weight).
- (4) For expected emissions, calculations use the maximum fuel sulfur content for 2019 (0.0011 percent by weight).

Table 8. Volatile Organic Compound (VOC) Emissions
Hecla Greens Creek Mining Company - Hecla Greens Creek Mine

ID	Emission Unit Description	Reference	Emission Factor	Maximum Throughput	Unlimited VOC Emissions	Limited VOC Emissions	Expected VOC Emissions
Significant Emission Units							
1	Ruston Engine Serial No. IH9763	AP-42 Table 3.4-1	0.000705 lb/hp-hr	2,200 kW	9.110 tpy	9.110 tpy	0.002 tpy
2	Ruston Engine Serial No. IH9796	AP-42 Table 3.4-1	0.000705 lb/hp-hr	2,200 kW	9.110 tpy	9.110 tpy	0.003 tpy
3	Ruston Engine Serial No. IH9795	AP-42 Table 3.4-1	0.000705 lb/hp-hr	2,200 kW	9.110 tpy	9.110 tpy	0.002 tpy
4	Caterpillar 3516B Engine Serial No. 1HZ01050	AP-42 Table 3.4-1	0.000705 lb/hp-hr	1,825 kW	7.557 tpy	7.557 tpy	3.9E-04 tpy
18	Caterpillar 3516B Engine Serial No. 1HZ01013	AP-42 Table 3.4-1	0.000705 lb/hp-hr	1,825 kW	7.557 tpy	7.557 tpy	0.001 tpy
19	Solar Taurus 60-T7300S Turbine Serial No. 0605T	Vendor Data	1.972113 lb/hr	5,045 kW	8.638 tpy	8.638 tpy	7.876 tpy
5	Volcano Boiler Serial No. W-1063	AP-42 Table 1.3-3	0.000252 lb/gal	2.5 MMBtu/hr	0.012 tpy	0.012 tpy	0.010 tpy
6	Sullair Model 900 Air Compressor	AP-42 Table 3.3-1	0.002470 lb/gal	266 hp	2.878 tpy	2.878 tpy	0.003 tpy
7	Sag Mill (Crusher)	NA	0	2,300 tpd	0 tpy	0 tpy	0 tpy
8	Ball Mill (Crusher)	NA	0	2,300 tpd	0 tpy	0 tpy	0 tpy
9	Conveyor Drop Points	NA	0	2,300 tpd	0 tpy	0 tpy	0 tpy
20	Cleaver Brooks Boiler	AP-42 Table 1.3-3	0.000252 lb/gal	4.5 MMBtu/hr	0.035 tpy	0.035 tpy	0.010 tpy
21	Weil McLain Boiler LW-02	AP-42 Table 1.3-3	0.000252 lb/gal	1.7 MMBtu/hr	0.016 tpy	0.016 tpy	0.016 tpy
22	Perkins Engine	AP-42 Table 3.3-1	0.002470 lb/gal	13 hp	0.142 tpy	0.142 tpy	0.142 tpy
23	John Deere Engine - PP-205 - Emergency 8" Godwin Pump	Tier 3 ⁽¹⁾	0.22 g/hp-hr	99 hp	0.012 tpy	0.012 tpy	2.4E-05 tpy
24	Caterpillar Engine - PP-204 - Emergency 16" Godwin Pump	Tier 3 ⁽¹⁾	0.19 g/hp-hr	300 hp	0.031 tpy	0.031 tpy	0.002 tpy
Subtotal					54.2 tpy	54.2 tpy	8.1 tpy
Insignificant Emission Units							
NA	Loading Tailings & Concentrate to Haul Trucks	NA	0	2,300 tpd	0 tpy	0 tpy	0 tpy
NA	Unloading Ore	NA	0	2,300 tpd	0 tpy	0 tpy	0 tpy
NA	Misc. Surface Activities (Unpaved Roads)	NA	0	NA	0 tpy	0 tpy	0 tpy
NA	920 Batch Plant - Sand Transfer	NA	0	1,130 tpd tails	0 tpy	0 tpy	0 tpy
NA	920 Batch Plant - Cement Storage Silo Unloading	NA	0	60 tpd cement	0 tpy	0 tpy	0 tpy
NA	920 Batch Plant - Weigh Hopper Loading	NA	0	1,190 tpd tails & cem.	0 tpy	0 tpy	0 tpy
NA	920 Batch Plant - Mixer Loading	NA	0	1,250 tpd concrete	0 tpy	0 tpy	0 tpy
NA	860 Shotcrete Plant - Aggregate Transfer	NA	0	2 tpd aggregate	0 tpy	0 tpy	0 tpy
NA	860 Shotcrete Plant - Sand Transfer	NA	0	4 tpd sand	0 tpy	0 tpy	0 tpy
NA	860 Shotcrete Plant - Weigh Hopper Loading	NA	0	6 tpd sand & aggr.	0 tpy	0 tpy	0 tpy
NA	860 Shotcrete Plant - Mixer Loading (Central)	NA	0	7 tpd concrete	0 tpy	0 tpy	0 tpy
NA	675 Underground Batch Plant - Truck Loading	NA	0	7 tpd concrete	0 tpy	0 tpy	0 tpy
NA	675 Underground Paste Plant - Weigh Hopper Loading	NA	0	660 tpd tails & cem.	0 tpy	0 tpy	0 tpy
NA	675 Underground Paste Plant - Mixer Loading (Central)	NA	0	740 tpd concrete paste	0 tpy	0 tpy	0 tpy
NA	Lime Storage Tank	NA	0	2 tpd	0 tpy	0 tpy	0 tpy
NA	1350 Mine Exhaust Adit	NA	0	NA	0 tpy	0 tpy	0 tpy
NA	Modine Heater WH-01	AP-42 Table 1.3-3	0.000252 lb/gal	0.100 MMBtu/hr	0.001 tpy	0.001 tpy	0.001 tpy
NA	Modine Heater WH-01	AP-42 Table 1.3-3	0.000252 lb/gal	0.145 MMBtu/hr	0.001 tpy	0.001 tpy	0.001 tpy
NA	Modine Heater UH-109	AP-42 Table 1.3-3	0.000252 lb/gal	0.100 MMBtu/hr	0.001 tpy	0.001 tpy	0.001 tpy
NA	Patriot Furnace CS-12	AP-42 Table 1.3-3	0.000252 lb/gal	0.097 MMBtu/hr	0.001 tpy	0.001 tpy	0.001 tpy
NA	OMNI (Econo) Heater	AP-42 Table 1.3-3	0.001280 lb/gal	0.500 MMBtu/hr	0.019 tpy	0.019 tpy	0.019 tpy
NA	Portable Heater	AP-42 Table 1.3-3	0.000252 lb/hp-hr	0.200 MMBtu/hr	0.002 tpy	0.002 tpy	0.002 tpy

