STATE OF MAINE
DEPARTMENT OF TRANSPORTATION
16 STATE HOUSE STATION
AUGUSTA, MAINE 04333-0016

Janet T. Mills
GOVERNOR

Bruce A. Van Note
COMMISSIONER

Memorandum

Date: April 11, 2023

To: Senator Ben Chipman, Chair
Rep. Lynne Williams, Chair
Joint Standing Committee on Transportation

From: Bruce A. Van Note, Commissioner
Dale Doughty, Director of Planning
Nate Moulton, Transportation Planning Division Director
Nate Howard, Rail Program Director

Re: Bangor Transit Propensity Study

Pursuant to 2021 Resolve Chapter 53, formerly LD 227 (the Resolve), the Maine Legislature directed the Maine Department of Transportation (MaineDOT) to conduct a transit propensity study to assess the demand and viability for new or enhanced transit service, including passenger rail, between the communities of Portland and Bangor. The Resolve called for a review of relevant traffic counts, most recent data from the United States Census Bureau, population, and employment data, all reasonably feasible corridors of service, and primary trip generators that could significantly affect demand. It also required that MaineDOT submit a report of the findings to the 131st Maine Legislature, Joint Standing Committee on Transportation. This memo with the supporting study entitled *Transit Propensity Study* by VHB, the prequalified consultant working for MaineDOT, dated March 2023 (the Study) constitutes that report.

A Project Advisory Group was established to help oversee and guide the Study. The Advisory Group consisted of representatives from the Cities of Augusta, Waterville, and Bangor as well as a representative of the Bangor Area Comprehensive Transportation System (BACTS), the Northern New England Passenger Rail Authority (NNEPRA), AMTRAK, and Concord Coach Lines.

This memo summarizes estimated transit ridership demand, existing transportation options along the corridor, passenger rail consideration including benefits, capital costs, ongoing operating costs, and estimated per passenger cost and ticket prices, enhancement of existing bus services, climate and equity considerations, conclusions and MaineDOT's recommended path forward.

Estimate of Transit Ridership Demand

The Study estimated that a new or improved transit service could serve between 56,000 - 80,000 trips per year, or about 153 to 219 trips per day in 2023, and between 62,250 - 87,650 trips per year, or about 171 to 240 trips per day, by 2040. (See section 4 of the Study for details and methodology, which is consistent with normal industry standards). The trips represent a potential shift from personal vehicles to transit however, some of these existing trips are already using existing transit services. A trip is defined as any one-way travel anywhere within the corridor, meaning a single rider making a round trip on transit would count as two trips. For comparison, adjoining interstate highways carry a range of about 3.7 to 8.9 million vehicles per year, or about 10,220 to 24,260 per day depending on location. In 2019, Concord Coach and Greyhound buses accounted for 149,000 trips in the study area.

Table 1. Concord Coach Lines Trip Summary

Concord Coach Lines Bus	
Trip	Bangor to Portland to Boston
2019 Round Trips Per Day	5
2022 Round Trips Per Day	4
2022 Ticket Price	$30 (to Portland) $47-$50 (to Boston)
2019 Ridership	130,000

Table 2. Greyhound Trip Summary

Greyhound Bus	
Trip	Bangor to Portland to Boston
2019 Round Trips Per Day	1
2022 Round Trips Per Day	1
2022 Ticket Price	$15-$21 (to Portland) $32-$43 (to Boston)
2019 Ridership	19,000

This relatively modest amount of transit demand is consistent with population densities, employers, and other transportation options along the corridor. As would be expected, transit services are generally successful in areas of higher population densities, generally urban areas, where there are large employers or attractions that draw large numbers of recurring travelers and where highways and existing transit services are congested and reaching capacity. The corollary is also true. Transit services are generally unsuccessful or require large ongoing operational subsidies when population densities in a corridor are relatively low, there are few large urban areas with significant employers or attractions drawing large numbers of recurring travelers, and the existing transportation options are relatively uncongested and therefore effective.

Existing Transportation Options Along the Corridor

The corridor between Portland and Bangor has effective parallel highway route(s) (I-95 and I-295) that are uncongested, predictable, have traffic speeds of up to 70 mph and provide for efficient travel times for personal vehicles and existing bus services in the corridor. The corridor is served by existing private intercity bus services, totaling five (5) round trips a day that continue to the Boston market and connect with intercity bus and AMTRAK Downeaster passenger rail service in Portland. The Concord Coach Lines service (4 round trips daily) provides AMTRAK thruway bus service between Portland and Bangor today allowing travel with a ticket purchased from AMTRAK. See https://www.amtrak.com/thruway-connecting-services-multiply-your-travel-destinations.

These bus services in the study corridor had a total annual ridership of 51,737 trips in 2021, or 138 per day on average. At 152,073 trips in 2019, pre-pandemic ridership was around three

times higher than in 2021. Ridership and service levels of existing intercity bus services continue to rebound.

