

VMT & GHG Analysis

501T3 Theater Camp

October 20, 2024

VMT Calculations

Vehicles Miles Traveled (VMT) refers to the total distance traveled by vehicles, including cars, trucks, and buses. VMT contributes to the emission of greenhouse gasses, such as carbon dioxide (CO₂), nitrogen oxides (NO_x), and particulate matter (PM).

As 501T3 Theater Camp (5TC)'s predecessor event has been held annually in prior years in Upper Lake, CA, the impact of holding it at County Line Ranch is calculated at an additional 90 miles of round-trip travel for each of the 2024 event's 700 vehicles (see Appendix C).

This historical analysis segments attendees and staff based on where they are traveling from. The data shows the following percentages from respective macro-origin destinations at previous events:

Bay Area	91%
Humboldt County (Garberville)	2%
Mendocino County (Ukiah)	3%
Los Angeles	3%
Pacific Northwest	1%

Moving the event farther north is anticipated to create the following slight changes in attendee makeup:

Bay Area	90%
Humboldt County (Garberville)	4%
Mendocino County (Ukiah)	3%
Los Angeles	2%
Pacific Northwest	1%

At the event’s maximum capacity of 3,000 persons, the above percentages can be multiplied by the approximate round-trip mileage per attendee divided by the event’s average persons per vehicle (see Appendix B).

5TC’s 1400-person predecessor events historically averaged 2 attendees per vehicle, which extrapolates to 1500 vehicles for 3000 attendees. 5TC’s mitigation measures, such as incentives for carpooling, no-cost centralized art transport, and shuttle service from the Bay Area are estimated to create a 197-vehicle reduction for a total of 1303 vehicles (see Appendix H). Summed across origin destinations, **the 3000 person event at County Line Ranch results in an additional 90,463 VMT when compared to its 1400-person predecessor event in Upper Lake** (see Appendix B).

See Appendices for all VMT calculations.

GHG Calculations

According to the US Environmental Protection Agency (EPA), the greenhouse gas equivalency of an average gasoline-powered passenger vehicle is 400 grams of CO₂E/mile.

3.8% of cars on the road in the United States are electric vehicles, according to data from the Department of Motor Vehicles. In San Francisco and Alameda counties, where the vast majority of the event’s attendees reside, adoption rates are much higher: 6.75% in 2023, according to the California Department of Energy’s Energy Almanac.

The expected greenhouse gas equivalency of battery electric vehicles is based on data from the EPA Beyond Tailpipe Emissions Calculator. As Greenhouse Gas Equivalency varies between vehicle models and charging locations, these calculations use the EPA data for the Tesla Model Y, the best-selling electric vehicle in the United States, at 76 grams of CO₂E/mile in San Francisco or Oakland. The calculations are based on the conservative assumption that the event's 2026 EV ratio will equal the 2022 EV ratio of all cars on the road in San Francisco and Alameda counties at 4.66%. Battery electric vehicles accounted for 35% of 2023 new vehicle sales and 6.75% of all 2023 cars on the road in Alameda and San Francisco counties, an increase of 29.63% and 44.85% respectively over 2022, and EV adoption rates trend dramatically upwards over recent years. Therefore, EVs are expected to account for a greater percentage of the event's VMT each year, reducing future greenhouse gas emissions (see Appendix D).

Other than VMT, Greenhouse gas (GHG) emissions from generators are the primary source of the event's GHG emissions, including carbon dioxide (CO₂), nitrogen oxides (NO_x), and methane (CH₄). The primary source of GHG emissions from generators is the combustion of fossil fuels, typically diesel or gasoline.

There are two primary types of generators found at events: diesel generators in the 15-125 kW range, which are used to power production equipment and infrastructure, and smaller gas-powered generators, which typically range from 1-3 kW and can be used for powering both infrastructure and RV.

Based on historical generator rental documentation, diesel consumed, and hours those generators are run over the course of previous events, large diesel generators ran for an estimated 144 generator-hours and produced 3.67 metric tons CO₂E at the 2023/2024 events in Upper Lake. At County Line Ranch, diesel generator usage is estimated at 216 generator-hours and 6.24 metric tons of CO₂E produced.

