



NEW JERSEY
DEPARTMENT OF
ENVIRONMENTAL
PROTECTION

New Jersey Department of Environmental Protection

Leading by Example

Emissions Inventory Report

October 2024

ACKNOWLEDGEMENTS

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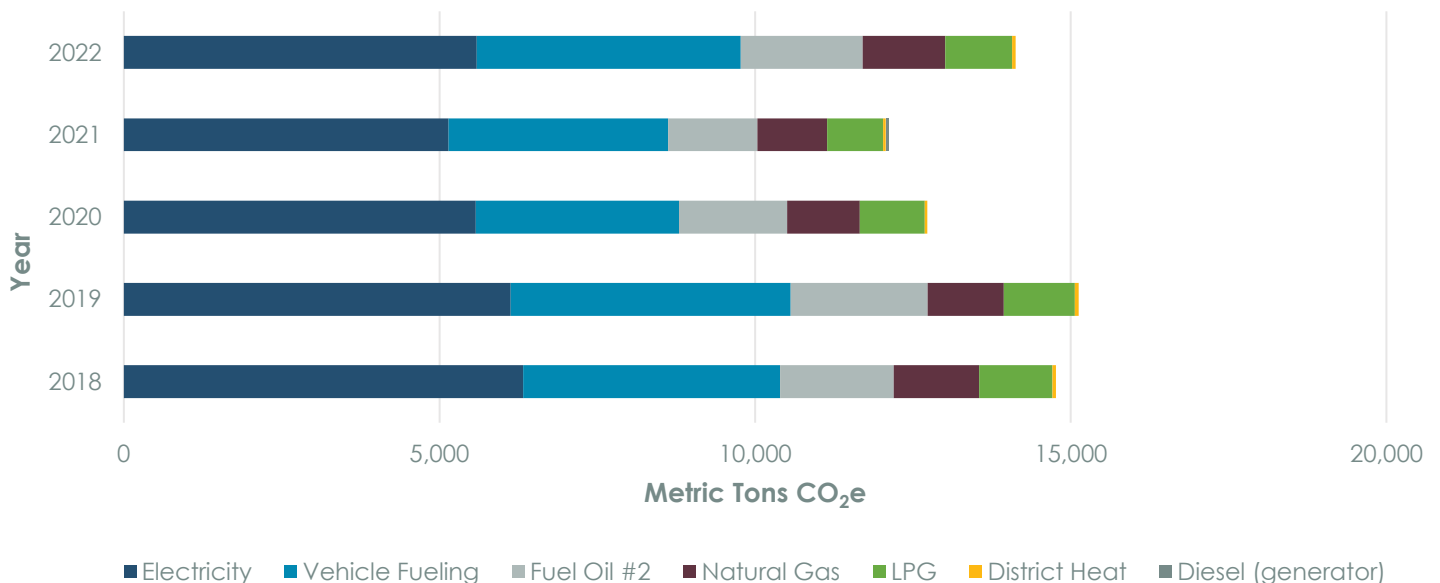
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EXECUTIVE SUMMARY

It is imperative that state and local governments lead by example in the fight against climate change. As large land stewards and fleet operators, governments can implement greenhouse gas reducing projects within their own operations demonstrating energy and environmental leadership. This inaugural “Leading by Example Emissions Inventory Report (2024)” seeks to catalyze other state agencies to undertake similar analyses to develop baseline inventories and identify opportunities to implement energy efficiency and climate mitigation projects. As directed by Commissioner Shawn M. LaTourette’s July 2023 Administrative Order (NJDEP, 2023), this report quantifies emissions for the Department of Environmental Protection’s (NJDEP or Department) buildings and vehicles from 2018 to 2022, identifies historical trends, details emission reduction progress to date, and enumerates priority future actions.

The Department’s emissions decreased 4.3% in 2022 compared to 2018 (Figure ES1). In 2022, the Department’s emissions totaled 14,125 metric tons CO₂e. The Department intends to periodically release updated inventory reports and potentially expand the scope of emissions captured in future versions.

Figure ES1: Total Department greenhouse gas emissions (CO₂e) by year.



Buildings

The greatest source of emissions from the Department’s facilities is from the use of electricity. The Department’s Trenton headquarters (at 401 East State Street in Trenton), where 30% of employees work, is responsible for the most greenhouse gas emissions. Liberty State Park, Pequest Trout Hatchery, Ringwood State Park, and 5 Station Plaza office building round out the top five emitting facilities in 2022. Energy audits, which identify historic energy consumption, occupancy, usage, equipment, and provide energy conservation measure recommendations, have been completed¹ or are in progress at

¹ Completed Energy Audits are available via New Jersey’s Clean Energy Program Local Government Energy Audit (LGEA) program <https://njcleanenergy.com/commercial-industrial/programs/local-government-energy-audit/local-government-energy-audit/reports/K-S> The LGEAs are limited to ASHRAE level 2 audits, and as such only include like for like equipment upgrades. Average peak demand of a building must be at least 200kW in the last 12 months of electric utility bills.

approximately one-third of the Department's facilities. The Department is in the process of implementing recommendations, such as lighting, Heating, Ventilation, and Air Conditioning (HVAC), hot water heater and building envelope upgrades. Additionally, along with energy efficiency improvements, the Department is evaluating its facilities for integrating renewable energy such as solar photovoltaic (PV) arrays. While there is a solar PV array on the roof of the Department's Trenton headquarters building², the Department is seeking to offset 100% of its building stock electricity demand with solar PV.

Vehicles

The Department's 1,400 vehicles are the second largest source of greenhouse gas emissions. Gasoline powered pickup trucks were responsible for the largest share of vehicle related emissions in 2022. The Department's Division of Health, Safety and Facility Management is actively working to transition DEP's fleet to zero emission vehicles. As of December 2023, eight electric, 62 hybrid, and 63 plug-in hybrid vehicles have been incorporated into the fleet. Simultaneously the Department is building out its EV charging infrastructure, having installed 37 Level 2 EV chargers and one direct current fast charger. Currently, charging for fleet vehicles and staff is available at locations in Trenton and Jersey City. More charging sites will be added in the near future. Additionally, public EV chargers have been installed at State Parks, Forests & Historic Sites facilities across the State.

Looking Forward

The Department is committed to reducing emissions in its buildings and transportation operations and encouraging other state agencies and local governments to do the same. To sustain this effort, the Department has designated an Energy Manager, and convened both an internal Steering Committee and an Energy Team to ensure procurement decisions evaluate and prioritize greenhouse gas reductions. Longer-term, the Department, in collaboration with the Board of Public Utilities and Treasury, anticipates developing guidance to support other State agencies and local governments in developing their own operational emissions inventory and mitigation plans.

² DEP's solar array [NJDEP | Clean Energy | Solar](https://dep.nj.gov/cleanenergy/technologies/solar/). Learn more about DEP's Solar array here: <https://dep.nj.gov/cleanenergy/technologies/solar/> [Note: This dashboard uses a static estimate of carbon offset, and as such will provide a different estimate than the number provided in this report.]

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BACKGROUND






To limit and reduce greenhouse gas emissions and other climate pollutants causing catastrophic global atmospheric warming, the New Jersey Legislature passed the Global Warming Response Act (P.L. 2007 c.112; P.L. 2018 c.197) establishing a goal to reduce statewide greenhouse emissions 80% by 2050. In 2021, Governor Murphy accelerated New Jersey's commitments, by signing Executive Order 274, setting an interim greenhouse gas reduction target of 50% below 2006 levels by 2030.³ Now the State is embarking on the hard work of achieving these goals. State government is in the unique position, as a large land steward, electricity consumer, vehicle fleet owner and purchaser of goods and services to lead by example in reducing greenhouse gas emissions.

The New Jersey Department of Environmental Protection (Department or DEP), acknowledging the critical leadership role it plays in reducing greenhouse gases, issued Administrative Order 2023-13. This Administrative Order, in part, requires the Department to develop a greenhouse gas inventory for its operations. This document serves as the inaugural report, quantifying Department emissions from 2018-2022⁴, and details progress to date on emissions reductions.

Inventory Approach

This inventory report evaluates both Scope 1 and Scope 2 emissions generated by the Department from 2018-2022. As shown in Figure 1 below, Scope 1 emissions are those generated directly onsite, such as when natural gas is used to create heat; whereas Scope 2 emissions are those generated offsite such as the emissions generated at a powerplant, to provide a building with electricity. Emissions associated with electricity, fleet motor vehicle fuel, fuel oil #2, district steam heat, natural gas (for heat and hot water), liquified petroleum gas (LPG) and generator-used diesel are analyzed to create a sector specific emissions analysis.

Figure 1. Summary of emissions included in this report. Scope 1 emissions are direct greenhouse emissions from sources that are controlled or owned by an organization (e.g., emissions associated with fuel combustion in boilers, furnaces, vehicles). Scope 2 emissions are indirect greenhouse gas emissions associated with the purchase of electricity, steam, heat, or cooling.

Scope 1 Emissions		Scope 2 Emissions	
	Vehicle Fuel Use		Electricity Emissions
	Fuels burned on site		District Heat
	Natural Gas		

³ More information on New Jersey's greenhouse gas reduction goals can be found at <https://dep.nj.gov/ghg/ghg-emissions-goals/>

⁴ Energy data was obtained via accessing the New Jersey Department of Treasury's State Energy Tracking System, established via Joint Circular No. 10-04-OES (OMB, 2009). Energy data in this system is consolidated at the facility / account level as far back as 2018.