Table 8. Volatile Organic Compound (VOC) Emissions
Hecla Greens Creek Mining Company - Hecla Greens Creek Mine

ID	Emission Unit Description	Reference	Emission Factor	Maximum Throughput	Unlimited VOC Emissions	Limited VOC Emissions	Expected VOC Emissions
NA	Dewalt Portable Heater	AP-42 Table 1.3-3	0.000252 lb/hp-hr	0.190 MMBtu/hr	0.002 tpy	0.002 tpy	0.002 tpy
NA	Dayton Portable Heater	AP-42 Table 1.3-3	0.000252 lb/hp-hr	0.170 MMBtu/hr	0.001 tpy	0.001 tpy	0.001 tpy
NA	Portable Heater	AP-42 Table 1.3-3	0.000252 lb/hp-hr	0.500 MMBtu/hr	0.003 tpy	0.003 tpy	0.003 tpy
NA	Portable Heater	AP-42 Table 1.3-3	0.000252 lb/gal	0.500 MMBtu/hr	0.003 tpy	0.003 tpy	0.003 tpy
NA	Portable Heater	AP-42 Table 1.3-3	0.000252 lb/gal	0.500 MMBtu/hr	0.003 tpy	0.003 tpy	0.003 tpy
NA	Portable Heater	AP-42 Table 1.3-3	0.000252 lb/gal	0.500 MMBtu/hr	0.003 tpy	0.003 tpy	0.003 tpy
NA	Assay Furnace Outlet	NA	0	NA	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Powerhouse FT-01	AP-42 Sec 7.1 ⁽²⁾	See Table 12	60,000 gal	0.025 tpy	0.025 tpy	0.025 tpy
NA	Diesel Storage Tank - 920 Powerhouse FT-04	AP-42 Sec 7.1 ⁽²⁾	See Table 12	48,000 gal	0.024 tpy	0.024 tpy	0.024 tpy
NA	Diesel Storage Tank - 920 Powerhouse FT-05	AP-42 Sec 7.1 ⁽²⁾	See Table 12	48,000 gal	0.020 tpy	0.020 tpy	0.020 tpy
NA	Diesel Storage Tank - 920 Ore Pad Grizzly FT-10	NA	0	500 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Warehouse FT-17	NA	0	500 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Powerhouse FT-44	NA	0	660 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Powerhouse FT-45	NA	0	660 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - Mill Cleaner Bldg FT-51	NA	0	500 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - Tails Press Heater FT-52	NA	0	440 gal	0 tpy	0 tpy	0 tpy
NA	Lube Oil Storage Tank - 920 Powerhouse TK-02	NA	0	5,000 gal	0 tpy	0 tpy	0 tpy
NA	Used Oil Storage Tank - 920 Powerhouse TK-03	NA	0	1,000 gal	0 tpy	0 tpy	0 tpy
NA	Engine Oil Storage Tank - 920 Maint. Shop TK-13	NA	0	5,000 gal	0 tpy	0 tpy	0 tpy
NA	Hydraulic Oil Storage Tank - 920 Maint. Shop TK-14	NA	0	5,000 gal	0 tpy	0 tpy	0 tpy
NA	Used Oil Storage Tank - HI/920 (portable) TK-121	NA	0	1,100 gal	0 tpy	0 tpy	0 tpy
NA	Used Oil Storage Tank - HI/920 (portable) TK-122	NA	0	1,100 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 860 Lab Building FT-03	NA	0	2,000 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 860 Safety Building FT-16	NA	0	500 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 860 Core Shed FT-28	NA	0	550 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - Pond 23 FT-204	NA	0	500 gal	0 tpy	0 tpy	0 tpy
NA	Jet A Storage Tank - 860 Helipad (summer)	NA	0	5,800 gal	0 tpy	0 tpy	0 tpy
Subtotal					0.1 tpy	0.1 tpy	0.1 tpy
Total VOC Emissions					54.3 tpy	54.3 tpy	8.2 tpy

Notes: (1) For Tier 3 emission factors, NHHC+NO_x is 95% NO_x and 5% VOC. A buffer of 1.25 was applied to all Tier 3 emission factors.
(2) See Table 11 for detailed tank VOC emission factors.