At prior events, RV parking was scarce and RV generator use was restricted. Approximately ½ of the 32 RVs at prior events used small gas generators, each running an average of 12 hours per day. Because the venue's power grid was not as extensive as that of County Line Ranch, far-flung production areas also accounted for another 4 small gas generators running an average of 20 hours per day. Between production and RV usage, small gas generators ran an estimated 1088 generator-hours at the 2024 event, creating 2.45 metric tons of CO₂E. Due to

County Line Ranch's extensive electrical grid and the mitigations of offering power from large production generators to RV campers, it is estimated that small gas generators at 5TC will create 1.73 metric tons of CO₂E (see Appendix G).

Total GHG emissions from VMT are estimated at 115.87 metric tons of CO₂E (see Appendix F).

5TC at County Line Ranch will produce an estimated total of 123.84 metric tons CO₂E from generators and vehicles in its first year, an increase of 7.59 metric tons over the 2024 event. GHG emissions are estimated to reduce to 101.44 metric tons of CO₂E by 2029, a decrease of 14.8 metric tons from the 2024 event.

See Appendices for all GHG calculations.

Mitigation Measures

In order to reduce event-related VMT and GHG emissions to meet or exceed its fair share in achieving the State of California's climate goals, 501T3 will implement the following mitigation measures:

VMT and Vehicle GHG Emissions

- Offer a shuttle service to and from the event from the Bay Area for attendees.
- Offer incentives for carpools and electric vehicles.
- Offer incentives for use of solar/battery generators in place of gasoline generators.
- Provide centralized transportation of art projects and materials at no cost to artists.
- Source building materials locally.

Generator GHG Emissions

- Use existing grid power and production generators to offer electrical hookups to RVs, minimizing the number of RV generators.
- Prohibit use of private generators within all river bar camping areas.
- Use electric alternatives to combustion equipment when feasible, such as battery-coupled generators and solar light towers.
- Provide charging stations for phones and other small portable electronic devices.

Other Mitigations

- Source ingredients for 5TC-provided staff meals from local farms.
- Encourage event attendees to recycle and compost at their homes (as 5TC does not collect participant waste on-site).

Appendix A. 2024 Event VMT Calculations

2024 Event			
<i>Location</i>	<i>VMT Per Vehicle</i>	<i>Vehicles</i>	<i>VMT Total</i>
Bay Area	276	637	175,812
Humboldt County (Garberville)	47	14	658
Mendocino County (Ukiah)	48	21	1,008
Los Angeles	1,022	21	21,462
Pacific Northwest (Portland)	1,168	7	8,176
2024 Event		700	207,116
2024 Event (Adjusted for CLR Origins)			
<i>Location</i>	<i>VMT Per Vehicle</i>	<i>Vehicles</i>	<i>VMT Total</i>
Bay Area	276	630	173,880
Humboldt County (Garberville)	47	28	1,316
Mendocino County (Ukiah)	48	21	1,008
Los Angeles	1,022	14	14,308
Pacific Northwest (Portland)	1,168	7	8,176
2024 Event Adjusted for CLR Points of Origin		700	198,688

Appendix B. CLR Event VMT Calculations

Vehicle Quantities			
Without Mitigation Measures			
2024 Vehicles	700		
CLR Additional Vehicles	800		
CLR Total Vehicles	1,500		
Adjusted for Mitigations Measures			
Mitigation Measure Reductions	197		
CLR Total Vehicles	1,303		
County Line Ranch Event (w/o Mitigation)			
Location	VMT Per Vehicle	Vehicles	VMT Total
2024 Event (Additional Travel)	90	700	63,000
Bay Area	390	720	280,800
Humboldt County (Garberville)	18	32	576
Mendocino County (Ukiah)	164	24	3,936
Los Angeles	1,138	16	18,208
Pacific Northwest (Portland)	974	8	7,792
CLR Total w/o Mitigations		1,500	374,312
County Line Ranch Event (w/ Mitigation)			
Location	VMT Per Vehicle	Vehicles	VMT Total
2024 Event (Additional Travel)	90	700	63,000
Bay Area	390	534	208,377
Humboldt County (Garberville)	18	27	495
Mendocino County (Ukiah)	164	21	3,380
Los Angeles	1,138	14	15,636
Pacific Northwest (Portland)	974	7	6,691
CLR Event Total		1,303	297,579
CLR Event Increase vs 2024 Event		603	90,463
CLR Event Mitigation Measure Reduction (20.5%)		197	76,733

