The Lack of Mass Transportation Options in South Jersey:

Building a Commuter Rail Line

(Retrieved from http://www.railcolor.net/images/basic/bomb_34931_51.jpg)

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Abstract

The intent of this paper is to construct a commuter rail line to alleviate the effects of the absence of one in specific areas in Monmouth, Ocean and Middlesex Counties. Within these counties in New Jersey holds a population of two million compared to the overall population of nine million. The populations of these areas have been growing since 2010 and have shown growth before. This large population and density of people leads to congestion and accidents which in turn leads to more congestion and accidents. By not having the option, using the roadways in general becomes costlier not only for the state, but for all drivers involved. The other options of adding more buses or creating more lanes on the most congested roadways will either not be sufficient or will not solve the problem while spending a large sum of money frivolously. In all, this proposal attempts to show the weaknesses of the current roadway situation in Monmouth, Ocean, and Middlesex Counties and what the benefits of constructing and running a commuter rail line through the affected area will bring to the people there and the state.

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Introduction

Traffic related issues plague the state of New Jersey. Especially within the borders of Middlesex, Monmouth, and Ocean Counties. These are some of the areas most affected by any traffic related problems including congestion and accidents which in turn cause more congestion. There is also an inefficiency occurring due to the lack of a mass transit option such as commuter rails within these areas.

Traffic Quantified

In New Jersey as of April 1st, 2016 there are 8,944,469 people (United States Census Bureau, 2016). For those 9 million people, there are 6,628,080 that are authorized with a New Jersey license plate to drive on the road including cars, buses, trucks and motorcycles (U.S. Department of Transportation Federal Highway Administration 2011). That means that about 74% of the population can be driving in New Jersey at any given time. Keep in mind that New Jersey is the most densely populated state in the United States. If we apply that to just the three counties of Monmouth, Ocean, and Middlesex with populations of 630,423, 576,548, and 809,867, they account for 2,016,838 according to the 2010 census (U.S. Census Bureau, 2016). That means that 22.5% of New Jersey's population live in these areas, and so should about 22.5% of vehicles do which means that about 1,491,318 vehicles drive through those counties. Yet in 2012, of the 244,029 car accidents that occurred in New Jersey, about 22.5% of them, or 54,796 occurred within Middlesex, Ocean, and Monmouth county (New Jersey Department of Transportation, 2017). That year, Monmouth accounted for 16,550 accidents, Middlesex accounted for 24,692 accidents, and Ocean accounted for 13,554 accidents (New Jersey Department of Transportation, 2017).

Accidents Happen Often

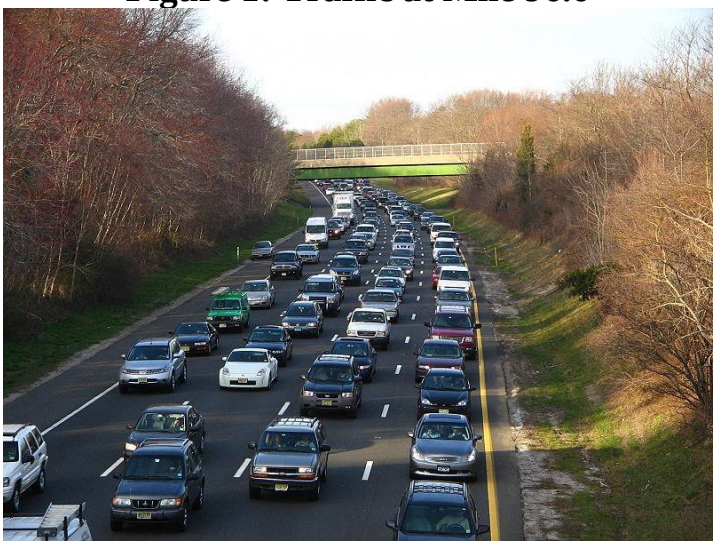
In Monmouth, Ocean, and Middlesex Counties, there are a lot of accidents. In a news report backed by data from the State Police in January of 2007, for example, Middlesex and Ocean county led the state in traffic-related fatalities (Barlas, 2007). The information from the newspaper states that Middlesex led the state in traffic related deaths in 2006 with 69 deaths, and they are the third most populous county in New Jersey (Barlas, 2007). For Ocean County in 2006, they came in second in the state with 64 fatalities that were related with traffic, while being the sixth-most populous county in the state (Barlas, 2007). In 2012, the 22.9% of New Jersey's population lay in Ocean, Monmouth and Middlesex Counties, and they accounted for 22.4% of the state's total crash records, about 55,000 out of 244,000 (NJDOT, 2017). In 2016, Middlesex, Monmouth, and Ocean accounted for 26,051, 17,298, and 13,876 crashes, respectively, out of the recorded 256,482 total accidents (NJDOT, 2017). This represents a total accident increase of about 1.06%. In Monmouth, Ocean and Middlesex Counties it represents an accident increase of about 1.05%, 1.02%, and 1.05%, respectively.

Accidents Are Expensive

According to the Rocky Mountain Insurance Information Association (otherwise known as RMIIA) accidents can cost $600-1200 per crash, with a nationwide average of $897 (RMIIA). The state and local municipalities can pay up to 3% of that cost meanwhile third-party motorists may end up paying up to 14% of those costs (RMIIA). RMIIA suggests that smaller and less populated states may have cheaper costs, so for the sake of my example, let's use the larger number of $1200. If we take that $1200 for the 256,482 accidents in 2016, the total cost for all

parties involved in the accident comes out to about $307,778,400 or about $307 million dollars. In this case, our state of New Jersey paid about $9,233,352 or about $9 million. For the third-party motorists who were delayed in the traffic that resulted from any one of these accidents, they ended up spending about $43,088,976. It appears to be in everyone's best interest to reduce the number of car accidents each year, especially if they lead to congestion.