Passenger Rail Consideration

The Resolve specifically identified passenger rail for analysis, which has been the focus of passenger rail supporters including the proponents of LD 227. Accordingly, the Study extensively considered this option.

To compete successfully for federal funding, an expansion project must meet specific criteria and application requirements. Ridership demand and other benefits need to be weighed against the cost of meeting it, and a positive and competitive benefit/cost ratio is needed. Also, compared to expanding current bus services the time to make necessary improvements, secure equipment, and recruit the necessary workforce is much greater.

Benefits. As noted above, given the nature of the corridor and relatively low demand, the transportation benefits of an extension of a higher capacity transit alternative such as passenger rail to Bangor are relatively low. A new rail service will not meet minimum thresholds for ridership or corridor density needed to qualify and successfully compete for Federal Transit Administration commuter rail funding at this time. Further, from a Federal Rail Administration (FRA) intercity rail perspective, the Bangor rail concepts do not provide a time competitive alternative to highway travel and do not address any significant highway congestion in a corridor nor does it connect major urban areas. These are all important criteria used by FRA when ranking discretionary intercity rail projects.

Capital Costs. On the cost side of the ledger, as seen on page 42 of the Study, the cost to extend passenger rail to Bangor is high – many hundreds of millions of dollars regardless of alignment chosen.

Table 3. Estimate Capital Costs Summary

ALIGNMENT	APPROXIMATE LENGTH	LOW ESTIMATE	HIGH ESTIMATE
Brunswick to Bangor via State-Owned Lower Road to CSX mainline	100 miles +/-	$628M	$902M
Yarmouth to Bangor via CSX mainline	120 miles +/-	$375M	$538M

These are huge amounts for Maine. By way of comparison, they rival the amount of capital funding from all sources both federal and state that MaineDOT expends on highway and bridges statewide in a year, a system that supports an estimated 15 billion vehicle miles traveled statewide per year. These capital costs are also many multiples of the average annual amount of capital funding from all sources both federal and state that Maine expends on the multimodal transportation systems statewide including transit, aviation, rail, ports, ferries, and active transportation. Further, even if federal funding was available, state, or local matching funds would be required, which would range from $75 to $180 million. Simply stated, passenger rail to Bangor would involve a very high initial capital cost.

Ongoing Operational Costs. Further, there would be an ongoing annual need to subsidize for the operation of the new passenger rail service. The proposed service would add approximately 70% more track miles to the Downeaster route for significantly fewer riders. By way of example, the current Downeaster service which has a farebox recovery of around 50% requires an annual public subsidy over $17 million per year. Assuming a similar fare structure, the lower ridership and significant length of such an extension would mean farebox recovery in this segment would be significantly lower, requiring more subsidy.

Estimated Per Passenger Costs and Ticket Prices. To get a conceptual "order of magnitude" estimate of costs and ticket prices at the per passenger level, estimates of the cost of passage and potential ticket prices for a trip between Bangor and Brunswick are provided in Table 4. Ticket prices in Scenarios 1 and 2 were extrapolated on a mileage basis from existing (2022) and budgeted (2023) Downeaster operating expenses minus administrative expenses. Further, although unrealistic, this estimate assumes that 100% of the upper end of estimated range of annual transit ridership demand (being 80,000) will use passenger rail. Based upon this extrapolation and assumption, an "order of magnitude" estimate of cost providing one-way passage from Brunswick to Bangor ranges from $168 and $232 per passenger. Assuming a subsidy of 50%, which is consistent with the existing Downeaster service, a single one-way ticket price would range from $84 to $116 . Similar estimates for round-trip passage costs and ticket prices would be roughly double the one-way figures.

Table 4. Estimated One-way Ticket Pricing

Scenario 1. Estimated Ticket Price based on Downeaster FY23 Budgeted Costs

Operating Expenses (Estimated)	Trips per year	Projected Revenue	Additional Funding Required	Subsidy Required	**Projected Ticket Price**
$18,630,729	80,000	$9,315,365	$9,315,365	50%	**$116**

Scenario 2. Estimated Ticket Price based Downeaster FY22 Operating Costs

Total Operating Expenses (Estimated)	Trips per year	Projected Revenue	Additional Funding Required	Subsidy Required	**Projected Ticket Price**
$13,493,523	80,000	$6,746,762	$6,746,762	50%	**$84**

Scenario 3. Estimated One-way Competitive Ticket Price

Operating Expenses (Estimated)	Trips per year	Projected Revenue	Additional Funding Required	Subsidy Required	**Ticket Price**
$18,630,729	80,000	$2,400,000	$16,230,729	87%	**$30**

Quantification of subsidy requires assumptions on routes, stops, and frequency, but given relatively low ridership demand and low farebox recovery, it is reasonable to estimate that the ongoing operational subsidy needed to extend passenger rail operations to Bangor could be in the range of $6.7 to $16.2 million dollars per year as noted in table 4.

