Congestion on 30A

Exploring the economic impact of implementing transit service on CR-30A, Florida

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The students are “hired” as associates in a fictitious consulting company called Applied Economics Research Group (AER Group). The consulting company is fictitious, and is only mentioned to enhance the realism of the project.

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EXECUTIVE SUMMARY

County Road 30A (CR-30A) is a highway located in the southern part of Walton County, Florida. Traffic congestion continues to be a significant issue along the roadway and threatens to limit future economic development. The Seaside Institute has proposed a plan to alleviate congestion along the roadway by augmenting capacity with autonomous or electric transit. There are three proposed configurations for the transit system:

1. Autonomous shuttles utilizing exclusive-use lanes
2. Electric buses utilizing exclusive-use lanes
3. Autonomous shuttles utilizing a multi-use path

AERG is tasked with evaluating the proposed scenarios.

RESULTS:

Economic Impact: AERG estimates there will be $17.9 million in direct spending, $4 million in indirect spending and $2.6 million in induced spending within the region.

Fiscal Impact: AERG finds that there will be an estimated increase of $283,000 tax revenue from the proposed project.
METHODOLOGY:

*Economic Impact*

The economy in Walton County is driven by the tourism sector and the numerous beach communities along CR-30A. The total economic impact of the project is the combination of the direct, indirect and induced effects. The impact depends on key assumptions such as ridership and vehicle capacity. AERG calculates the direct effects and estimates the indirect and induced effects of the additional money flowing through the local economy using an input-output model. An input-output model simulates the inter-industry trade linkages in a local economy and uses the flow of direct spending to estimate final demands.

*Fiscal Impact*

AERG evaluated the fiscal impact of the increase in visitor spending on the revenues of Walton County. Sales tax revenues for the county are found by applying the 1% local option sales tax in Walton County to total visitor spending. Revenues from the tourism development tax are found by applying the 4% tax rate to project visitor spending on accommodations.

RECOMMENDATIONS:

Of the three scenarios examined, AERG finds that the implementation of an AV shuttle on a multi-use path is the most viable solution. To maximize economic and fiscal benefits, the following policies should be considered:

- Ensure a high frequency of the shuttle service
- Focus on factors that would encourage ridership of the proposed service
- Advertise to regions outside Walton County to encourage absorption of the new capacity by out-of-county residents
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1. BACKGROUND

Introduction

Walton County is located along the Gulf Coast in northwest Florida. Tourism continues to be one of the major drivers of economic activity in the county. A 2018 survey of visitors to South Walton County conducted by Downs and St. Germain found that visitors contributed over $4.6 billion to Walton County’s economy as seen in Figure 1 (Downs, 2018). The 2018 study estimated that tourism was responsible for creating 28,300 jobs in Walton County. Visitors were estimated to generate over $108 million in tax revenue for the government of Walton County in 2018, which represents 67% of the county’s total revenues. A study conducted by Government Services Group, Inc. found that growth in property values along CR-30A contributed to a 68% increase in the county’s property tax base between 2005 and 2014 (Government Services Inc., 2014).

Figure 1: Sourced from Downs & St. Germain
Historically, the growth of tourism in the county has followed investment in transportation infrastructure. A prime example of this can be seen in the role played by County Road 30-A.

County Road 30-A (CR 30A) is an 18.5-mile highway in Southern Walton County. Hugging the Gulf of Mexico, the roadway is the showpiece of a 24-mile corridor and is part of Florida’s Scenic Highways Program. The roadway directly connects to Highway 98 on the East and West ends and has four additional connections to Highway 98. From West to East, they are County Road 393 (CR-393), County Road 83 (CR-83), County Road 283 (CR-283) and County Road 395 (CR-395). All roadways are maintained by Walton County.

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1 See Appendix B for a longer discussion
The 30A corridor currently hosts 16 beach communities that draw visitors from around the world. In 2018, over 4.1 million people visited South Walton County (Downs, 2018). The number of visitors to the area has been steadily increasing, as demonstrated by collections of the transient rental tax, which applies to short-term accommodation rentals. Collections increased by approximately 1200% from 1993 to 2018. Historical collections of the transient rental tax are presented in Figure 3.

![Transient Rental Tax Collections](image)

*Figure 3: Sourced from FDOR Sales Tax Data*

The area’s popularity with visitors has led to extensive development along CR-30A. This development can be traced to the master planned community of Seaside. Seaside was designed according to the principles of new urbanism, which encourages high-density and pedestrian friendly development.\(^2\) The concentration of development along CR-30A can be seen in Figure 4.

\(^2\) See Appendix C for an overview of Seaside and new urbanism
The combination of the beach communities’ increasing popularity with visitors and the high density of development is straining the existing transportation infrastructure in the 30A corridor and has led to traffic congestion along the roadway. The relationship between development and congestion can be seen in Figure 5, which shows Level of Service (LOS) ranks for segments of CR-30A. LOS is a qualitative metric used to measure a roadway’s operating conditions (Congestion Management Process). Each portion of a network is given a letter grade ranging from A to F, with F signifying the highest rates of congestion.

Figure 4: Sourced from Florida Property Tax Rolls (NAP)
Traffic congestion along CR-30A has been the focus of numerous past studies and continues to be an ongoing issue. The increasing popularity of the beach communities along CR-30A will continue to pressure the existing transportation infrastructure. A 2016 survey of travelers along CR-30A revealed that 58.3% of visitors have avoided traveling to shops or restaurants along CR-30A because of traffic issues (Atkins, 2019). Additionally, 57.6% of visitors have avoided travel in the area because of parking problems. Traffic congestion threatens future tourism growth in Walton County if the problem is not addressed.

Figure 5: Sourced from Freight Analysis Framework Version 4 (FAF4)

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3 See Appendix D for an overview of past studies
Overview

The 30A Mobility Project was born out of a workshop held by the Seaside Institute in October of 2015. The workshop was organized to address issues concerning parking and traffic congestion that have arisen along CR-30A as the number of visitors to the area has grown. The mobility project envisions “developing inter-modal, sustainable and advanced transportation solutions that will contribute to reducing traffic and parking congestion along 30A (ITIC, 2016).” Overall goals of the project include:

- Making 30A a transit friendly destination.
- Ensuring long-term sustainability of the 30A community.

Components of Project

Ultimately, the overarching vision of the 30A Mobility Project aims to improve the transit options in the area and achieve the overall goals of the effort. These projects include, but are not limited to:

- All electric, emission-free fleet of multimodal vehicles.
- E-Charging capabilities, with both fixed stations and dynamic charging.
- A dedicated lane built for automated, self-driving (AV) vehicles along 30A.

The first phase of the project focuses on CR-30A between CR-283 in the west and CR-395 in the east. This stretch of the roadway serves the communities of Watercolor, Grayton Beach, Seaside and Seagrove and is the most heavily congested section.
The plan envisions a dedicated lane for shared autonomous vehicles to run along CR-30A and connect a network of satellite park-and-ride facilities and transit stops located at strategic points along the route. An example of one of the proposed autonomous vehicles is given in Figure 7. The technology is currently deployed in several locations worldwide and continues to improve.\(^4\)

Based on user adoption data, the dedicated lane and the transit stop network would be extended to run the length of CR-30A during subsequent phases of the project. Satellite parking

\(^4\) See Appendix for state of technology, other test projects and legislative history of autonomous vehicles
facilities would also be expanded. Additional modal options such as on-demand taxis would then be able to utilize the dedicated lane to provide a range of transportation service options.

**Scope of Analysis**

It is hoped that in addition to improving congestion problems by decreasing the reliance on personal vehicle use along CR-30A, the project would be an economic stimulus to Walton County. This analysis focuses on the impacts of the first phase of the project, which entails the construction of a dedicated lane and the implementation of a shuttle service along CR-30A.

**Mobility Plan**

The mobility plan outlines a route running along CR-30A, starting at a current parking lot off CR-283 and ending at the Publix on CR-395. The satellite parking facilities are shown by points A and B on Figure 6. The start and endpoint will serve as satellite parking facilities, where visitors can leave their vehicles before boarding the shuttle. In total, the route will span 3.8 miles and have two stops along the way: the first at the Seaside city center and the second at Watercolor.

Currently, CR-30A and the adjoining roads along the route are two-lane, meaning that they must be modified in order to accommodate the new vehicles. There are three scenarios proposed by the Seaside Institute for the project:

1. Construction of an exclusive-use lane on CR-30A and the operation of an AV shuttle fleet
2. Construction of an exclusive-use lane on CR-30A and the operation of an EV bus fleet

3. Construction of a multi-use path alongside CR-30A and the operation of an AV shuttle fleet

There are two different construction requirements for the proposed scenarios that depend on whether the vehicles operate on an exclusive-use lane on CR-30A or on a designated path that parallels CR-30A.

**Exclusive Use Lanes**

The two exclusive-use lane scenarios require that the current roadway be widened from two to four lanes in order to accommodate the AV and EV vehicle traffic. These scenarios envision exclusive, dedicated lanes for the fleets running through the center of the road, with car traffic flowing on both sides. A depiction of this configuration is shown in Figure 8.

![Figure 8: Proposed Layout of Exclusive Used Lane, Sourced from](image-url)
Furthermore, for the vehicles to safely pass through the middle of the road, four medians must be removed along CR-30A. The length of the medians that must be removed vary along the proposed shuttle route, and are presented in Figures 9, 10, 11, 12.

Figure 9: Median (1) 209 ft., sourced from Google Earth

Figure 10: Median (1) 301 ft., Sourced from Google Earth

Figure 11: Median (2) 350 ft., Sourced from Google Earth
Multi-Use Path Parallel to CR-30A

AV shuttles weigh less than cars, meaning that they do not require as deep of a sediment barrier on the road to support them. Instead of conventional road widening, a multi-use path could be constructed parallel to the roadway. The implementation of the multi-use path is examined in Scenario Three. The multi-use path would be constructed parallel to CR-30A on the south side of the existing roadway. They would also be constructed on the east side of CR-283 and CR-395. A depiction of the multi-use path is shown in Figure 13.
Figure 13: Proposed Multi-Use Path Construction, Google Earth
3. Funding the Project

There are two scenarios possible to fund the project. One option would be to utilize grants to pay for the entire project. If the grants are from outside of the county, the funds would provide a net stimulus to local economic activity. The project may also be paid for exclusively by Walton County.

Outside Funding

**Figure 14: Levels of Funding Options**

**Federal**

The United States Department of Transportation (USDOT) provides funding opportunities for testing zero-emission electric and autonomous vehicles. The USDOT has
allocated funds for projects ranging from replacing diesel buses with electric counterparts to constructing new infrastructure and roadways to support advanced systems of transit. The following are examples of grants offered by the USDOT.

**The Low or No Emissions Grant**

The Low or No Emissions Grant provides funding to state and local governments for the purchase or leasing of zero-emission transit vehicles. The grant also funds the creation of new infrastructure to accommodate the buses as well as the passengers. The funding covers vehicles, the construction of new roadway and all required facilities such as charging stations and passenger stops. Funds are available for three years after the year of disbursement (USDOT, 2019).

**Automated Driving System Demonstration Grants**

The U.S. Department of Transportation enacted a grant focused on improving and collecting data on automated driving systems such as automated shuttles. The goal of this grant is to foster development within the sector and to demonstrate these projects to the public. The collected data is used to improve the development of automated driving systems and help integrate automated systems into the national transit network. This grant had 73 applicants ranging from Universities to small coastal towns (USDOT, 2019).

**BUILD Grant**

The Better Utilizing Investments to Leverage Development Grant was recently awarded to Jacksonville, FL. Jacksonville has a similar goal of creating an innovation corridor with autonomous technology. This grant was created to fund and invest in road, rail and transit
systems around the U.S. with hopes of moving toward advanced technology and zero-emission travel. Since inception in 2009, this program has provided over $7 billion worth of investment into over 550 transit projects around the United States.