Figure 1: Traffic at Mile 96.6



(Retrieved from https://en.wikipedia.org/wiki/Garden_State_Parkway#/media/File:Parkway_Congestion_02.jpg)

Congestion

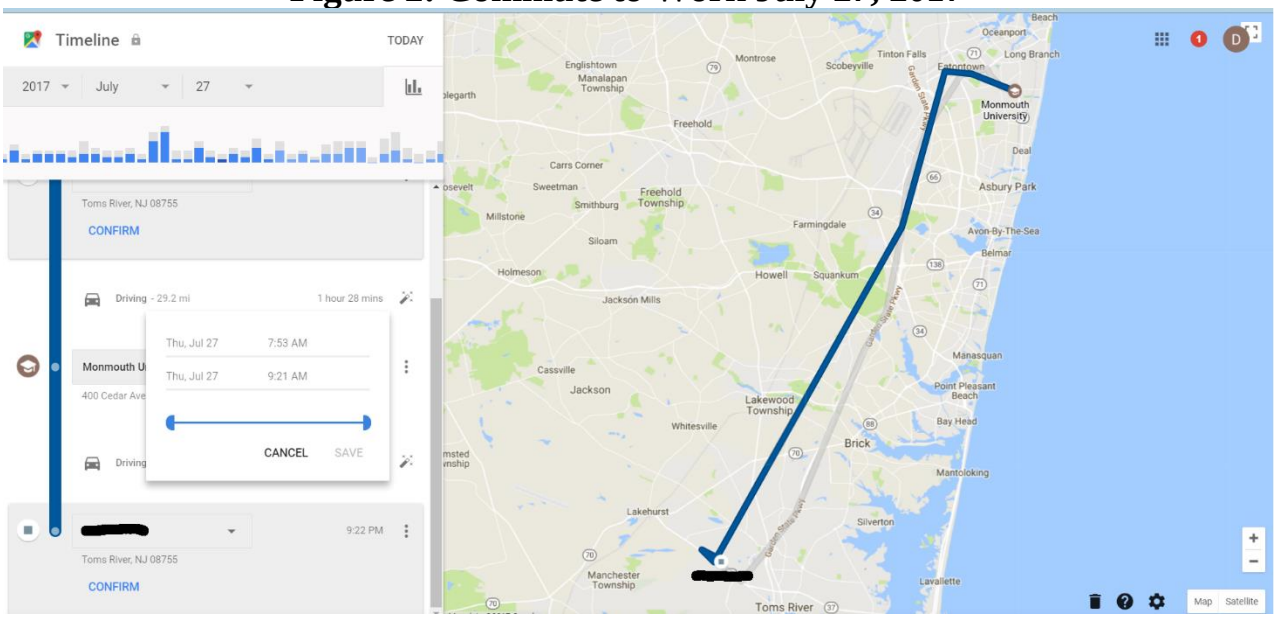
Congestion may be the biggest problem in traffic. Just a little bit of it may lead to more of it, and even to accidents. And it is very expensive like car accidents. For example, in a 2003 study whose participants were from the Ocean, Monmouth, Middlesex Counties area, about 89% of correspondents in the study said traffic was a problem in their area (Ocean County Department of Planning, 2003). As you can see in **Figure 1: Traffic at Mile 96.6**, the picture shows heavy traffic around mile 96.6 on the Garden State Parkway, around Wall Township, New Jersey. The correspondents of this 2003 study probably have experienced this traffic at this exact spot more than once in their lives. And if you take a look at the image closely, you can see that the traffic extends far beyond what the camera was able to take a picture of. Meanwhile, in the 20th Annual Highway Report, New Jersey ranked 46th in the country overall in highway performance and efficiency (Feigenbaum, Fields, & Hartgen 2013). It was also 45th in urban interstate congestion and 48th in interstate pavement in poor condition (Feigenbaum et al., 2013). This means the roads at this time were in very poor conditions, almost the worst in the entire country. Additionally, in the 20th Annual Highway Report, New Jersey ranked 1st in rural interstate pavement condition (Feigenbaum et al., 2013). That means that roads that are not used as often in the more rural parts of the state were relatively in shape. However, in the most recent Annual Highway Report, the 22nd Annual Highway Report, New Jersey has fallen from 46th to 49th overall in the United States (Feigenbaum, Fields, & Hartgen 2016). Our roads are currently only better than one other state, Alaska (Feigenbaum et al., 2016). We are the single worst place in the United States of America to get stuck in traffic as a state. Our rural interstate pavement, which we ranked 1st in in the 20th Annual Highway Report, fell to 28th in the 22nd Annual

Highway Report (Feigenbaum et al., 2016). Congestion also costs about $300 Billion in 2016, an average of $1,400 per driver, according to INRIX (2017). Which I would like you to keep in mind for now.

Cost of Congestion

The cost of congestion per year per driver is about $1,400, which comes out to about $0.16 per driver per hour (INRIX). Below, in **Figure 2: Commute to Work July 27, 2017**, is a map of my commute Thursday July 27, 2017. I commuted from my home in Toms River, New Jersey to Monmouth University in West Long Branch, New Jersey every day of the work week. That day I was stuck in traffic for an extra 50 minutes for a typically 40-minute drive, totaling my drive to 90 minutes of being inside my vehicle. If I remember correctly, when I first ran into traffic, which was not too far north from where I got onto the Parkway around exit 82, my phone notified me of two accidents. Around a later time, perhaps after another half an hour of sitting in traffic I was notified of another accident up ahead somewhere. So, for me personally, I lost about $0.13 for being caught in that traffic, while the accidents cost me and all the other drivers around me about $504. Now, the total loss of money due this congestion in this extra 50-minute period for the lanes between exit 82 and exit 105 comes out to about $4090.32. In those 23 miles, you can fit about 31464 cars, given they are the average length of a vehicle. Now, there were definitely more cars, because when I got off the Parkway at exit 105, there was still traffic far beyond what I could see. And the more cars and the more people who spent their time in that traffic ended up losing so much money together.