MaineDOT understands that rail ticket prices as high as in Scenario's 1 and 2 would not attract many riders and would likely need to be set to be competitive with existing bus service. As noted in Table 1, a one-way bus ticket from Portland to Bangor currently costs $30. As shown in Scenario 3 of Table 4 above, if the one-way rail ticket price was set to match this price ($30), the cost of each one-way rail trip ($168 and $232) would need to be subsidized between 83 and 87%, or about $138 to $202 per ticket.

Enhancement of Existing Bus Services

Given the challenges of the high costs and subsidies related to this passenger rail expansion and given the existence of uncongested parallel highway route(s) (I-95 and I-295) that provide predictable traffic speeds of up to 70 mph in the corridor, MaineDOT looked for other transportation alternatives that can meet the relatively low transit ridership demand in a more cost-effective and tailored manner. As noted above, the corridor today is served by existing private intercity bus services, totaling five (5) round trips a day that continue to the Boston market and connect with intercity bus and AMTRAK Downeaster passenger rail service in Portland.

If it is felt that more transit options and service is needed in the corridor, these existing intercity bus services can be readily enhanced to provide additional round trips within the corridor and/or adding additional stops or route deviations. This could provide more service to intermediate municipalities in the corridor. Better connections to the existing local bus services

within the corridor could also be accomplished by working with local transit operators to provide more frequent and well-timed connections to existing intercity bus stops.

The initial capital cost of such enhancements and any operating subsidy needed would need to be defined, but it is clear they would be a small fraction of the costs related to passenger rail as it leverages the existing capacity of the existing highway system, as opposed to building additional capacity.

Climate and Equity Considerations

Public transportation decisions need to consider factors beyond numerical unmet demand and costs. In accordance with Maine's climate action plan, Maine Won't Wait, reducing greenhouse gas emissions is a primary transportation goal in Maine. Additionally, in accordance with its Statement on Equity, MaineDOT is committed to meeting customers where they are and ensuring that all Maine people have access to safe and reliable transportation options that support economic opportunity and quality of life regardless of a person's economic, social, ethnic, racial, age, sexual orientation, physical, mental, or geographic circumstance. A key component of equity is acknowledgement that transportation needs, and solutions differ depending on geography, demographics, and individual circumstances. MaineDOT is committed to equitable delivery of our programs and services to meet the mobility equity needs of all Maine people in both rural and urban areas.

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Applying these considerations to this matter, greenhouse gas reductions from increased public transportation would be relatively small given relatively low ridership demand. Further, such reductions could be better addressed through additional bus service, especially as those buses electrify. In terms of equity, lower income, or elderly customers without access to vehicles are more typically users of intercity bus services in a state like Maine, as opposed to passenger rail services. Thus, it appears that enhanced bus service in the corridor will provide as good and perhaps better equity than rail service.

Conclusions and a Recommended Path Forward

Based upon the information above, MaineDOT has determined that the cost-effective, timely, equitable, and climate-friendly way to improve public transportation in the study area is to work with the current intercity bus operators in the corridor to advance a 2-year pilot to provide additional round trips and/or adding additional stops or route deviations. This will provide more service to more customers in intermediate municipalities in the corridor. Further,

better connections to the existing local bus services within the corridor could also be accomplished by working with local transit operators to meet workforce and other equitable needs by providing more frequent and well-timed connections to existing intercity bus stops.

This solution best fits the needs and the corridor at this time. It has a low barrier to entry, in terms of cost and time, provides the flexibility to adjust to changing needs, can be implemented quickly, and can be used to gauge the need for additional transit service in the future.

This approach was recently supported by the Bangor Area Comprehensive Transportation System (BACTS), the federally designated Metropolitan Planning Organization (MPO) for the region. This is chaired by civic leaders in the Bangor metropolitan area. See attached letter from BACTS dated February 24, 2023.

Even this cost-effective bus solution may need help to materialize, as it may require some limited on-going operational subsidy. The amount and source of funding of this operational subsidy needs to be further evaluated but likely can be funded through the Federal Transit Administrations intercity bus program. MaineDOT is committed to engaging in this evaluation with providers and stakeholders to seek a cost-effective and sustainable approach.

Given the relatively low transit demand, low population densities, high capital and operating costs, low climate and equity benefits, and extensive transportation needs statewide, MaineDOT has determined that it would be imprudent to continue the study of extending passenger rail to Bangor at this time.

MaineDOT is aware that this conclusion and path forward will not be accepted by some passenger rail project supporters, and that there could be calls for further studies, perhaps by different entities. That is all part of advocacy and the political process, and we respect the results of such processes.

In the end, MaineDOT is statutorily charged to consider all transportation needs statewide in a balanced, comprehensive, and objective manner and seek reasoned, cost-effective solutions to demonstrated needs. In accordance with this statutory charge, MaineDOT's guiding principles call for being responsible stewards of the public funds by seeking the most cost-effective solutions to demonstrated transportation needs, making reasoned, fact-based decisions that consider long-term benefits and costs, and pragmatically using pilot programs in implementation when feasible. A pilot program to enhance existing intercity bus service and local connections between Portland and Bangor meets this statutory charge and guiding principles.