Table 9. Hazardous Air Pollutant (HAP) Emissions
Hecla Greens Creek Mining Company - Hecla Greens Creek Mine

ID	Emission Unit Description	Reference	Emission Factor ⁽¹⁾⁽²⁾	Maximum Throughput	Unlimited HAP Emissions	Limited HAP Emissions	Expected HAP Emissions
Significant Emission Units							
1	Ruston Engine Serial No. IH9763	AP-42 Table 3.4-3 & 4	0.001562 lb/MMBtu	2,200 kW	0.141 tpy	0.141 tpy	0.079 tpy
2	Ruston Engine Serial No. IH9796	AP-42 Table 3.4-3 & 4	0.001562 lb/MMBtu	2,200 kW	0.141 tpy	0.141 tpy	0.094 tpy
3	Ruston Engine Serial No. IH9795	AP-42 Table 3.4-3 & 4	0.001562 lb/MMBtu	2,200 kW	0.141 tpy	0.141 tpy	0.080 tpy
4	Caterpillar 3516B Engine Serial No. 1HZ01050	AP-42 Table 3.4-3 & 4	0.001562 lb/MMBtu	1,825 kW	0.117 tpy	0.117 tpy	0.011 tpy
18	Caterpillar 3516B Engine Serial No. 1HZ01013	AP-42 Table 3.4-3 & 4	0.001562 lb/MMBtu	1,825 kW	0.117 tpy	0.117 tpy	0.023 tpy
19	Solar Taurus 60-T7300S Turbine Serial No. 0605T	AP-42 Tables 3.1-4 & 5	0.001248 lb/MMBtu	5,045 kW	0.259 tpy	0.259 tpy	0.236 tpy
5	Volcano Boiler Serial No. W-1063	AP-42 Tables 1.3-9 & 11	0.000158 lb/gal	2.5 MMBtu/hr	0.007 tpy	0.007 tpy	0.006 tpy
6	Sullair Model 900 Air Compressor	AP-42 Table 3.3-2	0.003872 lb/MMBtu	266 hp	0.032 tpy	0.032 tpy	2.9E-05 tpy
7	Sag Mill (Crusher)	NA	0	2,300 tpd	0 tpy	0 tpy	0 tpy
8	Ball Mill (Crusher)	NA	0	2,300 tpd	0 tpy	0 tpy	0 tpy
9	Conveyor Drop Points	NA	0	2,300 tpd	0 tpy	0 tpy	0 tpy
20	Cleaver Brooks Boiler	AP-42 Tables 1.3-9 & 11	0.000158 lb/gal	4.5 MMBtu/hr	0.022 tpy	0.022 tpy	0.006 tpy
21	Weil McLain Boiler LW-02	AP-42 Tables 1.3-9 & 11	0.000158 lb/gal	1.7 MMBtu/hr	0.010 tpy	0.010 tpy	0.010 tpy
22	Perkins Engine	AP-42 Table 3.3-2	0.003872 lb/MMBtu	13 hp	0.002 tpy	0.002 tpy	0.002 tpy
23	John Deere Engine - PP-205 - Emergency 8" Godwin Pump	AP-42 Table 3.3-2	0.003872 lb/MMBtu	99 hp	0.001 tpy	0.001 tpy	1.3E-06 tpy
24	Caterpillar Engine - PP-204 - Emergency 16" Godwin Pump	AP-42 Table 3.3-2	0.003872 lb/MMBtu	300 hp	0.002 tpy	0.002 tpy	1.6E-04 tpy
Subtotal					1.0 tpy	1.0 tpy	0.5 tpy
Insignificant Emission Units							
NA	Loading Tailings & Concentrate to Haul Trucks	NA	0	2,300 tpd	0 tpy	0 tpy	0 tpy
NA	Unloading Ore	NA	0	2,300 tpd	0 tpy	0 tpy	0 tpy
NA	Misc. Surface Activities (Unpaved Roads)	AP-42 Sec 13.2.2 ⁽²⁾	See Table 11	NA 0	0.133 tpy	0.133 tpy	0.133 tpy
NA	920 Batch Plant - Sand Transfer	NA	0	1,130 tpd tails	0 tpy	0 tpy	0 tpy
NA	920 Batch Plant - Cement Storage Silo Unloading	NA	0	60 tpd cement	0 tpy	0 tpy	0 tpy
NA	920 Batch Plant - Weigh Hopper Loading	NA	0	1,190 tpd tails & cem.	0 tpy	0 tpy	0 tpy
NA	920 Batch Plant - Mixer Loading	NA	0	1,250 tpd concrete	0 tpy	0 tpy	0 tpy
NA	860 Shotcrete Plant - Aggregate Transfer	NA	0	2 tpd aggregate	0 tpy	0 tpy	0 tpy
NA	860 Shotcrete Plant - Sand Transfer	NA	0	4 tpd sand	0 tpy	0 tpy	0 tpy
NA	860 Shotcrete Plant - Weigh Hopper Loading	NA	0	6 tpd sand & aggr.	0 tpy	0 tpy	0 tpy
NA	860 Shotcrete Plant - Mixer Loading (Central)	NA	0	7 tpd concrete	0 tpy	0 tpy	0 tpy
NA	675 Underground Batch Plant - Truck Loading	NA	0	7 tpd concrete	0 tpy	0 tpy	0 tpy
NA	675 Underground Paste Plant - Weigh Hopper Loading	NA	0	660 tpd tails & cem.	0 tpy	0 tpy	0 tpy
NA	675 Underground Paste Plant - Mixer Loading (Central)	NA	0	740 tpd concrete paste	0 tpy	0 tpy	0 tpy
NA	Lime Storage Tank	NA	0	2 tpd	0 tpy	0 tpy	0 tpy
NA	1350 Mine Exhaust Adit	NA	0	NA	0 tpy	0 tpy	0 tpy
NA	Modine Heater WH-01	AP-42 Tables 1.3-9 & 11	0.000158 lb/gal	0.1 MMBtu/hr	0.001 tpy	0.001 tpy	0.001 tpy
NA	Modine Heater WH-01	AP-42 Tables 1.3-9 & 11	0.000158 lb/gal	0.145 MMBtu/hr	0.001 tpy	0.001 tpy	0.001 tpy
NA	Modine Heater UH-109	AP-42 Tables 1.3-9 & 11	0.000158 lb/gal	0.1 MMBtu/hr	0.001 tpy	0.001 tpy	0.001 tpy
NA	Patriot Furnace CS-12	AP-42 Tables 1.3-9 & 11	0.000158 lb/gal	0.097 MMBtu/hr	0.001 tpy	0.001 tpy	0.001 tpy
NA	OMNI (Econo) Heater	AP-42 Tables 1.3-9 & 11	0.000158 lb/gal	0.5 MMBtu/hr	0.002 tpy	0.002 tpy	0.002 tpy
NA	Portable Heater	AP-42 Table 3.3-2	0.000158 lb/gal	0.2 MMBtu/hr	0.001 tpy	0.001 tpy	0.001 tpy