Figure 2: Commute to Work July 27, 2017



Source: Personal Google Timeline

Tourism

Frankly, tourism is a huge part of New Jersey. There is an entire cultural region called “The Jersey Shore” where a major portion of the area I am concerned with falls within. The North Jersey Coastline covers all of Monmouth County’s Shore region, which is only a portion of an estimated of 120 miles of coastline. There’s three more counties south of Ocean with huge tourism impacts such as in Seaside Heights, Atlantic City, Wildwood and Cape May. But mass

transit does capitalize on the most beautiful places of New Jersey. When it could not only help the economy boost from it, but profit from it. For example, tourism accounts for about 9.8% of total employment in New Jersey, which is just one in ten jobs (Tourism Economics, 2016). Go talk to twenty people that work, and you will most likely have found 2 people responsible for helping New Jersey make a profit of about $38.2 billion (Tourism Economics, 2016). Additionally, "other transit" makes about 13.2% of that $38.2 billion, or about $5 billion (Tourism Economics, 2016). That $5 billion is only partially capitalized on, as only one county out of the 4 shore region counties have true rail transit.

The Affected Population

So, whom exactly does this affect? Generally speaking, everyone and anyone that uses the roadways in Ocean, Monmouth and Middlesex Counties. For example, in 2001, on one of, if not the most heavily trafficked road in New Jersey, the Garden State Parkway had 400 million cars travel on it (NJDOT). If we specify this a little further, the citizens of Monmouth, Ocean, and Middlesex Counties are where I would like to focus on. These counties account for 2 million people of the overall 9 million people that live in New Jersey (United States Census Bureau, 2016). That is about 22.5% of the grand total of New Jersey's population. Another affected population is students. Two college campuses completely lack access to immediate rail lines with Ocean County College in Toms River and Georgian Court University in Lakewood. There is also the population of students, such as myself, who go to school at Rutgers in New Brunswick, and my sister, who went to university at Princeton University. Either of us would absolutely take a rail line from our home in Toms River in Ocean County if we had the option. Additionally, there are fluxes of tourists such as in Seaside Heights, one of, if not the most important shore town in northern Ocean County. Over the summer, Seaside Heights's population flourishes from around 3,000 to 40,000 people, bringing in millions or more dollars in tourism (Seaside Heights NJ: Brief History). Based on past experience from working in that area over the summer, many people are from northern New Jersey such as Bergen county.

The Affected Population: Super-Commuters

The last population of people I would like to shine a spotlight on is Super-Commuters. A Super-Commuter is a hard-working individual who commutes 45 minutes to 90 minutes or more to work daily. In Brick Township and Toms River Township, two of the more populated townships in Ocean County, these Super-Commuters make up about 10% of the working population or around 10,000 people for each township (Ocean County Department of Planning, 2017). In Ocean County, about 5,870 people stated they worked in New York City (Kempf, 2015). Keep in mind that nearly none of the people that live in this county have the ability to take a rail line to New York City, as the only area with a rail line exists around Bayhead and Point Pleasant. Additionally, in Monmouth and Middlesex Counties, 30,945 and 39,718 people work in New York City (Kempf, 2015). Both of these areas already do have access to some form of commuter rail line, Northeast Corridor in Middlesex and North Jersey Coast Line in Monmouth. However, the areas serviced by the rail lines leave a vast stretch between them without service, as seen below in **Figure 3: Northeast Corridor and North Jersey Coast Line**. For example, if you live in Freehold Township – which is just about in between North Jersey Coast Line and Northeast Corridor rail lines and you worked in New York City, it would probably take less time driving straight there than to try to catch either train.

Figure 3: Northeast Corridor and North Jersey Coast Line

(Retrieved from https://www.njtransit.com/sf/sf_servlet.srv?hdnPageAction=TrainSchedulesMapTo)

Literature Review

More Rails Are Better Than No Rails

According to Litman from the Victoria Transport Policy Institute, "large, well established rail systems have significantly higher per capita transit ridership, lower average per capita vehicle ownership and annual mileage, less traffic congestion, lower traffic death rates, lower consumer expenditures on transportation, and higher transit service cost recovery than otherwise comparable cities with less or no rail transit service" (2015). Therefore, it is clear that having proper rail systems are better than no rail system. But before we go on talking about rail, let us examine the costs and benefits of the other most used form of public transportation, the bus. Many times, I have personally picked up my sister from Toms River Park & Ride off the bus that leaves from New York City and heads all the way down to Toms River. I have also picked up friends who live in New York City from this Park & Ride. It is great to be connected to New York City by the bus transit system, but there has been more than one time I have had to wait longer than when the bus was expected to arrive because the bus was caught in traffic somewhere along the Parkway.

Buses may be a lot cheaper than rail transit to produce and maintain, and they may connect places, but they are not perfect and actually they may lead to add more to the problems they are trying to solve. Litman states that "congestion… increases as bus transit mileage expands, apparently because bus transit attracts fewer motorists, contributes to traffic congestion, and has less positive impact on land use accessibility" (2015). So, this tells us that not only do bus transit systems add to congestion, and eventually accidents, but it does not even attract as many motorists as rail line does. In fact, Litman states someone else's study in his work that "motorist and truck congestion delay declines in a city as rail transit mileage expands" (2015). And by decreasing congestion, it saves money, especially for the state and for the company or companies responsible for the rail line. In fact, large rail systems provide about "$19.4 billion annual congestion cost savings" (Litman, 2015).

I would like to look at one hugely trafficked areas in California, San Francisco. In a 2016 study of over 1,000 cities across the globe, San Francisco was found to be the 4th most congested city in the study with an average of 82.6 hours driving time spent in congestion during peak hours on roads within the city. (INRIX, 2016). I would like you to keep in mind that the next most congested city according to INRIX was New York City with an average of 89.4 hours spent in congestion, so San Francisco and New York City are similar when it comes to congestion (INRIX, 2016). San Francisco has a transit system to help alleviate this traffic, which, as stated earlier, would be much, much worse without the system. That system is called BART or Bay Area Rapid Transportation. We can see the astounding effects BART has on San Francisco when we see that BART can move 25,000 people compared to one lane of highway per hour while one highway lane moves only 2,400 vehicles per hour (Building a Better BART Investing in the Future of the Bay Area's Rapid Transit System, 2014). If we assumed that each car can carry about 5 people, then that comes out to 12,000 people per hour. We know, though, that most cars are actually only filled with one person, the driver. If we estimate this way, then only 2,400 people are moved per hour on the highway. And as well, if we look at the amount of people moved over the Bay Bridge in San Francisco at rush hour, BART moved 21,000 people per hour compared to 9,000 vehicles per hour (Building a Better BART Investing in the Future of the Bay Area's Rapid Transit System, 2014). Again, it can be assumed that only one person was in each vehicle at those times, resulting in about 9,000 people being moved across the bridge in an hour, compared to the 21,000 moved by BART. It becomes rather clear after looking at San Francisco that without proper transit systems the city would lose the ability to move at least around 20,000 more people to the destinations they need to get to per hour than without BART, and therefore to alleviate traffic problems.

