Database Design

For this project I used seven tables designed to organize the highways in Connecticut into different categories. There is a table that has all highways and their names, regardless of whether they are an interstate or a regular state highway. This table will be related to interstates, *stateRds*, and *RoutesandTowns*. Interstates will only have interstates and *stateRds* will only have state roads. *RoutesandTowns* only has the *routeNum* and Tax Code of the town that route is in. This serves as a bridge between the routes and towns. Interstates has a table related to it by *AnnualAverageDailyTraffic* which contains the daily traffic numbers. *StateRds* will have *AverageDailyTraffic* which will contain the number of cars on a section of state highway. Lastly the towns table contains all towns in Connecticut and completes the design because it is related to *AnnualAverageDailyTrafficInterstates*, *AverageDailyTraffic*, and *RoutesandTowns*.

For this project I only used a list of interstates that run through Connecticut. I used a partial list of state routes, as it was impractical to include all state routes. Lastly local town roads were not included. Also, I assumed all markers along highways belong to the towns that those highways go through. Personally, if I had more time, I would could have used mile markers or intersections. However, the data gathered from the DOT's website assisting to narrow down by town, as overall average daily traffic was consistent on any given road going through a town. Lastly the most important assumption is that all traffic is referred to as through traffic rather than local traffic.

Please see the original ER diagram below. In the original design I wanted to include accidents, however I later determined that while accidents may be related to highways. Accidents are not needed in this database to see how traffic flows the roads in CT.