Appendix C. Additional VMT to County Line Ranch per 2024 Event Vehicle

Additional County Line Ranch VMT Per 2024 Event Vehicle						
<i>Location</i>	<i>Upper Lake Vehicles</i>	<i>CLR Vehicles</i>	<i>Upper Lake VMT</i>	<i>CLR VMT</i>	<i>Upper Lake Total VMT</i>	<i>CLR Total VMT</i>
Bay Area	637	630	276	390	175,812	245,700
Humboldt County (Garberville)	14	28	200	9	2,800	252
Mendocino County (Ukiah)	21	21	47	164	987	3,444
Los Angeles	21	14	1,022	1,138	21,462	15,932
Pacific Northwest	7	7	1,168	974	8,176	6,818
TOTAL	700	700			209,237	272,146
Average Per Vehicle					298.91	388.78
CLR Event Additional Average Per Vehicle						89.87

Appendix D. GHG Per Vehicle & EV Adoption Rate Calculations

Total Event Vehicles by Type							
Year	2023	2024	2026	2027	2028	2029	2030
Total Vehicles	636	636	1282	1280	1280	1280	1280
Gas Passenger Vehicles	578	569	1,117	1,096	1,069	1,035	993
Centralized Transport Trucks	5	5	8	6	6	6	6
RVs	32	32	70	70	70	70	70
EVs	21	30	87	108	135	169	211

Event EV quantities estimated based on EV share of all vehicles on road in Alameda and San Francisco Counties, where the vast majority of 5TC attendees reside, two years prior to the event year. 25% annual in 2026 and beyond is conservatively estimated well below the past three years' overall increases. Over 92% of EVs on the road in Alameda and San Francisco Counties have a range of over 200 miles and will require no more than one stop for charging on the trip between the Bay Area and County Line Ranch. Incentives offered to 5TC attendees who arrive in EVs will offset the added travel time for charging stops. 2020-2024 EV adoption rate data sourced from the California Energy Commission's Energy Almanac. <https://www.energy.ca.gov/data-reports/energy-almanac/zero-emission-vehicle-and-infrastructure-statistics-collection/light>

EV Adoption Rates in Alameda and San Francisco Counties							
Year	2020	2021	2022	2023	2024 (est)	2025 (est)	2026 (est)
EV Share of Vehicles on Road (Alameda and San Francisco Counties)	2.60%	3.32%	4.66%	6.75%	8.44%	10.55%	13.18%
Annual Increase	No data available	27.69%	40.36%	44.85%	25%	25%	25%
EV Share of New Vehicle Purchases (Alameda and San Francisco Counties)	11.82%	17.32%	27%	35%	33.33%	35%	40%
Annual Increase	No data available	46.53%	55.89%	29.63%	-4.77%	5.01%	14.29%

2020-2024 EV adoption rate data for Alameda and San Francisco Counties, where the vast majority of 5TC attendees reside, sourced from the California Energy Commission's Energy Almanac. 2024 EV share of new purchases is Q2 year-to-date, not an estimate, and likely a temporary decrease due to many EV tax credits expiring at the end of 2023. <https://www.energy.ca.gov/data-reports/energy-almanac/zero-emission-vehicle-and-infrastructure-statistics-collection/light>

