Appendix I

GHG Calculations

Table 1.1 GHG Emissions Summary – New Tailings Basin Features and Proposed Stream Mitigation Projects - Construction

Emission Source	CO_2 (tons)	CH_4 (tons)	N_2O (tons)	CO_2e (tons)[1]
East Branch Beaver River	109.55	9.77E-03	5.97E-03	111.40
East Branch Beaver River - Ditch	109.55	9.77E-03	5.97E-03	111.40
East Branch Beaver River - Berm	9.13	8.14E-04	4.98E-04	9.28
White Rock River	109.55	9.77E-03	5.97E-03	111.40
Dam 1 Extension	17,370.05	6.91E-01	1.12E+00	17,686.57
Dam 2 Extension	13,580.22	5.40E-01	8.77E-01	13,827.68
West Ridge RR Relocation	6,312.63	2.51E-01	4.07E-01	6,427.64
Clay Borrow Site	2,846.48	1.11E-01	1.92E-01	2,900.39
Construction - Subtotal	40,447.15	1.62	2.62	41,185.77

Table 1.2 GHG Emissions Summary – New Tailings Basin Features and Proposed Stream Mitigation Projects – Land Use Changes

Emission Source	CO_2 (tons)	CH_4 (tons)	N_2O (tons)	CO_2e (tons)[1]
New Tailings Basin Features	120,430.09	N/A	N/A	120,430.09
Proposed Stream Mitigation Projects	30,588.33	N/A	N/A	30,588.33
Land-Use Change - Subtotal	151,018.42	N/A	N/A	151,018.42
Total[2]	191,465.56	1.62	2.62	192,204.19

(1) CO_2e calculated by multiplying the Global Warming Potential (GWP) for each pollutant by the potential pollutant emissions. GWPs (100-Year Time Horizon) are from Table A-1 to Subpart A of Part 98, Title 40.
(2) Land-Use Change emissions are excluded from the total CH_4 and N_2O due to the emission factor in tons CO_2.

Table 1A Construction Time Frames

Scope[1]	Years of Full-time Construction	Years of Part-time Construction
Dam 1 Extension	5	35
Dam 2 Extension	2	35
West Ridge RR Relocation	5	0
Clay Borrow Site	3	0

Table 1B On-Road Trucking Distance

Scope	On-Road Trucking	Vehicle Type	Number of Vehicles	Conservative Diameter of Area (miles)	Number of Passes per day	Total Miles Full-Time Construction	Total Miles Part-Time Construction
Dam 1 Extension	Worker Vehicles	Pickup Truck	2	2.50	2	13,000	22,750
Dam 2 Extension	Worker Vehicles	Pickup Truck	2	2.50	2	5,200	22,750
West Ridge RR Relocation	Worker Vehicles	Pickup Truck	2	1.20	2	6,240	0
Clay Borrow Site	Worker Vehicles	Pickup Truck	2	0.60	2	1,872	0

Table 1C Mobile Source On-Road GHG Emissions (tons) – Tailing Basin Projects Construction

Scope	CO_2[2]	CH_4[3]	N_2O[3]	GHG (CO_2e)[4]
Dam 1 Extension	19.86	6.29E-04	1.70E-03	20.33
Dam 2 Extension	15.53	4.92E-04	1.33E-03	15.89
West Ridge RR Relocation	3.47	1.10E-04	2.96E-04	3.55
Clay Borrow Site	1.04	3.29E-05	8.89E-05	1.06
Total	**39.89**	**1.26E-03**	**3.41E-03**	**40.83**

(1) Estimated full-time hours exclude weekends and assume 8 hours per weekday. Estimated part-time hours exclude weekends and assume 2 hours per weekday.
Both full-time and part-time assume 30 days/month.
Estimated timeframes based on information from Northshore.
Working days per year 260
Full-time hours per year 2080
Part-time hours per year 520

(2) Emission factors based on South Coast Air Quality Management District, SCAQMD EMFACT 2007 (v2.3).
http://www.aqmd.gov/home/rules-compliance/ceqa/air-quality-analysis-handbook/emfac-2007-(v2-3)-emission-factors-(on-road)
Scenario Year: 2026
All model years in the range 1982 to 2026
Pollutant Emission Factor (lb/mi)
CO_2 1.111058293
CH_4 3.51772E-05

(3) N_2O emissions calculated using the EPA CCCL emission factors, Table 4: Mobile Combustion CH4 and N2O for On-Road Diesel and Alternative Fuel Vehicles. https://www.epa.gov/system/files/documents/2025-01/ghg-emission-factors-hub-2025.pdf
Vehicle Type: Medium- and Heavy-Duty Vehicles (2007-2022)
Fuel Type: Diesel
N_2O Factor (g/mile): 0.0431

(4) CO_2e calculated by multiplying the Global Warming Potential (GWP) for each pollutant by the potential pollutant emissions. GWPs (100-Year Time Horizon) are from Table A-1 to Subpart A of Part 98, Title 40.