The data evaluated in this report were obtained from utility bills at each facility and vehicle odometer records for the Department fleet. With over 90 facilities⁵ that are owned or leased by the Department and approximately 1,400 fleet vehicles, data collection was not insignificant.

For the purposes of this report, emissions captured include the entire breadth of activities and facilities that the Department operates and performs. The roughly 90 facilities owned, leased, and/or operated by the Department include State Parks and Forests, Wildlife Management Areas, offices, Natural and Historical Sites, and even some weather and air monitoring stations that are billed for electricity. These facilities are located across the State and range in their size and function, with each location presenting unique challenges and opportunities for lowering emissions.

The vehicle fleet includes all State vehicles assigned to the Department such as patrol vehicles used by State Park Police, vehicles used by inspectors for field work, and a range of emergency response vehicles (forest fire, spill response, nuclear response) and specialty equipment like dump trucks. Some of these vehicles were driven over 20,000 miles annually in the years studied, whereas others recorded under 100 miles of use.

The data in this report covers three different periods in terms of workplace occupancy at the Department. Prior to the COVID-19 pandemic (2018-2019) staff worked in the office full time. From March 2020 into 2021, staff were fully remote, and then transitioned to working on a hybrid schedule (parts of 2021 into 2022), wherein most people were in the office three days a week.

Trends

In 2018, Department-wide emissions totaled 14,765 metric tons of CO₂e. This is equivalent to the typical annual CO₂ emissions from providing about 2,900 homes with electricity or driving a car about 38 million miles.⁶ Total emissions from 2020 and 2021 shrank, with 2021 having the lowest emissions in the years covered (12,117 metric tons CO₂e), and emissions rising again in 2022 to almost pre-COVID levels (14,125 metric tons CO₂e). This information is summarized in Figure 2. The Department has approximately 2,700 full-time employees and 1,300 hourly employees totaling 4,000.⁷ For 2022, this means that the Department emitted about 3.5 metric tons of CO₂e per employee (illustrated in Figure 3).

⁵ A facility is a collection of buildings or structures, anywhere from a small weather station to co-located and / or non-contiguous office buildings, that function as a single property. Facilities are owned and operated by the same party. The “facility” terminology is used in the classification of energy bills by the State Energy Tracking System.

⁶ The EPA Greenhouse Gas Equivalency calculator assumes that a car emits 3.90×10^{-4} metric tons CO₂e/mile, and that providing the average home with electricity emits 5.139 metric tons CO₂e/year.

⁷ This figure includes both full time staff and full-time staff equivalents (i.e. hourly employees). For example, a part-time employee working 3 days/week would equal 0.6 of a full-time employee. Additionally, since DEP staffing numbers have changed over time (with hiring, retirements, etc.) and due to seasonal positions, the figure of 4,000 full-time equivalents is a figure used to convey the average number of full-time employees over the course of the year.

Figure 2. Total Department Emissions by Year. Total yearly emissions from the Department, in metric tons of CO₂e. For each year, electricity was the largest source of emissions, followed by vehicle fueling.

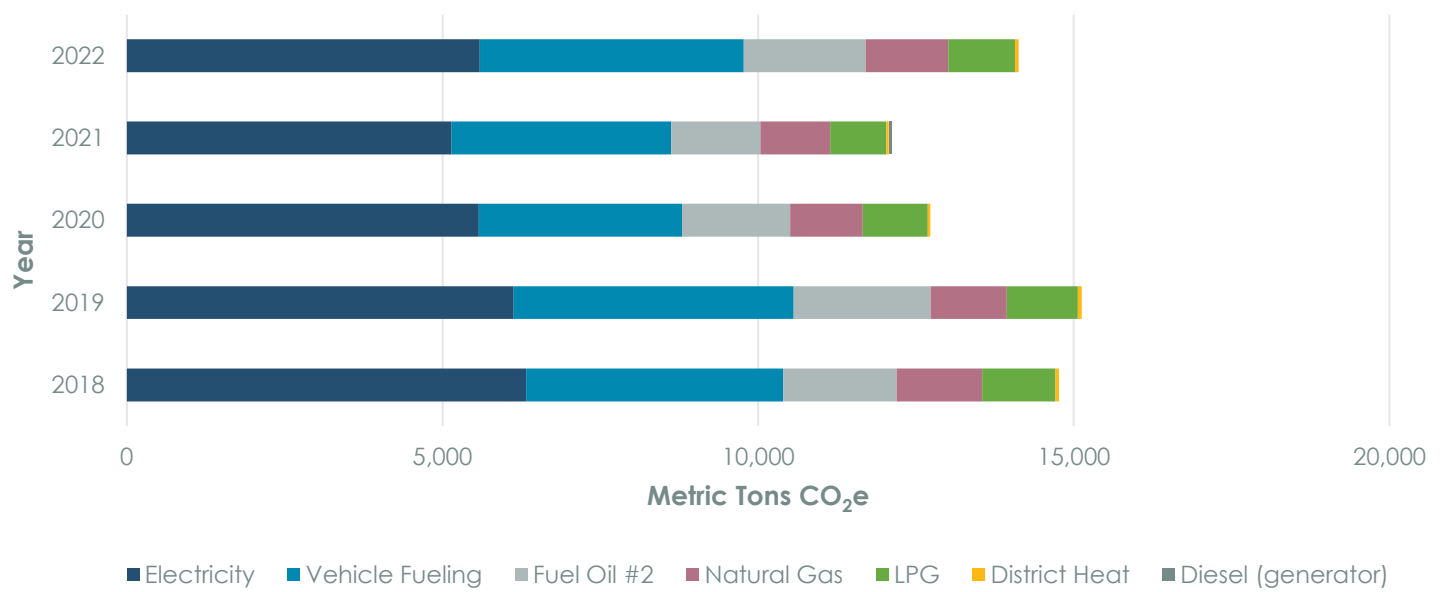
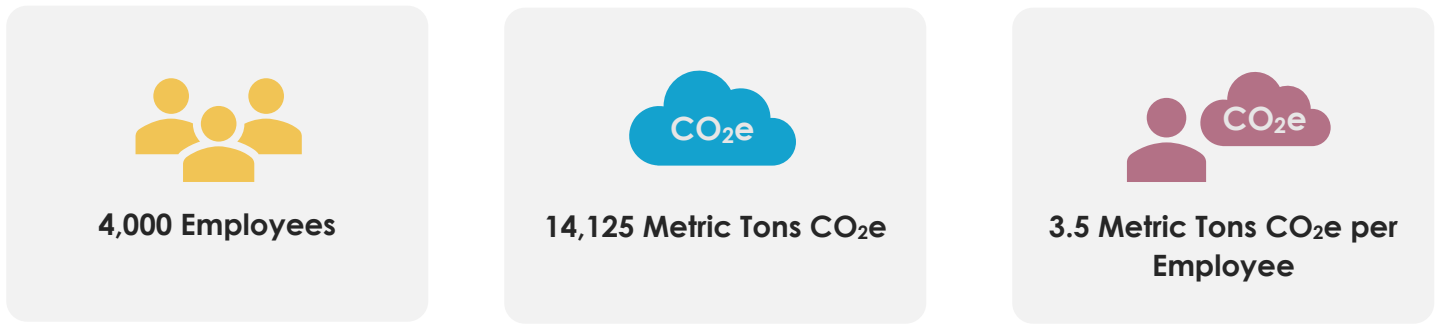


Figure 3. Per capita employee emissions. The Department employees roughly 4,000 employees. In 2022, Department emissions amounted to 14,125 metric tons, which averages out to 3.5 metric tons per employee. It should be noted, however, that many Department facilities are open to the public – such as State Parks- and thus it would be inaccurate to assume each employee emits 3.5 metric tons of CO₂e while at work.



Year over year, electricity primarily used for cooling, lighting, and office equipment makes up the largest source of emissions, ranging from 44% in 2020 to 40% in 2022, a decrease of 4% since the onset of a hybrid working schedule. Fleet motor vehicle fueling makes up the second largest portion of overall emissions, equating to roughly 30% of total emissions in any given year. The remaining emissions are primarily from fuel used to heat buildings and water. The remainder of this report breaks out emissions by sector and program areas, and highlights progress made by the Department to lower emissions.

SECTOR ANALYSIS

Buildings

The Department owns or leases a range of buildings at facilities across program areas. Utility bills were analyzed at the facility level. A “facility” may consist of a small weather station, office building (or several co-located office buildings), or every building in a park. The buildings included in a single facility may be located across several non-contiguous parcels of land. Map 1 to the right shows the location of Department buildings and structures within New Jersey. The facilities operated by the Department are varied in scope and include offices, fish hatcheries and parks. These facilities, which have different needs in terms of electricity and fuel, are located everywhere from cities to remote forests across the State.

Map 1. Location of NJ Department of Environmental Protection Buildings and Structures.