SunRail, the Youngest Commuter Rail Line in the United States

In 2014, SunRail opened in Central Florida. It currently covers about a 32 mile stretch running north to south through Orlando, Florida, which you can see in **Figure 4: Map of SunRail**. It was constructed over the course of two years between 2012 to 2014 under the guidance of the Florida Department of Transportation, CSX, RailWorks Track Systems, Inc. of New York City, and Atlanta-based Archer Western Contractors Ltd. (Judy, 2012). CSX was involved due to them owning the right of way to the tracks which SunRail runs through. RailWorks Track Systems, Inc. was responsible for track improvements meanwhile Archer Western Contractors were responsible for building the 12 stations (Judy, 2012). The total cost of the project was around $1.3 billion (Judy, 2012).

In its first year, SunRail made about $7.2 million dollars in profit while spending about $34.4 million (Judy, 2012). It is unsurprising, rail lines are expensive endeavors, and it was the line's first year. SunRail also had a daily ridership of about 3700 passengers (Central Florida Commuter Rail Commission, 2017) What is also important to note is the location of this rail line. It extends into what many would-be tourists, such as myself, would go to when touring Florida. SunRail runs right through Orlando, where some of the largest and most desirable amusement parks in the world are, not to mention Florida's beaches are within driving distance. Some of the amusement parks include Universal Studios Islands of Adventure, Disney's Magic Kingdom, and SeaWorld Orlando which all rank within the top 10 of the top 25 American amusement parks on tripadvisor.com (Trip Advisor). The area's tourism is as important to its economy as tourism is to us.

Figure 4: Map of SunRail

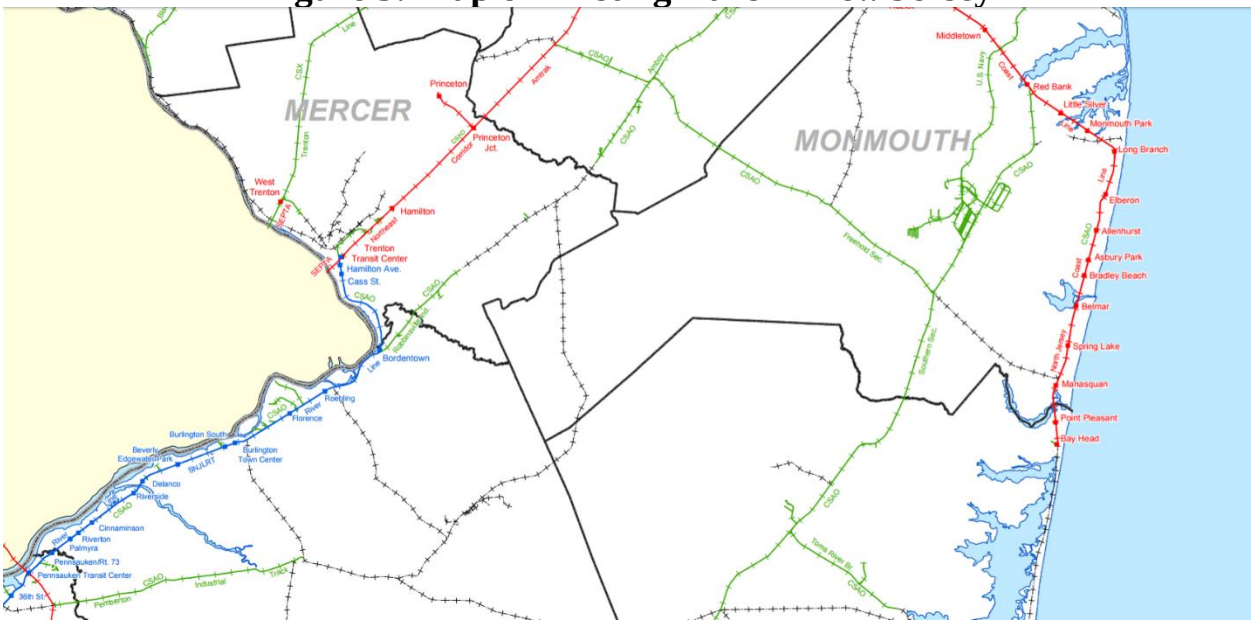
(Retrieved from https://en.wikipedia.org/wiki/SunRail#/media/File:Sunrail_map.svg)

North Jersey Coast Line

The only rail line servicing the area I am chiefly concerned with is the North Jersey Coast Line. If you refer back to **Figure 3: Northeast Corridor and North Jersey Coast Line**, you can see the exact shore towns that the North Jersey Coast line services. The North Jersey Coast Line supports 24,900 weekly passengers or about 3,557 daily passengers (NJ Transit, 2013). No doubt that a portion of those passengers are part of the 30,945 people who commute to New York City from Monmouth County every day (Kempf, 2015). I personally used this rail line over the summer to get from Long Branch, New Jersey to New York City at Penn Station. What is important to note is that I was with 2 people who are technically tourists as they were from the Midwest, and I am very grateful to have the option of taking the rail line into the city. The experience was comfortable and allowed my friends and I the freedom of not having to worry about parking a car and to freely walk the city and only worry about getting back onto the train. We did not have to worry about traffic or accidents, as we would with a bus. And, most importantly if we use the estimations provided by Wendover Productions, but decrease the estimation to about $10 of profit per ticket for calculations, then the North Jersey Coast Line makes about $12.9 million yearly (2017). If this rail line was not here, New Jersey would be losing $12.9 million, potentially 24,900 tourists a week, and no doubt more money to accidents, congestion, and inefficiency. But, as great as this rail line is for New Jersey and for the Jersey Shore, it fails to accommodate a huge population of people and to capitalize on more of our shore region.