Table 2A Construction Time Frames

Scope	Years of Full-time Construction	Years of Part-time Construction
Dam 1 Extension	5	35
Dam 2 Extension	2	35
West Ridge RR Relocation	5	0
Clay Borrow Site	3	0

Table 2B Off-Road Diesel Equipment Emission Factors (lb/hour)

Equipment Type	Estimated hp[2]	CO_2[4]	CH_4[4]	N_2O[4]
Excavators	175	112.00	4.70E-03	6.72E-03
Graders	250	172.00	7.10E-03	9.60E-03
Off-Highway Trucks	500	272.00	1.07E-02	1.92E-02
Other Construction Equipment	175	107.00	3.50E-03	6.72E-03
Plate Compactors	15	4.30	5.00E-04	5.76E-04
Rollers	175	125.00	5.10E-03	6.72E-03
Rubber Tired Loaders	250	149.00	6.00E-03	9.60E-03

Table 2C Off-Road Diesel Equipment Emissions (tons) – Dam 1 Extension

Equipment Type	Number of Equipment Types[3]	CO_2[1]	CH_4[1]	N_2O[1]	GHG (CO_2e)[5]
Excavators	1	1,601.60	6.72E-02	9.61E-02	1,628.94
Graders	1	2,459.60	1.02E-01	1.37E-01	2,498.80
Off-Highway Trucks	2	7,779.20	3.06E-01	5.49E-01	7,933.22
Other Construction Equipment	1	1,530.10	5.01E-02	9.61E-02	1,556.95
Plate Compactors	1	61.49	7.15E-03	8.23E-03	63.87
Rollers	1	1,787.50	7.29E-02	9.61E-02	1,815.00
Rubber Tired Loaders	1	2,130.70	8.58E-02	1.37E-01	2,169.46
Total Emissions	N/A	17,350.19	6.91E-01	6.91E-01	17,666.24

Table 2D Off-Road Diesel Equipment Emissions (tons) – Dams 2 Extension

Equipment Type	Number of Equipment Types[3]	CO_2[1]	CH_4[1]	N_2O[1]	GHG (CO_2e)[5]
Excavators	1	1,252.16	5.25E-02	7.51E-02	1,273.53
Graders	1	1,922.96	7.94E-02	1.07E-01	1,953.61
Off-Highway Trucks	2	6,081.92	2.39E-01	4.29E-01	6,202.33
Other Construction Equipment	1	1,196.26	3.91E-02	7.51E-02	1,217.26
Plate Compactors	1	48.07	5.59E-03	6.44E-03	49.94
Rollers	1	1,397.50	5.70E-02	7.51E-02	1,419.00
Rubber Tired Loaders	1	1,665.82	6.71E-02	1.07E-01	1,696.13
Total Emissions	N/A	13,564.69	5.40E-01	8.75E-01	13,811.79

Table 2E Off-Road Diesel Equipment Emissions (tons) – West Ridge RR Relocation

Equipment Type	Number of Equipment Types[3]	CO_2[1]	CH_4[1]	N_2O[1]	GHG (CO_2e)[5]
Excavators	1	582.40	2.44E-02	3.49E-02	592.34
Graders	1	894.40	3.69E-02	4.99E-02	908.66
Off-Highway Trucks	2	2,828.80	1.11E-01	2.00E-01	2,884.81
Other Construction Equipment	1	556.40	1.82E-02	3.49E-02	566.17
Plate Compactors	1	22.36	2.60E-03	2.99E-03	23.23
Rollers	1	650.00	2.65E-02	3.49E-02	660.00
Rubber Tired Loaders	1	774.80	3.12E-02	4.99E-02	788.90
Total Emissions	N/A	6,309.16	2.51E-01	4.07E-01	6,424.09

Table 2F Off-Road Diesel Equipment Emissions (tons) – Clay Borrow Site

Equipment Type	Number of Equipment Types[3]	CO_2[1]	CH_4[1]	N_2O[1]	GHG (CO_2e)[5]
Excavators	1	349.44	1.47E-02	2.10E-02	355.40
Off-Highway Trucks	2	1,697.28	6.68E-02	1.20E-01	1,730.88
Other Construction Equipment	1	333.84	1.09E-02	2.10E-02	339.70
Rubber Tired Loaders	1	464.88	1.87E-02	2.99E-02	473.34
Total Emissions	N/A	2,845.44	1.11E-01	1.92E-01	2,899.32

Table 2G Off-Road Diesel Equipment GHG Emissions (tons) – Tailings Basin Projects Construction

Scope	CO_2[1]	CH_4[1]	N_2O[1]	GHG (CO_2e)[5]
Dam 1 Extension	17,350.19	6.91E-01	1.12E+00	17,666.24
Dam 2 Extension	13,564.69	5.40E-01	8.75E-01	13,811.79
West Ridge RR Relocation	6,309.16	2.51E-01	4.07E-01	6,424.09
Clay Borrow Site	2,845.44	1.11E-01	1.92E-01	2,899.32
Total Emissions	40,069.48	1.59	2.59	40,801.45

(1) Estimated full-time hours exclude weekends and assume 8 hours per weekday. Estimated part-time hours exclude weekends and assume 2 hours per weekday. Both full-time and part-time assume 30 days/month.
Estimated timeframes based on information from Northshore.
Working days per year: 260
Full-time hours per year: 2080
Part-time hours per year: 520