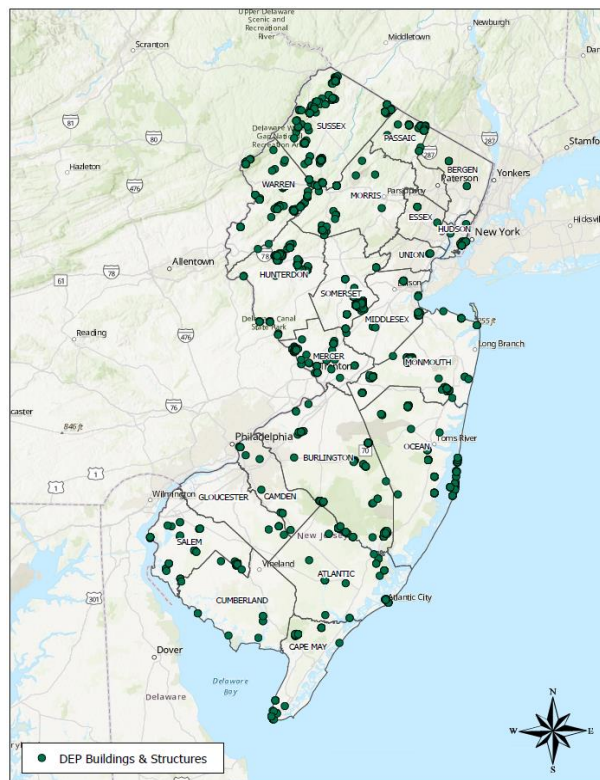
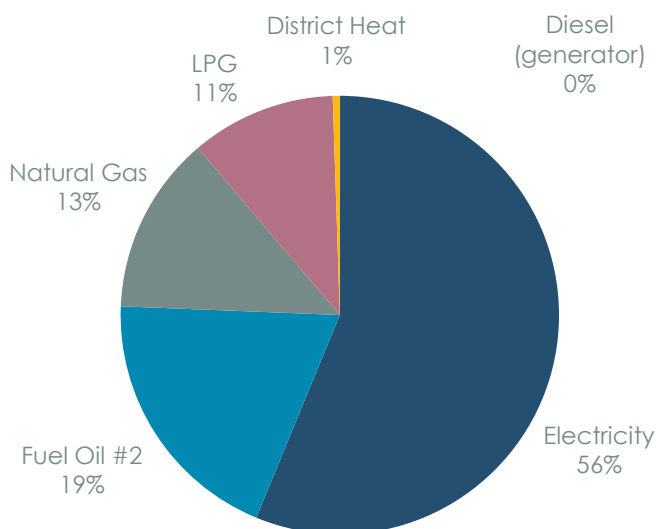
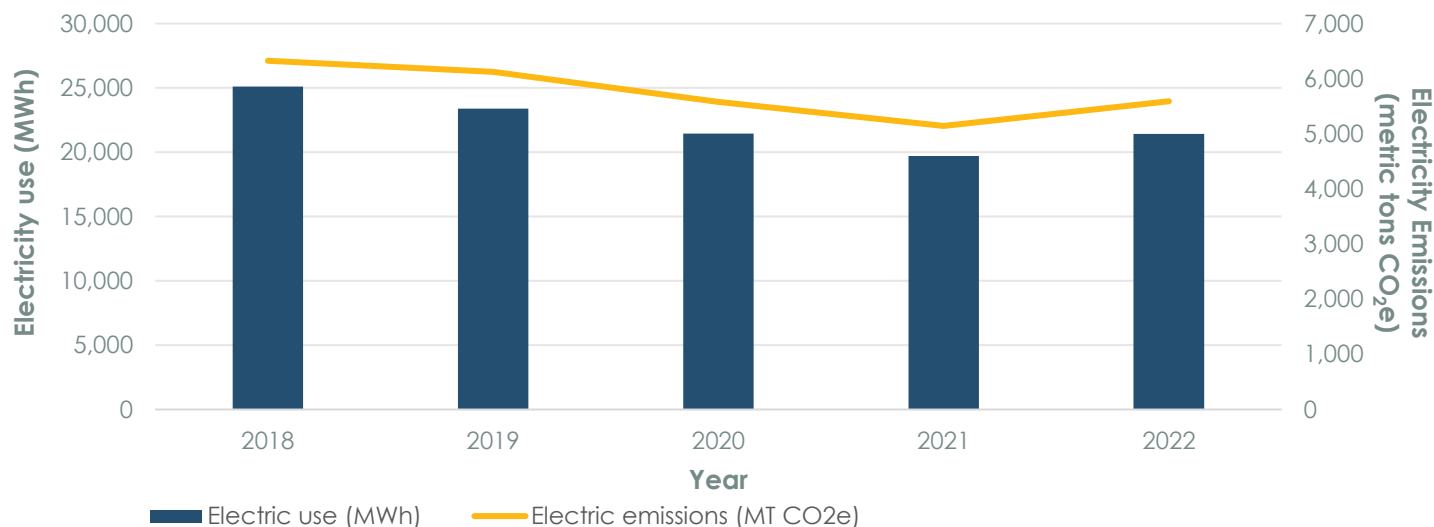


Figure 4. 2022 DEP Building Emissions. Breakdown of 2022 emissions from buildings by source.



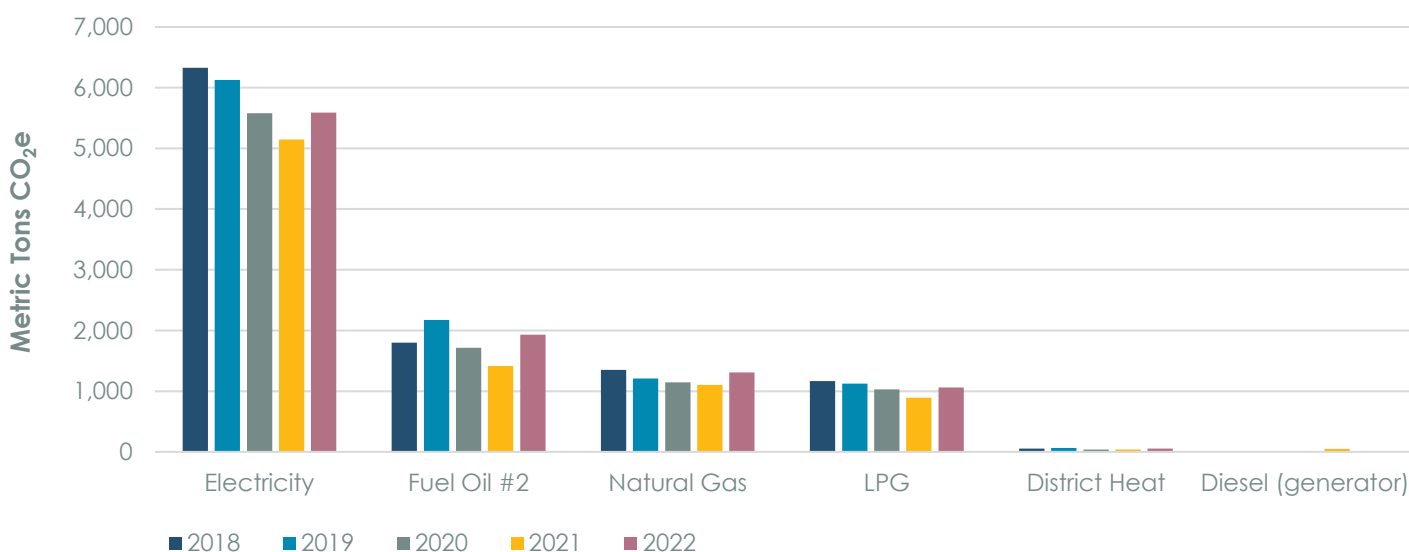
In this report “Building Emissions” will be used to describe all emissions not tied directly to vehicle fueling. Figure 4 to the left breaks down building-based emissions for Department facilities in 2022. In each year since 2018, the largest source of Department greenhouse gas emissions has been electricity use. Electricity-based emissions depend not only on how much electricity the Department uses, but also the source(s) of that electricity. This report utilizes an emission rate calculation based on the New Jersey Greenhouse Gas Inventory Reports (NJDEP, 2022a, NJDEP 2022b) (details on this can be found in the appendix). Figure 5 shows the relationship between electricity use and electricity-based emissions over time. In brief, as New Jersey has pursued greenhouse gas reduction policies, the amount of greenhouse gases emitted per unit of energy has trended downward over time.

Figure 5. Department Electricity Use and Electricity Emissions. This chart presents the use of electricity by Department facilities as compared to the emissions from electricity use. Note that this is not a 1:1 relationship since the mix of energy sources has changed over time. As New Jersey transitions to cleaner energy sources, it is expected that there will be lower emissions per unit of electricity used.