Plan

Figure 5: Map of Existing Rails in New Jersey



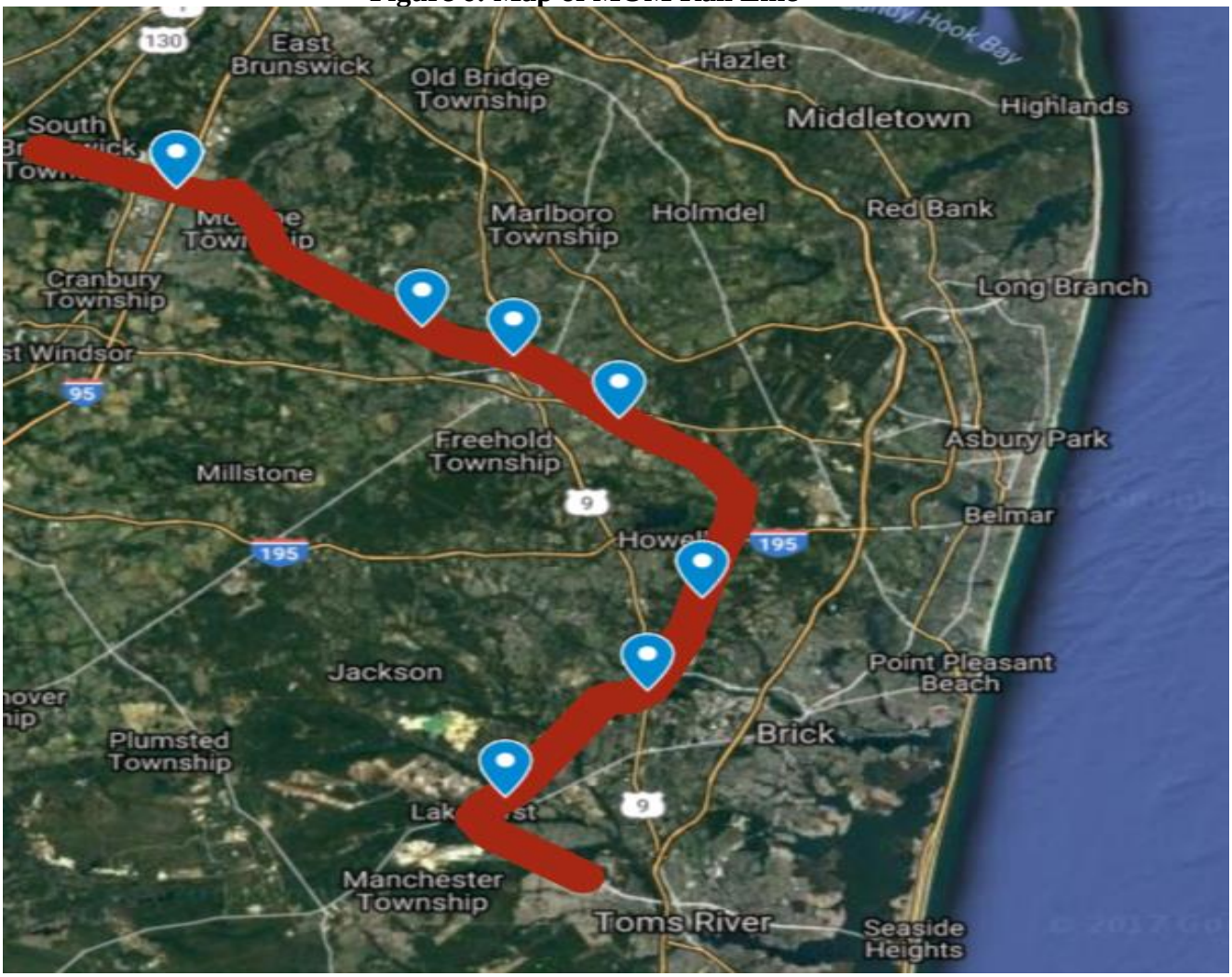
(Retrieved from http://www.state.nj.us/transportation/gis/maps/railroads.pdf)

Creating a Mass Transit Option

My plan to help Ocean, Monmouth and Middlesex Counties is to create the very mass transit option they lack: more commuter rail. As I said earlier, I understand that portions of Middlesex

and Monmouth Counties already have commuter rails, but large areas between the two existing rail lines along with nearly all of Ocean County is completely stranded. If you refer to **Figure 5: Map of Existing Rails in New Jersey**, the green line that says "CSAO", "Freehold Sec.", and "Southern Sec." is the area where I suggest constructing this rail line. The "CSAO" is another name for Conrail, the owner of the rail tracks. They will have to be cooperated with like CSX in SunRail's case to create a rail line. The "Southern Sec." and "Freehold Sec." are just the designated names of the rails in those areas. If you refer to **Figure 6: Map of MOM Rail Line**, you can see exactly where I suggest this rail line to run through. It will make use of mostly cleared land and already existing rails for this new rail line. The red line south of the bottom most blue dot, which stands for the Lakehurst Station, is only optional and there to show potential to be built directly into Toms River. So, the rail line itself would exist from the northern most point on the red line, which meets up with the Northeast Corridor rail line all the way down to Lakehurst, New Jersey, which is the designated terminus and rail yard area necessary for this rail line to have the proper effect it needs to.