(2) Horsepower values obtained from the following references:

Equipment Type	SCAQDM hp	Spec Sheet hp	hp Reference
Excavators	175	159	https://www.deere.com/en/excavators/mid-size-excavators/210g-excavator/
Graders	250	250	https://www.cat.com/en_US/products/new/equipment/motor-graders/motor-graders/15969811.html
Off-Highway Trucks	500	400	https://www.trailer-bodybuilders.com/archive/article/21730986/kenworth-offers-advice-on-specs-for-dump-trucks
Other Construction Equipment	175	170	https://www.cat.com/en_US/products/new/equipment/dozers/medium-dozers/15969993.html
Plate Compactors	15	15	https://www.bgequipmentsupply.com/wp-content/uploads/Multiquip-MVH306-Specs.pdf
Rollers	175	145	https://www.ritchiespecs.com/model/caterpillar-cs563-vibratory-smooth-drum-roller
Rubber Tired Loaders	250	250	https://www.cat.com/en_US/products/new/equipment/wheel-loaders/medium-wheel-loaders/1000029161.html

(3) Estimated number of equipment types provided by Barr Senior Geotechnical Engineer, Sara Leow. Email date 7/19/2022.

(4) CO_2 and CH_4 emission factors are based on the South Coast Air Quality Management District. SCAB Fleet Average Emission Factors (Diesel), 2025. http://www.aqmd.gov/home/rules-compliance/cega/air-quality-analysis-handbook/off-road-mobile-source-emission-factors
N_2O emission factors calculated using the EPA CCCL emission factors for construction/mining equipment, Table 5: Mobile Combustion CH4 and N2O for Non-Road Vehicles.https://www.epa.gov/system/files/documents/2025-01/ghg-emission-factors-hub-2025.pdf

(5) CO_2e calculated by multiplying the Global Warming Potential (GWP) for each pollutant by the potential pollutant emissions. GWPs (100-Year Time Horizon) are from Table A-1 to Subpart A of Part 98, Title 40.

Table 3 Construction Mobile Equipment GHG Emissions – East Branch Beaver River

Emission Source	Number of Units[9]	Total Hours of Operation[6]	Vehicle Type	Estimated Vehicle Year[7]	Fuel Type	MPG	VMT/day	horsepower if applicable	hp-hr if applicable	Fuel Amount Value[5]	Fuel Amount Unit	CO_2 Emission Factors Value[1]	CO_2 Emission Factors Unit[1]	CH_4 Emission Factors Value	CH_4 Emission Factors Unit	N_2O Emission Factors Value	N_2O Emission Factors Unit	CO_2 (tons)	CH_4 (tons)	N_2O (tons)	CO_2e (tons)[10]
Construction - gasoline mobile sources On-Road	4	240	Passenger Cars	2007	Gasoline	20	14	N/A	N/A	84	Total gallons	8.78	kg CO_2/gallon	0.0103	g CH_4/mile[3]	0.0061	g N_2O/mile[3]	0.81	1.91E-05	1.13E-05	0.82
Construction - diesel mobile sources - On-Road	2	480	Medium- and Heavy-Duty Trucks	2007-2018	Diesel	15	5	N/A	N/A	40	Total gallons	10.21	kg CO_2/gallon	0.0095	g CH_4/mile[4]	0.0431	g N_2O/mile[4]	0.45	6.28E-06	2.85E-05	0.46
Construction - diesel mobile sources - On-Road	2	240	Light Trucks	2007-2018	Diesel	14	5	N/A	N/A	21	Total gallons	10.21	kg CO_2/gallon	0.029	g CH_4/mile[4]	0.0214	g N_2O/mile[4]	0.24	9.59E-06	7.08E-06	0.24
Construction - diesel mobile sources - Nonroad	4	480	Construction Equipment[8]	N/A	Diesel	N/A	N/A	100	192000	9,600	Total gallons	10.21	kg CO_2/gallon	0.92	g CH_4/gallon[2]	0.56	g N_2O/gallon[2]	108.04	9.74E-03	5.93E-03	109.89
Total Emissions	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	109.55	9.77E-03	5.97E-03	111.40

(1) Table 2, Mobile Combustion CO2. Emission Factors for Greenhouse Gas Inventories, EPA CCCL. January, 2025. https://www.epa.gov/climateleadership/ghg-emission-factors-hub
(2) Table 5, Mobile Combustion CH4 and N2O for Non-Road Vehicles. Emission Factors for Greenhouse Gas Inventories, EPA CCCL. January, 2025. https://www.epa.gov/climateleadership/ghg-emission-factors-hub
(3) Table 3, Mobile Combustion CH4 and N2O for On-Road Gasoline Vehicles. Emission Factors for Greenhouse Gas Inventories, EPA CCCL. January, 2025. https://www.epa.gov/climateleadership/ghg-emission-factors-hub
(4) Table 4, Mobile Combustion CH4 and N2O for On-Road Diesel and Alternative Fuel Vehicles. Emission Factors for Greenhouse Gas Inventories, EPA CCCL. January, 2025. https://www.epa.gov/climateleadership/ghg-emission-factors-hub
(5) For nonroad sources, fuel amount is calculated based on fuel usage estimates per horsepower-hour (0.05 gallons for diesel, 0.12 gallons for gasoline) from Table A9-3E in SCAQMD CEQA Air Quality Handbook (https://www.cvwd.org/ArchiveCenter/ViewFile/Item/608).
(6) Based on 8 hrs/day, 5 days/week for 12 weeks for construction and 4hrs/day, 5 days/week for 12 weeks for operations
(7) Values based off of the most conservative year (2007) for the most recent year average for medium- and heavy-duty trucks and light trucks (2007-2022). https://www.epa.gov/climateleadership/ghg-emission-factors-hub
(8) Includes equipment, such as dumpers, and excavators, as well as fuel consumption from trucks that are used off-road in construction.
(9) Numbers are based on a hypothetical assessment and not from a specific source.
(10) CO2e calculated by multiplying the Global Warming Potential (GWP) for each pollutant by the potential pollutant emissions. GWPs (100-Year Time Horizon) are from Table A-1 to Subpart A of Part 98, Title 40.