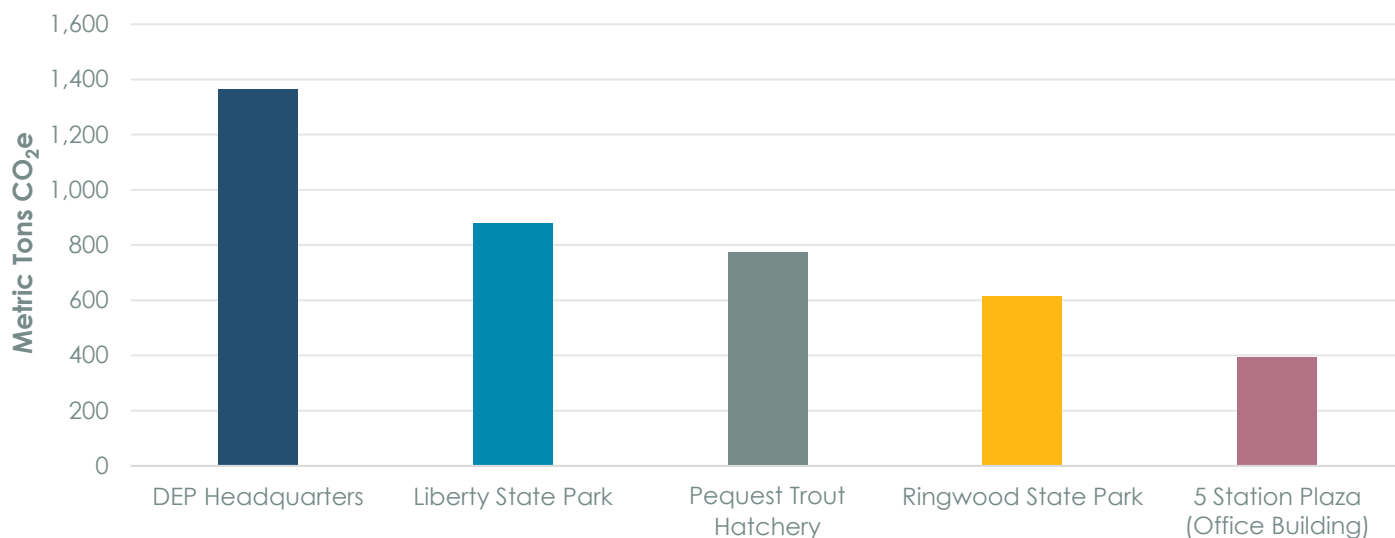
The reduction in electricity usage from 2020-2022 could be attributable to the COVID-19 pandemic. Work from home policies, as well as lower visitation rates to public state facilities such as parks may have both lowered emissions. Figure 6 breaks out the different types of building emissions by year. Natural gas and LPG follow the same general trend of emissions declining from 2018-2021 but picking back up in 2022. For Fuel Oil #2, emissions were higher in 2019 than 2018, but otherwise follow this pattern. The small amount of diesel fuel is attributed to an emergency generator, acquired after Superstorm Sandy, at the Department headquarters building.

Figure 6. Department Building Emissions Over Time by Source. This chart presents emissions from Department buildings over time, split out by the source. Emissions are presented in metric tons, carbon dioxide equivalent units (CO₂e). Emissions from electricity usage are the largest portion of Department buildings-based emissions.



The largest greenhouse gas emitter is the Department’s headquarters located at 401 East State Street in Trenton, which was responsible for 1,364 metric tons CO₂e in 2022, or 13.7% of the Department’s total building-based emissions. About 1,200 Department employees work at the Department headquarters, which represents about 30% of the Department’s workforce. Figure 7 highlights the five Department facilities with the highest building-based emissions in 2022. Since vehicles often move among Department facilities, motor vehicle fueling emissions are not included in these by-facility emissions estimates.

Figure 7. Top five emitting Department facilities for 2022. Emissions given in metric tons CO₂e. These five facilities generated over 40% of the Department’s total emissions in 2022. The Department’s Headquarters Complex is located at 401 East State Street, Liberty State Park, and Ringwood State Park are both State Parks, Pequest Trout Hatchery, and 5 Station Plaza is an office building in Trenton.



Collectively, these five facilities generated over 40% of the Department’s buildings-related emissions in 2022, however they are very different in their functions. The Department Headquarters Complex and 5 Station Plaza are both offices in Trenton. The Department’s headquarters building has the largest number of Department staff on site, a total of roughly 1,200 people, and Station Plaza has about 350 staff on site. Liberty State Park has over 23 full-time staff which can increase up to 70 with supplemental seasonal staff during the busy months staff and there are various buildings such as a historic rail terminal. Ringwood State Park has about 18 full-time staff, which can increase up to 80 with supplemental seasonal staff during the busy months and contains historic buildings, including the Skylands Manor and Ringwood Manor. The Pequest Trout Hatchery hosts 14 staff that support fish hatchery operations with infrastructure that includes indoor nursery tanks, and sixty-six outdoor concrete raceways for fish. The continuous water flow required is supplied by a system of seven wells with the capacity to pump 7,000 gallons of water per minute.

Progress to Date

The Department recognizes that energy audits provide invaluable insights into how best to improve the efficiency of its building portfolio. To this end, it completed energy audits at thirteen facilities, via the New Jersey Board of Public Utilities (BPU) Local Government Energy Audit program,⁸ with an additional nineteen facilities working towards completion (see Appendix B). Of the thirteen facilities that completed energy audits, eight were at Fish & Wildlife facilities that

⁸ New Jersey’s Clean Energy Program Local Government Energy Audit program can found at: <https://njcleanenergy.com/commercial-industrial/programs/local-government-energy-audit/local-government-energy-audit>

implemented energy conservation measures such as lighting upgrades, programmable thermostat installations and upgraded furnaces. These upgrades, completed in 2019 and 2020, are expected to result in an annual cost savings of \$43,730, providing an average 2-year return on investment. The upgrades are anticipated to reduce annual energy consumption by 614,349 kWh, which is a reduction of about 20% in energy usage across these eight facilities. The Pequest Hatchery, one of the eight Fish & Wildlife sites that performed an energy audit, is an energy intensive facility that is operated year-round to provide trout for stocking programs. Due to its energy intensity, the Pequest Hatchery alone is expected to see \$17,260 in annual cost savings and 423,052 kWh of annual energy savings.

For over a decade, the Department has demonstrated leadership within state government through its on-site solar installation. In 2012, the Department installed a 184 kW Solar Photovoltaic (PV) array on the roof of its headquarters in Trenton. This rooftop solar array generated a total of 238,540 kWh of electricity in 2022, with production peaking in the summer months when there is more sunlight. Lifetime generation of the rooftop array stands at 2.68 Gigawatt hours. This represents over 4.5% of required electricity for the year. Relying on the same emissions assumptions used throughout this report, this is estimated to offset about 37.5 metric tons CO₂e emissions. Most Department facilities use far less electricity than the headquarters building, thus, there is the potential for on-site solar arrays to offset a far larger portion of their electricity.

With respect to electrifying building heating and cooling demand, the Department has installed four ground source heat pump (GSHP) systems at State Parks and Forests. The GSHP systems are located at Monmouth Battlefield State Park Visitor Center, Batsto Village Visitor Center and Mansion at Wharton State Forest, and at the Forest Resource Education Center in the Pinelands Area of Jackson Township. The Department is evaluating additional opportunities to leverage energy efficient heat pump systems across the state.

Additionally, in accordance with the Clean Energy Act of 2018 (P.L. 2018, c.17 (C.48:3-87.8 et al.) and in collaboration with BPU, the Department is in the process of benchmarking its buildings that are 25,000 square feet and above for their electricity and water usage. Benchmarking is another important step toward reducing energy consumption and is an effective means to inform and motivate building owners to undertake energy efficiency improvements. Building energy benchmarking uses data to measure how efficiently a building performs over time and enables comparison between similar buildings. As an indicator of energy performance, benchmarking can drive up demand for energy efficiency. Buildings labeled more efficient can command higher rents, have lower vacancy rates, and result in higher property values.

DEP Facilities with Completed Energy Audits

2019

- ✓ Black River Wildlife Management Area Office, Chester & Randolph Townships
- ✓ Clinton Wildlife Management Area Office, Bethlehem & Union Townships
- ✓ Hackettstown State Fish Hatchery, Washington Township; Hackettstown & Mansfield Townships
- ✓ Millville Shellfish Office, Millville
- ✓ Pequest Trout Hatchery, Multiple Municipalities
- ✓ Tuckahoe Wildlife Management Area Office, Multiple Municipalities
- ✓ Winslow Southern Regional Office, Winslow & Monroe Townships

2022

- ✓ Drumthwacket, Princeton

2023

- ✓ 428 East State Street, Trenton
- ✓ DEP Headquarters, Trenton
- ✓ Island Beach State Park, Seaside Park

2024

- ✓ Liberty State Park, Jersey City
- ✓ Monmouth Battlefield State Park, Manalapan