Figure 6: Map of MOM Rail Line



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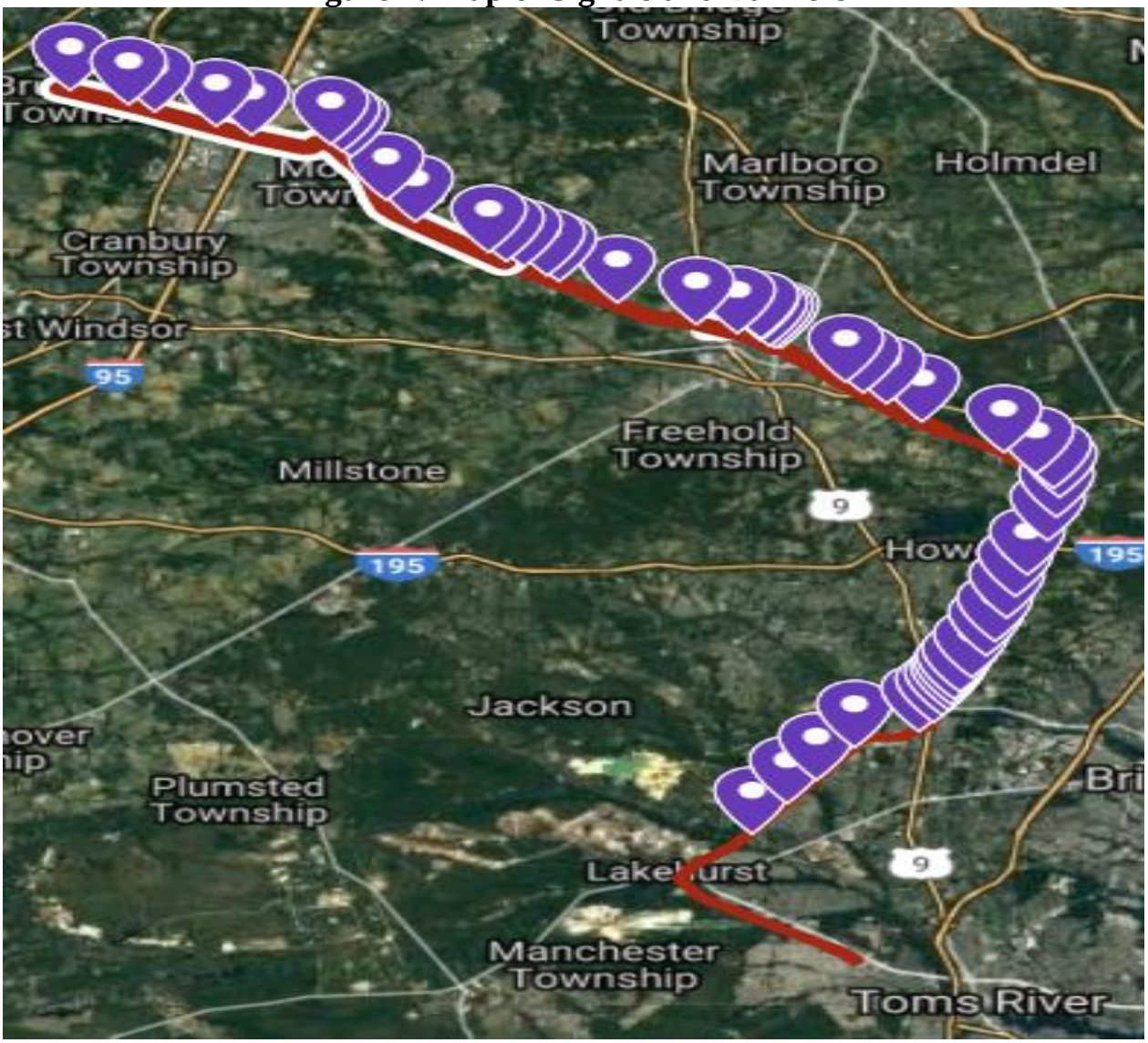
If you would like to examine the map yourself, please type in the web address under **Figure 6**. The rail itself will take up around 39 miles between Lakehurst and South Brunswick. Ballast, or the crushed stone often laid beneath rails, will not be needed to be bought, as there are already rails running through the area. We will need at least 39 miles of new siding, which will be used to create the new track that will run parallel to the existing track. With an estimation of about 50% of the existing rails needing upgrades, that means about 19.5 miles total of the existing will need upgrades. Those upgrades will not need new siding but they will need new rail ties, fasteners, and spikes. There will need to be barriers placed at every intersection on the rail's path, and signals will need to be placed there going both ways on the rail's track. If you look in **Figure 7: Map of Signals and Barriers**, the purple spots are the exact locations where the signals and stops are needed. If you use the web address and interact with the map itself, you will also see the locations that need more than one set of barriers, most often because of two intersections being right after one another.

Figure 7: Map of Signals and Barriers



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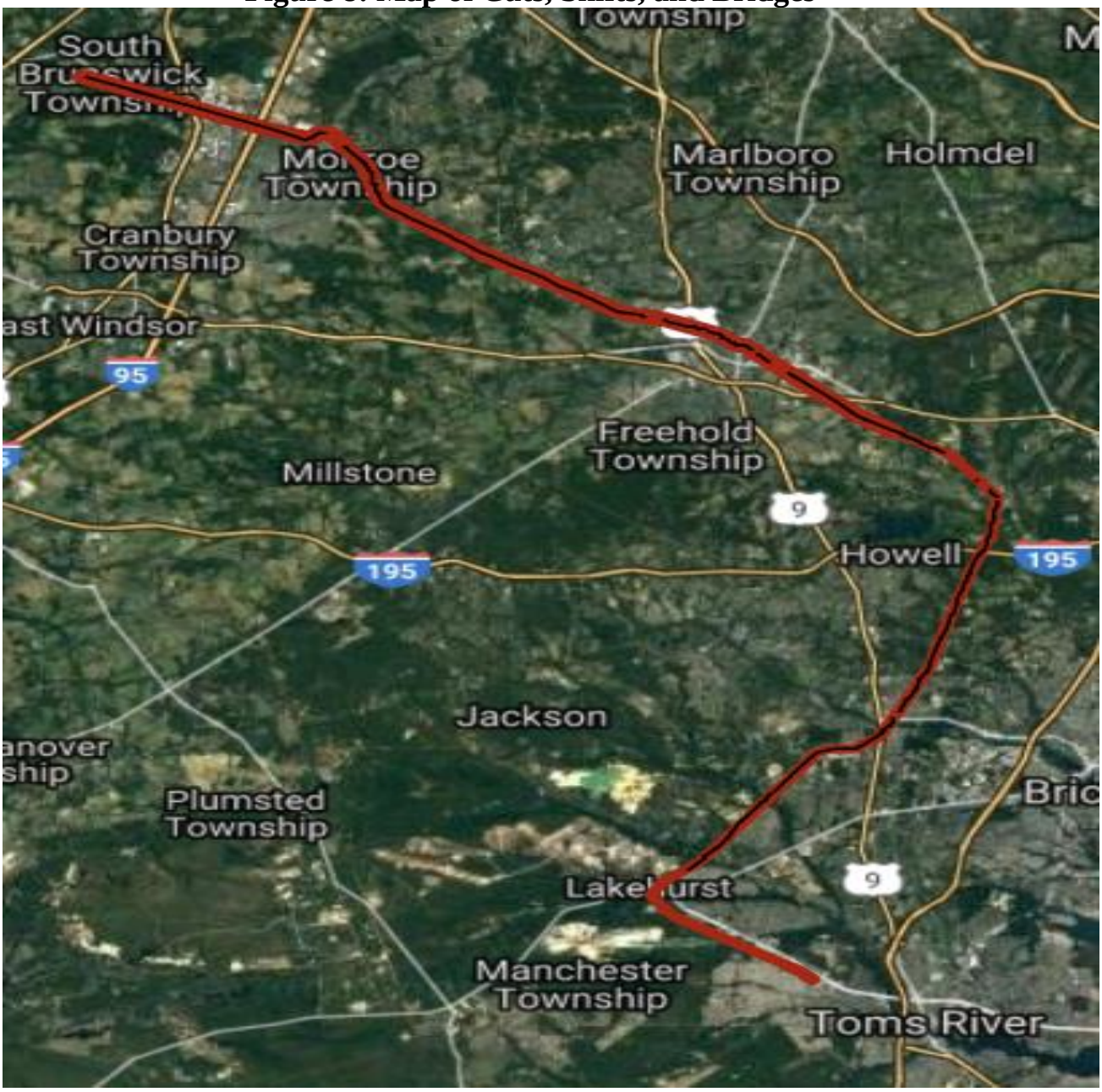
There will also need to be clearing of trees nearly all along these 39 miles, as well as construction of some bridges, and shifts of the track to better accommodate the system. If you look at **Figure 8: Map of Cuts, Shifts, and Bridges**, you can see the exact places where all these events need to take place. Again, if you desire to interact with the map to better see the locations I am talking about, please use the web address directly under the figure. The layer labeled "Tree Cuts, Bridges, and Minor Track Shifts" will show you the exact spots where cutting, bridges or minor shifts of rails is necessary. They are labeled as to follow from south to north.