Table 4 Construction Mobile Equipment GHG Emissions – East Branch Beaver River – Berm

Source Type ID	Emission Source	Number of Units[9]	Total Hours of Operation[6]	Vehicle Type	Estimated Vehicle Year[7]	Fuel Type	MPG	VMT/day	horsepower if applicable	hp-hr if applicable	Fuel Amount Value[5]	Fuel Amount Unit	CO_2 Emission Factors Value[1]	CO_2 Emission Factors Unit[1]	CH_4 Emission Factors Value	CH_4 Emission Factors Unit	N_2O Emission Factors Value	N_2O Emission Factors Unit	CO_2 (tons)	CH_4 (tons)	N_2O (tons)	CO_2e (tons)[10]
DE-3	Construction - gasoline mobile sources On-Road	2	40	Passenger Cars	2007	Gasoline	20	14	N/A	N/A	7	total gallons	8.78	kg CO_2/gallon	0.0103	g CH_4/mile[3]	0.0061	g N_2O/mile[3]	0.07	1.59E-06	9.41E-07	0.07
DE-3	Construction - diesel mobile sources - On-Road	1	80	Medium- and Heavy-Duty Trucks	2007-2018	Diesel	15	5	N/A	N/A	3	total gallons	10.21	kg CO_2/gallon	0.0095	g CH_4/mile[4]	0.0431	g N_2O/mile[4]	0.04	5.24E-07	2.38E-06	0.04
DE-3	Construction - diesel mobile sources - On-Road	1	40	Light Trucks	2007-2018	Diesel	14	5	N/A	N/A	2	total gallons	10.21	kg CO_2/gallon	0.029	g CH_4/mile[4]	0.0214	g N_2O/mile[4]	0.02	7.99E-07	5.90E-07	0.02
DE-3	Construction - diesel mobile sources - Nonroad	2	80	Construction Equipment[8]	N/A	Diesel	N/A	N/A	100	16000	800	total gallons	10.21	kg CO_2/gallon	0.92	g CH_4/gallon[2]	0.56	g N_2O/gallon[2]	9.00	8.11E-04	4.94E-04	9.16
Total Emissions	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	9.13	8 14E-04	4.98E-04	9.28

(1) Table 2, Mobile Combustion CO2. Emission Factors for Greenhouse Gas Inventories, EPA CCCL. January, 2025. https://www.epa.gov/climateleadership/ghg-emission-factors-hub
(2) Table 5, Mobile Combustion CH4 and N2O for Non-Road Vehicles. Emission Factors for Greenhouse Gas Inventories, EPA CCCL. January, 2025. https://www.epa.gov/climateleadership/ghg-emission-factors-hub
(3) Table 3, Mobile Combustion CH4 and N2O for On-Road Gasoline Vehicles. Emission Factors for Greenhouse Gas Inventories, EPA CCCL. January, 2025. https://www.epa.gov/climateleadership/ghg-emission-factors-hub
(4) Table 4, Mobile Combustion CH4 and N2O for On-Road Diesel and Alternative Fuel Vehicles. Emission Factors for Greenhouse Gas Inventories, EPA CCCL. January, 2025. https://www.epa.gov/climateleadership/ghg-emission-factors-hub
(5) For nonroad sources, fuel amount is calculated based on fuel usage estimates per horsepower-hour (0.05 gallons for diesel, 0.12 gallons for gasoline) from Table A9-3E in SCAQMD CEQA Air Quality Handbook (https://www.cvwd.org/ArchiveCenter/ViewFile/Item/608).
(6) Based on 8 hrs/day, 5 days/week for 2 weeks for construction and 4hrs/day, 5 days/week for 2 weeks for operations
(7) Values based off of the most conservative year (2007) for the most recent year average for medium- and heavy-duty tricks and light trucks (2007-2022). https://www.epa.gov/climateleadership/ghg-emission-factors-hub
(8) Includes equipment, such as dumpers, and excavators, as well as fuel consumption from trucks that are used off-road in construction.
(9) Numbers are based on a hypothetical assessment and not from a specific source.
(10) CO_2e calculated by multiplying the Global Warming Potential (GWP) for each pollutant by the potential pollutant emissions. GWPs (100-Year Time Horizon) are from Table A-1 to Subpart A of Part 98, Title 40.