Vehicles

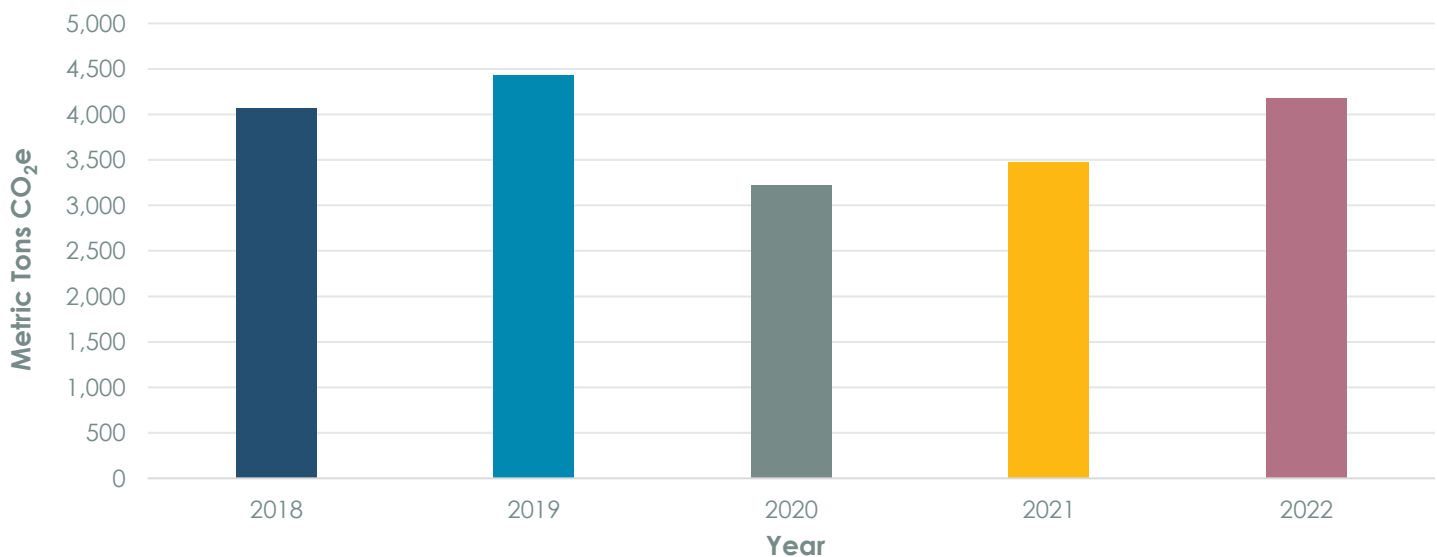
The Department has a fleet of approximately 1,400 vehicles. These range from cars driven to inspection sites to law enforcement vehicles, and heavy machinery used at State parks. The oldest vehicles date to the 1970s and include specialty equipment that would be expensive or challenging to replace. Table 1, below, shows the breakdown of Department vehicles by fuel type as of July 2024. Over the years, the Department has added a handful of all-electric vehicles and a growing number of plug-in hybrids, but the fleet is still predominantly gasoline powered vehicles.

Table 1. Department Vehicles by Fuel Type

Fuel Type	# of Vehicles
Diesel	136
Electric	9
Gasoline	1,198
Gasoline/CNG	2
Hybrid (HEV)	43
Plug-in Hybrid (PHEV)	56

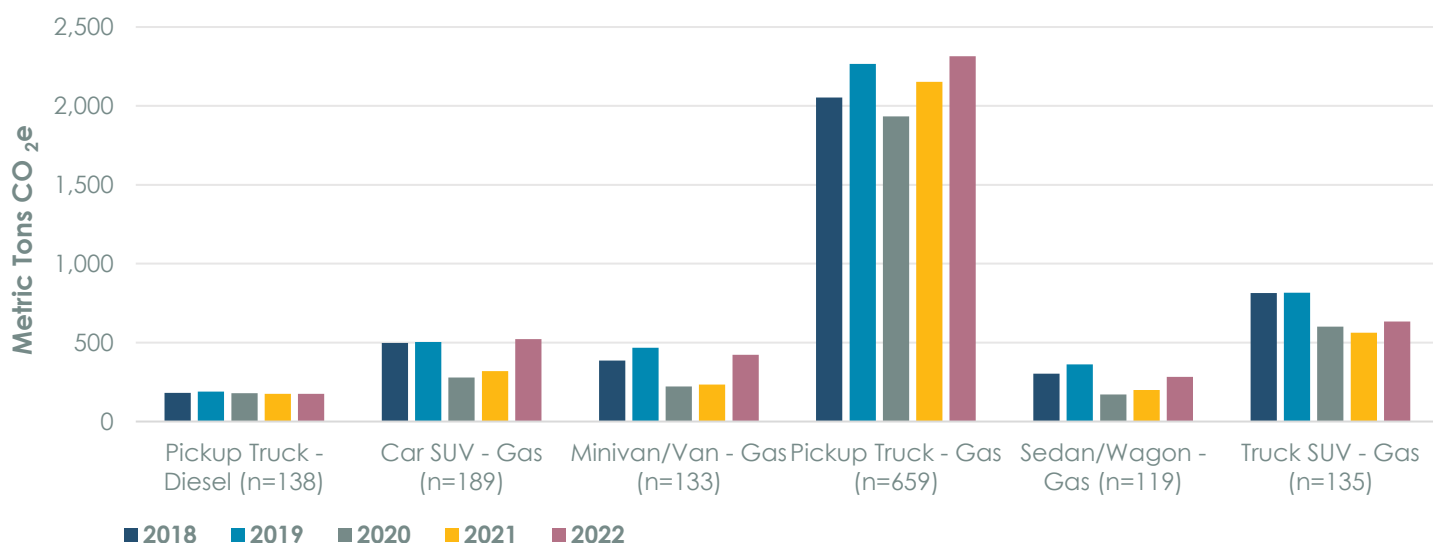
Greenhouse gas emissions from vehicles depend on both the vehicle miles traveled (VMT) and the efficiency of those vehicles. Figure 8 tracks greenhouse gas emissions for Department vehicles from 2018-2022. While emissions dipped in 2020 and 2021, 2022 emissions levels were comparable to 2018 and 2019, at 4,239 and 4,607 metric tons CO₂e. Due to gaps in data and record-keeping, it is likely that fuel usage in some non-road vehicles – such as boats and planes – as well as equipment such as chainsaws and lawnmowers was not fully captured in this analysis.

Figure 8. Emissions from vehicle fueling over time. It can be observed that emissions dipped in 2020 and 2021, but in 2022 they rebounded to pre-pandemic levels.



Records maintained by the Department record the mileage of these vehicles, but not their direct fuel use. As such, the emissions from vehicles were estimated using federal emissions classifications that split vehicles into five types (details can be found in Appendix A). Figure 9 below gives the emissions of Department fleet vehicles based on the five auto trend categories, with a sixth category for diesel vehicles (the Department only has vehicles in the “Pickup Truck” category that run on diesel fuel). Electric vehicles were assumed to have zero emissions. It should be noted that the following figures are based on vehicles that were in service in 2018-2022, and thus will not match exactly with the vehicle fuel types from Table 2, on the following page.

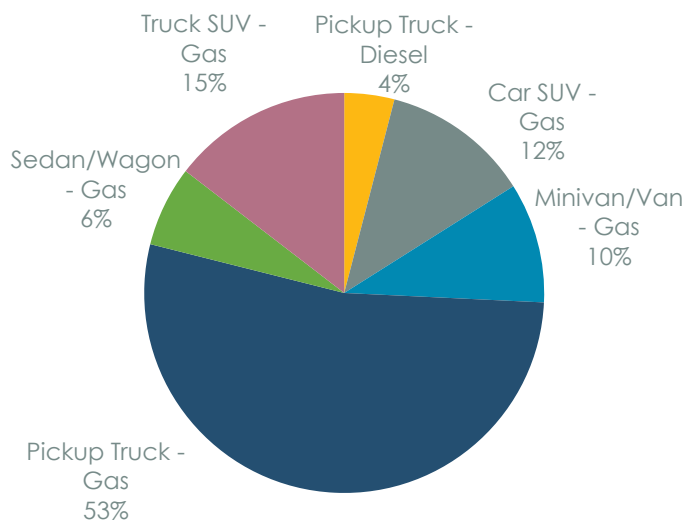
Figure 9. Total emissions in metric tons CO₂e over time from 2018-2022. Gasoline pickup trucks represent the largest share of vehicles and the largest emissions over time in each year. Note n=number of vehicles in the class with recorded miles from 2018-2022.



In 2022, gasoline powered pickup trucks were responsible for the largest share of vehicle related emissions. The Department utilized 659 pickup trucks for its daily operations, making up about 48% of the agency’s fleet. These gasoline trucks contribute 53% of vehicle emissions. The next largest portion of emissions is attributable to Truck SUVs, which make up about 10% of fleet and contribute 15% to overall vehicle emissions. This can be due to differences in use and fuel economy. Vehicles that are used more will result in greater emissions, and larger vehicles typically produce more emissions than smaller vehicles.

Beyond looking at emissions, analyzing Vehicle Miles Traveled (VMT) provides a more complete perspective on the impact of emission reduction efforts and highlights potential targets for replacement. Table 2 shows a breakdown of VMT by vehicle type over time. While VMT dipped in 2020 and 2021, 2022 VMT was comparable to 2018 and 2019, at about 10.4 million miles traveled. The Department fleet added some all-electric vehicles in 2020,

Figure 10. The proportion of emissions attributable to each class of vehicles. Pickup trucks are the largest category of vehicles and have the largest proportion of emissions.



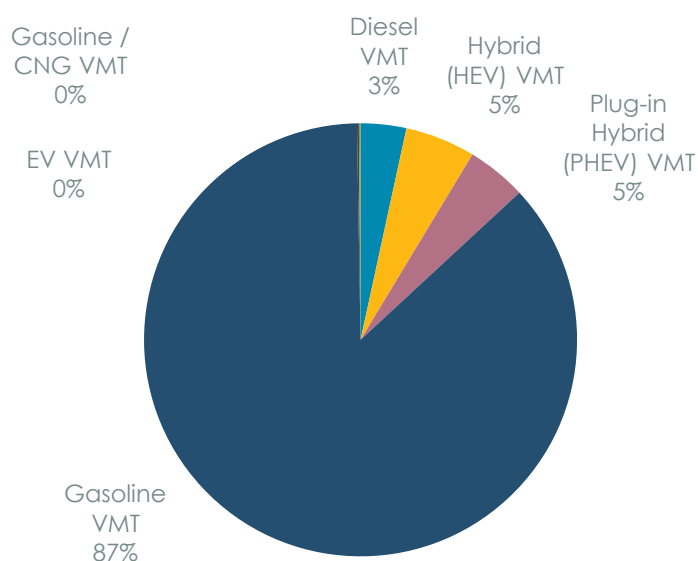
but by 2022, those vehicles only represented 14,600 miles traveled out of the total VMT of 10.4 million miles. The Department's fleet of hybrid vehicles has grown over the years, and in 2022 miles driven by hybrid vehicles represented almost 10% of total VMT. While hybrid vehicles are an improvement over gasoline vehicles, they still produce greenhouse gas emissions and will ultimately need to be phased out to achieve New Jersey's 80x50 goals. Figure 11 provides a graphical representation of these data (data as of May 2023).