**State Grants**

Florida has received $166 million from the Volkswagen Settlement. Up to 15% of this sum may be used for improving infrastructure such as charging stations, bus stops and other facilities that improve transportation infrastructure. The Volkswagen funds may be used to finance projects that reduce emissions or create new opportunities for environmentally friendly travel. Beneficiaries are permitted to draw funds in the amount of 75% of the costs of new all-electric vehicles (FDEP, 2019).

**Private Funding**

A portion of the funding could come from the private sector. An example is the Seaside Institute, which is currently listed as a co-sponsor of the 30A Mobility Project. Other opportunities for private funding come in the form of private grants, an example being Triumph Gulf Coast Inc. Triumph Gulf Coast Inc. is a non-profit organization that oversees the disbursement of funds recovered by the Florida Attorney General as a result the economic damages caused by the 2010 Deepwater Horizon oil-spill (TRIUMPH, 2019). The funds benefit disproportionately affected counties by assisting in a range of different projects. Past applications include funding for higher education, environmental rehabilitation and improvement and investment in advanced technology. This money is disbursed to stimulate the economies of regions affected by the oil spill in the Gulf of Mexico and Hurricane Michael (October 2018).
Funding from Walton County

If Walton County funds the project, funds must be diverted from other uses in the county’s budget. This would mean that the money that is spent on the project is not a net gain for the region, merely a substitution of existing funds. There is also the option to issue a municipal bond to cover the cost of the project (USDOT, 2019).

Owing to the widespread availability of grants, the subsequent analysis assumes that there will be enough grant funding obtained to cover the entire cost of the project. The scenario where Walton County funds the project is examined in Section 10.
Theoretical Approach

Economic impacts are “the net changes to the economic base of a region that can be attributed to the industry, event or policy that would otherwise not be there (Watson, 2007).” Typically, these impacts are measured in terms of business output, value added, wealth, and personal income. There are multiple approaches to estimating the impact of investment in transportation, including:

- Travel time and cost impacts
- Access impacts
- Property value impacts
- Spending impacts

Each of these approaches target a different aspect of a project’s effect on the region. The appropriateness of the method depends on the specifics of the project in question.

Travel Time and Cost Impacts

Transportation investment can lead to savings in a traveler’s time or travel cost. The sources of these savings are:

- Less time spent traveling
- Lower automobile ownership
- Less unanticipated delays
- Reductions in accidents.
The valuation of these savings depends on the purpose of the trip. Trips relating to business or commuting to work are valued using labor costs, but personal trips are not commonly analyzed. While these trips have a clear value, they do not generally directly affect the flow of income generated in an economy (Osman, 2014).

**Access Impacts**

Improvements to a transportation network may also lead to productivity benefits by providing access to broader labor and customer markets and by increasing efficiency from the clustering of economic activity around the transportation network. Typically, these types of impacts are the greatest in areas with previously low levels of development (Watson, 2007).

**Property Value Impacts**

Investments in transportation services can also lead to increases in property values in areas close to the transportation service. Increases in the market value of property represent the capitalization of access cost and travel time savings. The benefits of this typically accrue to the owners of the property, rather than to the region in general.

**Spending Impacts**

The flow of funds relating to the new transportation services also affects the regional economy as the money percolates through the directly affected local industries. These spending impacts are classified as capital investment and ongoing spending. Capital investment includes the development of the required facilities and the purchasing of vehicles and related equipment. Ongoing spending includes expenditures on administration and maintenance incurred during the operation of the transportation service.
The impacts of spending can be broken down into three types of effects:

- Direct effects
- Indirect effects
- Induced effects

Direct effects represent the construction and operations jobs that stem directly from spending associated with the project. This leads to sales for regional suppliers of the directly affected industries and can lead to further growth in wages and jobs, which are known as the indirect effects. Induced effects are a result of the new consumer spending that arises from wage and job growth in the supplier industries.

In addition to the direct spending related to the AV shuttle service, this project will likely lead to changes in visitor spending in the region. New visitor spending represents an additional direct effect that stems from the project.

The beach communities along CR-30A are primarily resort towns, suggesting that most of the travel along CR-30A is likely personal travel. Attempting to value this time would not capture how the project affects the flow of funds in the local economy. The area surrounding the project is largely developed, minimizing the additional impact from further expansions in accessibility to the area. The growth in property values also would not capture the overall changes in economic activity in Walton County. To capture the net impact to Walton County, this analysis will examine the spending impact that results from the 30A Mobility Project.
**Economic Impact of Direct Spending**

There are two basic components to a spending impact study. They are:

1. An estimate of the stimulus serving as the direct impact
2. A model of a regional economy that estimates the indirect and induced effects

There are several important considerations when estimating the direct stimulus to the region. Since the economic impact of a project represents the net changes to a region’s economic activity, the spending of local residents must be excluded from this analysis. If residents did not spend their money along CR-30A, they would have likely spent it elsewhere in the county. This would be a substitution, rather than a net gain for Walton County. It is also important to consider the share of purchased equipment and labor that comes from outside Walton County, as these funds do not directly affect industries in Walton County. At the regional level, these shares are often smaller as much of the equipment is produced outside the region.

A commonly used model to simulate how the funds from the direct stimulus flow through the regional economy is the input-output (I/O) model. The input-output model is based on the idea that a firm purchases the inputs it needs from multiple sectors and produces goods that become inputs in the production activities of other sectors. For example, the construction of a highway requires materials such as asphalt or guide rails. To produce these new guide rails, producing firms purchase more of the basic materials like steel. To produce the steel, the steel foundry must purchase more of the required raw materials. These interactions, known as inter-industry linkages, can be used to simulate how increased spending in one sector transfers to other related sectors. At its heart, an input-output (I/O) model is a series of tables that traces the inter-industry linkages in a regional economy.
The I/O model calculates multipliers which quantify the impact as the initial spending permeates through the economy. Indirect and induced effects are estimated by how each dollar of direct spending multiplies in the local economy. A discussion of the model’s limitations is presented in Appendix A.

**Estimation of the Direct Stimulus**

The direct stimulus associated with the project falls into three categories:

- The costs of constructing the required infrastructure
- The costs of acquiring and operating the vehicles
- Consumer spending by the new visitors

The spending associated with each of the three categories will be calculated separately for each of the scenarios in this analysis. The discussion of how these costs are estimated is now discussed.

**Costs of Construction**

The cost of the infrastructure depends on the specific requirements of the project. For the inclusion of a dedicated line, significant work would be needed to expand the width of CR-30A. The cost of this roadway expansion is calculated using FDOT cost estimates.

Operating the AV service on a multi-use path would require less adjustment to the existing infrastructure. To estimate the cost of construction the multi-use path along CR-30A, bids from a previous project to renovate the existing multi-use path along CR-30A are used.
Costs of Acquiring and Operating the Vehicles

The vehicles required by the project may either be purchased outright or may be leased from a vendor. If the vehicles are purchased, the required charging equipment must be obtained as well. Costs relating to insurance, operations and maintenance will also be incurred during the lifecycle of the project.

If the vehicles are leased, many of the costs incurred during the operation of the vehicles will be covered by the lease agreement.

Spending from the New Visitors

The spending generated by new visitors is determined by the number of out-of-county visitors who now travel to Walton County as a result for the project. Changes in travel behavior are often modeled using four-step travel demand models. The existing travel demand models do not account for the changes in demand that result from the construction of transportation facilities, known as induced traffic (Mladenović, 2014). Additionally, the model is not sensitive enough to model changes from the proposed project.

Measuring how travel demand responds to changes in transportation infrastructure is a major focus in transportation literature. To determine how travel demand will be affected by the proposed project, estimates obtained from previous research are utilized.

There are four links in the estimation of how the proposed service in Seaside leads to an increase in consumer spending from new visitors. The steps, outlined below, are described in the following sections.
Utilization of the New Service

The first step is to estimate how many people would use the proposed service. Utilization is chiefly determined by two factors: the passenger capacity supplied by the shuttle service and the demand for the service from visitors. The first is primarily determined by the technical characteristics of the service, while the second is a function of both the quality of the service provided and the tastes and preferences of visitors to the area. These two factors are quantified using two common metrics in transportation planning: person capacity and load factor.

Supply

The person capacity of a transit route is defined as:

“The maximum number of people that can be carried past a given location during a given time period under specified operating conditions; without unreasonable delay, hazard, or restriction; and with reasonable certainty” (Kittelson, 2013).

At the basic level, person capacity is the product of facility capacity and vehicle passenger capacity. Vehicle passenger capacity is determined by the quantity and layout of seating or standing room in the passenger vehicle, but the facility capacity is much more complex.
Vehicle Capacity

There are two vehicle options proposed for the project. The first is a standard electric bus, while the second is an autonomous shuttle.

Electric Buses

The many electric bus options available worldwide have differing capacities, depending on the size and purpose of the bus. A popular model for urban public transit has been Proterra’s Catalyst vehicle, which has seen actual use by the city of Chicago, Baltimore, Washington D.C., New York and Tallahassee (Charged EVs, 2019). The 35-foot model has a maximum capacity of 28 passengers (Proterra, 2019). This report assumes that electric buses purchased as part of the project will have the same capacity.

Autonomous Shuttles

There are numerous autonomous shuttles available on the market with varying levels of passenger capacities. Several popular models are summarized in the table below.

<table>
<thead>
<tr>
<th>Model</th>
<th>Maximum Capacity</th>
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<tbody>
<tr>
<td>EasyMile</td>
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<tr>
<td>Navya</td>
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<tr>
<td>Local Motors Olli</td>
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<tr>
<td>ISEAUTO</td>
<td>6</td>
</tr>
<tr>
<td>Aurigo</td>
<td>4</td>
</tr>
</tbody>
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*Table 1: Autonomous Vehicle Models*

This analysis assumes that autonomous vehicles will be purchased with the maximum available capacity of 15 persons.
Facility Capacity

There are numerous factors that influence facility capacity. Roadway characteristics such as traffic light timing or whether the service operates in a mixed-traffic environment or on a dedicated lane determine the frequency that a route may be completed. The amount of time a transit vehicle takes to load or unload also determines the operating capacity of a transit system. Vehicle dwell time is influenced by the design of both the vehicle and the bus stations, as well as the existence and method of fare collection. Even when there are real world observations of these characteristics, the Transportation Research Board warns that “capacities obtained from analytical methods must be checked against actual operating experience for reasonableness” (Kittelson, 2013).

As the project is still in the planning stages, observations of the actual characteristics are not available. A similar service is provided by the shuttle funded by the Seaside Community Development Corporation. The shuttle operates from the same parking facility on CR 283 that is proposed for the EV/AV line, and traces a similar route through the community. As the shuttle currently does not stop at a parking facility on CR-395, using information for the existing shuttle may overestimate the capacity provided by the proposed service route. Also, autonomous vehicles currently operate at lower maximum speeds than gas- or diesel-powered options. Unlike the operation of the existing service, a lane with exclusive usage would allow the autonomous vehicle to avoid traffic congestion. This could potentially make up for the lower operating speeds and result in capacities comparable to the existing service. For this analysis, the facility capacity of the existing service is assumed to be representative of that proposed by the 30A Mobility Project.
Data on the shuttle service from 2018 shows that most of the time, the facility capacity was between two and three round trips per hour of operation. For this analysis, two will be used as the low estimate and three as the high.

**Person Capacity**

To arrive at the maximum potential person capacity of the proposed service, the passenger capacity of each vehicle is multiplied by the facility capacity-per-hour. It is important to note that employees will be utilizing the same service to travel to work. Ridership data from the employee shuttle in 2018 had an average of 328 rides a day, or 10 rides-per-hour of operation. To calculate the potential capacity available for visitors, the hourly average of 10 rides per hour is subtracted from the hourly maximum capacity of the shuttle. The results are presented in the table below and represent the maximum number of individual trips-per-hour supplied for visitors by single vehicle in the service.

![Average Roundtrips per Hour of Operation, 2018](image)
The proposed operating schedule would result in 36 hours of bus operation-per-day between the four buses included in the fleet.