Table 5 Construction Mobile Equipment GHG Emissions – East Branch Beaver

Source Type ID	Emission Source	Number of Units[9]	Total Hours of Operation[6]	Vehicle Type	Estimated Vehicle Year[7]	Fuel Type	MPG	VMT/day	horsepower if applicable	hp-hr if applicable	Fuel Amount Value[5]	Fuel Amount Unit	CO_2 Emission Factors[1] Value	CO_2 Emission Factors[1] Unit	CH_4 Emission Factors Value	CH_4 Emission Factors Unit	N_2O Emission Factors Value	N_2O Emission Factors Unit	CO_2 (tons)	CH_4 (tons)	N_2O (tons)	CO_2e (tons)[10]
DE-3	Construction - gasoline mobile sources On-Road	4	240	Passenger Cars	2007	Gasoline	20	14	N/A	N/A	84	total gallons	8.78	kg CO_2/ gallon	0.0103	g CH_4/ mile[3]	0.0061	g N_2O/ mile[3]	0.81	1.91E-05	1.13E-05	0.82
DE-3	Construction - diesel mobile sources - On-Road	2	480	Medium- and Heavy-Duty Trucks	2007-2018	Diesel	15	5	N/A	N/A	40	total gallons	10.21	kg CO_2/ gallon	0.0095	g CH_4/ mile[4]	0.0431	g N_2O/ mile[4]	0.45	6.28E-06	2.85E-05	0.46
DE-3	Construction - diesel mobile sources - On-Road	2	240	Light Trucks	2007-2018	Diesel	14	5	N/A	N/A	21	total gallons	10.21	kg CO_2/ gallon	0.029	g CH_4/ mile[4]	0.0214	g N_2O/ mile[4]	0.24	9.59E-06	7.08E-06	0.24
DE-3	Construction - diesel mobile sources - Nonroad	4	480	Construction Equipment[8]	N/A	Diesel	N/A	N/A	100	192000	9,600	total gallons	10.21	kg CO_2/ gallon	0.92	g CH_4 /gallon[2]	0.56	g N_2O/ gallon[2]	108.04	9.74E-03	5.93E-03	109.89
Total Emissions	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	109.55	9.77E-03	5.97E-03	111.40

(1) Table 2, Mobile Combustion CO2. Emission Factors for Greenhouse Gas Inventories, EPA CCCL. January, 2025. https://www.epa.gov/climateleadership/ghg-emission-factors-hub
(2) Table 5, Mobile Combustion CH4 and N2O for Non-Road Vehicles. Emission Factors for Greenhouse Gas Inventories, EPA CCCL. January, 2025. https://www.epa.gov/climateleadership/ghg-emission-factors-hub
(3) Table 3, Mobile Combustion CH4 and N2O for On-Road Gasoline Vehicles. Emission Factors for Greenhouse Gas Inventories, EPA CCCL. January, 2025. https://www.epa.gov/climateleadership/ghg-emission-factors-hub
(4) Table 4, Mobile Combustion CH4 and N2O for On-Road Diesel and Alternative Fuel Vehicles. Emission Factors for Greenhouse Gas Inventories, EPA CCCL. January, 2025. https://www.epa.gov/climateleadership/ghg-emission-factors-hub
(5) For nonroad sources, fuel amount is calculated based on fuel usage estimates per horsepower-hour (0.05 gallons for diesel, 0.12 gallons for gasoline) from Table A9-3E in SCAQMD CEQA Air Quality Handbook (https://www.cvwd.org/ArchiveCenter/ViewFile/Item/608).
(6) Based on 8 hrs/day, 5 days/week for 12 weeks for construction and 4hrs/day, 5 days/week for 12 weeks for operations
(7) Values based off of the most conservative year (2007) for the most recent year average for medium- and heavy-duty tricks and light trucks (2007-2022). https://www.epa.gov/climateleadership/ghg-emission-factors-hub
(8) Includes equipment, such as dumpers, and excavators, as well as fuel consumption from trucks that are used off-road in construction.
(9) Numbers are based on a hypothetical assessment and not from a specific source.
(10) CO2e calculated by multiplying the Global Warming Potential (GWP) for each pollutant by the potential pollutant emissions. GWPs (100-Year Time Horizon) are from Table A-1 to Subpart A of Part 98, Title 40.