Table 9. Hazardous Air Pollutant (HAP) Emissions
Hecla Greens Creek Mining Company - Hecla Greens Creek Mine

ID	Emission Unit Description	Reference	Emission Factor ⁽¹⁾⁽²⁾	Maximum Throughput	Unlimited HAP Emissions	Limited HAP Emissions	Expected HAP Emissions
NA	Dewalt Portable Heater	AP-42 Table 3.3-2	0.000158 lb/gal	0.19 MMBtu/hr	0.001 tpy	0.001 tpy	0.001 tpy
NA	Dayton Portable Heater	AP-42 Table 3.3-2	0.000158 lb/gal	0.17 MMBtu/hr	0.001 tpy	0.001 tpy	0.001 tpy
NA	Portable Heater	AP-42 Table 3.3-2	0.000158 lb/gal	0.5 MMBtu/hr	0.002 tpy	0.002 tpy	0.002 tpy
NA	Portable Heater	AP-42 Tables 1.3-9 & 11	0.000158 lb/gal	0.5 MMBtu/hr	0.002 tpy	0.002 tpy	0.002 tpy
NA	Portable Heater	AP-42 Tables 1.3-9 & 11	0.000158 lb/gal	0.5 MMBtu/hr	0.002 tpy	0.002 tpy	0.002 tpy
NA	Portable Heater	AP-42 Tables 1.3-9 & 11	0.000158 lb/gal	0.5 MMBtu/hr	0.002 tpy	0.002 tpy	0.002 tpy
NA	Assay Furnace Outlet	Scoping Stack Test	0.007045 lb/hr	NA	0.031 tpy	0.031 tpy	0.031 tpy
NA	Diesel Storage Tank - 920 Powerhouse FT-01	NA	0	60,000 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Powerhouse FT-04	NA	0	48,000 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Powerhouse FT-05	NA	0	48,000 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Ore Pad Grizzly FT-10	NA	0	500 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Warehouse FT-17	NA	0	500 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Powerhouse FT-44	NA	0	660 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Powerhouse FT-45	NA	0	660 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - Mill Cleaner Bldg FT-51	NA	0	500 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - Tails Press Heater FT-52	NA	0	440 gal	0 tpy	0 tpy	0 tpy
NA	Lube Oil Storage Tank - 920 Powerhouse TK-02	NA	0	5,000 gal	0 tpy	0 tpy	0 tpy
NA	Used Oil Storage Tank - 920 Powerhouse TK-03	NA	0	1,000 gal	0 tpy	0 tpy	0 tpy
NA	Engine Oil Storage Tank - 920 Maint. Shop TK-13	NA	0	5,000 gal	0 tpy	0 tpy	0 tpy
NA	Hydraulic Oil Storage Tank - 920 Maint. Shop TK-14	NA	0	5,000 gal	0 tpy	0 tpy	0 tpy
NA	Used Oil Storage Tank - HI/920 (portable) TK-121	NA	0	1,100 gal	0 tpy	0 tpy	0 tpy
NA	Used Oil Storage Tank - HI/920 (portable) TK-122	NA	0	1,100 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 860 Lab Building FT-03	NA	0	2,000 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 860 Safety Building FT-16	NA	0	500 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 860 Core Shed FT-28	NA	0	550 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - Pond 23 FT-204	NA	0	500 gal	0 tpy	0 tpy	0 tpy
NA	Jet A Storage Tank - 860 Helipad (summer)	NA	0	5,800 gal	0 tpy	0 tpy	0 tpy
Subtotal					0.2 tpy	0.2 tpy	0.2 tpy
Total HAP Emissions					1.2 tpy	1.2 tpy	0.7 tpy
Highest Individual HAP Emission (Benzene)					0.3 tpy	0.3 tpy	0.2 tpy

Notes: (1) See Table 13 for detailed emission factors and totals for all individual HAPs.

(2) See Table 11 for lead emissions from Misc. Service Activities.

(3) Brake specific fuel consumption for diesel is 7000 Btu/hp-hr.

Table 10. Carbon Dioxide Equivalent (CO₂e) Emissions
Hecla Greens Creek Mining Company - Hecla Greens Creek Mine