<table>
<thead>
<tr>
<th>Start</th>
<th>End</th>
<th>Hours of Operation</th>
<th>Number of buses</th>
<th>Bus Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>5:00 AM</td>
<td>6:00 AM</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>6:00 AM</td>
<td>11:00 PM</td>
<td>17</td>
<td>2</td>
<td>34</td>
</tr>
<tr>
<td>11:00 PM</td>
<td>12:00 AM</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>36</strong></td>
</tr>
</tbody>
</table>

*Table 2: Proposed Operation Schedule*

Multiplying the maximum hourly capacity-per-vehicle by hours of bus operation-per-day results in the estimated maximum daily capacity of the proposed shuttle service.

**Demand**

The extent to which visitors demand and utilize the new service is key to determining how many cars could be removed from the road. Travel demand is considered a derived demand, which means that it is ultimately derived from the demand for other activities such as eating out or shopping. Overall travel demand is influenced by land use patterns and accessibility, demographic and economic trends, public policy and the quality of the transportation facilities provided.

Research has found that areas with a higher density of both commercial and residential land-use tend to use public transportation more. Additionally, policies that encourage development oriented towards public transit result in greater utilization of the service (Wang, 2014). The relatively high land-use density in Seaside should positively affect transit ridership.
The existence of fares is also associated with negative effects on ridership (Boisjoly, 2018). A survey conducted as part of a transit feasibility study in 2016 revealed that 19% of respondents would not be willing to pay for the service, but 49.8% would be willing to pay between $0.50 and $2.00 for a transit service (Haight, 2016). It is the stated intention of the project that the service will be provided for free to visitors, like the operation of the current shuttle in the community. This should have a positive effect on ridership.

Research has found that people perceive the time spent waiting for a service as costlier than time spent on the service (Millonig, 2012). In a 2016 survey conducted in South Walton Count by Atkins, 77.5% of respondents stated that they did not want to be reliant on the schedule of the transportation service and almost half stated that they would not be willing to wait more than 10 minutes for the service. The wait time has also been a frequent complaint regarding the existing shuttle service, which has an average wait time of between 10 and 15 minutes. Maintaining a high frequency of the proposed service would contribute to higher levels of ridership.

*Figure 17: Factors that Affect Transit Ridership*
Personal Vehicle ownership is associated with lower levels of public transit ridership (Millonig, 2012). The Seaside town council limits visitors to two vehicle parking passes and considers golf carts to be vehicles (Seaside Town Council, 2014). A survey conducted by the Genesis Group in 2005 found that 77% of motorists on CR-30A had two or more vehicles in their household (Genesis Group, 2006). The extent to which visitors still prefer to use their personal vehicles or golf carts to travel the area will play a strong role in determining ridership of the new service. The Seaside Town Council could pursue additional policies to discourage personal vehicle use to improve ridership.

High levels of personal income have been found to have a strong positive effect on public transit ridership (Taylor, 2009). Visitor surveys conducted by Downs & St. Germain Research show that in 2018, the average median income of a visitor to Seaside was $165,775; almost three times the national median income of $57,652 (Downs, 2018).

The tastes and preferences of visitors are also a strong determinant of their ridership of a transit service. The 2006 survey conducted by Genesis Group found that only 40% of motorists on CR-30A would consider using a trolley service, while the 2016 survey found that 65% of residents and 76% of visitors would be willing to use a transit service if it met their needs (Genesis Group, 2006). For park-and-ride services, 50% of residents and 47.3% of visitors would be willing to use the service.

It is important to note that an autonomous vehicle service may be received differently than traditional public transit services. Current research suggests that overall attitudes toward using autonomous vehicles for public transit are positive (Nordhoff, 2018). A test of an autonomous shuttle in Seaside in April of 2019 was well received (ITIC, 2019).
Load Factor

The Transportation Research Board defines the load factor as the “ratio of used capacity to offered capacity of equipment during a specified period” (Kittelison, 2013). This is also referred as the utilization coefficient and is equal to the percentage of the capacity of the service that is used. A load factor of 1.00 means that every seat on the bus is taken, while a load factor of 1.50 would signify that not only is every seat full, half as many people are standing. While city buses in large urban areas may experience average load factors of 1.25, the Public Infrastructure Advisory Facility (PPIAF) advises that the theoretical maximum is likely unachievable in urban transport (Public Private Infrastructure Advisory Facility, 2006). A value of 0.30 to 0.40 is suggested for large buses, and up to 0.65 for busy mid-sized buses that accommodate 20 to 35 seated passengers.

Ridership data from operation of the existing shuttle service in 2018 shows a lower load factor in practice. The hourly load factors from 2018 are presented in Figure 18.

![Average Hourly Load Factor, 2018](image)

*Figure 18: Average Hourly Load Factor, Existing Shuttle Service Data*
The average hourly load factor from 2018 operations was 0.23. For this analysis, 0.23 is taken as a low estimate of the load factor, while the 0.65 suggested by the PPIAF is used as a high estimate.

![Load Factor Estimates](image)

*Figure 19: Load Factor Estimates*

To project how many individuals will use the proposed service in a day, the hourly load factor estimates are multiplied by the daily maximum capacity of the service.

**Cars Taken off CR-30A**

The next step is to describe how traffic flows would be affected by the proposed project. The impact on traffic flows depends on how the capacity of the service accommodates the travel behavior of visitors to the area. As the majority of visitor groups to the area are families, the travel behavior of visitor groups is assumed to be similar to that of households. Joint travel by households occurs when two or more members of the household share the same activity and tour and is common for non-work-related travel. As visitors to Seaside are already spending their
time for leisure, this analysis assumes that all travel conducted by trip groups in the area is joint travel.

The 2018 visitor survey found that the average visitor group was 5.5 people (Downs, 2018). Based on these results, this analysis assumes that every 5.5 units of capacity is equivalent to the removal of one trip group, or vehicle, from the road. Dividing the utilization scenarios by this number results in the projected number of daily vehicles taken off CR-30A by the service.

**Effect on Visitor Capacity of Seaside**

According to the 2017 National Household Travel Survey, the average household makes 5.11 daily vehicle trips (Federal Highway Administration. 2017). The share of vehicle trips by trip purpose is presented in Figure 20.

![2017 Household Vehicle Trips by Trip Purpose](image)

*Figure 20: 2017 National Household Travel Survey*

As visitors are on vacation, it is assumed that trips relating to work and personal errands will not be taken during the stay. Activities likely to be continued, shopping and recreational trips, represent 46% of all vehicle trips. This analysis assumes that these trips will be undertaken.
with the same frequency during the visit to the area. The trips that would still be generated during the visit is then taken as 46% of the normal daily vehicle trips. This results in an estimate of two household daily vehicle trips for visitor groups.

Dividing how many cars that could be taken off the road by the number of daily household vehicle trips results in an estimate for how many more trip groups could be accommodated in Seaside per day because of the service. The proposed project represents an overall increase in the capacity of the existing transportation network.

**Effect on Visitor Spending**

In transportation literature, latent demand is known as “the increase in travel demand that could be solely attributed to an increase in a transportation system’s capacity” (Agarwal, 2014a). When an individual decides to take a trip, they weigh the cost and benefit of making the trip and make a choice that maximizes their utility. This decision is usually determined by which route or modal choice presents the lowest travel cost, both in terms of time and money. Transportation literature has documented that traffic flows in an equilibrium state determined by the aggregation of each traveler’s decisions of when, where and how to travel (Agarwal, 2014b). A project that changes the existing transportation infrastructure will change the costs of travel in the system, and thus will affect the equilibrium flows as people respond to changes in travel costs.

**Fundamental Law of Road Congestion**

Originally posed as the Law of Peak-Hour Expressway Condition in 1962, the Fundamental Law of Road Congestion holds that any increase in the vehicle capacity of a roadway will be met by a corresponding increase in traffic (Downs, 1962). This results in a new equilibrium with the same levels of congestion but a higher capacity. The added capacity may
also encourage more people and firms to move into an area (Downs, 1992). The proposed transit service effectively increases the capacity of the transportation network. In simple terms, taking a vehicle off the roadway makes room for another. The increase in traffic is generated from the reduction in travel costs and a corresponding increase in the quantity of travel demanded.

How Capacity Expansion Generates Traffic

![Graph showing how capacity expansion generates traffic](image)

Research has found that increases in highway miles are associated with equivalent increases in vehicle miles traveled (Duranton, 2011). This suggests that the more physical roadway that was built, the more people traveled. Additionally, increases in the supply of transit facilities are found to lead to lagged increases in ridership (Chen, 2011). This implies that the same principle that holds for highways holds for other transit services. The effects of supply side interventions are often not instantaneous, but the long-term effects of an increase in capacity is a new equilibrium congestion condition at the new maximum capacity of the system.

*Figure 21: Fundamental Law of Traffic, AERG*
A review of the work done on quantifying this effect was performed by a study conducted by the Victoria Transit Policy Institute (Litman, 2019). The authors report that researchers have found evidence that supports the Fundamental Theorem of Road Congestion in practice. In the short term, defined as up to three years, it is found that between 10% and 50% of the new capacity is absorbed by generated traffic. Long term estimates point to a 100% absorption rate over time. This analysis assumes that one-quarter of the new vehicle capacity will be used in the first year of the project. This will continue to increase by an additional one-quarter every year until 100% of the new roadway capacity is filled with new traffic. South Walton already has enough lodging to accommodate an increase in these visitors, as illustrated by the occupancy rates in Figure 22. AERG assumes that the new traffic consists entirely of out-of-county visitor groups.

![South Walton Average Occupancy Rate](image)

*Figure 22: Average Occupancy Rate 2017 & 2018, Sourced from Visit South Walton*

**New Spending**
The average amount of money spent by a trip group during their visit to the 30A area changes depending on the season. Additionally, the length of a group’s visit also changed between the seasons. To find the daily spending for a trip group by each season, the average total spending was divided by the average length of the visit. There is also substantial variation in the number of visitors per season. To account for this, a weighted average of the daily spending by a trip group is calculated based on the number of visitors in that season. The calculations are presented in Table 3.

<table>
<thead>
<tr>
<th></th>
<th>Spring</th>
<th>Summer</th>
<th>Fall</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group Spending</td>
<td>$4,097</td>
<td>$5,338</td>
<td>$5,853</td>
<td>$4,313</td>
</tr>
<tr>
<td>Days per Visit</td>
<td>6.1</td>
<td>6.2</td>
<td>6.4</td>
<td>7.6</td>
</tr>
<tr>
<td>Spending per Day</td>
<td>$671.64</td>
<td>$860.97</td>
<td>$914.53</td>
<td>$567.50</td>
</tr>
<tr>
<td>Visitors</td>
<td>1026100</td>
<td>2040600</td>
<td>639500</td>
<td>383250</td>
</tr>
<tr>
<td>Weight</td>
<td>0.25</td>
<td>0.50</td>
<td>0.16</td>
<td>0.09</td>
</tr>
<tr>
<td>Weighted Average of Spending, 2018</td>
<td>$794.34</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3: Sourced from Visit South Walton

This weighted average is then adjusted from 2018 to 2019 dollars using the Consumer Price Index to account for inflation. To calculate the new daily spending resulting from the project, the amount of new visitor groups into the area is multiplied by the average daily spending of a visitor group. To annualize the new daily spending, the amounts are multiplied by 365.

As this represents spending levels in the long term when 100% of the new capacity has been absorbed by new visitors, the first three years of the project will not have this impact. To account for this, one-quarter of the spending associated with long-term usage is taken as the direct effects in the first year. This is increased by one-quarter for each of the next two years,
before the maximum is reached in the long-term after three years. These spending totals are adjusted for inflation using the Congressional Budget Office’s forecasts for U.S. inflation (CBO, 2018).