Figure 8: Map of Cuts, Shifts, and Bridges



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Total Materials

Again, we will need 39 miles of new track using existing ballast for the double track. The upgrades for the current track will require about 19.5 miles worth of upgrades. This comes out to 39 miles of new siding at the very least. AECOM, a civil engineering company, will be contacted to take care of engineering, bridges, construction, the seven stations, signaling, and the optional electrification. There will need to be 15 new bridges constructed and about 114 signals (Lynch, 2017). This will in turn need 242 barriers at the purple dots in **Figure 7** (Lynch, 2017). The construction of new track and upgrades will come out to about 58.5 miles of new materials needed. This will require about 7000 steel rail fasteners per mile, which comes out to 409,500 rail fasteners (Forrest, 1877). Using this information of 2 rail fasteners for each wooden rail tie, it comes out to 3500 rail ties per mile. Our grand total of rail ties are 204,750 rail ties. We can now estimate the amount of other materials we need, knowing how many rail ties this commuter line requires. About 4 rail spikes will be needed per tie, or about 14,080 per mile. This comes out to 823,680 rail spikes. Additionally, the track will be at standard gauge of 4 feet and 8 and a half inches wide, with continuously welded rails for easier maintenance and smoother rides for the commuters.

The stations, which again can be seen in **Figure 6**, from south to north are: Lakehurst, Lakewood, Howell – Oak Glen Road, Freehold – Howell Road, Freehold – Throckmorton Street, Manalapan, and Monmouth Junction. The seven stations need only be barebones and have an accessible platform with the two rails beside it and a parking lot. Inspiration for this type of lot comes from the Long Branch Station of the North Jersey Coast Line. The parking lot of that station has dimensions of 130 feet wide by 900 feet long and houses around 200 cars. This is a total area of 2.69 acres, which can be expanded at a later time if demand desires it, but for now only needs the acreage of 2.69 to 3.

Construction of the Monmouth, Ocean, Middlesex Rail Line

The first thing required of the three counties of Ocean, Monmouth and Middlesex, along with all of the townships through which this rail line will run through agree to its construction. We will then contact Conrail and create a deal to which we can use the rails entirely or partially while they still run freight through the area. It should be noted, however, that a large section between the ideal locations for the Freehold Throckmorton Street Station and the Lakehurst Station is barely used according to Conrail's own website. If necessary we will need to acquire the right of way to the tracks similar to what SunRail did with CSX. While Florida was constructing its commuter rail line, CSX detoured its freight shipments (Linares, J., Parish, J. D., Weissert, R., et al., 2014). However, it will most likely not even be necessary at all to impede Conrail's business in the area since, while constructing the new rail lines, the existing rails can be used. And once the upgrades for the existing railway is needed, Conrail can simply go onto the newly built rails parallel with the old rails to not hinder freight service in the area.

The next thing that is necessary for most areas of this project is logging and cutting down trees to make some space for more rails to be constructed. We will contact Tim's Timber, located in Hackettstown, New Jersey to help us complete this task. The logging company will have to clear out the black lines seen in **Figure 8**, that are labeled on the map as "Cut #X". This will open up the avenue of the rails to at least 32 feet wide which is necessary as the standard gauge rails along with their ties take up a width of about 12 feet. Another 8 feet is necessary to separate

them from each other, especially for safety concerns. The total length needed to cut down is about 32.2 miles in 29 sections. Since the width needed for the lane through which the rail will run through is 32 feet, this comes out to a total acreage of 124.89732 or 125. They will start logging immediately in January, as it will be easier to clear out and clean up trees in the winter than in the spring, especially since it will be right after the holidays and it will affect the population the least.