Table 6 Construction Mobile Equipment GHG Emissions – White Rock River

Number of Units[9]	Total Hours of Operation[6]	Days of Operation	Vehicle Type	Estimated Vehicle Year[7]	Fuel Type	MPG	VMT/day	horsepower if applicable	hp-hr if applicable	Fuel Amount Value[5]	Fuel Amount Unit	CO_2 Emission Factors Value	CO_2 Emission Factors Unit	CH_4 Emission Factors Value	CH_4 Emission Factors Unit	N_2O Emission Factors Value	N_2O Emission Factors Unit	CO_2 (tons)	CH_4 (tons)	N_2O (tons)	CO_2e (tons)[10]
4	240	30	Passenger Cars	2007	Gasoline	20	14	N/A	N/A	84	total gallons	8.78	kg CO_2/ gallon	0.0103	g CH_4/ mile[3]	0.0061	g N_2O/ mile[3]	0.81	1.91E-05	1.13E-05	0.82
2	480	60	Medium- and Heavy-Duty Trucks	2007-2018	Diesel	15	5	N/A	N/A	40	total gallons	10.21	kg CO_2/ gallon	0.0095	g CH_4/ mile[4]	0.0431	g N_2O/ mile[4]	0.45	6.28E-06	2.85E-05	0.46
2	240	30	Light Trucks	2007-2018	Diesel	14	5	N/A	N/A	21	total gallons	10.21	kg CO_2/ gallon	0.029	g CH_4/ mile[4]	0.0214	g N_2O/ mile[4]	0.24	9.59E-06	7.08E-06	0.24
4	480	60	Construction Equipment[8]	N/A	Diesel	N/A	N/A	100	192000	9,600	total gallons	10.21	kg CO_2/ gallon	0.92	g CH_4/ gallon[2]	0.56	g N_2O/ gallon[2]	108.04	9.74E-03	5.93E-03	109.89
Total Emissions	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	109.55	9.77E-03	5.97E-03	111.40

(1) Table 2, Mobile Combustion CO2. Emission Factors for Greenhouse Gas Inventories, EPA CCCL. January, 2025. https://www.epa.gov/climateleadership/ghg-emission-factors-hub
(2) Table 5, Mobile Combustion CH4 and N2O for Non-Road Vehicles. Emission Factors for Greenhouse Gas Inventories, EPA CCCL. January, 2025. https://www.epa.gov/climateleadership/ghg-emission-factors-hub
(3) Table 3, Mobile Combustion CH4 and N2O for On-Road Gasoline Vehicles. Emission Factors for Greenhouse Gas Inventories, EPA CCCL. January, 2025. https://www.epa.gov/climateleadership/ghg-emission-factors-hub
(4) Table 4, Mobile Combustion CH4 and N2O for On-Road Diesel and Alternative Fuel Vehicles. Emission Factors for Greenhouse Gas Inventories, EPA CCCL. January, 2025. https://www.epa.gov/climateleadership/ghg-emission-factors-hub
(5) For nonroad sources, fuel amount is calculated based on fuel usage estimates per horsepower-hour (0.05 gallons for diesel, 0.12 gallons for gasoline) from Table A9-3E in SCAQMD CEQA Air Quality Handbook (https://www.cvwd.org/ArchiveCenter/ViewFile/Item/608).
(6) Based on 8 hrs/day, 5 days/week for 12 weeks for construction and 4hrs/day, 5 days/week for 12 weeks for operations
(7) Values based off of the most conservative year (2007) for the most recent year average for medium- and heavy-duty tricks and light trucks (2007-2022). https://www.epa.gov/climateleadership/ghg-emission-factors-hub
(8) Includes equipment, such as dumpers, and excavators, as well as fuel consumption from trucks that are used off-road in construction.
(9) Numbers are based on a hypothetical assessment and not from a specific source.
(10) CO2e calculated by multiplying the Global Warming Potential (GWP) for each pollutant by the potential pollutant emissions. GWPs (100-Year Time Horizon) are from Table A-1 to Subpart A of Part 98, Title 40.

Table 7 GHG Emissions Summary – Ongoing Tailings Basis Operations

Emission Source	CO_2 (tons/year)	CH_4 (tons/year)	N_2O (tons/year)	CO_2e (tons/year)[1]
On-Road Equipment Operation	2,250.91	0.09	0.02	2,258.31
Off-Road Equipment Operation	7,523.85	0.33	0.51	7,669.51
Electrical Consumption	3,069.12	0.32	0.05	3,090.56
Fuel Delivery	7.37	0.00	0.00	7.44
Operation - Subtotal	12,851.25	0.74	0.58	13,025.81
Land-Use Change	CO_2 (tons)	CH_4 (tons)	N_2O (tons)	CO_2e (tons)[2]
Ongoing Tailings Basin Operations	418,547.48	N/A	N/A	418,547.48
Land-Use Change - Subtotal	418,547.48	N/A	N/A	418,547.48

(1) CO_2e calculated by multiplying the Global Warming Potential (GWP) for each pollutant by the potential pollutant emissions. GWPs (100-Year Time Horizon) are from Table A-1 to Subpart A of Part 98, Title 40.
(2) Land-use change emissions from CH4 and N2O are excluded due to the emission factor in tons CO2.

Table 8 Ongoing Tailings Basin Operations GHG Emissions – Mobile On-Road Equipment

Equipment[1]	Fuel Type[2]	Number of Units[1]	Total Operations Hours/Unit[1]	Anticipated Horsepower[1]	CO_2 Emissions (tons/year)[3]	CH_4 Emissions (tons/year)[3]	N_2O Emissions (tons/year)[3]	CO_2e Emissions (tons/year)[4]
Heavy Duty Trucks	Diesel	1	104	425	25.22	1.02E-03	2.05E-04	25.31
Worker Vehicles (Pick Up Truck)	Gasoline	3	5,200	250	2225.69	9.03E-02	1.81E-02	2233.00
Total	N/A	N/A	N/A	N/A	2,250.91	0.09	0.02	2,258.31

(1) Equipment and operating data obtained from NSM in "GHG Information Request_updated_v2 11112025.xlsx."
(2) Fuel type assumed based on equipment type.
(3) GHG Emission factors from 40 CFR Part 98 Subpart C Tables C-1 and C-2. Using a conversion of 7,000 btu gasoline/hp-hr.