BANGOR AREA COMPREHENSIVE
BACTS
TRANSPORTATION SYSTEM

February 24th, 2023

Maine Department of Transportation
16 State House Station
Augusta, Maine 04333

Dear Mr. Moulton,

I am writing on behalf of the Bangor Area Comprehensive Transportation System (BACTS) Policy Committee to provide feedback on the draft Bangor Transit Propensity Study, dated January 2023. As the Metropolitan Planning Organization for the greater Bangor region, we are committed to the safe and efficient movement of people, both within our region as well as to and from our region.

The purpose of this study was to evaluate the viability of new or enhanced transit service, including passenger rail, between Bangor and Portland, considering ridership, trip times, cost, along with other factors. As a member of the Project Advisory Group, BACTS has been involved in the study process, including a review of the study results.

BACTS recognizes the appeal of extending passenger rail service to Bangor, however, the significant capital costs associated with the rail alternative appears to outweigh the benefits and conflicts with our goal of maintaining fiscal responsibility for transportation investments in the greater Bangor region. Alternatively, BACTS would support MaineDOT investing in enhancements to the existing intercity bus services and local services in the study area.

BACTS appreciates the opportunity to weigh in on these discussions and is committed to enhancing our transportation system, both locally and statewide. We look forward to future MaineDOT partnerships on projects that further this goal.

Sincerely,

John Theriault, PE, Bangor City Engineer
Chair of the BACTS Policy Committee

12 Acme Road, Suite 104, Brewer, Maine 04412
(207) 974-3111
www.bactsmpo.org

BANGOR TRANSIT PROPENSITY STUDY

Transit Propensity Report

January 2023

PREPARED BY

vhb

IN ASSOCIATION WITH

MaineDOT

CITY OF BANGOR

CITY of Waterville
MAINE

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INTRODUCTION

1.1 Project Overview

Legislative Document (LD) 227[1] directed the Maine Department of Transportation (MaineDOT) to conduct a transit propensity study to assess the demand and viability for new or enhanced transit service, including passenger rail, between the communities of Portland and Bangor. The LD stated that the study must include a review of relevant traffic counts, most recent data from the United States Census Bureau, population and employment data, all reasonably feasible corridors of service, and primary trip generators that could significantly affect demand and that the MaineDOT submit a report of the findings to the Transportation Committee of the 131st Maine Legislature.

1.2 Project Purpose

The purpose of this report is to describe the data used, methodology, and outputs of the transit propensity assessment for new or enhanced transit service to Bangor.

Chapter 2 considers corridors similar to the Portland to Bangor corridor in some, but not all, respects to inform understanding and assumptions for transit propensity. It presents

[1] LD 227 can be found online at https://legislature.maine.gov/legis/bills/getPDF.asp?paper=SP0095&item=3&snum=130.

average daily ridership and area population with a resulting capture rate for each comparable corridor alongside Portland to Bangor. Peer corridors were selected based on their service of relatively small urban areas, being relatively parallel to good highway access.

Chapter 3 provides an overview of all data considered in the analysis, including activities, density, demographics, and travel data, as well as current intercity bus operations in the highway corridor including ridership.

Chapter 4 examines a potential range of ridership for new or enhanced transit service to Bangor as a portion of trips diverted from vehicle trips. Existing travel data present in Chapter 3 is evaluated to identify the potential to divert trips to new transit services. A range is presented to account for inherent uncertainties as part of high-level planning estimates including assumptions with respect to service frequency and perceived trip time.

Chapter 5 provides an overview of the planning-level cost estimates for new or enhanced transit service in the Portland to Bangor corridor. A conceptual capital cost estimate was completed for potential infrastructure improvements to support extended passenger rail service to Bangor. Additionally, a conceptual operating cost estimate was completed for a new commuter bus service between Portland and Bangor.