Table 2. VMT breakdown by fuel type. This chart provides a breakdown of VMT by vehicle type. Diesel and gasoline vehicles are combined, electric only vehicles are the second category, and hybrid vehicles are the third category. The Department did not acquire its first EV until 2020.

Year	Gas & Diesel Vehicle Miles Traveled	Electric -Only Vehicle Miles Traveled	Hybrid Vehicle (HEV) Miles Traveled	Plug-In Hybrid Vehicle (PHEV) Miles Traveled	Total Vehicle Miles Traveled
2018	9,232,402	NA	677,552	NA	9,909,954
2019	10,134,735	NA	692,854	6,954	10,834,543
2020	7,416,745	4,008	322,808	27,545	7,771,106
2021	7,909,438.7	12,909	378,493.8	133,733.8	8,434,575.3
2022	9,382,520.1	14,601	545,459.9	463,852.8	10,406,433.8

By knowing which vehicle classes emit the most per vehicle, the Department can target changes to purchasing behavior. There are barriers, however, in that some vehicles are specialty equipment, including emergency vehicles. These vehicles often have specific requirements in terms of things like carrying or towing capacity, and thus, lowering their usage, mileage, or emissions may be more challenging compared to vehicles used for routine inspections.

Figure 11. Vehicle Miles Traveled by Vehicle Type. This chart presents a breakdown of VMT for 2022 and breaks down the miles traveled by Department vehicles according to type of fuel. The majority of miles driven were via gasoline vehicles.



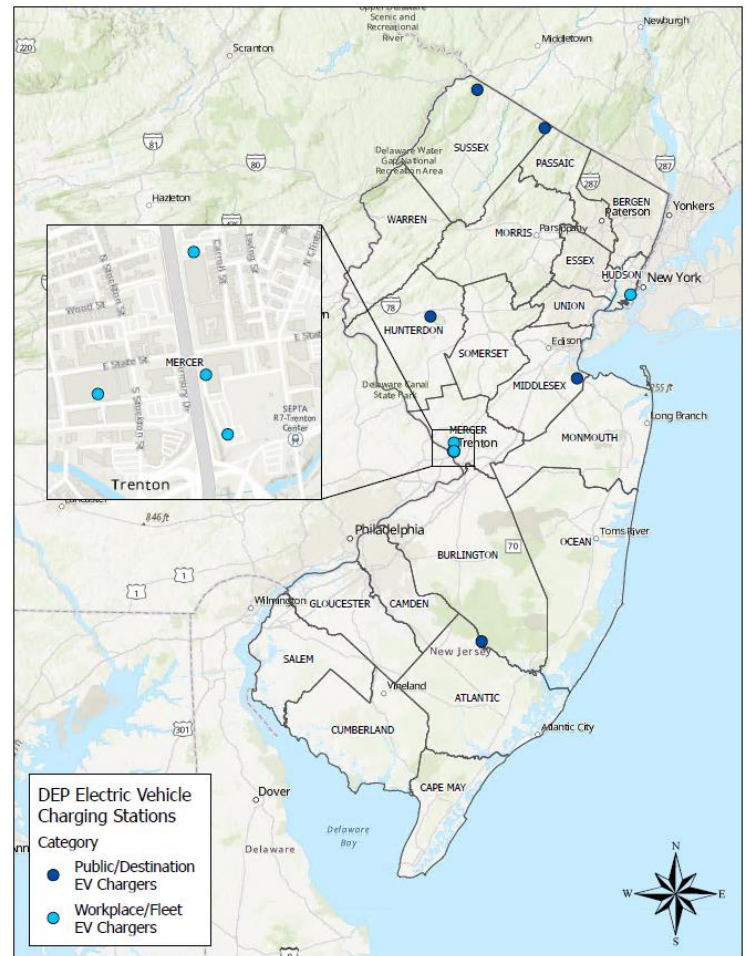
Progress to Date

To date, the Department has committed to purchasing the most fuel-efficient vehicles possible in the following order of priority: Battery Electric Vehicles, Plug-In Hybrid Electric Vehicles, Hybrid Electric Vehicles, and, only where strictly necessary, the most fuel-efficient combustion engine vehicles. The State's Electric Vehicle Law (P.L. 2019 c.362, 2020) establishes goals for vehicle electrification: (1) by December 31, 2025, at least 25 percent of State-owned, non-emergency, light duty vehicles shall be plug-in electric vehicles; and (2) by December 31, 2035, 100 percent of State-owned, non-emergency, light duty vehicles shall be plug-in electric vehicles.

The Department has 490 light-duty non-emergency vehicles, 25% (123) of which are required to transition to electric by 2025. Currently the Department has 76 vehicles (65 delivered, 11 pending delivery) that are Battery Electric Vehicles or Plug-in Hybrid Electric Vehicles, which the Division of Health, Safety and Facility Management has led the charge in obtaining. Despite electric vehicle procurement being delayed by chip shortages and other supply chain issues, the Department is 62% of the way to the 2025 goal and will be acquiring 47 additional electric vehicles by the end of 2025.

Additionally, the Department has pursued the installation of the necessary charging equipment to encourage fleet, workplace, and public charging. Since 2019 the Division of Health, Safety and Facility Management has overseen the installation of a total of 37 Level 2 electric vehicle chargers and one DCFC. There are EV chargers for staff and fleet use at locations in Trenton (401 Headquarters complex, the Document Control Center, and 225 East State Street), Ewing (Arctic Parkway Offices), and Jersey City (Liberty State Park). Public EV chargers have been installed at Round Valley Recreation Area, Wharton State Forest, Cheesequake State Park, High Point State Park, and Wawayanda State Park, with public chargers coming soon to Liberty State Park.

Map 2. Location of Department EV chargers by type.



DEP Plug in electric vehicles. Source: NJDEP



Program Areas

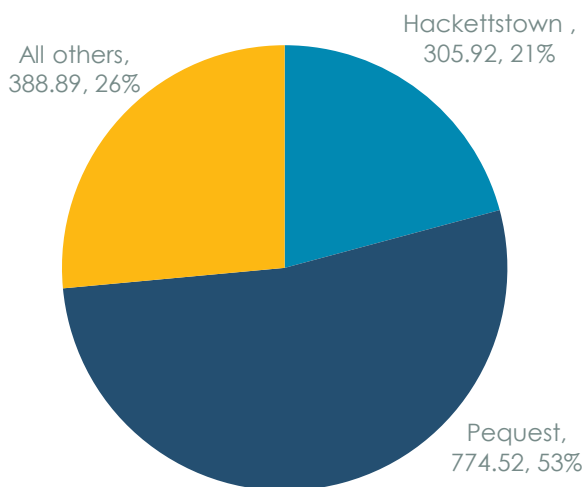
Department emissions can be apportioned to our agency program areas⁹ to some extent. Each vehicle is assigned to a program area, and thus those emissions can be quantified at the program area level. The entirety of building emissions, however, cannot be attributed to a particular program area as larger office buildings are shared by program areas.

The Fish & Wildlife and State Parks, Forests & Historic Sites program areas manage most of the Department's facilities (Appendix B). This section explores emissions attributable to these two program areas.

Fish & Wildlife

Fish & Wildlife is responsible for 19 facilities (field offices), located on Wildlife Management Areas, including two fish hatcheries, and a pathology lab, and over 365,000 acres of land. In 2022, these facilities emitted 1,469 metric tons of CO₂e, which was 14.8% of the Department's total non-vehicle emissions (9,944 metric tons of CO₂e). Most of Fish & Wildlife's building emissions come from the two fish hatcheries, Pequest and Hackettstown, with these two facilities making up 74% of all non-vehicle emissions. As Figure 12 demonstrates, only 26% of all Fish & Wildlife emissions come from the remaining 17 facilities.

Figure 12. Fish & Wildlife Building Emissions 2022. This chart presents the building-based emissions from the Division of Fish & Wildlife. The emissions are broken out to show the top two emitting facilities vs. all other facilities.



Of approximately 1,400 Department fleet vehicles, 255 (about 18%) are assigned to Fish & Wildlife. Those vehicles reported 2,032,404 vehicle miles traveled in 2022 and used an estimated 105,047 gallons of fuel. This resulted in an estimated 929 metric tons CO₂e of emissions, which is about 21% of total Department vehicle emissions (total Department vehicle emissions for 2022 were 4,367.1 metric tons CO₂e).

State Parks Forests, and Historic Sites

State Parks, Forests, and Historic Sites (SPFHS) is responsible for 55 facilities, with a range of functions. These include State Parks, State Forests, Recreation Areas, Historic Sites, and Forest Fire Service facilities, as well as over 452,000 acres of land. In 2022, these facilities emitted 5,455.4 metric tons CO₂e, which was 55% of the Department's total non-vehicle emissions (9,944 metric tons CO₂e). Emissions from SPFHS facilities are more distributed than those from Fish & Wildlife facilities. Table 3, below, presents all seventeen SPFHS facilities that had emissions greater than 100 metric tons CO₂e in 2022, and thus make up about 75% of all SPFHS non-vehicle emissions.