**Indirect and Induced Effects**

To model the secondary effects of the direct spending associated with the project, an input-output model is used to simulate how the initial expenditures would flow through the economy. Input-output analysis requires for each type of new spending to be assigned to a specific sector. The breakdown of the sectors corresponds with the North American Industry Classification System (NAICS), the standard used by the Federal Government in collecting statistical business information.\(^5\)

Infrastructure spending associated with the project is injected into the highway construction industry to simulate the contracting of an in-county construction company to carry out the project. The maintenance and operating costs of running the service are modeled as being injected into the transit and ground passenger transportation sector. The leasing costs of the AV vehicle fleet do not impact Walton County as no existing AV vehicle vendors are based in Walton County. The cost of the electric vehicle fleet is not injected into the local economy as the buses are also not produced in the county. Figure 23 shows domestic locations of AV and EV plants for potential buses and shuttles that would be implemented along CR-30A.

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\(^5\) See Appendix I for further details
Spending from the new visitors is broken down into several categories, including accommodations, retail trade, and the restaurant industry. The breakdown of visitor spending is based on the 2018 visitor survey conducted by Downs & St. Germain.

Figure 23: Manufacturing Sites for AV and EV Production

Figure 24: Visitor Spending, Downs & St. Germain
Each of these broad categories encompass multiple sectors, and it is not possible to determine the sector of “other.” For input-output modeling, each of these cash flows must be assigned to a specific sector that corresponds with the North American Industry Classification System (NAICS) codes. To estimate which specific sectors would be affected by the new spending, Walton County’s 2018 Name-Address-Property (NAP) tax roll was utilized. The NAP roll contains a field with a NAICS code that corresponds to the property’s economic activity. The county rolls down to those parcels in the CR-30A corridor were filtered, as they are the most likely recipients of the increased visitor spending. Counts of each type are presented in Appendix H. Parcel counts were then used to distribute the new visitor spending between the relevant sectors.

Accommodations

The 2018 Visitor Survey revealed that 11% of visitors stay in hotels during their visit to the area. Therefore, 11% of the total accommodation spending is injected into the hotel sector. The remainder represented vacation rentals and was distributed to the real estate sector. This breakdown is presented in Figure 25.
**Entertainment**

The economic activity attributable to entertainment related sectors falls into two categories: golf courses and gyms and fitness centers. The share of these two industries in the area is presented in Figure 26. Entertainment spending was distributed to these two sectors using the same market shares.

![Entertainment Spending Breakdown](chart)

*Figure 26: Visitor Entertainment Spending, 2018 Walton County Property Tax Rolls*

**Groceries**

All the new visitor spending on groceries is injected into the grocery store sector.

**Restaurants**

The restaurants present in the 30A corridor can be classified as either full-service or limited service restaurants. Full-service restaurants are those that provide waiter or waitress services, while limited service restaurants are commonly referred to as counter service. The visitor spending attributed to restaurants is allotted between the two categories based on the proportion of existing restaurants in the corridor. The proportions are presented in Figure 27.
Shopping

There are numerous sub-sectors of retail trade present in the 30A corridor. Visitor spending on shopping was injected according to the shares presented in Figure 28.
**Transportation**

AERG assumes that the portion of visitor spending reported as transportation-related expenses represents the purchase of fuel. Thus, visitor spending from transportation is injected into the gas-station sector.

**Other**

As there is no way to classify the spending visitors reported as “other,” this spending was distributed proportionally among all other affected sectors. The proportions used are presented in Table 4.

<table>
<thead>
<tr>
<th>Category</th>
<th>Sector</th>
<th>Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodations</td>
<td>Rental</td>
<td>90.20%</td>
</tr>
<tr>
<td>Accommodations</td>
<td>Hotels</td>
<td>0.18%</td>
</tr>
<tr>
<td>Entertainment</td>
<td>Golf Course</td>
<td>0.06%</td>
</tr>
<tr>
<td>Entertainment</td>
<td>Gym</td>
<td>0.46%</td>
</tr>
<tr>
<td>Groceries</td>
<td>Grocery Stores</td>
<td>0.92%</td>
</tr>
<tr>
<td>Restaurants</td>
<td>Full-Service Restaurant</td>
<td>2.39%</td>
</tr>
<tr>
<td>Restaurants</td>
<td>Limited Service Restaurant</td>
<td>0.89%</td>
</tr>
<tr>
<td>Shopping</td>
<td>Pharmacy/Beauty Supply</td>
<td>0.34%</td>
</tr>
<tr>
<td>Shopping</td>
<td>Clothing</td>
<td>1.65%</td>
</tr>
<tr>
<td>Shopping</td>
<td>Hobbies, Sporting Goods</td>
<td>0.40%</td>
</tr>
<tr>
<td>Shopping</td>
<td>Dept. Stores</td>
<td>0.31%</td>
</tr>
<tr>
<td>Shopping</td>
<td>Gifts, Art</td>
<td>1.96%</td>
</tr>
</tbody>
</table>

*Table 4: Share of Other, 2018 Walton County Property Tax Rolls:*
Taxes contributed over $128 million to Walton County in 2018 and represented 80% of county revenues, as seen in Figure 29 (Office of the Clerk of Circuit Court and County Comptroller, 2018). This share has grown by over 20% since 2009.

Since 2011, taxes other than property taxes have represented the larger share of the total revenues of Walton County. These taxes fall into two groups. The first is the state-imposed taxes or fees that are shared with local governments (Florida Department of Revenue, 2018a). The second is an additional group of revenue sources approved by the Florida Legislature that require a county to enact an ordinance that explicitly authorizes the levying and collection of the additional tax.
In Walton County, revenue streams from three groups of currently enacted local option taxes are likely to see growth because of the proposed project. These are:

- Local Discretionary Sales Surtaxes
- Tourist Development Taxes
- Motor Fuel and Diesel Fuel Taxes

In the following sections, each tax group is discussed in detail. Forecasts of the additional local tax revenues from each tax are estimated by applying the current local option tax rates to the additional spending generated by the project.

**Local Discretionary Sales Surtax**

Florida law allows for county governments to levy a series of eight taxes known collectively as local option sales taxes (F.S. 2123.055, 2018). The taxes are levied on all transactions in the county that are subject to the state’s sales and use tax, up to the amount of $5,000 ((F.S. 2123.055, 2018). Hotels, condominiums and vacation rentals are all subject to the tax.

Of the 3% of local option sales taxes which Walton County is eligible to levy, only the Small County Surtax has been enacted (Florida Department of Revenue, 2018). The tax is authorized for counties with a population of 50,000 or less on April 1, 1992 and is currently levied at the maximum 1% rate. The approved uses of revenues generated by the tax include county road and bridge construction as well as other county services and facilities.

While the construction of the new dedicated lane is likely to generate transactions subject to this tax, the collections will ultimately be determined by the specific purchasing activity of firms contracted for construction. Additionally, it is possible that purchases will be made from
vendors outside Walton County. It is likely that businesses will be aware of the tax laws and will
seek to minimize costs by constructing their transactions in a way that avoids as much taxation as
possible. Therefore, this fiscal impact analysis ignores the potential revenues from transactions
relating to construction of the project.

As vacation rentals are subject to the tax, this analysis assumes that the complete amount
of new tourism spending generated by the project will be subject to the tax. The indirect and
induced spending that results from the project will also be taxable. To calculate the ensuing
revenues, the 1% sales tax is applied to the new visitor spending and the indirect and induced
spending generated by the project.

**Tourism Development Tax**

County governments are given the power to enact a set of five taxes known collectively
as Tourism Development Taxes (F.S. 125.0104). The tax applies to rentals of

“any living quarters or accommodations in any hotel, apartment hotel, motel,
resort motel, apartment, apartment motel, rooming house, mobile home park,
recreational vehicle park, condominium, or timeshare resort for a term of 6
months or less” (F.S. 125.0104).

Walton County is currently levying 3 out of the 5 Tourism Development Taxes, totaling
to a 4% tax rate (Florida Department of Revenue, 2018a).
Local Option Tourist Taxes

<table>
<thead>
<tr>
<th>Tax Description</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tourism Development Tax</td>
<td>2%</td>
</tr>
<tr>
<td>Additional Tourist Development Tax—Beach Renourishment</td>
<td>1%</td>
</tr>
<tr>
<td>Additional Tourist Development Tax—Autumn Tides, etc.</td>
<td>1%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4%</strong></td>
</tr>
</tbody>
</table>

Figure 30: Walton County Local Option Tourist Taxes, FDOR

All revenues from the tax go to the Tourism Development Council Trust Fund, and fund the County’s Tourism Development Plan, beach nourishment and maintenance, and the promotion of the location as a destination for visitors.

According to the 2018 Downs & St. Germain, accommodations represented 48% of the total expenditures of visitors to South Walton County (Downs, 2018).

To calculate the revenues that would be generated from the Local Option Tourist Taxes, this analysis assumed that 48% of the projected spending of new visitors represents the amount that would be spent on short-term vacation rentals. The 4% rate is then applied to the portion of visitor spending that is attributed to transactions subject to the tax.

This may overestimate the revenues from this tax. Visitors likely reported fees associated with their rental as part of their expenditures on accommodations. In practice, these fees and service charges are not subject to the 4% Tourist Development Taxes.

**Motor Fuel and Diesel Fuel Taxes**

Motor Fuel and Diesel Fuel Taxes encompass three separate levies (Florida Department of Revenue, 2018a). Walton County currently imposes two of the three for a total of $0.07 on
every gallon of gasoline purchased in the county. These funds are authorized to be used for transportation infrastructure improvements in Walton County.

As more visitors travel to the county, it is likely that these tax revenues will increase as the new visitors purchase gas. It is difficult to quantify this increase, as it will depend on whether visitors purchase their gas in Walton County or in a neighboring region. While this analysis acknowledges the possibility of an increase, this analysis did not include these potential revenues in the calculation of the county fiscal impact.

**Total Fiscal Impact**

To find the total new revenues for Walton County, the estimates for revenues from both the Local Discretionary Sales Surtax and the Local Option Tourist Taxes are combined. This resulted in a projected revenue increase of $457,000 to Walton County revenues.

**Cost of Visitors**

The increase in visitors will also generate costs for the county as new visitors use county services. According to research performed by Downs & St. Germain, Walton County spend $76,597,028 servicing visitors in 2018. They also reported that 4,174,900 people visited Walton County in 2018. Dividing the total cost by the number of visitors results in an average cost of $18.35 per visitor. To find the total cost of new visitors, the cost-per-visitor is multiplied by the total number of projected new visitors.

**Net Fiscal Impact**

To find the net fiscal impact for Walton County, the cost of the new visitors is subtracted from the new tax revenue generated by the project.
Construction of the Dedicated Lane

The 2019 FDOT cost estimate of widening an existing two-lane arterial road to four lanes in a rural area is $2,310,000 per-mile. For adding two lanes to an existing two lane undivided arterial road in an urban area, FDOT estimates the cost to be $4,730,000 per-mile (FDOT, 2019).

The new bus route would run through the town of Seaside for 1.6 miles. AERG assumes that this is an urban area and will use FDOT’s urban estimate to evaluate the construction cost on this portion of the road. Multiplying the length of the road by the construction cost yields an estimated cost of $7,568,000.

West of Seaside, towards Watercolor, CR-30A is not bordered by existing development. The FDOT rural estimate is used to evaluate the construction cost for this portion of the road, which spans 2.2 miles. This yields an approximate construction cost of $5,088,600. Adding these two estimates together, AERG estimates the total cost of widening to be $12,656,600.

The dedicated-use option would require bus lanes in the middle of the road. This would pose an additional cost, as there are four medians in the town of Seaside that must be removed and then paved over. In 2013, a median removal project in Chicago cost $940 per foot (Slowik, 2016). Measurements of the four medians that need to be removed are 209, 350, 301, and 171 feet respectively. Summed together, they total 1,031 feet in length. Using the Chicago proxy, AERG estimates the total cost of median removal to be approximately $969,000. Adding the cost
of median removal to the cost of widening results in a total estimated cost of construction of $13,625,000.

**Leasing of the Autonomous Shuttles**

Currently, purchasing autonomous vehicles for transit services incurs significant capital costs. In addition to the purchase price of the vehicle, there are costs associated with charging infrastructure, maintenance equipment and facilities. To help alleviate this cost, many vendors of autonomous vehicles offer leasing options. These programs allow for the testing of the autonomous shuttles without committing to the full cost of owning and operating these vehicles. Leasing programs make the technology more accessible for smaller projects by circumventing the high capital costs currently associated with autonomous vehicles. Current AV leasing agreements cost $270,000 annually (EasyMile, 2019). After adjusting for inflation, the estimated total cost of leasing the four vehicles for five years is $5.8 million.