ID	Emission Unit Description	Reference ⁽¹⁾	Emission Factor	Maximum Throughput	Unlimited CO ₂ e Emissions	Limited CO ₂ e Emissions	Expected CO ₂ e Emissions
Significant Emission Units							
1	Ruston Engine Serial No. IH9763	40 CFR 98 Table C-1 & 2	74.209 kg/MMBtu	2,200 kW	14,798.37 tpy	14,798.37 tpy	8,287.76 tpy
2	Ruston Engine Serial No. IH9796	40 CFR 98 Table C-1 & 2	74.209 kg/MMBtu	2,200 kW	14,798.37 tpy	14,798.37 tpy	9,843.62 tpy
3	Ruston Engine Serial No. IH9795	40 CFR 98 Table C-1 & 2	74.209 kg/MMBtu	2,200 kW	14,798.37 tpy	14,798.37 tpy	8,389.12 tpy
4	Caterpillar 3516B Engine Serial No. 1HZ01050	40 CFR 98 Table C-1 & 2	74.209 kg/MMBtu	1,825 kW	12,275.92 tpy	12,275.92 tpy	1,164.53 tpy
18	Caterpillar 3516B Engine Serial No. 1HZ01013	40 CFR 98 Table C-1 & 2	74.209 kg/MMBtu	1,825 kW	12,275.92 tpy	12,275.92 tpy	2,427.16 tpy
19	Solar Taurus 60-T7300S Turbine Serial No. 0605T	40 CFR 98 Table C-1 & 2	74.209 kg/MMBtu	5,045 kW	33,935.36 tpy	33,935.36 tpy	30,940.83 tpy
5	Volcano Boiler Serial No. W-1063	40 CFR 98 Table C-1 & 2	74.209 kg/MMBtu	2.5 MMBtu/hr	1,791.45 tpy	1,791.45 tpy	1,434.59 tpy
6	Sullair Model 900 Air Compressor	40 CFR 98 Table C-1 & 2	74.209 kg/MMBtu	266 hp	1,334.27 tpy	1,334.27 tpy	1.22 tpy
7	Sag Mill (Crusher)	NA	0	2,300 tpd	0 tpy	0 tpy	0 tpy
8	Ball Mill (Crusher)	NA	0	2,300 tpd	0 tpy	0 tpy	0 tpy
9	Conveyor Drop Points	NA	0	2,300 tpd	0 tpy	0 tpy	0 tpy
20	Cleaver Brooks Boiler	40 CFR 98 Table C-1 & 2	74.209 kg/MMBtu	4.5 MMBtu/hr	3,224.61 tpy	3,224.61 tpy	866.52 tpy
21	Weil McLain Boiler LW-02	40 CFR 98 Table C-1 & 2	74.209 kg/MMBtu	1.7 MMBtu/hr	1,218.19 tpy	1,218.19 tpy	1,218.19 tpy
22	Perkins Engine	40 CFR 98 Table C-1 & 2	74.209 kg/MMBtu	13 hp	65.71 tpy	65.71 tpy	65.71 tpy
23	John Deere Engine - PP-205 - Emergency 8" Godwin Pump	40 CFR 98 Table C-1 & 2	74.209 kg/MMBtu	99 hp	28.34 tpy	28.34 tpy	0.06 tpy
24	Caterpillar Engine - PP-204 - Emergency 16" Godwin Pump	40 CFR 98 Table C-1 & 2	74.209 kg/MMBtu	300 hp	85.89 tpy	85.89 tpy	6.70 tpy
Subtotal					110,630.8 tpy	110,630.8 tpy	64,646.0 tpy
Insignificant Emission Units							
NA	Loading Tailings & Concentrate to Haul Trucks	NA	0	2,300 tpd	0 tpy	0 tpy	0 tpy
NA	Unloading Ore	NA	0	2,300 tpd	0 tpy	0 tpy	0 tpy
NA	Misc. Surface Activities (Unpaved Roads)	NA	0	NA 0	0 tpy	0 tpy	0 tpy
NA	920 Batch Plant - Sand Transfer	NA	0	1,130 tpd tails	0 tpy	0 tpy	0 tpy
NA	920 Batch Plant - Cement Storage Silo Unloading	NA	0	60 tpd cement	0 tpy	0 tpy	0 tpy
NA	920 Batch Plant - Weigh Hopper Loading	NA	0	1,190 tpd tails & cem.	0 tpy	0 tpy	0 tpy
NA	920 Batch Plant - Mixer Loading	NA	0	1,250 tpd concrete	0 tpy	0 tpy	0 tpy
NA	860 Shotcrete Plant - Aggregate Transfer	NA	0	2 tpd aggregate	0 tpy	0 tpy	0 tpy
NA	860 Shotcrete Plant - Sand Transfer	NA	0	4 tpd sand	0 tpy	0 tpy	0 tpy
NA	860 Shotcrete Plant - Weigh Hopper Loading	NA	0	6 tpd sand & aggr.	0 tpy	0 tpy	0 tpy
NA	860 Shotcrete Plant - Mixer Loading (Central)	NA	0	7 tpd concrete	0 tpy	0 tpy	0 tpy
NA	675 Underground Batch Plant - Truck Loading	NA	0	7 tpd concrete	0 tpy	0 tpy	0 tpy
NA	675 Underground Paste Plant - Weigh Hopper Loading	NA	0	660 tpd tails & cem.	0 tpy	0 tpy	0 tpy
NA	675 Underground Paste Plant - Mixer Loading (Central)	NA	0	740 tpd concrete paste	0 tpy	0 tpy	0 tpy
NA	Lime Storage Tank	NA	0	2 tpd	0 tpy	0 tpy	0 tpy
NA	1350 Mine Exhaust Adit	NA	0	NA	0 tpy	0 tpy	0 tpy
NA	Modine Heater WH-01	40 CFR 98 Table C-1 & 2	74.209 kg/MMBtu	0.100 MMBtu/hr	71.66 tpy	71.66 tpy	71.66 tpy
NA	Modine Heater WH-01	40 CFR 98 Table C-1 & 2	74.209 kg/MMBtu	0.145 MMBtu/hr	103.90 tpy	103.90 tpy	103.90 tpy
NA	Modine Heater UH-109	40 CFR 98 Table C-1 & 2	74.209 kg/MMBtu	0.100 MMBtu/hr	71.66 tpy	71.66 tpy	71.66 tpy
NA	Patriot Furnace CS-12	40 CFR 98 Table C-1 & 2	74.209 kg/MMBtu	0.097 MMBtu/hr	69.51 tpy	69.51 tpy	69.51 tpy
NA	OMNI (Econo) Heater	40 CFR 98 Table C-1 & 2	74.249 kg/MMBtu	0.500 MMBtu/hr	358.48 tpy	358.48 tpy	358.48 tpy
NA	Portable Heater	40 CFR 98 Table C-1 & 2	74.209 kg/MMBtu	0.200 MMBtu/hr	143.32 tpy	143.32 tpy	143.32 tpy

Table 10. Carbon Dioxide Equivalent (CO₂e) Emissions
Hecla Greens Creek Mining Company - Hecla Greens Creek Mine