⁹ A program area is a functional unit within the Department. Each program area is made up of one or more divisions that work on related areas of regulatory enforcement and/or lands management. Program areas are identified at: <https://nj.gov/dep/commissioner/orgchart.pdf>

Table 3. These are all seventeen State Parks, Forests, and Historic Sites facilities with emissions greater than 100 metric tons of carbon dioxide equivalent for 2022.

Facility	Metric Tons CO ₂ e	Percent of SPFHS non-vehicle emissions
Liberty State Park	876.53	16.07%
Ringwood State Park	615.35	11.28%
Wharton State Forest	309.59	5.67%
Island Beach State Park	261.41	4.79%
High Point State Park	253.34	4.64%
Allaire State Park	201.14	3.69%
Stokes State Forest	185.89	3.41%
Monmouth Battlefield State Park	169.51	3.11%
Forest Fire Service, Division A	163.70	3.00%
Cheesequake State Park	160.24	2.94%
Hopatcong State Park	159.71	2.93%
Brendan T. Byrne State Forest	145.05	2.66%
Spruce Run Recreation Area	143.15	2.62%
Washington Crossing State Park	134.58	2.47%
Drumthwacket	118.39	2.17%
Belleplain State Forest	109.79	2.01%
Kittatinny Valley State Park	101.31	1.86%
All others (38 facilities)	1,346.73	24.69%

Of approximately 1,400 Department fleet vehicles, 598 (about 43%) are assigned to SPFHS. Those vehicles reported 3,478,659 vehicle miles traveled in 2022 and used an estimated 172,417 gallons of fuel. This resulted in an estimated 1,566 metric tons CO₂e emissions, which is about 36% of total Department vehicle emissions (4,367.1 metric tons CO₂e vehicle emissions total for all of the Department).

LOOKING FORWARD

The Department is committed to updating this report and continuing to build upon its Lead By Example successes. Future iterations of this report will seek to capture emissions from refrigerants, such as hydrofluorocarbons (HFCs), as well as water and sewer usage. The Department would also like to include Scope 3 emissions – from sources like waste management, employee commuting, and business travel and is investigating quantification methods and data availability for these emissions. Incorporating these would serve to make this inventory more comprehensive, and better serve as a template for other State agencies seeking to inventory, and improve upon, their emissions.

Future analyses could also include accounting for differences due to weather and in-office versus remote staffing levels time. Policies for remote and hybrid work may also offer avenues for reducing emissions. Enacting all of these would allow the Department to serve as an example for other State agencies, and the State at large.

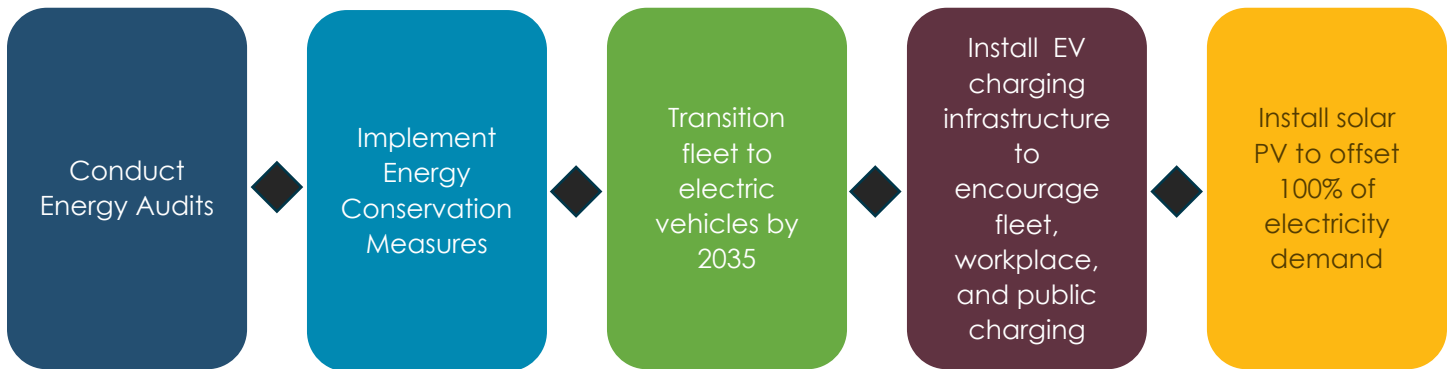
With respect to emission reductions strategies, the Department is committed to decarbonizing its facilities, fleet, and equipment. Reducing emissions from the current universe of facilities requires conducting energy audits, implementing energy conservation measures, obtaining electricity via renewable energy, transitioning the fleet to EVs, and installing EV chargers at facilities. To that end, energy audits are in progress (Appendix B). The Department is committed to conducting energy audits at all its buildings and prioritizing energy efficiency and building decarbonization efforts to lower emissions and tax dollars spent on utilities. These activities will require close coordination with the BPU'S Division of State Energy Services, which serves as a one-stop shop for State agency energy planning, and the Department of the Treasury, which owns some of the facilities occupied by Department staff and which manages the Solar Power Purchase Agreement (PPA) process for State agencies.

Further, the Department is evaluating its facilities for renewable energy potential – namely for hosting on-site solar PV. The Department envisions installing enough solar PV (roughly 16 MW) to offset 100% of its total electricity demand (21,420 MWh in 2022), while making sure that all solar PV is sited in an environmentally responsible manner. Preliminary efforts are underway to evaluate the solar PV potential at NJDEP facilities, with an early focus on identifying parking lots that could host canopy solar arrays. Once the capacity to offset electricity demand with on-site behind the meter solar, via Treasury's Solar PPA, is determined, the Department will then evaluate its facilities for alternative solar PV options, such as community solar and remote net metering. Subsequently, if the Department is not able to offset 100% of its electricity demand via solar PV, it will investigate other options for procuring renewable energy.

Fleet motor vehicle fuel emissions are the second largest source of emissions for the Department. The Department will continue to prioritize the transition of the fleet to lower and zero emissions vehicles and seek to reduce vehicle miles traveled through right sizing its fleet. The Department will also continue to work with Treasury to analyze vehicle usage trends and identify opportunities for charging infrastructure. The Department will also explore inventorying its power equipment and tools (e.g., lawn mowers, utility task vehicles, weed trimmers, etc.) and evaluate replacing them with electric powered alternatives.

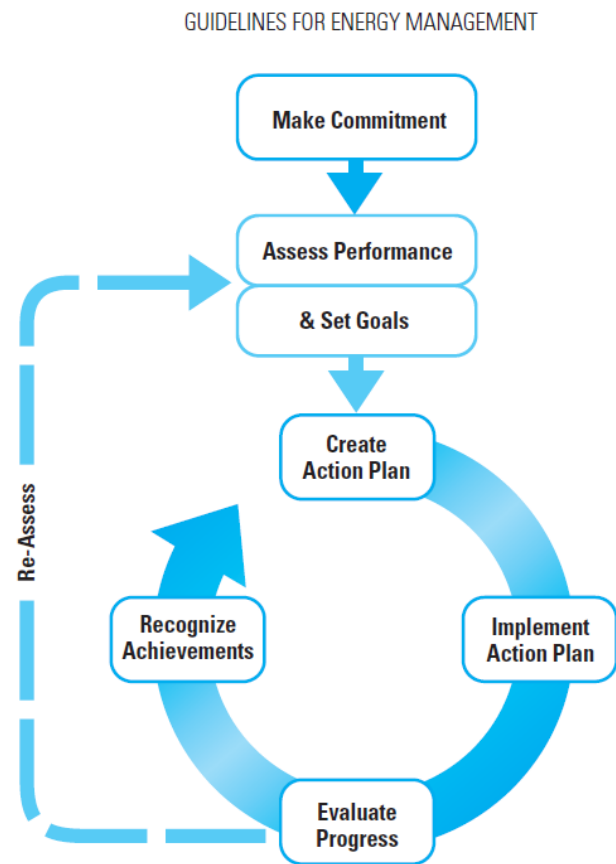
The Department will identify financial incentives, in consultation with BPU, to move forward our priority emission reduction strategies. Potential funding sources include BPU's Local Government Energy Audit and Energy Savings Improvement Programs, Federal incentives available via the Inflation Reduction Act, and rebates and incentives from local utility companies.

Prioritized Actions



Lastly, to accomplish these goals, the Department is moving forward with a management structure based on USEPA’s Guidelines for Energy Management as seen in Figure 13 (EPA, 2013). The Department has named a Department Energy Manager as directed in Treasury’s Circular (10-04-OES OMB, 2009) to monitor and manage energy use and costs across all agency facilities, as well as to work with Treasury’s Division of Property Management and Construction to develop and manage the agency’s energy savings plan. Additionally, the Department has established a Lead By Example Steering Committee comprised of senior managers to provide strategic guidance on all energy efficiency, renewable energy and EV projects. The Department Energy Manager, working with the Lead By Example Steering Committee has established a Department-wide Energy Team. The Energy Team is actively working to ensure that all Department energy efficiency, renewable energy and EV projects are centrally coordinated and supported by the Lead By Example Steering Committee.

Figure 13. ENERGY STAR “Guidelines for Energy Management



This diagram illustrates the main management elements of the ENERGY STAR “Guidelines for Energy Management.” To read the Guidelines, visit www.energystar.gov.