**New Tourism Spending**

For this scenario, a facility capacity of two for the base case is assumed. The autonomous shuttle has a capacity of 15 riders, resulting in a hourly-person capacity of 30 people. Subtracting the space that will be taken by employees traveling to work in the communities leaves an hourly capacity of 20 people. Multiplying this hourly capacity by the 36 hours of bus operation results in a daily person capacity of 720 people. Assuming a load factor of 0.23, this results in a total of 166 riders-per-day. Dividing by the average visitor group size results in a total of 30 cars removed from CR-30A. As each visitor group makes two vehicle trips per-day, this results in a new visitor capacity of 15. This results in a new daily capacity of 5,555 visitor groups. The rate that the new capacity is absorbed is shown in Figure 31.
After adjusting for inflation, this results in a total of $17.2 million of new visitor spending after 5 years. The new visitor spending is broken down by category in Figure 32.
Impact on Personal Income in Walton County

The analysis estimates that the impact of the project on personal income will be $11.1 million. Approximately $8.1 million in personal income is generated by the changes in direct spending associated with the project. The multiplier effects lead to an additional $3 million of growth for labor income in Walton County. The impact on personal income is shown in Figure 33.

![Impact on Labor Income](image)

*Figure 33: Impact on Labor Income, IMPLAN*

Impact on Sales

We estimate that the implementation of an AV shuttle on the multi-use path will result in a $36.2 million impact on sales in Walton County. Most of these sales, approximately $26.7 million, are a result of the construction expenditures and the new visitor spending. The multiplier effects lead to an additional $9.4 million impact on sales in Walton County. The projects impact on sales is presented in Figure 34.
The top three affected industries are real estate, new highway construction and full-service restaurants as shown in Figure 35.

Figure 34: Impact on Industry Sales, IMPLAN

Figure 35: Total Impact on Sales by Industry, IMPLAN
Sensitivity Analysis

Facility Capacity: AERG assumes that each shuttle can complete between two and three circuits of the route each hour. As mentioned in the Section 4, person capacity is derived from the number of hourly circuits completed by a vehicle. Figure 35 shows the variation in the person capacity when the completed hourly circuits ranges from two to three an hour, given the base load factor of 0.23. The person capacity ranges from 728 to 1268.

![Graph showing Daily Max AV Capacity]

*Figure 36: Maximum Daily Capacity (AV)*

As visitor spending is a result of shuttle capacity, these differing levels of route completion produce different indirect and induced effects. To examine these alternative assumptions, several facility capacity scenarios are simulated using a multiplier model. Figure 37 shows how the impact of the project varies with different hourly route scenarios. The impact ranges from $37.9 to $52.6 million.
Ridership: Variations in the ridership of the service could also affect the magnitude of the impact resulting from the proposed scenario. Ridership is quantified in this analysis using the load factor. To simulate different levels of ridership, AERG varies the load factor from a lower bound of 0.23 to an upper bound of 0.65. Still assuming the shuttles complete two circuits an hour, daily cars on the road vary from 30 to 86, as shown in Figure 38.
When these numbers are input into our I/O model, the total economic impact ranges from $37.9 million to $74 million, as illustrated in Figure 39.
Absorption of New Capacity by Out-of-County Visitors: New visitors will only provide additional economic impacts if they come from outside Walton County. If the new capacity is replaced by Walton County residents, this would result in a substitution effect as they would have likely spent their money elsewhere in the county. As a base case, AERG assumes that every additional visitor generated by the shuttle fleet comes from outside of the county. To test how changes in this assumption change the impact of the project, AERG estimates scenarios where 100%, 75%, 50% and 25% of new visitors come from outside of the county. This results in daily amounts of new visitors of 167, 126, 84, and 42 respectively, as shown in Figure 40.

![Figure 40: More Visitors From Out of County Increase Economic Impact](image-url)
Figure 41 shows that, if the out-of-county percentage of visitors falls from 100% to 25%, total economic impact decreases from $37.9 million to $23 million.

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Induced</th>
<th>Indirect</th>
<th>Induced</th>
</tr>
</thead>
<tbody>
<tr>
<td>25%</td>
<td>$2,600,000</td>
<td>$3,200,000</td>
<td>$2,600,000</td>
</tr>
<tr>
<td>50%</td>
<td>$3,200,000</td>
<td>$4,000,000</td>
<td>$3,200,000</td>
</tr>
<tr>
<td>75%</td>
<td>$3,700,000</td>
<td>$4,900,000</td>
<td>$3,700,000</td>
</tr>
<tr>
<td>100%</td>
<td>$4,200,000</td>
<td>$5,800,000</td>
<td>$4,200,000</td>
</tr>
</tbody>
</table>

*Figure 41: Impact with Varying Levels of Out-of-County Visitors*

**Fiscal Results**

New visitors pose a cost to Walton County, as they will use county facilities during their visit. Assuming that the average visitor cost of $18.35, AERG estimates the total visitor cost incurred for the first five years of AV operation.

For an AV installment on a dedicated lane, AERG estimates the yearly cost of servicing tourists to increase from $22,000 in the first year of operation to $89,000 in the fifth year. AERG estimates the total cost of servicing new tourists to be $312,000 with an estimated revenue of $628,000 as seen in Figure 42.
This results in a net revenue of $316,000 as seen in Figure 43.
Construction of the Dedicated Lane

The construction requirements for this scenario are the same as Scenario One, so the estimate $13,625,000 is used for the cost of constructing the exclusive-use lane.

Electric Bus Acquisition

To estimate the cost of a fleet of electric buses, both the purchase price and operations costs for the service are estimated.

In 2017, the average Proterra Electric Bus cost $750,000 (Reuters, 2017). In 2019, the Southeastern Pennsylvania Transportation Authority spent $2.4 million on 25 battery-electric buses, or $960,000 per vehicle (Murphy, 2019). The city of Madison, Wisconsin is expecting to spend $667,000 per electric vehicle (City of Madison, 2019).

<table>
<thead>
<tr>
<th>Year</th>
<th>Source</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>Proterra</td>
<td>$750,000.00</td>
</tr>
<tr>
<td>2018</td>
<td>SEPTA</td>
<td>$960,000.00</td>
</tr>
<tr>
<td>2018</td>
<td>Madison, Wisconsin</td>
<td>$667,000.00</td>
</tr>
<tr>
<td>average</td>
<td></td>
<td>$792,333.33</td>
</tr>
</tbody>
</table>

Table 5: Average Electric Bus Acquisition Cost
To estimate the purchase price for the EV buses, AERG uses the average of the three previous purchases, as shown in Table 5.

**Electric Bus Operating Costs**

Due to the speed of the vehicle and the designated center lane, the EV is assumed to have a higher facility capacity than the scenarios with a slower AV shuttle. AERG estimates the EV scenario will have a facility capacity of three vehicles per-hour. The United States Department of Transportation (USDOT) recently did an analysis of electric bus costs and found that the vehicles average $0.18 per-mile for fuel costs and routine maintenance (City of Madison, 2019). The USDOT cost per-mile does not include labor costs.

**Electric Bus Labor Costs**

To operate the electric fleet, AERG assumes the need for a mechanic as well as a driver for each EV bus. A mechanic will be on duty for emergency repairs as well as to charge the buses after each rotation. Average wages for these workers have been obtained through the BLS database (BLS, 2019). To obtain the full cost to hire, AERG calculates payroll taxes for each position as well as the annual cost of operation as seen in Figure 44 and Table 6.
Scenario 2: EV Vehicle on an Exclusive-Use Lane

Figure 44: Total Cost to Hire New Employees

<table>
<thead>
<tr>
<th>Vehicle Type</th>
<th>Miles/Trip</th>
<th>Hourly Facility Capacity</th>
<th>Bus Hours</th>
<th>Days/Year</th>
<th>$/Mile</th>
<th>Annual Driver Cost</th>
<th>Annual Mechanic Cost</th>
<th>Annual Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>EV</td>
<td>7.6</td>
<td>2</td>
<td>36</td>
<td>365</td>
<td>0.18</td>
<td>$175,944.60</td>
<td>$129,753.85</td>
<td>$341,649.49</td>
</tr>
<tr>
<td>EV</td>
<td>7.6</td>
<td>2.5</td>
<td>36</td>
<td>365</td>
<td>0.18</td>
<td>$175,944.60</td>
<td>$129,753.85</td>
<td>$350,637.25</td>
</tr>
<tr>
<td>EV</td>
<td>7.6</td>
<td>3</td>
<td>36</td>
<td>365</td>
<td>0.18</td>
<td>$175,944.60</td>
<td>$129,753.85</td>
<td>$359,625.01</td>
</tr>
</tbody>
</table>

Table 6: Annual Operation Cost for Each Facility Capacity of EV

New Tourism Spending

For this scenario, a facility capacity of three for the base case is assumed. The autonomous shuttle has a capacity of 28 riders, resulting in a hourly-person capacity of 84 people. Subtracting the space that will be taken by employees leaves an hourly capacity of 74 people. Multiplying this hourly capacity by the 36 hours of bus operation results in a daily person capacity of 2,664 people. Assuming a load factor of 0.23, this results in a total of 612 riders per-day. Dividing by the average visitor group size results in a total of 111 cars removed
from CR-30A. As each visitor group makes two vehicle trips per-day, this results in a new visitor capacity of 56. As the new capacity is absorbed over the lifecycle of the project, this results in a new daily visitor capacity of 71,371 groups. The rate that the new capacity is absorbed is shown in Figure 45.

![Annual New Visitor Groups](image)

**Figure 45: New Visitor Groups**

After adjusting for inflation, this results in a total of $36 million of new visitor spending.

The new visitor spending is broken down by category in Figure 46.

![Breakdown of Visitor Spending](image)

**Figure 46: Visitor Spending Breakdown**
Impact on Personal Income in Walton County

The analysis estimates that the impact of the project on personal income will be $24.16 million. Approximately $17.4 million in personal income is generated by the changes in direct spending associated with the project. The multiplier effects lead to an additional $6.8 million of growth for labor income in Walton County. The impact on personal income is shown in Figure 47.

![Impact on Labor Income](image)

*Figure 47: Impact on Labor Income, IMPLAN*

Impact on Sales

We estimate that the implementation of an EV bus on an exclusive-use lane will result in an 84.6 million impact on sales in Walton County. Most of these sales, approximately $61.6 million, are a result of the construction expenditures and the new visitor spending. The multiplier effects lead to an additional $22.9 million impact on sales in Walton County. The projects impact on sales is presented in Figure 48.
The top three affected industries are real estate, new highway construction and full-service restaurants, as shown in Figure 49.

Figure 48: Impact on Industry Sales, IMPLAN

Figure 49: Top 10 Impacted Industries, IMPLAN
Sensitivity Analysis

Facility Capacity: To estimate how changes in facility capacity affect the total impact, AERG estimates the impact when the buses average 2 and 2.5 circuits per hour. Given these situations, the capacity varies from 1664 to 2672 riders per day, as shown in Figure 50.

![Daily Max EV Capacity](image)

*Figure 50: Increase Trips per Hour, Lead to a Higher Maximum Capacity*
Varying the facility capacity results in impact ranges from $63.4 million to $90.8 million, as shown in Figure 51.

![Impact with Varying Facility Capacity](image)

**Figure 51: Economic Impact of Trip Rates**

**Ridership:** To examine alternative ridership assumptions, AERG models situations where the load factor increases to 0.3, 0.4, and 0.65. When the load factor changes from 0.23 to 0.65, daily cars increase from 112 to 316, as shown in Figure 52.
The economic impact of these situations ranges from $90.8 million to $223.4 million, as depicted in Figure 53.
**Absorption of New Capacity by Out-of-County Visitors:** To examine how the impact of the project changes if the newly created capacity is utilized by Walton County residents, AERG estimates economic impacts from different ranges of out-of-county visitors, shown in Figure 54.