ID	Emission Unit Description	Reference ⁽¹⁾	Emission Factor	Maximum Throughput	Unlimited CO ₂ e Emissions	Limited CO ₂ e Emissions	Expected CO ₂ e Emissions
NA	Dewalt Portable Heater	40 CFR 98 Table C-1 & 2	74.209 kg/MMBtu	0.190 MMBtu/hr	136.15 tpy	136.15 tpy	136.15 tpy
NA	Dayton Portable Heater	40 CFR 98 Table C-1 & 2	74.209 kg/MMBtu	0.170 MMBtu/hr	121.82 tpy	121.82 tpy	121.82 tpy
NA	Portable Heater	40 CFR 98 Table C-1 & 2	74.209 kg/MMBtu	0.500 MMBtu/hr	358.29 tpy	358.29 tpy	358.29 tpy
NA	Portable Heater	40 CFR 98 Table C-1 & 2	74.209 kg/MMBtu	0.500 MMBtu/hr	358.29 tpy	358.29 tpy	358.29 tpy
NA	Portable Heater	40 CFR 98 Table C-1 & 2	74.209 kg/MMBtu	0.500 MMBtu/hr	358.29 tpy	358.29 tpy	358.29 tpy
NA	Portable Heater	40 CFR 98 Table C-1 & 2	74.209 kg/MMBtu	0.500 MMBtu/hr	358.29 tpy	358.29 tpy	358.29 tpy
NA	Assay Furnace Outlet	NA	0	NA	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Powerhouse FT-01	NA	0	60,000 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Powerhouse FT-04	NA	0	48,000 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Powerhouse FT-05	NA	0	48,000 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Ore Pad Grizzly FT-10	NA	0	500 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Warehouse FT-17	NA	0	500 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Powerhouse FT-44	NA	0	660 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 920 Powerhouse FT-45	NA	0	660 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - Mill Cleaner Bldg FT-51	NA	0	500 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - Tails Press Heater FT-52	NA	0	440 gal	0 tpy	0 tpy	0 tpy
NA	Lube Oil Storage Tank - 920 Powerhouse TK-02	NA	0	5,000 gal	0 tpy	0 tpy	0 tpy
NA	Used Oil Storage Tank - 920 Powerhouse TK-03	NA	0	1,000 gal	0 tpy	0 tpy	0 tpy
NA	Engine Oil Storage Tank - 920 Maint. Shop TK-13	NA	0	5,000 gal	0 tpy	0 tpy	0 tpy
NA	Hydraulic Oil Storage Tank - 920 Maint. Shop TK-14	NA	0	5,000 gal	0 tpy	0 tpy	0 tpy
NA	Used Oil Storage Tank - HI/920 (portable) TK-121	NA	0	1,100 gal	0 tpy	0 tpy	0 tpy
NA	Used Oil Storage Tank - HI/920 (portable) TK-122	NA	0	1,100 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 860 Lab Building FT-03	NA	0	2,000 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 860 Safety Building FT-16	NA	0	500 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - 860 Core Shed FT-28	NA	0	550 gal	0 tpy	0 tpy	0 tpy
NA	Diesel Storage Tank - Pond 23 FT-204	NA	0	500 gal	0 tpy	0 tpy	0 tpy
NA	Jet A Storage Tank - 860 Helipad (summer)	NA	0	5,800 gal	0 tpy	0 tpy	0 tpy
Subtotal					2,509.7 tpy	2,509.7 tpy	2,509.7 tpy
Total CO₂e Emissions					113,140.4 tpy	113,140.4 tpy	67,155.7 tpy

Note: (1) See Table 14 for detailed CO₂e emission factors.

Table 11. Fugitive (Unpaved Roads) Emission Factors from AP-42, Section 13.2.2
Hecla Greens Creek Mining Company - Hecla Greens Creek Mine

Vehicle	Average Silt Content (%)	Vehicle Weight (tons)	Distance Traveled (VMT/yr)	Fugitive TSP Emission Factor, E (lb/VMT)	Fugitive TSP Emission Factor with Natural Mitigation, E _{ext} (lb/VMT)	Annual Fugitive TSP Emissions with Road Watering (ton/year)	Fugitive PM-10 Emission Factor, E (lb/VMT)	Fugitive PM-10 Emission Factor with Natural Mitigation, E _{ext} (lb/VMT)	Annual Fugitive PM-10 Emissions with Road Watering (ton/year)	Fugitive PM-2.5 Emission Factor, E (lb/VMT)	Fugitive PM-2.5 Emission Factor with Natural Mitigation, E _{ext} (lb/VMT)	Annual Fugitive PM-2.5 Emissions with Road Watering (ton/year)	Annual Fugitive Lead Emissions with Road Watering (ton/year)
Tailings Truck (full)	5.8	84	67655	13.18	5.09	43.05	3.49	1.35	11.39	0.35	0.13	1.14	0.04
Tailings Truck (empty)	5.8	36	67655	9.01	3.48	29.44	2.39	0.92	7.79	0.24	0.09	0.78	0.03
Concentrate Truck (full)	5.8	84	31520	13.18	5.09	20.06	3.49	1.35	5.31	0.35	0.13	0.53	0.02
Concentrate Truck (empty)	5.8	36	31520	9.01	3.48	13.72	2.39	0.92	3.63	0.24	0.09	0.36	0.01
Freight Truck (full)	5.8	58	23360	11.13	4.30	12.55	2.94	1.14	3.32	0.29	0.11	0.33	0.01
Freight Truck (empty)	5.8	24	23360	7.55	2.92	8.52	2.00	0.77	2.25	0.20	0.08	0.23	0.01
Volvo Truck (full)	5.8	58	4375	11.13	4.30	2.35	2.94	1.14	0.62	0.29	0.11	0.06	0.00
Volvo Truck (empty)	5.8	32	4375	8.49	3.28	1.79	2.25	0.87	0.47	0.22	0.09	0.05	0.00
Underground Haul Truck (full)	5.8	73	1475	12.39	4.79	0.88	3.28	1.27	0.23	0.33	0.13	0.02	0.00
Underground Haul Truck (empty)	5.8	40	1475	9.45	3.65	0.67	2.50	0.97	0.18	0.25	0.10	0.02	0.00
Total (tpy)									35.21			3.52	0.13

Notes:

VMT means Vehicle Mile Traveled.