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APPENDIX A: METHODS

Buildings

For buildings emissions, utility bills were used as the primary source of data. These data were collected using the State's internal billing software. Everything is billed at the "facility" level. A "facility" can be something small like a weather monitoring station or a State Park or Wildlife Management Area. A "facility" may also be an individual office building, or a group of buildings located near each other. This report includes all facilities for which the Department pays the bills that could be found in the AvidXchange software, and includes buildings owned, rented, and leased by NJDEP. It does not include buildings that are owned by the Department but used as private residences for Department employees.

In the AvidXchange software, most bills are provided on a monthly basis. However, some utilities are billed quarterly, and fuel drop-offs typically occur as needed. Electricity, Natural Gas, and Hot Water are all attributed based on the billing cycle, and thus when they are used. However, LPG and Fuel Oil #2 are attributed to the year in which they are delivered, which may cause some discrepancies. For example, if a facility gets LPG delivered in both January and December of the same year, that could throw off the apparent emissions for that year, even though the bulk of the December delivery is used in the following year.

Knowing the amount of some activity – for example, gallons of gasoline consumed in a year – it is possible to estimate the greenhouse gas emissions by multiplying that activity by an emissions factor – in this case, the CO₂ produced by burning a gallon of gasoline. All emissions factors used in this report are taken from the EPA Emissions Factors Hub (EPA, 2015). According to the EPA, an emissions factor is "A unique value for scaling emissions to activity data in terms of a standard rate of emissions per unit of activity (e.g., grams of carbon dioxide emitted per barrel of fossil fuel consumed, or per pound of product produced)" (EPA, n.d.). Emissions factors allow us to compare emissions from different sources over time. For this report, the 2022 emissions factors were used, as the 2023 emissions factors were not yet posted at the time of this work.

There are many different greenhouse gases, and the degree to which a given gas can impact climate depends on the gas's individual properties. By multiplying the amount of a gas by its ability to warm the atmosphere (referred to as its Global Warming Potential or GWP), it is possible to create a consistent assessment for each gas. These individual impact assessments can then be added together into a single value representing the combined impact of all the gases released. These are usually reported as Carbon Dioxide equivalents or "CO₂e". This report used AR4 Global Warming Potentials, since work was completed prior to the release of AR5 figures (2.10.2, n.d.).

For each gallon of Liquefied Petroleum Gas (LPG) burned, emissions were calculated as 5.68 kg CO₂, 0.28 g CH₄, and 0.06 g N₂O, based on the EPA emissions hub. To calculate the CO₂e equivalent based on 100-GWP, 25 was used as factor for CH₄ and 298 for N₂O. Thus, for one gallon of LPG burned, the total 100-year GWP is 5.70 kg CO₂e. Therefore, in 2022, 186,276.23 gallons of LPG were used by the Department generating 1,063 metric tons CO₂e.

Diesel and Fuel Oil #2 have equivalent emissions and refer to the same material, with minor differences (such as added dyes). A similar method was employed as that above for LPG. For these fuels, each gallon has a 100-year GWP of 10.24kg CO₂e. Therefore, in 2022, 188,384.4 gallons of Fuel Oil #2 was used by the Department, which emitted 1,930 metric tons CO₂e.

Natural gas use is billed by thousand standard cubic feet (scf). The EPA emissions hub provides emissions based on these units, and the total 100-year GWP for one thousand scf is 54.5 kg CO₂e. For example, in 2022 Department facilities used 24,013.85 thousand scf of natural gas, emitting 1,309 metric tons CO₂e.

Electricity use is billed by the kilowatt hour. In building the state inventory, the Department calculates an average emissions rate for retail electricity purchases for each year, based on in-state electricity production and imports of

electricity from out-of-state from the PJM interconnection. This emissions rate for New Jersey as a whole was used as the emissions rate for electricity used in all Department facilities. For details, see the New Jersey Greenhouse Gas Emissions Inventory.

For 2018-2021, the rates are below in Table 4. For 2022, the 2021 emissions rate was used. The 2021 figure is still considered preliminary, as EPA has not yet released all necessary data.

While there are some changes year over year, these are relatively minor in scale, and we expect that electricity will remain the largest source of Department emissions even if the emissions rate changes for 2022. Any changes in this rate reflect changes in the power mix. For example, more use of coal in the power grid will increase the emissions per unit of electricity used, whereas more renewables coming online will result in a lower rate of GHGs emitted for each unit of electricity used.

Table 4. These are the emissions rates for electricity from 2018 through 2022.

Year	kg CO ₂ e/kWh
2018	0.252
2019	0.262
2020	0.260
2021 (2022)	0.261

The Department’s 401 complex receives hot water from Vicinity Energy Trenton. Using EIA form 923 from each year, we were able to determine the amount and type of fuel used in that facility, and the combustion efficiency of the facility as a whole (EIA, n.d.). Based on this, we calculated the total heat output of the plant, and the total emissions based on the relative percentage of the two fuel types used – distillate fuel oil and natural gas. Knowing this, we were able to calculate Department -attributable emissions based on the amount of hot water purchased, and how much fuel of each type was burned to generate that amount of hot water.

Vehicles

The Department has a fleet of approximately 1,400 vehicles. For most vehicles, mileage is recorded monthly, though some record mileage only twice a year. The Bureau of Climate Change and Clean Energy requested data on the mileage readings of each vehicle from 2018 through the present, as well as the type of vehicle (including make, model, year and fuel type).

Using these readings, the total mileage each vehicle was driven in each calendar year was calculated. Then, using the 2022 EPA automotive trends report (EPA, 2018), vehicles were sorted into 5 classes based on size and characteristics (Federal Register, 2024). Using vehicle class and year, the estimated MPG (as defined by the above Trends report) for each vehicle was used to estimate the fuel use for each vehicle.

Once the fuel use for each vehicle had been estimated, the total estimated fuel use for all Department vehicles for each fuel type was summed. Using EPA emissions factors, the total emissions from vehicle use were estimated by multiplying gallons of fuel by the appropriate emissions factor. This process was used for gas and diesel vehicles. Electric vehicles were assumed to have no on-road emissions (any charging done at Department facilities would be included in the electricity emissions estimates). For vehicles with 2022 model years, 2021 emissions estimates were used if 2022 model year emissions estimates were not available.

APPENDIX B: ENERGY AUDIT STATUS

Facility Name	Energy Audit Status
25-39 Arctic Parkway	In Progress
428 E. State Street	Completed
436 E. State Street	-
440 E. State Street	In Progress
5 Station Plaza	In Progress
9 Ewing Street (PAL Building)	-
Allaire State Park	In Progress
Assunpink WMA	Partially Complete
Barneget Lighthouse State Park	-
Bass River State Forest	In Progress
Bayshore Floodgate Security	-
Belleplain State Forest	In Progress
Black River WMA	Completed
Boxwood Hall	-
Brendan T. Byrne State Forest	In Progress
Bulls Island Recreation Area	-
Cape Island WMA	-
Cape May Point State Park	-
Central Rd	-
Cheesequake State Park	In Progress
Clinton WMA	Completed
Colliers Mills WMA	Partially Complete
D & R Canal State Park	In Progress
DEP Headquarters	Completed
DIX WMA	-
Double Trouble State Park	-
Drumthwacket	Completed
Forest Fire Service, Air Operations	-
Forest Fire Service, Division A	In Progress
Forest Fire Service, Division B	-
Forest Fire Service, Division C	-
Forest Service, Forest Resource Education Center	-
Forest Service, NJ Tree Nursery	-
Forked River State Marina	-
Fort Mott State Park	In Progress
Green Bank Office	-
Green Residential Community Home	-
Grover Cleveland Birthplace	-
Hackettstown State Fish Hatchery	Completed
Hacklebarney State Park	-
Higbee Beach WMA	-
High Point State Park	In Progress
Holly Farm WMA	-
Hooper Avenue, Toms River	-

Facility Name	Energy Audit Status
Hopatcong State Park	In Progress
Indian King Tavern	-
Island Beach State Park	Completed
Jenny Jump State Forest	-
Kittatiny Valley State Park	-
Lake Hopatcong – Weed Harvesters	-
Lebanon Lab	-
Leeds Point	-
Leonardo State Marina	-
Liberty State Park	Completed
Millville WMA	Completed
Monmouth Battlefield State Park	Completed
Parks Central Region Office	-
Parvin State Park	In Progress
Pequest WMA	Completed
Port Republic-Nacote Creek	-
Princeton Battlefield State Park	-
Pump - 700 Port Monmouth Road	-
Ramapo Fire Tower	-
RBD Meadowlands	-
Ringwood State Park	Partially Complete
Rockingham	-
Rockport WMA	-
Round Valley Recreation Area	In Progress
Sedge Island WMA	-
Spruce Run Recreation Area	In Progress
Spruce Street Container	-
Stephens State Park	-
Steuben House	-
Stokes State Forest	In Progress
Swartswood State Park	-
Trenton Battle Monument	-
Tuckahoe WMA	Completed
Twin Lights	-
Union Lake WMA	-
Voorhees State Park	-
Walt Whitman House	-
Washington Crossing State Park	In Progress
Waterloo Historic Village	-
Wawayanda State Park	-
Wharton State Forest	In Progress
Whittingham WMA	Partially Complete
Winslow Southern Regional Office	Completed
Worthington State Forest	-