![Impact by Percentage of Capacity Absorbed by Out-of-County Visitors](image)

*Figure 54: Economic Impact Increases as Visitors from Out of County Increases*

If out-of-county visitors fall from 100% to 25%, then the total economic impact falls from $90.8 million to $36.2 million. The changes in total impact from the different absorption scenarios are illustrated in Figure 55.
Fiscal Results

For an EV installment, AERG expects the yearly cost of visitors to increase from $83,000 in the first year to $333,000 in the fifth as more of the newly created capacity is absorbed. AERG estimates the total cost of servicing new tourists for 5 years to be $1,165,000. The analysis estimates that the new spending associated will generate new tax revenues of $2,185,000, as seen in Figure 56.
This results in a net revenue gain of $1,020,000 for Walton County as seen in Figure 57.
Construction of the Multi-Use Path

To accommodate the proposed shuttle route, a multi-use path must be constructed along the southern side of CR-30A. At 1,200 pounds, the autonomous shuttle is lighter than traditional automobiles which can weigh between 3,000 and 4,000 pounds. Because their decreased weight, the autonomous vehicles do not require as deep of a sediment barrier for support as traditional automobiles do. The lessened requirements mean that construction of the multi-use path will be significantly cheaper than highway lane expansions.

Walton County currently owns the right-of-way along CR-30A, meaning that no additional land will need to be purchased for the construction of the new path along CR-30A.

To estimate the cost of creating the multi-use path for the transit vehicles, a prior infrastructure project in Walton County that is comparable to the proposed multi-use path is used. In January of 2018, North Florida Construction was contracted to renovate the existing multi-use path along CR-30A stretching from CR-83 to CR-283. The project involved removing and replacing the existing asphalt, creating a roadside drainage system, and building bridges along the route. The bid for the project was approximately $1,850,000, of which $800,000 was allotted for the construction of the bridges (Walton County Board of Commissioners, 2018). As there are no bridges required to be constructed for the proposed service, this cost is subtracted from the original bid. This leaves approximately $1,000,000 for the construction of the actual path. The length of the renovation project was 2.1 miles. Dividing the cost of the overall path by 2.1 results in an estimated cost of $476,000 per-mile to construct the multi-use path. In order to
accommodate a multi-directional bus route, the width of the path would have to be double that of the renovation project. The cost of the new path would be approximately twice the cost of the renovation project at $952,000 per-mile. The proposed shuttle route is 3.8 miles long. Multiplying this length by the estimated cost of $952,000 per-mile results in an estimated cost of $3,619,000 for the new path along CR-30A.

**Leasing of the Autonomous Shuttles**

The estimate for the cost of leasing the shuttle fleet is the same estimate used in Scenario One. The estimated total cost of leasing the four vehicles for five years is $5.8 million.

**New Tourism Spending**

For this scenario, a facility capacity of two for the base case is assumed. The autonomous shuttle has a capacity of 15 riders, resulting in an hourly-person capacity of 30 people. Subtracting the space that will be taken by employees leaves an hourly capacity of 20 people. Multiplying this hourly capacity by the 36 hours of bus operation results in a daily person capacity of 720 people. Assuming a load factor of 0.23, this results in a total of 166 riders-per-day. Dividing by the average visitor group size results in a total of 30 cars removed from CR-30A. As each visitor group makes two vehicle trips per-day, this results in a new visitor capacity of 15. As the new capacity is absorbed over the lifecycle of the project, this results in a new daily visitor capacity of 5,555 visitor groups. The rate that the new capacity is absorbed is shown in Figure 58.
After adjusting for inflation, this results in a total of $15.7 million of new visitor spending. The new visitor spending is broken down by category in Figure 59.
Impact on Personal Income in Walton County

The analysis shows that the impact of the project on personal income will be $6.54 million. Approximately $4.7 million in personal income is generated by the changes in direct spending associated with the project. The multiplier effects lead to an additional $1.8 million of growth for labor income in Walton County. The impact on personal income is shown in Figure 60.

![Impact on Labor Income](image)

*Figure 60: Impact on Labor Income, IMPLAN*

Impact on Sales

The analysis shows that the implementation of an AV shuttle on the multi-use path will result in a $22.9 million impact on sales in Walton County. Most of these sales, approximately $16.7 million, are a result of the construction expenditures and the new visitor spending. The multiplier effects lead to an additional $6.2 million impact on sales in Walton County. The project's impact on sales is presented in Figure 61.
The top three affected industries are real estate, new highway construction and full-service restaurants, as seen in Figure 62.
Sensitivity Analysis

**Facility Capacity:** To estimate how changes in the facility capacity affect the impact of the project, three different facility capacities are simulated. Changing the facility capacity leads to a range of 728 and 1268 of new capacity, as seen in Figure 63.

![Daily Max AV Capacity](chart)

*Figure 63: Maximum Daily Riders, AV Scenario*

The total economic impact from the different facility capacity scenarios ranges from $24.6 million to $39.3 million, as shown in Figure 64.
Ridership: To estimate how a different level of ridership affects the impact, the load factor is varied from the base case of 0.23 to the upper bound of 0.65. Changes leads to ridership levels that range from 30 to 86 cars removed daily, as seen in Figure 65.
Changes in ridership leads to the total economic impact increasing from $24.6 million to $60.8 million, as seen in Figure 66.
Absorption of New Capacity by Out-of-County Visitors: To examine different rates of absorption, AERG projects economic impact when the out of county percentage of additional visitors is 25%, 50%, 75%, and 100%. The new visitor groups calculated using the alternate scenarios are presented in Figure 67.

![Impact by Percentage of Capacity Absorbed by Out-of-County Visitors](image)

*Figure 67: New Out of County Visitor Groups*

The impact is projected to vary from $9.8 million at the low bound to $24.6 million when all new visitors come from out of county, as shown in Figure 68.
Fiscal Results

For an AV path installment, AERG expects the yearly cost to increase from $22,280.82 in the first year to $89,123.29 in the fifth. The total cost of servicing new tourists as a result of the project is estimated to be $312,000. The analysis estimates that the project will generate $596,000 in new tax revenues during five years of operation, as seen in Figure 69.
This results in a net revenue increase of $283,000 as seen in Figure 70.
To calculate each scenario’s rate of return, the present value of both the project costs and new tourism revenues is calculated using a discount rate of 2.85% and the base case for each scenario. The present values are calculated using Equation 1.

\[
Present\ Value = \frac{Future\ Value}{(1 + Discount\ Rate)^year}
\]

Equation 1: Present Value

The present value of each scenario’s costs and tourism revenues is used to calculate the respective returns on invest for the first five years following implementation using Equation 2.

\[
Return\ on\ Investment = \frac{(New\ Tourism\ Spending - Project\ Cost)}{Project\ Cost}
\]

Equation 2: Return on Investment

The results of these calculations are presented in Figure 71.
**Scenario 1**: the AV shuttle on an exclusive use lane, is estimated to not provide a return-on-investment during the lifetime of the five year period under study.

**Scenario 2**: the EV bus on an exclusive use lane, is the first to break even. AERG estimates that this will occur between the second and third year following the implementation of the project. AERG estimates that the return-on-investment as a result of the direct effects will be 214% of the cost.

**Scenario 3**: the operation of an AV shuttle on a multi-use path, is estimated to break even between the third and fourth year after the implementation of the project. AERG estimates that the total return on investment after five years for Scenario Three is 84% of the project’s cost.

The previous calculations are potentially an underestimate of each project’s return, as the multiplier effects that result from each scenario are not included in the estimation.
10. Financing the Project Using Walton County Funds

For each scenario AERG evaluates the possibility of the proposed project being funded entirely by Walton County. AERG assumes that funds used for the project will come from those already allocated for infrastructure projects. Rather than inject new money into the local economy, construction of the project would merely transfer money from one project to another. Because of the transfer, there is not an influx of new money being moved into the area. The money being used would have been spent on another planned infrastructure project. As a result of this transfer of spending AERG models the scenarios for AV and EV operation where Walton County transfers existing infrastructure spending. As a result of Walton County paying for the project, new jobs would not be created but rather transferred from existing infrastructure projects.

**AV Shuttle Project Funded by the County**

Analysis shows the total effect on personal income is $5.05 million. Direct spending accounts for $3.6 million of the total effects. The multiplier then estimates $890,000 as an indirect effect and $560,000 as an induced effect on personal income as seen in Figure 72.
The industry sales have a total effect of $18.1 million. Direct spending accounts for $13.1 million of the total effect. The multiplier model then estimates $3.1 million as the indirect effect and $1.9 million as the induced effect as seen in Figure 73.
EV Bus Project Funded by the County

AERG estimates a total impact on personal income of $20.3 million. Direct spending accounts for $14.4 million of the total impacts. The multiplier effects are estimated to be $5.9 million as a result of the indirect and induced effects as seen in Figure 74.

*Figure 74: Breakdown of Total Effect, EV County Funded Project*
The total impact on industry sales is estimated to be $72.5 million. Direct spending accounts for $52.4 million of the total impacts. The multiplier model estimates $12.5 million of indirect effects and $7.6 million of induced effects will result from the EV Bus scenario as seen in Figure 75.

Figure 75: Breakdown of Total Effect, County Funded EV Project
11. Summary and Policy Recommendations

Of the three scenarios examined, AERG finds that the implementation of an AV shuttle on a multi-use path is the most viable solution.

The construction of an exclusive lane is not appropriate for the bus or shuttle traffic associated with the proposed project. According to the Transportation Research Board, the recommended minimum level of bus traffic for priority lane treatment is 40-60 buses per-hour during peak traffic (Kittelson, 2013). The estimated facility capacity of between four and six total buses per-hour is far below this recommended amount.

AERG estimates that tourism spending associated with the operation of an AV shuttle on a multi-use path would result in a return-of-investment of 84% after five years of operation. Scenario One also provides the lowest required construction costs, and does not permanently alter the layout of CR-30A.

To maximize the return on investment, AERG suggests three policy recommendations:

1. Ensure a high frequency of the shuttle service
2. Focus on factors that would encourage ridership of the proposed service
3. Advertise to regions outside Walton County so the new capacity is absorbed by out-of-county residents
Additional Options

Fares could be charged to recoup some of the cost of operating the service. AERG examines fare revenues for the AV shuttle using both the high and low estimates of ridership.

Figure 76: Load Factor 0.23 Operational Cost Recovery

Figure 76 displays how much of the annual operating cost of the AV shuttle fleet would be covered by the revenue generated by charging per-rider at a load factor of 0.23. Charging $2.00 per-rider recovers approximately 10% of the annual cost of operating the fleet.
Figure 77 shows fare revenue at a load factor of 0.65. Charging $0.50 covers less than 10% of the cost of annual operation of the fleet, while charging $2.00 per-ride would cover approximately 25% of the annual cost of the fleet.

In addition to the proposed solution to traffic congestion along CR-30A, AERG also recommends the exploration of a demand-side solution that affects the travel behavior of visitors, as opposed to a supply-side project that targets the capacity of the transportation network. These solutions are outlined in Appendix J.
12. Appendix

A. Limitations
B. History of Transportation and Tourism in Walton County
C. Seaside and New Urbanism
D. Traffic Congestion on CR-30A: Past Studies and Current Situation
E. State of Autonomous Driving Technology
F. Existing Autonomous Transit Programs
G. Legislative History of Autonomous Vehicle
H. 30A Corridor Industry Counts
I. NAICS Code to IMPLAN Crosswalk
J. Alternate Solutions
Appendix A: Limitations

Estimation of Direct Effects

Another limitation of the study pertains to the estimated cost of construction. Estimates were used from the FDOT and in the case of the multi-use path, the real cost of a similar project was used as a proxy. Changes in these assumptions will affect the total impact of the project.

It is also worth noting the limitations regarding ridership. AERG assumes the same load factor for EV’s and AV’s, even though EV’s have a higher maximum capacity. As there is no way for AERG to pinpoint load factor of the buses and shuttles, a wide range of load factors are used in the analyses.