While Tim's Timber is logging to open up the lane for the rails to be constructed, AECOM will be held responsible for upgrading the rails where they deem most necessary. A&K Railroad Materials, Inc. will be contacted and expected to supply the materials to AECOM for the necessary rail upgrades, and eventual construction. Tim's Timber can even bring the wood from the logged areas to A&K's closest material manufacturer and in an effort to help recycle the wood used. Once AECOM is able to begin new construction of stations or rails, they should begin in Lakehurst, as this is where the railyard and current terminus of the system will be. Once AECOM completes construction of the rail line and stations, Bombardier will be contacted to buy 2 ALP-45DP locomotives and 14 multilevel coaches, as seen on North Jersey Coast Line. The ALP-45DP is the only locomotive we must buy as it has dual mode diesel and electric transport, as electrification is very expensive and will save money in the long run, but will cost a lot upfront. Therefore, if electrification is deemed too expensive, then the rail line can still run anyway, albeit not as cleanly. If everything goes smoothly for the 39-mile track, it should be completed and running in about 2 years in January 2020, as SunRail took the same time frame to be completed. And finally, NJ Transit's own funding source should be able to fund this entire project, as I plan to make it as cost effective as possible.

Price

Figure 9: Cost-Benefit Analysis

Costs							
	Item	Amount	Rate (Low Cost)	Total(Low Cost)		Rate (High Cost)	Total (High Cost)
	Locomotive(ALP-45DP)	2	$2,410,171.00	$4,820,342.00		$2,410,171.00	$4,820,342.00
	Passenger Cars(Bilevel)	14	$2,014,230.00	$28,199,220.00		$2,014,230.00	$28,199,220.00
	Repairs for Existing Line in Miles	39	$330,000.00	$12,870,000.00		$440,000.00	$17,160,000.00
	New Railtrack in Miles	39	$1,265,000.00	$49,335,000.00		$1,485,000.00	$57,915,000.00
	Stations/Stops	7	$1,846,279.94	$12,923,959.58		$1,846,279.94	$12,923,959.58
	Signals	114	$2,950.00	$336,300.00		$8,835.00	$1,007,190.00
	Barriers	242	$11,000.00	$2,662,000.00		$22,500.00	$5,445,000.00
	Electrification per mile	39	$4,300,000.00	$167,700,000.00		$4,300,000.00	$167,700,000.00
	Engineering, Design and Construction Management Fees		10%	$11,114,682.16		15%	$19,120,606.74
			Total Low Costs without electrification:	$121,925,203.74		Total High Costs without electrification	$146,591,318.32
			Total Low Costs with electrification:	$306,731,503.74		Total High Costs with electrification	$339,446,318.32
	Total Costs Road Pavement Upgrades	Miles	Lanes	Total Cost			
	$212,927.00	50.00	8	$85,170,800.00			
	NJ Transit Funding Source Total	$2,100,000,000.00	17.2 Rail Lines (Low Cost)	682.5 Miles of rail		14.3 Rail Lines (High Cost)	
			6.85 Rail Lines (Low Cost with electrification)			6.19 Rail Lines (High Cost with electrification)	
Benefits	Item	Profit/Ticket	People/Day	Daily Yield	Yearly Yield		
	Profit	$10.00	4,000	$40,000.00	$14,600,000.00		
				Years to break even			Years to break even
			Total Low Costs without electrification:	8.35		Total High Costs without electrification	10.04
			Total Low Costs with electrification:	21.01		Total High Costs with electrification	23.25
	Proft via SunRail	$7,200,000.00	$1,300,000,000.00				
			Years to Break Even				
			180.56				

(Wendover Productions, 2017; Feigenbaum, 2016; McConville; Carnegie, 2016; American Public Transportation Association; Railway Track and Structures, 1922; Druce,1970)

Figure 9: Cost-Benefit Analysis itemizes into a digestible manner the costs of everything mentioned in the previous section. It will cost between about $122 thousand and $339.5 thousand for the cheapest rail line to the most expensive rail line. Electrification is not entirely necessary, right away at least, as it will increase the price of the rail line by about more than half without electrification. Especially since the locomotives being purchased run on diesel or on electricity. If the cost of electrification is what pushes the cost of the rail line over the edge, then we do not need it right now. Therefore, the range we should be most concerned with is between $122 thousand and $147 thousand. This will allow train access to the area in dire need of it in Ocean, Monmouth and Middlesex Counties. Taking into mind the funding source of New Jersey Transit being about $2.1 billion, without electrification, we could make about 17.2 to 14.3 of the rail lines I am suggesting.

I also estimated the cost of 50 miles, the distance in roadways on heavily trafficked roads that could use the upgrade of more lanes, and I used about 8 lanes for the estimation. 4 lanes would be used for the Garden State Parkway, if space permits, more could be added in theory. 2 lanes would be added to Route 9, and 2 lanes to Route 35, two of the other heavily trafficked roads I know of from experience. The cost of this is about $80 million, which is three quarters the cost of the cheapest estimation for this rail line. It is important to keep in mind that adding more lanes will not only increase traffic related problems during the construction, but afterwards it may only increase problems similar to how a bus-reliant transit system would.

If we estimate that this rail line had a daily ridership of about 4,000 people making about $10 of profit per person, then the cheapest rail line would break even in 8.35 years (Wendover Productions, 2017). The high cost of the rail line without electrification would take about 10 years to break even at that same rate. So, let's bring back SunRail, the youngest commuter rail line in the United States as of December 2017. It cost Florida about $1.3 billion to construct their rail line. At the rate of their first yearly profits of $7.2 million, it would take Florida 180 and a half years to break even on their rail line. Nearly two centuries while my rail line will only take up to 23 and a quarter years at its very most expensive. But Florida went through and built their rail line anyway, because they understand that even if they cannot pay it off for 180 years, that they need the rails.

Discussion

It is rather clear that Monmouth, Ocean, and Middlesex Counties are in dire need of this rail line. They needed it 14 years ago when the 2003 study occurred and 89% of correspondent found that congestion was a problem in their area. That was when these counties had less than two million people, and Middlesex and Ocean's populations have increased around 2% since the 2010 U.S. Census. The rail line will decrease congestion, alleviate accidents, and help the area become more efficient, especially economically. It can even lead to a plethora of other benefits such as: reducing commuting time while providing a stress-free trip to work, increasing property values by about $1,000 for every one minute reduction of automobile commuting time, attract major corporations to this region, expanding the available labor force for employers, and boosting that each $45 million spent on the construction of a rail station and the maintenance of track boosts the local and national economy by $98 million (Ocean County Department of Planning). Please consider funding this rail line, my people, your people, our people need it now, more than ever.

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