Appendix E. GHG Per Vehicle Calculations

Average Passenger Vehicle GHG				
Year	Type	Adoption Rate	g CO2E/mile	Adjusted
2023	EV	2.60%	76	1.976
	Gas	97.40%	400	389.6
	Average Adjusted Grams CO2E/mile			391.576
2024	EV	3.32%	76	2.5232
	Gas	96.68%	400	386.72
	Average Adjusted Grams CO2E/mile			389.2432
2026	EV	4.66%	76	3.5416
	Gas	95.34%	400	381.36
	Average Adjusted Grams CO2E/mile			384.9016
2027	EV	6.75%	76	5.13
	Gas	93.25%	400	373
	Average Adjusted Grams CO2E/mile			378.13
2028	EV	8.44%	76	6.4144
	Gas	91.56%	400	366.24
	Average Adjusted Grams CO2E/mile			372.6544
2029	EV	10.55%	76	8.018
	Gas	89.45%	400	357.8
	Average Adjusted Grams CO2E/mile			365.818
2030	EV	13.08%	76	9.9408
	Gas	86.92%	400	347.68
	Average Adjusted Grams CO2E/mile			357.6208
Note: Calculated using emissions data from the US Department of Energy Beyond Tailpipe Emissions Calculator and the US Environmental Protection Agency, and Alameda/San Francisco County EV adoption rate data from the California Energy Commission Energy Almanac. Calculations based on 400g/mile CO2E average for gas passenger vehicles and 76g/mile for a Tesla Model Y.				

Appendix F. Vehicle GHG Calculations

Vehicle GHG Calculations				
Location	Vehicles	VMT Per Vehicle	VMT Total	Metric Tons CO2E
2023/2024 Event Vehicle Total	700	403	282,100	110.13
2024 Event Vehicles (Additional Travel)	700	90	63,000	24.25
Bay Area	534	390	208,539	80.27
Humboldt County (Garberville)	27	18	275	0.11
Mendocino County (Ukiah)	21	164	3,444	1.33
Los Angeles	14	1,138	20,061	7.72
Pacific Northwest	7	974	5,723	2.20
2023/2024 Event Total GHG				110.13
CLR Event Total GHG				115.87
CLR Event GHG Increase vs 2024 Event				5.74
<i>2023/2024 GHG calculated using an average of 2020 and 2021 EV share of all vehicles on the road in Alameda and San Francisco Counties. CLR event GHG calculated using 2022 EV share.</i>				

Appendix G. Generator GHG Calculations

Event Generator GHG Calculations										
Type of Generator	Days Used	Average Hrs/Day	2024 Quantity	2026 Quantity	2024 Generator-Hrs	2026 Generator-Hrs	2024 Gal Gas Used	2026 Gal Gas Used	2024 Metric Tons CO2E	2026 Metric Tons CO2E
Small Gas RV	4	12	16	16	768	768	192	192	1.728	1.728
Small Gas Production	4	20	4	0	320	0	80	0	0.72	0
70 kVa Diesel Production	6	18	1	2	144	216	367.2	624.24	3.672	6.2424
Total Metric Tons CO2E									6.12	7.9704
<i>Calculations based on MQ Power Whisperwatt DCA70SSIU4F 70kVa diesel generator at 1/4 load and Honda EU2000i at high load running an RV air conditioner. GHG emissions based on US Environmental Protection Agency Greenhouse Gas Equivalency Calculator. Both the previous venue and County Line Ranch have extensive grid power systems in place which have been and will continue to be utilized whenever possible. County Line Ranch has more grid power distribution which negates production's need for small gas generators at previous events. 501T3 plans to use solar power and battery hybrid generators wherever feasible to further lower generator GHG emissions.</i>										