The last limitation of this paper regards the subjective nature of AV’s. Throughout the project, AERG quantitatively measured ridership based on previous shuttles in Seaside and national standards. However, because AV’s are a new method of travel, they could quite possibly entice more riders and visitors just because of their futuristic nature. In fact, they could themselves be an attraction. With more time provided, AERG could have conducted surveys asking local residents questions tailored specifically towards the proposed scenarios, but because this project was only completed in three months, this was not an option. Instead, AERG stuck to conservative estimates only regarding the objective nature of previous transportation situations.

Input-Output Modeling:

There are several limitations of input-output modeling that should be addressed (Stynes, 1997):
· Changes in quality: Goods and services are always subject to change. Growth within the tourism sector may increase the supply and increase the quality of goods and services available but this cannot be measured due to the subjective nature.

· Changes in taxes: This is a section that will be evaluated within a fiscal impact section.

· Social factors: These are considered economic impacts but are not as easily quantified. A social factor would be trying to quantify the actual cost of congestion which would be a completely different path of analysis. Social costs include amenities which are also very subjective in nature and require more assumption to quantify.

· Time: the model does not keep track of time and does not have forecasting ability; it is assumed that the outputs are for one year of activity.

· Data: I/O models rely on underlying data to create a base model of a regional economy; the most recent year of data is from 2017 which we must assume represents the current year. This is generally not an issue unless there has been some event that has thrown the economy off course. Outputs are generally adjusted to the base year of the model.

· Linear Nature: I/O models are linear in nature and if inputs were doubled this would essentially just double the outputs.

· Induced Effects: Since the model is linear, induced effects are computed with the same specification. The model assumes household spending is linear to personal income, this ignores personal preferences when it comes to spending and saving.
Appendix B: History of Transportation and Tourism in Walton County

The beaches of South Walton County have drawn visitors since the beginning of the 20th century (History and Culture, 2012). The growth of tourism was enabled by the growth of transportation infrastructure in the region. In 1884, a passenger railway service built between Pensacola and Tallahassee connected Defuniak Springs to the rail network. This led to the homesteading of Grayton Beach by the end of the decade, and the construction of the first hotel in the 1890s (Jackson, 2011). The land that became Seagrove Beach was bought and planned by the Seagrove Company in 1923, but the Depression put a brake on development in the area. Construction of the paved roadway that later became highway 98 in 1935 improved access and rejuvenated growth. CR-283 was paved in 1938, leading to further development in Grayton Beach (The History of 30A Vacation Rentals, 2019). The paving of what eventually became CR-395 in 1949 led to further construction at Seagrove Beach (South Walton Pioneer C.h. Mcgee Known as Mr. Seagrove, 2019). In the mid 1950s, Seagrove Beach, Grayton Beach and the few houses at Dune Allen were linked by the paved roadway that became CR-30A. Recently in 2010, the Northwest Florida Beaches International Airport opened in neighboring Bay County for commercial flights, further increasing accessibility to South Walton’s beaches (Henderson, 2019).

From its humble beginnings over a hundred years ago, tourism has grown into one of the main economic drivers of Walton County.
Appendix C: Seaside and New Urbanism

South Walton County’s growth in popularity as a destination for visitors can be tied to the development of the town of Seaside.

Seaside is an unincorporated, master-planned community built on 80 acres along CR 30A between CR 283 and CR 395. Planning began in the 1970s under the initiative of landowner and developer Robert Davis. He was driven by criticisms of sub-urbanism as a model for development and was searching for an alternative (The Seaside Research Portal, 2019). The layout of the community was heavily influenced by the new-urbanism movement, an approach in urban planning opposed to sub-urban sprawl. One of the planners behind the project, Andre Duany, was a founder of the Congress for New Urbanism, an organization of 19 local chapters that advocates for the adoption of the movement’s principles in urban planning. The organization defines new urbanism as a

“planning and development approach based on the principles of how cities and towns had been built for the last several centuries: walkable blocks and streets, housing and shopping in close proximity, and accessible public spaces” (McKeag, 2015)
Construction began in the early 1980s, with the first lot sales taking place in 1982. Plans for the community originally rerouted CR 30A around the perimeter of the town, but the final plan called for the road to be left in place. Seaside neighbors and blends with Seagrove, a 160-acre development tracing to the 1950s (South Walton Pioneer C.h. Mcgee Known as Mr. Seagrove, 2019).
The town was developed according a code laid out in a one-page document known as the Seaside Code (The Seaside Code, 2019). The code is a form-based code, which regulates building form rather than land-use. High-density, mixed-use developments are concentrated in the town center, which is surrounded by a mixed variety of 5 residential land use types determined by the regulating code. All mixed used and commercial developments depend on street parking and are intended to be within a ten-minute walk of all residential areas.

Figure 78 PLAN 5, ILLUSTRATIVE PLAN: Definition of Civic Spaces (Explore The Plan — The Seaside Research Portal, 2019)
Seaside was followed by the development of Watercolor in 2000 (General Information - WaterColor Community Association). Watercolor is a 499-acre community to the immediate north and west of Seaside built around Western Dune Lake. Both developments seek to minimize the use of personal automobiles and encourage other modes of traveling the towns.
Appendix D: Traffic Congestion on CR-30A: Past Studies

Previous Studies

Traffic along the CR-30A corridor has been a frequent object of study. Summaries of previous work was presented in a 2006 traffic study conducted by Genesis.

The first study was conducted by Hall Planning and Engineering in May of 1998. Recommendations from the study include creating new roadway designations, traffic calming techniques such as roundabouts, and the creation of a multi-use trail. It was noted that this suggestion was approved and incorporated into a resurfacing project (Genesis, 2006).

In July of 1999, a study was commissioned on behalf of a CR 30-A task force on traffic resulting in numerous suggestions. The suggested improvements include additional connector roadways in the corridor and transportation options such as public or private bus or tram services.

In December 2000, HAS Consulting Group was also hired to perform a traffic study. The HAS study recommended standardizing trail crosswalks and adding warning signs and signal devices to increase visibility at pedestrian crossings (Genesis, 2006).

From January 2005 to January 2006, a fourth study was completed by Genesis Group, and included a successful effort to support a Florida Scenic Highway Designation for CR-30A. The report included a survey to identify corridor user’s traffic goals (Genesis, 2006).

Short term recommendations from the Genesis study included traffic signals, roundabouts and standardization of signage and pavement markings. Long term solutions included additional roadways, enhancing amenities for other methods of travel and planning for advanced traffic
technology. The report also forecasted that future traffic growth would increase congestion above acceptable levels.

A final study was completed in 2016 by Atkins. The report noted that the expected traffic predicted in the 2006 study had not come to fruition but notes that these estimates could have been thrown off by the 2008 recession and may eventually materialize (Haight, 2016).

Driver expectations along CR-30A were assumed to be based on direct access to amenities rather than being focused on arterial service. The study identified the primary need of CR-30A as providing “regular collection from the direct access collector (CR-30A) to the primary arterial (US 98)” (Haight, 2016).

Traffic counts were collected during June of 2016 which showed traffic build-up peaks around 8:00 AM and is sustained through 7:00 PM. The busiest roadway was CR-395, which frequently experienced congestion and a reduction of travel speeds below county guidelines.

Overall, the report noted that the roadway operated at acceptable levels considering the driver expectations of a roadway providing direct access to tourist amenities.
Appendix E: State of Autonomous Driving Technology

In the early 2000’s, few entities pursued the notion of driverless cars. An exception was DARPA, a technological branch of the United States Department of Defense who spearheaded early efforts at developing the required technology. In 2004, they hosted a Grand Challenge in the Mojave Desert, inviting teams to compete in a race to produce a self-driving car with the capability of driving across the 142 miles of arid terrain. That first event failed, as no team was able to send their car further than seven miles. However, the seed was planted, and sub-communities around the country and the world began to take an interest in AV. The following year, five teams were able to send their self-driving car across the desert, and at the 2007 Challenge, some of the vehicles were able to merge lanes, adhere to traffic laws, and even perform U-turns. The corporate world took notice, and in 2007 Google began an AV endeavor and hired from those who competed in these early DARPA Challenges. They were soon joined by Uber, Lyft, and many conventional car companies like Ford and Nissan in developing driverless technology (Davies, 2018).

The National Highway Traffic Safety Administration (NHTSA) and the Society of Automotive Engineers (SAE) divide autonomous vehicles into six categories, ranging from Level 0 to Level 5. Level 0 vehicles are not autonomous at all and require a human to control every facet of operation. Level 1 vehicles can perform a single autonomous task at a time, such as adaptive cruise control. At level 2, automobiles have the ability of performing two autonomous tasks simultaneously, i.e. steering and auto breaking. Level 3 and 4 vehicles both have the capability of being autonomous in certain conditions, like during good weather, on desirable terrain, and at certain speeds (Walch, 2019). Level 5 vehicles are completely autonomous and are the class of AV’S that are ultimately envisioned in the township of Seaside.
The technological features of AV’s are not all the same, but many features are similar. One integral piece is the creation and maintenance of an internal map of the vehicle’s surroundings. The map is generated by a collection of sensors, such as radar. Uber, for example has self-driving prototypes which utilize 64 laser beams to create this map (ScienceDirect, 2019). After this map is developed, software is put in place to create a path for the vehicle to take. Algorithms are used to avoid obstacles and recognize pedestrians as well as predict their movement. This process is calculated through machine learning. When autonomous vehicles are on the road, they also collect new data, which allows the algorithm to update and improve, enabling the vehicles to better predict how pedestrians respond.

To explore how autonomous vehicles work, a self-driving shuttle produced by NAVYA, a company specializing in producing self-driving shuttles is evaluated. NAVYA shuttles are in place in several locations throughout the world, ranging from the University of Michigan in Anne Arbor, MI to Fukushima, Japan. To perceive the world around them, NAVYA shuttles are equipped with an array of multi-sensor technology. A GNSS Antenna is placed on the top of the shuttle, which allows its GPS sensor to communicate with a base station, enabling the shuttle to precisely pinpoint its position always. The shuttle’s wheels are equipped with motion sensors, which estimate the vehicle’s velocity and its fluctuations in position. A camera system is also placed on the shuttle, allowing it to determine the location of obstacles along the vehicle’s path, and the obstacle’s position relative to the vehicle. Furthermore, the shuttle is complete with six LIDAR sensors (NAVYA, 2019). LIDAR stands for Light Detection and Ranging, and uses pulsed lasers to calculate distances (NOAA, 2019). LIDAR sensors allow the shuttle to perceive the environment around it. There is also a Wi-Fi system in place that collects data when the shuttle is operating, allowing it to become more precise.
F. Exiting AV Transit Programs

Several universities, municipalities, and industrial areas have brought on similar technology in the US and across the world. These areas have participated in this endeavor not only because of initial benefits for them, but to educate and inform their respective localities on the positives of AV’s (AAA, 2018).

The first self-driving shuttle operation in America to run in live traffic and transport actual people was conducted by AAA in Las Vegas in November 2017. The trial program concluded in October of the following year, operating for a total of 1,515 hours and carrying 32,827 riders in the process. The driving reason for AAA to initiate this operation was to help increase safety on the roadway, as well as to increase AV awareness and ease uncertainty regarding self-driving vehicles. Ambassadors were stationed at the shuttle stops, answering questions regarding the operation of AV’s and encouraging participants to take a survey on their experience. Results from the survey indicated that upon taking a trip, 30% of riders were more positive in their outlook towards autonomous technology, and that 98% of riders would recommend AV shuttles to their family and friends. Furthermore, 91% of the riders admitted that AAA’s service made autonomous vehicles seem safer to them.