1.3 Project Advisory Group

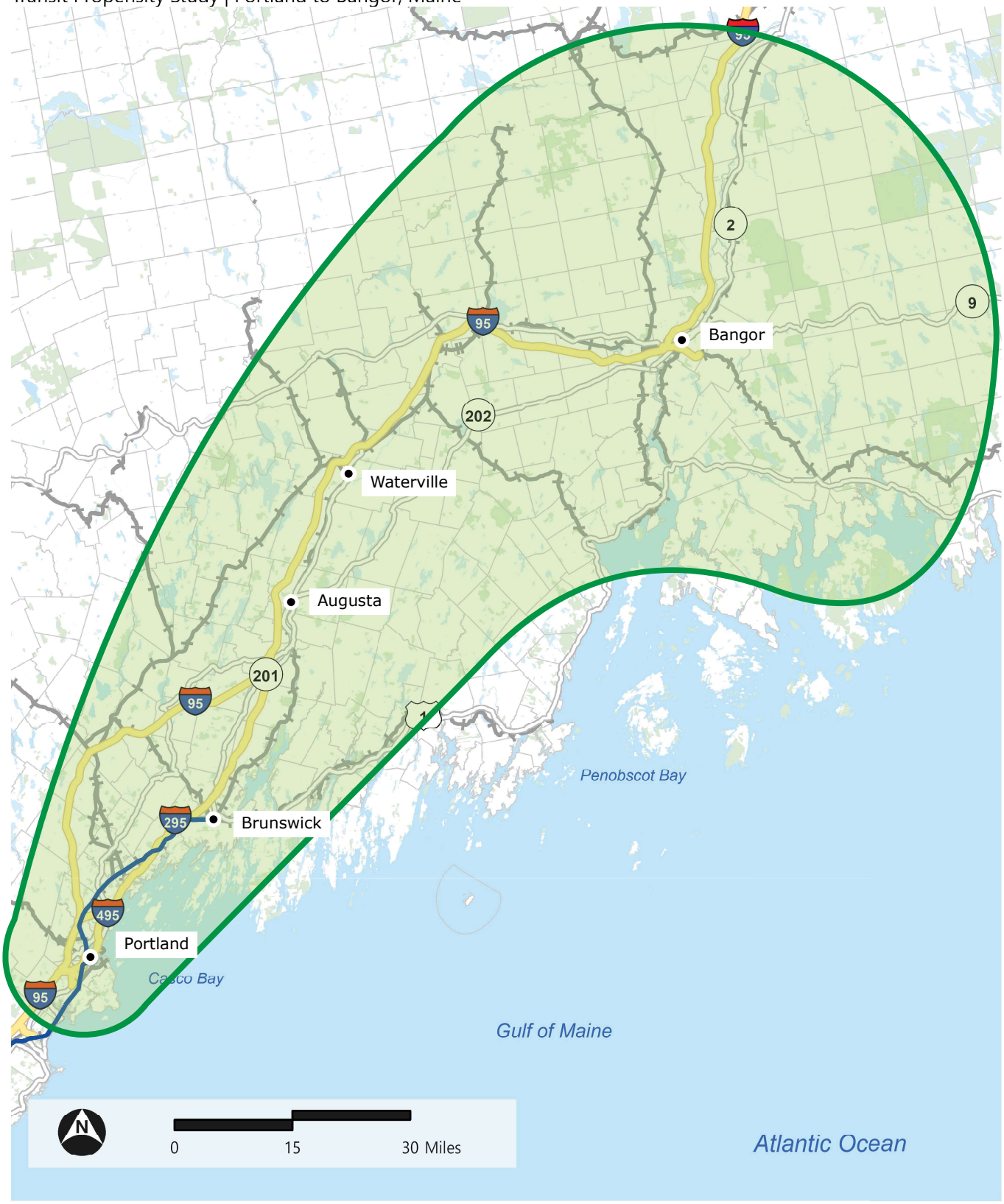
An Advisory Group was established to oversee the project. This group represents the views and perspectives of the communities that could be served by the passenger rail service expansion. The Advisory Group consisted of representatives from Augusta, Waterville, Bangor, and Bangor Area Comprehensive Transportation System (BACTS) as well as MaineDOT, NNEPRA, Amtrak, and Concord Coach Lines. The group met virtually at two points during the study, once to review assumptions made during project development and once to review outcomes.

1.4 Study Area

The Study Area for the project was established to encompass a wide area around the potential rail and highway corridors connecting communities between Portland and Bangor, Maine. See Figure 1-1.

Figure 1-1: Study Area

Transit Propensity Study | Portland to Bangor, Maine



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Source: MEGIS, ACS 2016-2020

2

PEER CORRIDOR OVERVIEW

2.1 Peer Corridor Descriptions

This chapter analyses existing intercity transit corridors within the United States that share common characteristics with the proposed transit corridor between Portland and Bangor. Due to the availability of data for existing bus services in the corridor, peer rail corridors were reviewed to assess potential additional transit propensity for enhanced transit service. Both the existing bus service, as described in Chapter 3, as well as information from these peer rail corridors were part of the transit propensity analysis. Table 2-1 summarizes service characteristics of the three comparable rail corridors and Table 2-2 shows 2019 population, average daily ridership, and capture rates for the rail corridors.

- Amtrak Ethan Allen Express – Vermont and Eastern New York
- Amtrak Illinois Corridors – Illinois Zephyr and Carl Sandburg – Quincy to Chicago
- Amtrak Illinois Corridors – Illini, Saluki, and City of New Orleans – Carbondale to Chicago

2.1.1 Amtrak Ethan Ellen Express – Vermont and Eastern New York

Amtrak operates the Ethan Allen Express service to provide residents of Vermont, Albany, and Eastern New York with regional passenger rail connections in Northern New York State and continues to New York City. This service provides intercity rail connections between Burlington, VT to the north, Albany, NY, and New York City's Penn Station to the south. It offers a single round trip every weekday and covers its 310-mile route in approximately 7.5 hours with an average speed of 41 miles per hour. The service stops at 15 total stations along its corridor. A map displaying Amtrak's Ethan Allen Express and its stations is provided in Figure 2-1.