Appendix H. Mitigation Measure VMT/GHG Calculations

2026 Event Mitigation Measure VMT/GHG Reductions				
Mitigation Measure	Vehicle Reduction	Vehicle Point of Origin	VMT Reduction	GHG Reduction
Shuttles	21	Bay Area	8,190	3.19
Centralized Art Transport	51	Bay Area	19,890	7.76
Onsite Container Storage	0	Bay Area	0	0.00
Locally Sourced Building Materials	13	Bay Area	5,070	1.98
Carpool Incentives	75	All	29,250	11.26
Additional RV Parking	38	All	14,820	N/A
Total - Bay Area	85		33,150	12.93
Total - Various Points of Origin	113		44,070	11.26
TOTAL COMBINED REDUCTIONS	198		77,220	24.19
<i>Note 1: Carpool incentives are conservatively estimated to result in a 5% decrease in vehicles from the estimated total based on the ratio of people to vehicles at the 2024 predecessor event. 501T3 will adjust and modify incentives each year based on their performance the prior year.</i>				
<i>Note 2: Onsite container storage will not effect VMT or GHG in the event's first year at County Line Ranch, as all equipment stored onsite would be transported from the Bay Area before the event. In successive years, each 40' shipping container removes the need for two 5-ton 26' box truck round trips from Enterprise Truck Rental in San Leandro, CA to County Line Ranch at 422 miles each.</i>				
<i>Note 3: As RVs produce more GHG emissions per mile than an average passenger vehicle, these calculations assume there are no GHG reductions from increased RV parking, only VMT reductions. RV electrical hookups from Production Generators are estimated to offset any resulting increase in GHG from RV generators by taking advantage of unused Production Generator output.</i>				
<i>Note 4: No attempt has been made to quantify the GHG impact of the following mitigation measures due to a lack of obtainable data:</i>				
• Encouraging attendees to recycle and compost upon returning to their homes, as 501T3 has no way to collect metrics of attendee recycling and composting habits pre and post event.				
• Solar power incentives, as the event's previous venue had far less sun exposure, thus solar power was not a feasible option at previous events and there is no historic data to base projections on.				
• Battery power incentives, as the adoption rate of portable battery power stations is growing incredibly quickly but there is no holistic market data available to base projections on.				
• Locally sourced staff meal ingredients, as 2026 availability, quantities, and pricing is unknown.				
• Public charging stations, as there is no baseline data to base projections on.				

Onsite Storage				
Event Year	Storage Containers Onsite Prior to Event	Equipment Transport Vehicle Reduction	VMT Reduction	GHG Reduction, Metric Tons CO2E
2026	0	0	0	0
2027	1	2	844	0.3376
2028	1	2	844	0.3376
2029	2	4	1688	0.6752
2030	2	4	1688	0.6752

501T3 plans to store event-specific equipment and infrastructure onsite at County Line Ranch in standard 40 ft shipping containers. There will be no resulting VMT/GHG reduction the first year, as all equipment stored in containers will be transported to the event as usual. In successive events, each shipping container will reduce the need for event-related equipment transportation. Calculations assume each shipping container reduces VMT by two box truck round trips at from Enterprise Truck Rental in San Leandro, CA, or 844 VMT.

Locally Sourced Building Materials						
Locally Sourced Materials, Cu Ft	Equivalent RAV4 Back Seats	Additional Passengers	Vehicle Reduction	VMT Reduction	Adt Transport Vehicle GHG	GHG Reduction, Metric Tons CO2E
850	26.31578947	26.31578947	13.15789474	5131.578947	268.1835	-266.2083471

Calculations based on a 26' box truck with 1700 cubic feet of cargo capacity and the Toyota RAV4, the best selling SUV in the US, with 37.5 cubic of cargo capacity behind the rear seats and 69.8 cubic feet of cargo capacity with the rear seats folded down. Calculations assume each vehicle not using the additional cargo capacity of the folded back seat for equipment will transport an average of 3 people rather than the overall 2024 event average of 2 people per car. VMTs calculated at an average 390 per vehicle, as most 5TC art and infrastructure are transported from the Bay Area. Passenger vehicle GHG calculated at each event year's predicted average CO2E per mile. Box truck GHG calculated based on Environmental Defense Fund data of 161.8g CO2E per ton-mile with a 5-ton payload.

Onsite Storage				
Event Year	Storage Containers Onsite Prior to Event	Equipment Transport Vehicle Reduction	VMT Reduction	GHG Reduction, Metric Tons CO2E
2026	0	0	0	0
2027	1	2	844	0.3376
2028	1	2	844	0.3376
2029	2	4	1688	0.6752
2030	2	4	1688	0.6752

501T3 plans to store event-specific equipment and infrastructure onsite at County Line Ranch in standard 40 ft shipping containers. There will be no resulting VMT/GHG reduction the first year, as all equipment stored in containers will be transported to the event as usual. In successive events, each shipping container will reduce the need for event-related equipment transportation. Calculations assume each shipping container reduces VMT by two box truck round trips at from Enterprise Truck Rental in San Leandro, CA, or 844 VMT.