A current example of AV’s operating in an American municipality is the Smart Circuit shuttles in Columbus, Ohio. Three shuttles with a maximum speed of 25 miles per hour circle around a 1.4-mile loop, taking roughly 15 minutes per route. The vehicles operate in a circle called the ‘Scioto Mile’ from 6 AM to 10 PM every day of the week, providing rides for passengers to leisure and educational destinations south of the Uptown District. The program has been successful in its ability to transport passengers, but short-run logistics are not its only goal. Smart Circuit intends to educate local business and entrepreneurial figures on AV’s potential, as
well as to embolden the community towards a vision of more autonomous Columbus (Smart Circuit, 2019).

The Fukushima Daiichi Nuclear Power Station in Japan is an example of a corporation utilizing autonomous shuttle technology. The power station began their AV program in April of 2018 with a goal of speeding up infrastructure creation. The facility currently has three shuttle routes of 2km, 4km, and 5km roundtrip. An added benefit to pursuing this to share knowledge with local governments of the Hamadori region, so they can help the transportation services industry recover in the wake of the nuclear reactor disaster earlier this decade. Besides just damaging infrastructure, the meltdown in 2011 has caused local bus-drivers to be exposed to radiation as they go about their daily business. The installation of driverless fleets would remove these drivers from the road, eliminating the safety hazard (Tepco, 2019).

Universities have proven to be excellent testing grounds for autonomous vehicles as well. The Mcity project at the University of Michigan in Anne Arbor one of the more iconic instances of AV’s in the United States (University of Michigan, 2019). Mcity has a 32-acre testing grounds for AV’s, as well as an autonomous shuttle fleet which runs a course of roughly a mile. MCity has a team of 10 professionals and an array of undergraduate and graduate students helping with the technology. Their research encompasses a wide range of issues, including safety, accounting for humans on the road, testing, simulation, and legal and consumer issues regarding autonomous vehicles. One of their goals is to build a dataset comprised of 10,000 hours of cyclist and pedestrian movement so that they can create an optimization scheme to predict pedestrian motion and avoid collisions. Ultimately, Mcity’s goal is to provide education for stakeholders regarding autonomous vehicles, particularly regarding their benefit to society.
G. Legislative History of Autonomous Vehicles

Florida was one of the first states to enact legislation regarding autonomous vehicle technologies. Legislation regarding autonomous vehicles was first passed in Florida in 2012. At the time, Nevada was the only state to have similar legislation. HB 1207 stated that it was the intent of the legislature to encourage the development, testing and operation of the technologies in the State. The language authorized any person who possesses a valid driver’s license to operate an autonomous vehicle and identifies the person who causes the vehicle to engage as the operator regardless of whether they are physically present in the vehicle. The law also contained a provision requiring that a human operator be present in the vehicle during testing. This operator was required to be affiliated with the manufacturer of the autonomous technology. Prior to testing in the state of Florida, the law also required the submission to the Department of Highway Safety and Motor Vehicles of either an instrument of insurance, surety bond of proof of self-insurance in the amount of $5 million. The statute also provided that the original manufacturer of a vehicle converted to autonomous operation was not liable in the case of an accident unless there was a defect in the original vehicle. Finally, the law required the submission of a report on the subject by the Department of Highway Safety and Motor Vehicles by February of 2014 (HB 1207, 2012).

The 2014 report recommended that the State form relationships with motor vehicle manufacturers and technology developers to encourage business opportunities in developing the technology and researching policy relating to the use of autonomous vehicles (Florida Highway Safety and Motor Vehicles, 2014). It was also noted that as of February 2014, the Department had not received any requests for testing in the State of Florida. During the 2014 legislative session, HB 7005 was passed, and authorized individuals affiliated with research
organizations in association with accredited educational institutions to be operators of autonomous vehicles for testing purposes (HB 7005, 2014). The statutes were again updated in 2016 by the enactment of HB 7061. The bill removed all language requiring an operator to be present in the vehicle and deleted the requirement regarding submission of insurance information during testing to the Department of Highway Safety and Motor Vehicles. The frequency of updates to the state regulations suggest that there is broad political support for the development of autonomous vehicles in the State of Florida (HB 7061, 2016). It is reasonable to believe that the legislature will continue to be responsive to the regulatory needs of the emerging technologies.

Florida Statute 316.86 exempts the manufacturers of a vehicle from liability when a third party converts the vehicle to an autonomous one (F.S. 316.86). Autonomous vehicles registered in the State of Florida must operate in compliance with applicable federal and state standards and regulations. Regulations from the National Highway Traffic Safety Administration (NHTSA) supersede state law in the event of a conflict.

The 2019 legislative session saw the passage of SB 7068, which established the Multi-Use Corridors of Regional Economic Significance Program. Chapter 338 of the Florida Statutes defines three transportation corridors in Central and South Florida as members of the program. The purpose of the program is to:

“Revitalize rural communities, encourage job creation, and provide regional connectivity while leveraging technology, enhancing the quality of life and public safety, and protecting the environment and natural resources. The objective of the program is to advance the construction of regional corridors that are intended to accommodate multiple modes of transportation and multiple types of infrastructure” (F.S. 338, 2018).
Targets of the program include congestion relief, autonomous and shared vehicle technologies, hurricane evacuation and mobility as a service. Projects in the program will be approved by a task force of stakeholders convened by the Florida Department of Transportation and will be funded in part by revenues redirecting the State Transportation Trust fund and a portion of the motor vehicle license tax. Projects must begin no later than December 31st, 2022 and be open by December 31st, 2030. The bill also creates funding for a construction workforce development program to train individuals on multi-use corridor projects.

There are other regulatory considerations that will need to be addressed prior to humans and autonomous vehicles sharing roadways. Testing is permitted, but current law does not address whether lane sharing is permitted between autonomous vehicles and bicycles, cars or golf carts. Additionally, different driving environments present different challenges for autonomous systems. Explicitly defining these scenarios is an ongoing project.

Recently House Bill 311 has been passed and enacted as of July 1st, 2019. This bill made it law that a licensed human operator does not need to be present to operate a fully autonomous vehicle. The following conditions must be met for the law to be upheld. Included within the conditions is insurance, infrastructure to uphold the network of vehicles, and teleoperation system in place to monitor the vehicle at a distance. This teleoperation system will be used to house remote human operators. Each remote licensed human operator will oversee the monitoring of one autonomous vehicle from afar (HB 311, 2019).
### Appendix H: 30A Corridor Industry Counts

<table>
<thead>
<tr>
<th>NAICS Industry Title</th>
<th>NAICS Code</th>
<th>Spending Category</th>
<th># of Parcels</th>
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</thead>
<tbody>
<tr>
<td>Lessors of Residential Buildings and Dwellings</td>
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</tr>
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<td>Hotels</td>
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<td>713910</td>
<td>Entertainment</td>
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</tr>
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<td>Fitness and Recreation Centers</td>
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<td>Grocery Stores</td>
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<td>Baked Goods Stores</td>
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<td>Groceries</td>
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<td>Specialty Food Stores</td>
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<td>Groceries</td>
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<td>Beer, Wine, Liquor Stores</td>
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<td>Groceries</td>
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<td>Full-Service Restaurants</td>
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<td>Cosmetics and Beauty Supply</td>
<td>446120</td>
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<tr>
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<tr>
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</tr>
<tr>
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<tr>
<td>Clothing Accessories</td>
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<td>Department Stores</td>
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<td>All Other General Merchandise</td>
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<tr>
<td>Florists</td>
<td>453110</td>
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<tr>
<td>Gift, Novelty, Souvenir Stores</td>
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</tr>
<tr>
<td>Used Merchandise Stores</td>
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<td>Pet Supplies Stores</td>
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<td>Art Dealers</td>
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<td>453991</td>
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</tr>
<tr>
<td>All Other Miscellaneous Retailers</td>
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</tr>
<tr>
<td>Gas Stations</td>
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<td>Transportation</td>
<td>7</td>
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</table>
## Appendix I: NAICS Code to IMPLAN Crosswalk

<table>
<thead>
<tr>
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<th>NAICS Title</th>
<th>IMPLAN Code</th>
<th>IMPLAN Title</th>
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</thead>
<tbody>
<tr>
<td>445</td>
<td>Food and Beverage Stores</td>
<td>400</td>
<td>Retail- Food and Beverage Stores</td>
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<td>446</td>
<td>Health and Personal Care Stores</td>
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<td>Retail- Health and Personal Care Stores</td>
</tr>
<tr>
<td>447</td>
<td>Gasoline Stations</td>
<td>402</td>
<td>Retail- Gasoline Stores</td>
</tr>
<tr>
<td>448</td>
<td>Clothing and Clothing Accessories Stores</td>
<td>403</td>
<td>Retail-Clothing and Clothing Accessories Stores</td>
</tr>
<tr>
<td></td>
<td>Book Stores</td>
<td></td>
<td></td>
</tr>
<tr>
<td>452</td>
<td>General Merchandise Stores</td>
<td>405</td>
<td>Retail- General Merchandise Stores</td>
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<td>453</td>
<td>Miscellaneous Store Retailers</td>
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<td>Retail- Miscellaneous Store Retailers</td>
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<td>531</td>
<td>Real Estate</td>
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<td>Real Estate</td>
</tr>
<tr>
<td>711</td>
<td>Performing Arts, Spectator Sports, and Related</td>
<td>489</td>
<td>Commercial Sports Except Racing</td>
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<tr>
<td></td>
<td>Industries</td>
<td></td>
<td></td>
</tr>
<tr>
<td>713</td>
<td>Amusement, Gambling and Recreation</td>
<td>496</td>
<td>Other Amusement and Recreation Industries</td>
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<tr>
<td>721</td>
<td>Accommodation</td>
<td>499</td>
<td>Hotels and Motels, Including Casino Hotels</td>
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<td>Limited-Service Restaurants</td>
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</table>
Appendix J: Alternative Solutions

Pay-to-park

A 2014 assessment of parking along CR 30A found that most of the available public parking was at capacity (AVCON Inc., 2014). When most spaces are occupied, turnover between parking spaces leads to fewer available spaces over time. This leads drivers to spend time driving around and searching for a vacant space, leading to higher time-costs and higher levels of traffic (Schoup, 2011). This phenomenon is known as cruising for parking. Charging an efficient price for parking can lead to higher turnover rates, thus increasing the availability of vacant spots (Litman, 2014). This increase in parking reliability would decrease the time spent cruising for parking, leading to lower traffic levels.

One way to combat this would be the installation of parking meters around Seaside. The 2014 Parking Assessment noted that each meter can range from $1,600 to $3,000 to purchase but can generate annual revenues from $2,500 to $4,000 (AVCON Inc., 2014). The installation of meters would also require enforcement, potentially incurring an additional cost.

Another option is a mobile application for parking with a dynamic pricing scheme that is responsive to real time demand (Smart Parking and Demand-Based Pricing). An example of this has been implemented in San Francisco where prices for on-street parking varies by block, time-of-day, and day-of-week. This also allows for the identification of vacant spaces in advance. An evaluation of the pilot program has found that the application, called SFpark, leads to a decrease in vehicle-miles-traveled and an increase in the availability of parking (Pilot Evaluation – SFpark).
Implementing a pricing strategy for public parking could provide a low-cost measure for reducing traffic congestion and increasing the availability of parking.

**Road Toll**

Another method of reducing congestion could involve implementing a Pigouvian Tax, which involves taxing negative externalities. Instead of pricing parking, peak-hour traffic tolls could be placed along CR-30A (Downs, 1992). As people respond to incentives, the additional cost of these taxes would deter people from driving along CR-30A, prompting them to instead travel along Highway 98. While this could prove to be one of the more effective means of reducing congestion, common arguments against this solution are that it is inequitable and disadvantages certain people with lower levels of income. Therefore, it might disproportionately affect individuals working in Seaside over their tourist counterparts, as these visitors have higher levels of income. Furthermore, this process is also usually regarded as being politically unfeasible.

**Miscellaneous**

Other ways of combating congestion could include installing push-button crosswalks along CR-30A. The culture of beach-towns like Seaside is for cars to stop every time a pedestrian crosses the road. A blinking crosswalk could potentially alleviate this problem. Also, in the town of Seaside, there is also a lack of explicit parking spaces. If some of these areas were painted over, this could open for more room for parking as well.
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