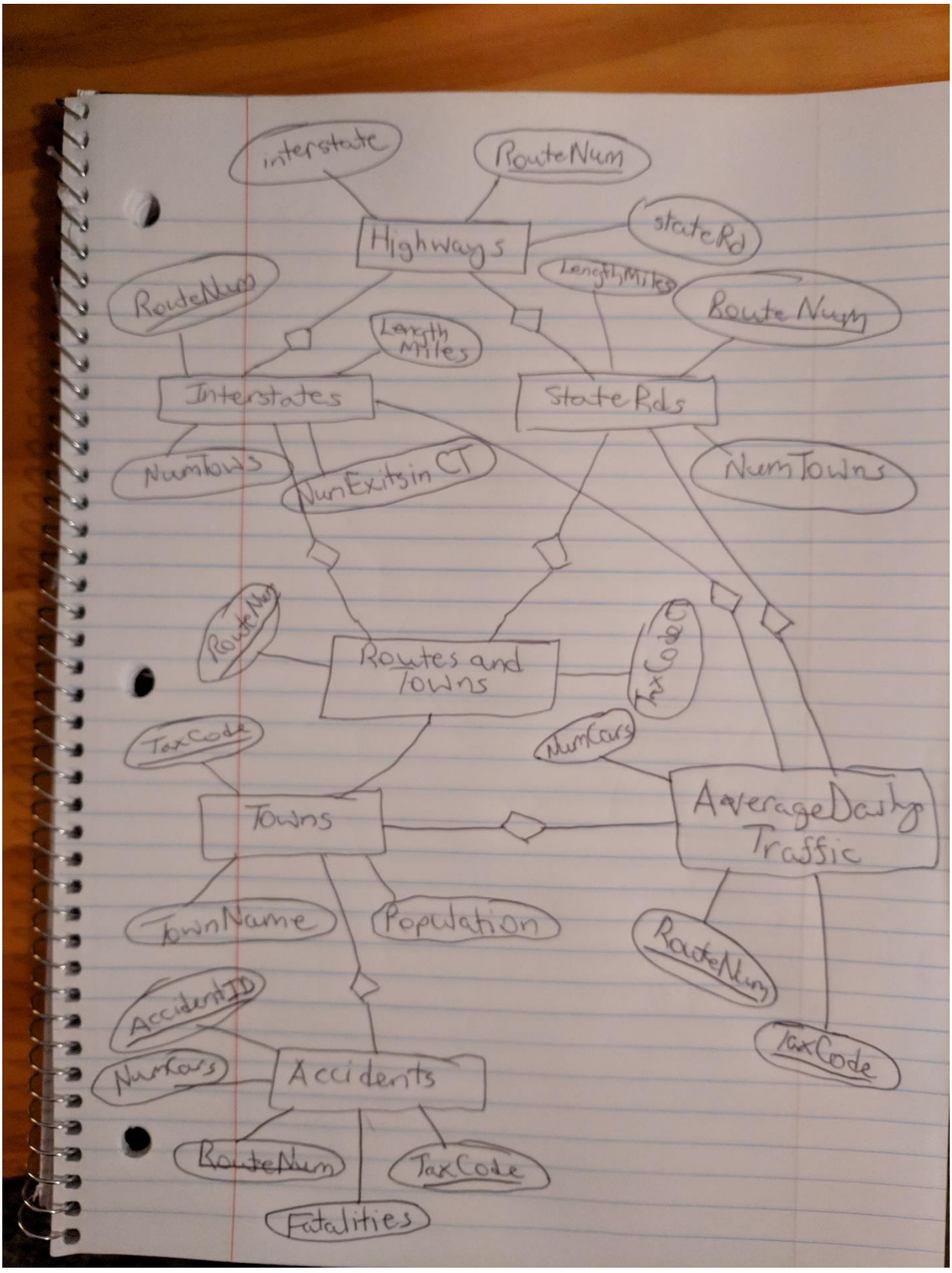

Figure 1. Original ER Diagram

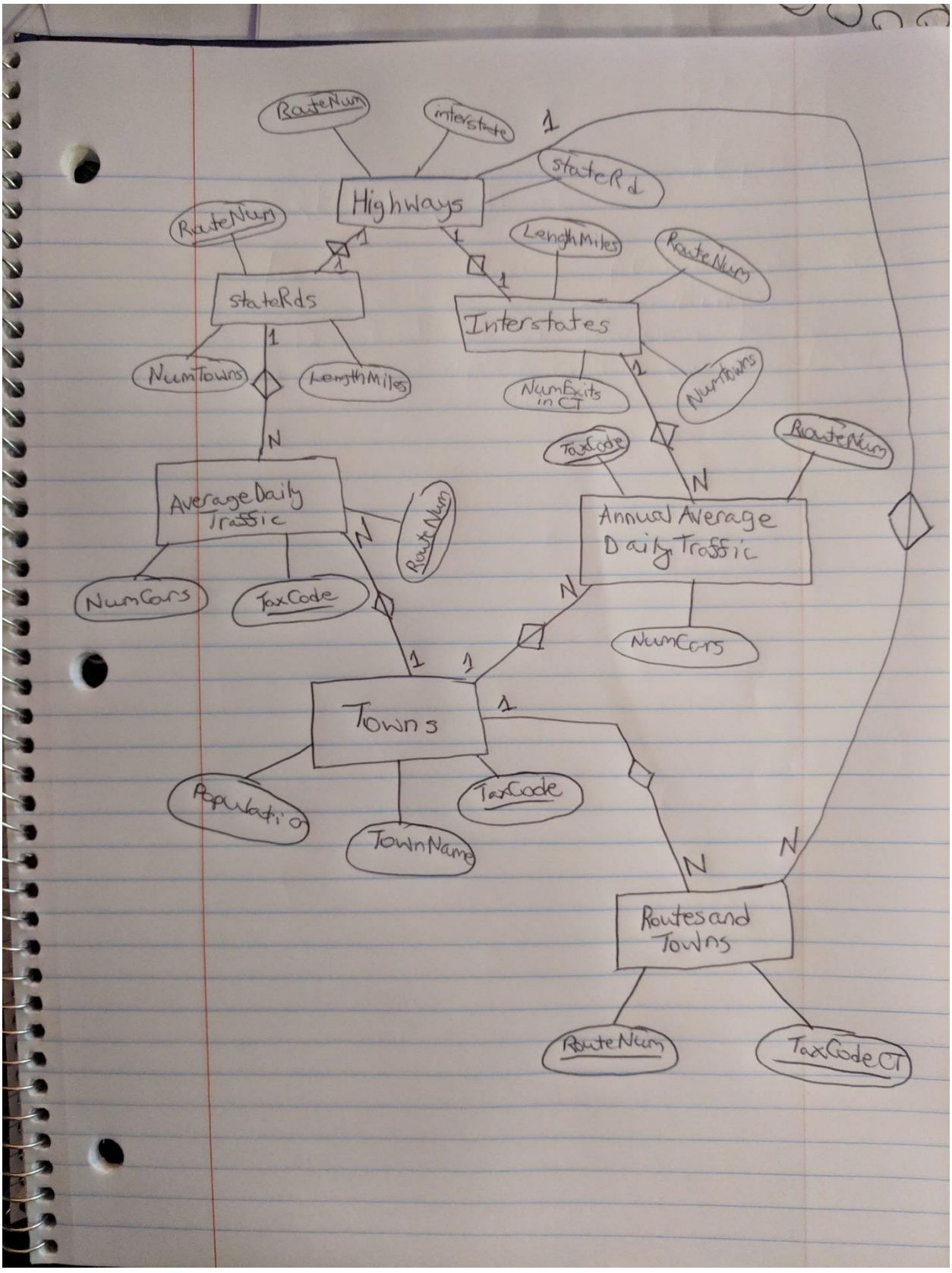

Figure 2. Final ER Diagram

The second diagram is in the third normal form. Third normal form includes all columns in each table related to the primary key. In highways, the *RouteNum* primary key has two Booleans in the table related to it. This table will have all interstates and state routes in Connecticut in it, at least a 100. In this case a route can be either an interstate or a state route. So therefore, both those keys are related. The highways table has relationships with *stateRds* table, Interstates table, and *RoutesandTowns* table.

Staterds table primary key is the *routeNum*, it has a one to one relationship with highways. This table contains many state roads, at least 100. It has a 1 to many relationship with *AverageDailyTraffic* table, as a route can have different average daily traffic values depending where eon the road you are.) The number of towns and length of the road are distinct to each route and so always related.

The Interstates table also has a routeNum for a primary key. It has a 1 to 1 relationship with the highways table. The interstates table has only a few entries, as there are only a few interstates in Connecticut. It has a 1 to many relationship with the AverageAnnualDailyTraffic table, because the highways go through many towns. The number of towns, the length of the road, and the number of exits is always related to the road in question, and therefore leaves this table in the third normal form.

The *RoutesandTowns* table is in the third normal form because all the columns are primary keys. This table has hundreds of entries, because it has every possible combination of a town tax code and a route number. This table bridges the routes and the towns. This table has a many to 1 relationship with both highways and the towns table.

The towns table primary key is the tax code of the town. There are 169 towns in Connecticut and they are all assigned a unique tax code starting with 001 and ending with 169, which is why I chose varchar(3) for the tax code. The town name and population are both related to the primary key since each tax code corresponds to the town's name and its population. The towns table has a 1 to many relationship with the tables *RoutesandTowns*, *AverageDailyTraffic*, and *AnnualAverageDailyTraffic*.

AverageDailyTraffic has *RouteNum* and *TaxCode* as its primary key. This table contains hundreds of entries as well, due to the number of towns a road can pass through. The Average Daily Traffic is related to each primary key. It has a many to 1 relationship with the tables towns and *stateRds*. *AverageDailyTraffic* contains the Average Daily traffic of each town at any one position on the road.

AnnualAverageDailyTraffic has *RouteNum* and *TaxCode* as its primary key. This table contains approximately 40 to 50 entries since the number of highways is few. The Average Daily Traffic is related to the primary key because each section of an interstate in a town has a different average daily traffic.