For this study, the segment from Rutland, VT to Schenectady, NY was analyzed. The northern segment to Burlington was not included in the analysis as service began in Summer 2022. In analyzing the portion between Rutland, which is relatively rural, and Albany, which has roughly the same population as Portland, this portion of the service was determined to be the most comparable to service between Bangor and Portland.

In 2019, the average daily ridership between Rutland and Schenectady was 140 trips. The combined population of the communities served by the Ethan Allen Express between Rutland and Schenectady was approximately 128,000 in 2019.

Figure 2-1 Overview of Amtrak's Ethan Allen Express

Source: Travelanguist.com

Note: Recently added stops at Middlebury, Ferrisburgh-Vergennes, and Burlington, VT not shown

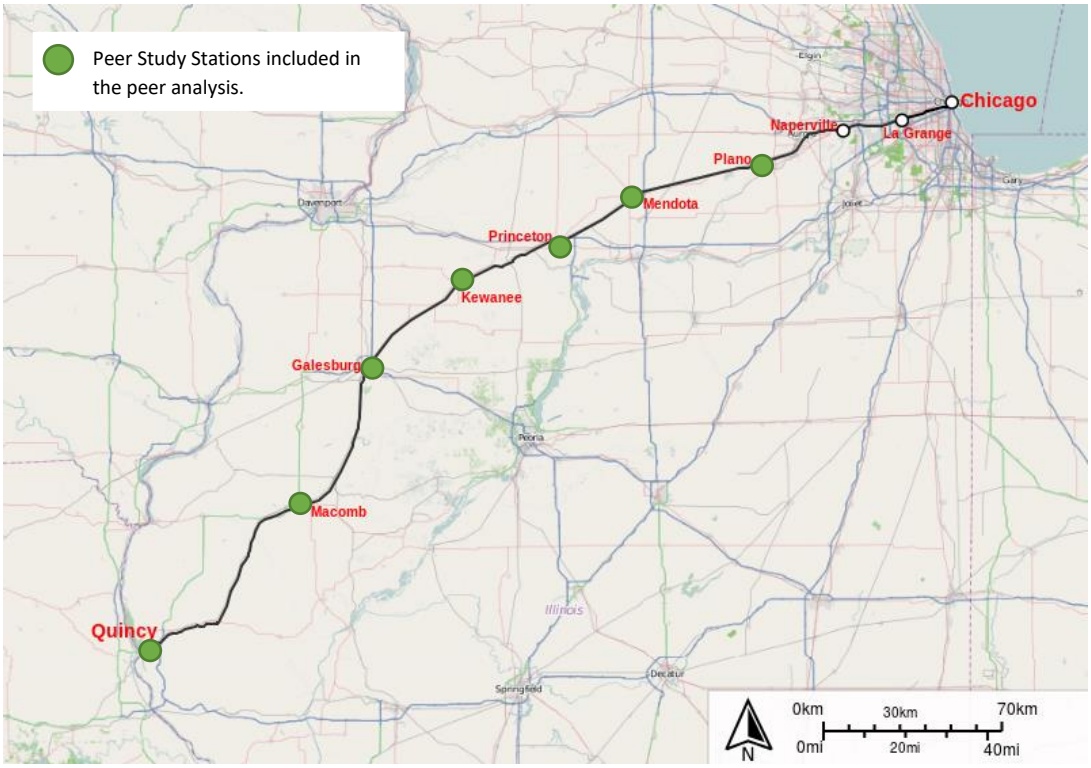
2.1.2 Amtrak Illinois Corridors – Illinois Zephyr and Carl Sandburg (Quincy to Chicago)

Amtrak operates the Illinois Zephyr and Carl Sandburg services to provide residents of western Illinois with intercity rail service to Chicago. The two services provide connections between Chicago, Illinois and Quincy, Illinois. Illinois Zephyr service provides morning trips to Chicago and evening trips to western Illinois, while Carl Sandburg service provides morning trips to western Illinois and evening trips to Chicago along the same alignment. Both services offer one weekday round trip for a total of two round trips on the corridor per day. The services travel the 258-mile route in approximately four hours and 20 minutes with an average speed of 60 miles per hour. Each trip stops at 10 total stations along the corridor. A map showing this corridor and its stations is provided in Figure 2-2.

For this study, the segment from Quincy to Plano was analyzed. The eastern segment from Plano to Chicago was excluded as the dense urban area of Greater Chicago is not comparable to the study area.

In 2019, the average daily ridership along the seven stations spanning from Quincy to Plano was 565 trips. The combined population of the seven communities located outside of Greater Chicago in 2019 was approximately 127,800.