Centralized Art Truck Transport							
Year	Transport Vehicles	Equivalent RAV4 Back Seats	Adt Passengers	Vehicle Reduction	VMT Reduction	Adt Transport Vehicle GHG	GHG Reduction, Metric Tons CO2E
2026	2	105	105	51	19,890	0.63	7.02
2027	3	158	158	76	28,449	0.95	9.81
2028	3	158	158	76	28,449	0.95	9.66
2029	4	211	211	101	37,933	1.26	12.61
2030	4	211	211	101	37,933	1.26	12.30

Calculations based on a 26' box truck with 1700 cubic feet of cargo capacity and the Toyota RAV4, the best selling SUV in the US, with 37.5 cubic of cargo capacity behind the rear seats and 69.8 cubic feet of cargo capacity with the rear seats folded down. Calculations assume each vehicle not using the additional cargo capacity of the folded back seat for equipment will transport an average of 3 people rather than the overall 2024 event average of 2 people per car. VMTs calculated at an average 390 per vehicle, as most 5TC art and infrastructure are transported from the Bay Area. Passenger vehicle GHG calculated at each event year's predicted average CO2E per mile. Box truck GHG calculated based on Environmental Defense Fund data of 161.8g CO2E per ton-mile with a 5-ton payload.

Increased RV Parking

Event	RV Parking	Passengers @ 4 people/RV	Passengers @ 2 people/vehicle	Passenger Vehicle Equivalent	Passenger Vehicle Reduction	VMT Reduction
2024	32	128	64	32	0	0
CLR	70	280	140	70	38	9500

As RVs produce more GHG emissions per mile than an average passenger vehicle, these calculations assume there is no reduction of GHG due to increased RV parking, only VMT. RV electrical hookups from Production Generators are estimated to offset any resulting increase in RV generator usage and leverage of unused Production Generator output. An increase in Production Generators is accounted for in the Generator GHG Calculations.

Appendix I. Future GHG Reduction from EV

Future GHG Reductions from Increased EV Adoption				
Event Year	2027	2028	2029	2030
Event EV Increase from 2026	21	48	82	124
Metric Tons CO2E Reduction	1.69	3.85	6.58	9.95
<i>Calculated using emissions data from the US Department of Energy Beyond Tailpipe Emissions Calculator and the US Environmental Protection Agency, and Alameda/San Francisco County EV adoption rate data from the California Energy Commission Energy Almanac. Calculated based on 400g/mile CO2E average for gas passenger vehicles and 76g/mile for a Tesla Model Y with a baseline average of 247.66 VMT per vehicle.</i>				

Appendix J. Points of Origin for 2024 Event & CLR Event

Point of Origin Changes		
Point of Origin	2024	CLR
Bay Area	91%	90%
Humboldt County (Garberville)	2%	4%
Mendocino County (Ukiah)	3%	3%
Los Angeles	3%	2%
Pacific Northwest	1%	1%
<i>Small changes in the distribution of event attendee point of origin are expected as a result of moving farther north, notably a slight increase in attendees from Humboldt County and decrease in attendees from Los Angeles.</i>		

Appendix K. VMT Maps for Attendee Points of Origin

1. San Francisco to County Line Ranch - 195 miles
2. Los Angeles to County Line Ranch - 569 miles
3. Portland to County Line Ranch - 487 miles
4. Ukiah to County Line Ranch - 81.7 miles
5. Garberville to County Line Ranch - 9.1 miles
6. San Francisco to Saratoga Springs Retreat Center - 138 miles
7. Los Angeles to Saratoga Springs Retreat Center - 506 miles
8. Portland to Saratoga Springs Retreat Center - 584 miles
9. Ukiah to Saratoga Springs Retreat Center - 24.2 miles
10. Garberville to Saratoga Springs Retreat Center - 100 miles



