Road watering to 2.0 moisture ratio reduces the PM emission rate by 75 percent (AP-42 Figure 13.2.2-2).

Assume that percent lead in silt is equivalent to percent lead in road dirt (measured at 0.1 percent).

Emission Factors:

$$E = k (s/12)^a (W/3)^b$$

$$E_{ext} = E [(365 - P)/365]$$

Where:

E = annual average particulate emission factor (lb/vehicle mile traveled, VMT)

k = particle size multiplier (4.9 for TSP; 1.5 for PM-10; 0.15 for PM-2.5)

s = silt content of gravel road (%)

a = constant (0.7 for TSP; 0.9 for PM-10 & PM-2.5)

W = mean vehicle weight (tons)

b = constant (0.45 for TSP; PM-10 & PM-2.5)

P = number of days in a year with at least 0.254 mm (0.01 in) precipitation (224 days pursuant to NOAA avg annual data from 1936-2018)

E_{ext} = annual size-specific emission factor extrapolated for natural mitigation, lb/VMT

Table 12. Diesel Tank Emission Factors from AP-42, Section 7.1
Hecla Greens Creek Mining Company - Hecla Greens Creek Mine

Tank Name	FT-01	FT-04	FT-05
Orientation	Vertical	Vertical	Vertical
Contents	Diesel	Diesel	Diesel
Capacity (gallons)	60000	48000	48000
Diameter, D (ft)	24	16	16
Radium, R _S (ft)	12	8	8
Shell Height, H _S (ft)	17.9	32.0	32.0
Average Liquid Height (H _L)	8.9	16.0	16.0
Maximum Liquid Height (H _{LX})	16.9	31.0	31.0
Diesel Throughput (gal/yr)	3025296	4871803	2420236
Color	Light Gray	Light Gray	Light Gray
Paint Condition	Average	Average	Average
Roof Type	Cone	Cone	Cone
Slope, S _R (ft/ft)	0.0625	0.0625	0.0625
Standing Loss (L_S) Calculations			
Vapor Space Expansion Factor, K _E	0.032	0.032	0.032
Vapor Space Outage, H _{VO} (ft)	9.19	16.17	16.17
Average Daily Ambient Temperature, T _{AA} (°R)	502.15	502.15	502.15
Liquid Bulk Temperature, T _B (°R)	503.61	504.63	504.63
Average Daily Liquid Surface Temperature, T _{LA} (°R)	505.46	506.07	506.07
Vened Vapor Density, K _S	0.9971	0.9949	0.9949
Stock Vapor Denisty, W _V (lb/ft ³)	1.44E-04	1.44E-04	1.44E-04
Standing Loss, L_S (lb/yr)	7.07	5.51	5.51
Working Loss (L_W) Calculations			
Tank Maximum Liquid Volume, V _{LX} (ft ³)	7,636	6,233	6,233
Number of Turnovers per Year, N	52.95	104.48	51.90
Turnover Factor, K _N	0.7	0.5	0.7
Working Loss, L_W (lb/yr)	43.63	42.38	34.55
Total VOCs (tpy)	0.0253517	0.0239460	0.0200296

Meteorological Inputs (Juneau, AK):

T _{AX} =	48.1 F	508.1 R
T _{AN} =	36.2 F	496.2 R
a =	0.58	Average, Light Gray
I =	838	Btu/ft ² -d

Constants:

M _V (Diesel) =	130	lb/lb-mol
P _{VA} (Diesel) =	0.006	psi
K _P =	1	

Table 13. Section 112 HAP Emission Factors
Hecla Greens Creek Mining Company - Hecla Greens Creek Mine