(4) CO2e calculated by multiplying the Global Warming Potential (GWP) for each pollutant by the potential pollutant emissions. GWPs (100-Year Time Horizon) are from Table A-1 to Subpart A of Part 98, Title 40.

Table 9 Ongoing Tailings Basin Operations GHG Emissions (tons/year) – Mobile Off-Road Equipment

Equipment Type	Number of Units[1]	Total Operations Hours/Unit[1]	Anticipated Horsepower[1]	CO_2 (lb/hr)[2]	CH_4 (lb/hr)[2]	N_2O (lb/hr)[3]	CO_2	CH_4	N_2O	GHG (CO_2e)[4]
Crawler Tractors	1	520	347	259.00	0.01	1.33E-02	67.34	3.28E-03	3.46E-03	68.35
Excavators	1	1,040	314	159.00	0.01	1.21E-02	82.68	3.02E-03	6.27E-03	84.43
Excavators	1	1,040	425	234.00	0.01	1.63E-02	121.68	4.42E-03	8.48E-03	124.05
Forklifts	1	156	50	14.70	0.00	1.92E-03	1.15	1.09E-04	1.50E-04	1.19
Graders	1	676	297	172.00	0.01	1.14E-02	58.14	2.40E-03	3.85E-03	59.22
Off-Highway Trucks	3	4,680	1200	625.00	0.03	4.61E-02	4,387.50	1.79E-01	3.23E-01	4,478.19
Pumps	1	9,360	107	77.90	0.00	4.11E-03	364.57	1.54E-02	1.92E-02	370.10
Rubber Tired Dozers	1	3,120	907	592.00	0.04	3.48E-02	923.52	6.08E-02	5.43E-02	939.61
Rubber Tired Loaders	2	3,120	800	486.00	0.02	3.07E-02	1,516.32	5.96E-02	9.58E-02	1,543.38
Skid Steer Loaders	1	52	70	25.50	0.00	2.69E-03	0.66	4.42E-05	6.99E-05	0.68
Welders	1	52	30	11.30	0.00	1.15E-03	0.29	3.38E-05	2.99E-05	0.30
Total Emissions	N/A	N/A	N/A	N/A	N/A	N/A	7,523.85	0.33	0.51	7,669.51

(1) Equipment and operating data obtained from NSM in "GHG Information Request_updated_v2 11112025.xlsx."
(2) CO_2 and CH_4 emission factors (lb/hour) are based on the South Coast Air Quality Management District. SCAB Fleet Average Emission Factors (Diesel), 2025.
http://www.aqmd.gov/home/rules-compliance/cega/air-quality-analysis-handbook/off-road-mobile-source-emission-factors
(3) N_2O emission factors (lb/hour) calculated using the EPA CCCL emission factors for construction/mining equipment, Table 5: Mobile Combustion CH4 and N_2O for Non-Road Vehicles.
https://www.epa.gov/system/files/documents/2025-01/ghg-emission-factors-hub-2025.pdf

(4) CO_2e calculated by multiplying the Global Warming Potential (GWP) for each pollutant by the potential pollutant emissions. GWPs (100-Year Time Horizon) are from Table A-1 to Subpart A of Part 98, Title 40.

Table 10 Ongoing Tailings Basin Operations GHG Emissions – Electrical Consumption

Source	Energy Consumption[1] (MWh/year)	eGRID Subregion	CO_2 Emission Factor[2] (lb/MWh)	CH_4 Emission Factor[2] (lb/MWh)	N_2O Emission Factor[2] (lb/MWh)	CO_2 (tons/year)	CH_4 (tons/year)	N_2O (tons/year)	CO_2e[3] (tons/year)
Basin Operation	6,672	MROW	920.0	0.097	0.014	3,069.12	0.32	0.05	3,090.56

(1) Electrical consumption provided via email from NSM on 11/13/25.
(2) Table 6, Electricity. Emission Factors for Greenhouse Gas Inventories, EPA CCCL. January, 2025. https://www.epa.gov/system/files/documents/2025-01/ghg-emission-factors-hub-2025.pdf
(3) CO_2e calculated by multiplying the Global Warming Potential (GWP) for each pollutant by the potential pollutant emissions. GWPs (100-Year Time Horizon) are from Table A-1 to Subpart A of Part 98, Title 40.