Figure 2-2 Overview of Amtrak's Illinois Zephyr and Carl Sandburg (Quincy to Chicago)



Source: Open Street Map Data

2.1.3 Amtrak Illinois Corridors – Illini, Saluki, and City of New Orleans (Carbondale to Chicago)

Amtrak operates the Illini, Saluki, and City of New Orleans services to provide residents of southern Illinois with intercity rail service to Chicago. Within the same corridor from Carbondale Illinois to Chicago, both the Illini and Saluki services provide bi-directional intercity service, with the Illini trains running in the evening and the Saluki trains running in the afternoon. The corridor is also served by Amtrak's City of New Orleans service, which provides overnight stops in southern Illinois in both northbound and southbound directions.

These three services run one round trip each weekday, combining for a total of three round trips per day along the corridor. These trains travel the 309-mile route in approximately five and a half hours with an average speed of 56 miles per hour. Each trip stops at nine total stations along the corridor. A map showing Amtrak's Carbondale to Chicago corridor and its stations is provided in Figure 2-3.

In 2019, the average daily ridership along the nine stations spanning from Carbondale to Kankakee was 1,045 trips. The combined population of the nine communities located outside of Greater Chicago in 2019 was 244,905.

Figure 2-3 Overview of Amtrak's Illini and Saluki (Carbondale to Chicago)

Source: Wikipedia

Table 2-1 Summary of Comparable Intercity Transit Corridors Service Characteristics

Comparable Rail Corridor	Service Description	Daily Round Trips	Length (mi)	Stops/Stations	Trip Time	Average Speed (mph)
Amtrak Ethan Allen Express VT & Eastern NY	Intercity rail service connecting Vermont and Albany with NYC	*1*	*310*	15	7:30	41
Amtrak IL Corridors – Quincy to Chicago	Intercity rail service connecting Chicago to communities in the southwest	*2*	*258*	8	4:20	60
Amtrak IL Corridors – Carbondale to Chicago	Intercity rail service connecting Chicago to communities to the south, including Champaign-Urbana	*3*	*309*	9	5:30	56

Table 2-2 Comparable Intercity Transit Corridors Population and Ridership Within Applicable Segments

Comparable Rail Corridor	2019 Average Daily Ridership	2019 Area Population [1]	2019 Capture Rate [2]
Amtrak Ethan Allen Express VT & Eastern NY	151	127,586	0.11%
Amtrak IL Corridors – Quincy to Chicago	565	127,785	0.44%
Amtrak IL Corridors – Carbondale to Chicago	1,045	244,905	0.43%

[1] "Area Population" refers to the population residing within station-area communities not including the major terminus (e.g., New York City, Chicago, and Milwaukee).

[2] "Capture Rate" is defined as the 2019 average daily ridership divided by the "Area Population". Ridership data for the intercity bus corridors was not available, therefore their capture rates could not be calculated.

2.2 Summary of Review

These corridors were chosen for the peer review as they all serve population areas with similar populations and densities. They also all feed into larger metro areas, similar to how proposed service from Bangor to Portland would also generate ridership on the Downeaster that serves the regional city, similar to Portland, and continue to its terminus in Boston. While they share some characteristics with the proposed service to Bangor and Portland, they also differ in others and cannot be considered direct comparisons but will inform and support further analysis results.

The three peer review services represent services that connect rural and suburban communities with employment and entertainment centers. Potential new or enhanced transit service between Bangor and Portland, Maine would seek to do the same. As these services are operating over long distances, it is assumed that most trips are made for intercity purposes either to a major city from less populated areas or vice versa. This is similar to the market of intercity trips that this analysis seeks to identify within the corridor from Bangor to Portland and on to Boston.

By applying the capture rates calculated from the three rail peer studies to the populations that would be served by potential service to Bangor, a predicted propensity for daily ridership can be approximated. This value will be compared to the results of the more in-depth analysis to further affirm and contextualize the results.

3

EXISTING DATA & TRAVEL MARKET CATCHMENT AREAS

3.1 Introduction

To help inform potential propensity for transit trips in the corridor, existing travel data and population demographics were used to develop travel markets and catchment areas for analysis. Population trends, travel patterns, and existing corridor transit ridership are all important considerations in developing an estimation of potential ridership for additional transit services.

This chapter provides an overview of demographic data and travel data used in Chapter 4 to inform understanding of travel in the study area. The sources of data used include the following:

- US Census demographics data
- Interstate Highway traffic counts
- Streetlight trip data
- Bus ridership data
- Downeaster ridership data

3.2 Activity and Demographic Density

Historical and projected population data were obtained from the US Census Bureau and Maine's Statewide Travel Demand Model (STDM), respectively, to assess growth patterns over time within the corridor and study areas around potential stations. These data can be used as a basis for forecasting estimates of opening year and long-range ridership of enhanced transit services.

3.2.1 Activity Density

Transit service is most efficient and can serve more potential travel needs when it connects areas of higher population density and employment density. By being able to serve these frequent trips, as well as regional and intercity service, transit can have a higher potential for use.