Pollutant	Oil Fired Boilers/Heaters AP-42 Tables 1.3-9 & 11	Large Diesel Engines AP-42 Tables 3.4-3 & 4	Small Diesel Engines AP-42 Table 3.3.2	Oil Fired Gas Turbines AP-42 Tables 3.1.4 & 5	Assay Furnace Outlet Scoping Stack Test	Misc. Service Act. AP-42 Sec. 13.2.2	Limited HAP Emissions
Acenaphthene	2.11E-05 lb/10 ³ gal	4.68E-06 lb/MMBtu	5.06E-06 lb/MMBtu				2.0E-03 tpy
Acenaphthylene	2.53E-07 lb/10 ³ gal	9.23E-06 lb/MMBtu	1.42E-06 lb/MMBtu				3.9E-03 tpy
Acetaldehyde		2.52E-05 lb/MMBtu	7.67E-04 lb/MMBtu				1.8E-02 tpy
Acrolein		7.88E-06 lb/MMBtu	9.25E-05 lb/MMBtu				4.2E-03 tpy
Anthracene	1.22E-06 lb/10 ³ gal	1.23E-06 lb/MMBtu					5.2E-04 tpy
Antimony	5.25E-03 lb/10 ³ gal						1.8E-03 tpy
Arsenic	1.32E-03 lb/10 ³ gal			1.10E-05 lb/MMBtu			2.7E-03 tpy
Benz(a)anthracene	4.01E-06 lb/10 ³ gal	6.22E-07 lb/MMBtu	1.68E-06 lb/MMBtu				2.8E-04 tpy
Benzene	2.14E-04 lb/10 ³ gal	7.76E-04 lb/MMBtu	9.33E-04 lb/MMBtu	5.50E-05 lb/MMBtu			3.5E-01 tpy
Benzo(a)pyrene		2.57E-07 lb/MMBtu	1.88E-07 lb/MMBtu				1.1E-04 tpy
Benzo(b)fluoranthene	1.48E-06 lb/10 ³ gal	1.11E-06 lb/MMBtu					4.7E-04 tpy
Benzo(g,h,i)peylene	2.26E-06 lb/10 ³ gal	5.56E-07 lb/MMBtu	4.89E-07 lb/MMBtu				2.4E-04 tpy
Benzo(k)fluoranthene		2.18E-07 lb/MMBtu	1.55E-07 lb/MMBtu				9.3E-05 tpy
Beryllium	2.78E-05 lb/10 ³ gal			3.10E-07 lb/MMBtu			7.4E-05 tpy
1,3-Butadiene			3.91E-05 lb/MMBtu	1.60E-05 lb/MMBtu			3.7E-03 tpy
Cadmium	3.98E-04 lb/10 ³ gal			4.80E-06 lb/MMBtu	5.00E-06 lb/hr		1.2E-03 tpy
Chromium	8.45E-04 lb/10 ³ gal			1.10E-05 lb/MMBtu			2.6E-03 tpy
Chromium VI	2.48E-04 lb/10 ³ gal						8.5E-05 tpy
Chrysene	2.38E-06 lb/10 ³ gal	1.53E-06 lb/MMBtu	3.53E-07 lb/MMBtu				6.5E-04 tpy
Cobalt	6.02E-03 lb/10 ³ gal						2.1E-03 tpy
Dibenzo(a,h)anthracene	1.67E-06 lb/10 ³ gal	3.46E-07 lb/MMBtu	5.83E-07 lb/MMBtu			0.133 tpy	1.3E-01 tpy
Ethylbenzene	6.36E-05 lb/10 ³ gal						2.2E-05 tpy
Fluoranthene	4.48E-06 lb/10 ³ gal	4.03E-06 lb/MMBtu	7.61E-06 lb/MMBtu				1.8E-03 tpy
Fluorene	4.47E-06 lb/10 ³ gal	1.28E-06 lb/MMBtu	2.92E-05 lb/MMBtu				8.1E-04 tpy
Formaldehyde	3.30E-02 lb/10 ³ gal	7.89E-05 lb/MMBtu	1.18E-03 lb/MMBtu	2.80E-04 lb/MMBtu			1.1E-01 tpy
Indeno(1,2,3-cd)pyrene	2.14E-06 lb/10 ³ gal	4.14E-07 lb/MMBtu	3.75E-07 lb/MMBtu				1.8E-04 tpy
Lead	1.51E-03 lb/10 ³ gal			1.40E-05 lb/MMBtu	6.60E-03 lb/hr		3.2E-02 tpy
Manganese	3.00E-03 lb/10 ³ gal			7.90E-04 lb/MMBtu			1.6E-01 tpy
Mercury	1.13E-04 lb/10 ³ gal			1.20E-06 lb/MMBtu	4.40E-04 lb/hr		2.2E-03 tpy
Naphthalene	1.13E-03 lb/10 ³ gal	1.30E-04 lb/MMBtu	8.48E-05 lb/MMBtu	3.50E-05 lb/MMBtu			6.3E-02 tpy
Nickel	8.45E-02 lb/10 ³ gal			4.60E-06 lb/MMBtu			3.0E-02 tpy
o-Xylene	1.09E-04 lb/10 ³ gal						3.7E-05 tpy
Phenanthrene	1.05E-05 lb/10 ³ gal	4.08E-05 lb/MMBtu	2.94E-05 lb/MMBtu				1.7E-02 tpy
Phosphorus	9.46E-03 lb/10 ³ gal						3.2E-03 tpy
Polycyclic Organic Matter	3.30E-03 lb/10 ³ gal						1.1E-03 tpy
Pyrene	4.25E-06 lb/10 ³ gal	3.71E-06 lb/MMBtu	4.78E-06 lb/MMBtu				1.6E-03 tpy
Selenium	6.83E-04 lb/10 ³ gal			2.50E-05 lb/MMBtu			5.4E-03 tpy
Toluene	6.20E-03 lb/10 ³ gal	2.81E-04 lb/MMBtu	4.09E-04 lb/MMBtu				1.2E-01 tpy
1,1,1-Trichloroethane	2.36E-04 lb/10 ³ gal						8.1E-05 tpy
Xylenes	1.09E-04 lb/10 ³ gal	1.93E-04 lb/MMBtu	2.85E-04 lb/MMBtu				8.4E-02 tpy
Total HAPs	1.58E-01 lb/10³ gal	1.56E-03 lb/MMBtu	3.87E-03 lb/MMBtu	1.25E-03 lb/MMBtu	7.05E-03 lb/hr	0.133 tpy	1.17 tpy

Notes: See Table 11 for lead emissions from Misc. Service Activities.

Oil-fired boilers/heaters maximum capacity at 8760 hr/yr:	78.36 gal/hr
Large diesel engines maximum capacity at 8760 hr/yr:	10250 kW
Small diesel engines maximum capacity at 8760 hr/yr:	279.1 hp
Small diesel engines maximum capacity at 500 hr/yr:	399 hp
Oil-fired turbine maximum capacity at 8760 hr/yr:	5045 kW

**Table 14. Carbon Dioxide Equivalent (CO₂e) Emissions Factors
Hecla Greens Creek Mining Company - Hecla Greens Creek Mine**

	Distillate Fuel Oil No. 2 40 CFR 98 Tables C-1 & 2	Used Oil 40 CFR 98 Tables C-1 & 2
CO ₂ Emission Factor	73.96 kg/MMBtu	74.00 kg/MMBtu
CH ₄ Emission Factor	0.003 kg/MMBtu	0.003 kg/MMBtu
N ₂ O Emission Factor	0.0006 kg/MMBtu	0.0006 kg/MMBtu
CO₂e Emission Factor	74.209 kg/MMBtu	74.249 kg/MMBtu

Note: CO₂e EF = CO₂ + 21(CH₄) + 310(N₂O)