Table 11 Ongoing Tailings Basin Operations GHG Emissions – Fuel Delivery Services

Vehicle Type	Fuel Type	Daily Miles Traveled[1]	Annual Miles Traveled	Fuel Efficiency[2] (miles/gal)	Fuel Used (gal/ year)	CO_2 Emission Factor[3] (kg/gal)	CH_4 Emission Factor[4] (g/vehicle-mile)	N_2O Emission Factor[4] (g/vehicle-mile)	CO_2 (tons/ year)	CH_4 (tons/ year)	N_2O (tons/ year)	CO_2e[5] (tons/ year)
Fuel Delivery (Single Unit Truck)	Diesel	14	5,110	7.8	655	10.21	0.0095	0.0431	7.37	5.35E -05	2.43E -04	7.44

(1) Fuel delivery data provided via email from NSM on 11/13/25.
(2) Fuel efficiency from 2023 values for single-unit trucks from U.S. Department of Transportation, Federal Highway Administration, Highway Statistics (Washington, DC: Annual Issues), Table VM-1. https://www.fhwa.dot.gov/policyinformation/statistics/2023/vm
(3) CO2 emission factors from 40 CFR Part 98 Subpart C Tables C-1.

Fuel Type	Default High Heat Value (mmBtu/gal)	Default CO2 Emission Factor (kg CO2/mmBtu)	CO2 Emission Factor (kg/gal)
Distillate Fuel Oil No. 2	0.138	73.96	10.21

(4) CH_4 and N_2O emissions calculated using the EPA CCCL emission factors for on-road diesel vehicles, Table 4: Mobile Combustion CH_4 and N_2O for On-Road Diesel and Alternative Fuel Vehicles, 2025. https://www.epa.gov/system/files/documents/2025-01/ghg-emission-factors-hub-2025.pdf

Vehicle Type	Model Year	CH4 Emission Factor (g/vehicle-mile)	N2O Emission Factor (g/vehicle-mile)
Medium- and Heavy-Duty Trucks	2007-2022	0.0095	0.0431

(5) CO_2e calculated by multiplying the Global Warming Potential (GWP) for each pollutant by the potential pollutant emissions. GWPs (100-Year Time Horizon) are from Table A-1 to Subpart A of Part 98, Title 40.

Table 12 Land Use Change Emissions – New Tailings Basin Feature

Existing Land Type[1]	Carbon Stock (metric tons CO_2/acre)[2]	Estimated Disturbance (acres)[1]	Estimated CO_2 Emissions (tons)[3]
Wetlands, not forested	776.2	0.61	521.95
Forest	363.0	294.42	117808.89
Rivers and streams	0.0	0	0.00
Brush and grassland	149.6	12.73	2099.25
Cropland	119.2	0	0.00
Livestock rangeland/pastureland	149.6	0	0.00
Impervious	0.0	13.79	0.00
Total	N/A	321.55	120,430.09

(1) Estimated acreage and land types from NLCD 2019 Land Cover dataset.
(2) Equation 8. Net Change in Carbon Stock from Construction , Minnesota Climate Calculator, Final Report, May 2025, Version 1.1, Minnesota Environmental Quality Board https://www.eqb.state.mn.us/sites/eqb/files/climate_calculator_final_report.pdf. Conversion of 44/12 was applied to convert from carbon to CO_2.
(3) Emission factors assumes full realization of the land transition over 30 years.

Table 13 Land Use Change Emissions – Stream Mitigation Projects

Existing Land Type[1]	Carbon Stock (metric tons CO_2/acre)[2]	Estimated Disturbance (acres)[1]	Estimated CO_2 Emissions (tons)[3]
Wetlands, not forested	776.2	2.19	1873.87
Forest	363.0	71.04	28425.87
Rivers and streams	0.0	0.89	0.00
Brush and grassland	149.6	1.11	183.05
Cropland	119.2	-	0.00
Livestock rangeland/pastureland	149.6	0.64	105.54
Impervious	0.0	1.11	0.00
Total	N/A	76.98	30,588.33

(1) Estimated acreage and land types from NLCD 2019 Land Cover dataset.
(2) Equation 8. Net Change in Carbon Stock from Construction , Minnesota Climate Calculator, Final Report, May 2025, Version 1.1, Minnesota Environmental Quality Board https://www.eqb.state.mn.us/sites/eqb/files/climate_calculator_final_report.pdf Conversion of 44/12 was applied to convert from carbon to CO2.
(3) Emission factors assumes full realization of the land transition over 30 years.

Table 14 Land Use Change Emissions - Ongoing Tailings Basin Operations

Existing Land Type[1]	Carbon Stock (metric tons CO_2/acre)[2]	Estimated Disturbance (acres)[1]	Estimated CO_2 Emissions (tons)[3]
Wetlands, not forested	776.2	145.46	124462.93
Forest	363.0	721.69	288776.24
Rivers and streams	0.0	1,450.18	0.00
Brush and grassland	149.6	30.15	4971.91
Cropland	119.2	0	0.00
Livestock rangeland/pastureland	149.6	2.04	336.41
Impervious	0.0	456.60	0.00
Total	N/A	2,806.12	418,547.48

(1) Estimated acreage and land types from NLCD 2019 Land Cover dataset.
(2) Equation 8. Net Change in Carbon Stock from Construction , Minnesota Climate Calculator, Final Report, May 2025, Version 1.1, Minnesota Environmental Quality Board https://www.eqb.state.mn.us/sites/eqb/files/climate_calculator_final_report.pdf
Conversion of 44/12 was applied to convert from carbon to CO_2.
(3) Emission factors assumes full realization of the land transition over 30 years.