



(using <https://www.sqlshack.com/understanding-sql-decimal-data-type/> to approximate DECIMAL sizes)

Notes: these data types account for the ranges needed to store single entries, and have not yet been checked for overflow in the case of e.g. aggregate summation. In order to save space, and minimize redundancy, MUNICIPALITY uses an ID number so as to not duplicate the 40 bytes of name/county information in all other relations, which would also create entities with four (!) attributes for the key.

MUNICIPALITY:

SMALLINT MNo

VARCHAR(30) Name

VARCHAR(10) County

= 2 + 30 + 10 = 42 bytes for one entry, 42 \* 565 municipalities = 23730 bytes

POPULATION:

SMALLINT MNo

SMALLINT Year

INT Pop

INT CO2

SMALLINT EVs

INT PersonalVehicles

= 2 + 2 + 4 + 4 + 2 + 4 = 18 bytes for one entry, 18 \* 565 municipalities \* 2 years = 20340 bytes

ON\_ROAD\_VEHICLE:

SMALLINT MNo

SMALLINT Year

TINYINT Type (enum value)

DECIMAL(8,2) CO2

INT Miles

= 2 + 2 + 1 + 5 + 4 = 14 bytes for one entry, 14 \* 565 \* 2 \* 13 vehicle types = 205660 bytes

MEANS\_OF\_TRANSPORTATION:

SMALLINT MNo

SMALLINT PYear

TINYINT Type (enum value)

DECIMAL(5,4) Percentage

= 2 + 2 + 1 + 5 = 10 bytes for one entry, 10 \* 565 \* 2 \* 8 transportation types = 90400 bytes

Total estimated size: 340130 bytes at minimum

Average search estimates:

For querying data by municipality:

1 query to find municipality ID by name and county name

1 query to select population by municipality ID

1 query to select vehicle types by municipality ID

1 query to select means of transportation by municipality ID

For querying statewide data:

Likely only a few queries to collect most of the data on the frontend

Work used to calculate types:

Municipality Name can be varchar(30), as the longest municipality string length is 30 characters (Parsippany-Troy Hills township)

Municipality County can be varchar(10), as the longest county string length is 10 characters (Burlington, Cumberland, Gloucester)

Population Year can be 2015 or 2020

Population Pop has max value 281917  
Population CO2 has max value 4156993  
Population EVs has max value 737  
Population Personal Vehicles has max value 92490

On Road Vehicle Year can be 2015, 2017, 2019, or 2020  
On Road Vehicle Type is enum with options { Combination Long-Haul, Combination Short-Haul, Intercity Bus, Light Commercial, Motor Home, Motorcycles, Passenger Cars, Passenger Trucks, Refuse Truck, School Bus, Single Unit Long-Haul, Single Unit Short-Haul, Transit Bus }  
On Road Vehicle CO2 Max value 761964.05  
On Road Vehicle Miles Max value 1726980607

Means of Transportation Type is enum with options { CarTruckVan, PublicTransport, Taxi, Motorcycle, Bicycle, Walked, Other, WorkedAtHome }