Total population in the Portland to Bangor corridor has seen continued growth between 2000 and 2020 and is projected to continue growing through 2040 per the Maine Statewide Travel Demand Model. Population counts and growth within the Study Area are documented in Table 3-1. A growing population throughout the Study Area suggests the travel needs of the corridor will continue to increase into the future, in addition to travel demand which exists now.

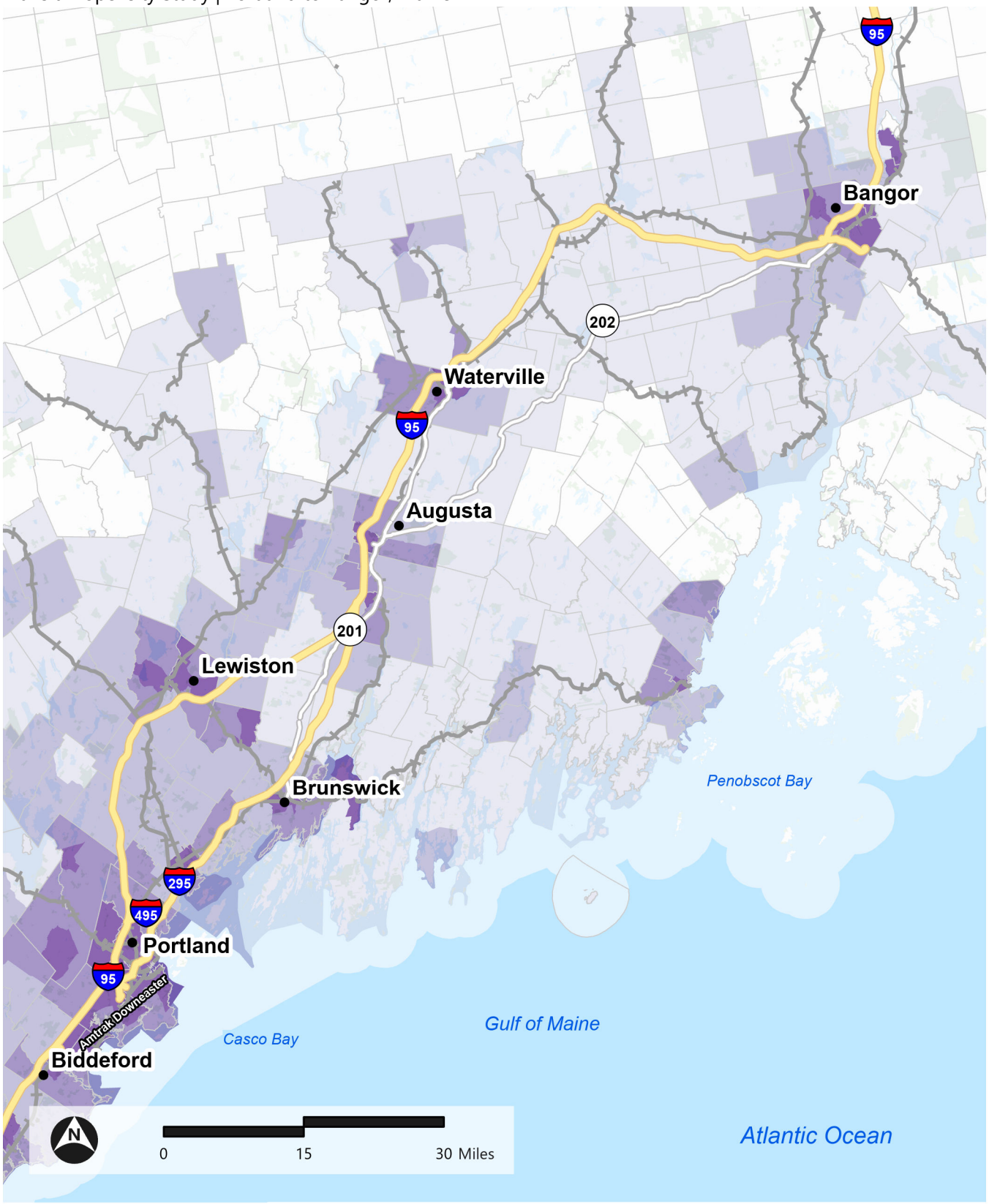
Table 3-1 Corridor Population Growth (2000, 2010, and 2020)

	Population			**Growth**	
	2000	2010	2020	2000-2020	2010-2020
Total Study Area	838,310	880,804	915,084	9.2%	3.9%

Source: US Census Bureau – 2000, 2010, and 2020 Decennial Censuses

Population and employment densities in 2020 by census tract for the Portland to Bangor corridor are presented in Figures 3-1 and 3-2. Highest population and employment densities are concentrated around Study Area municipalities of Portland, Brunswick, Augusta, Waterville, and Bangor. These municipalities have census tracts of 500 people per square mile or more, along with a number of areas containing 200 to 500 people per square mile. Potential enhanced or new transit services would likely be focused in these dense areas with more people and potential destinations focused within key census tracts.

Figure 3-1: Population Density
Transit Propensity Study | Portland to Bangor, Maine



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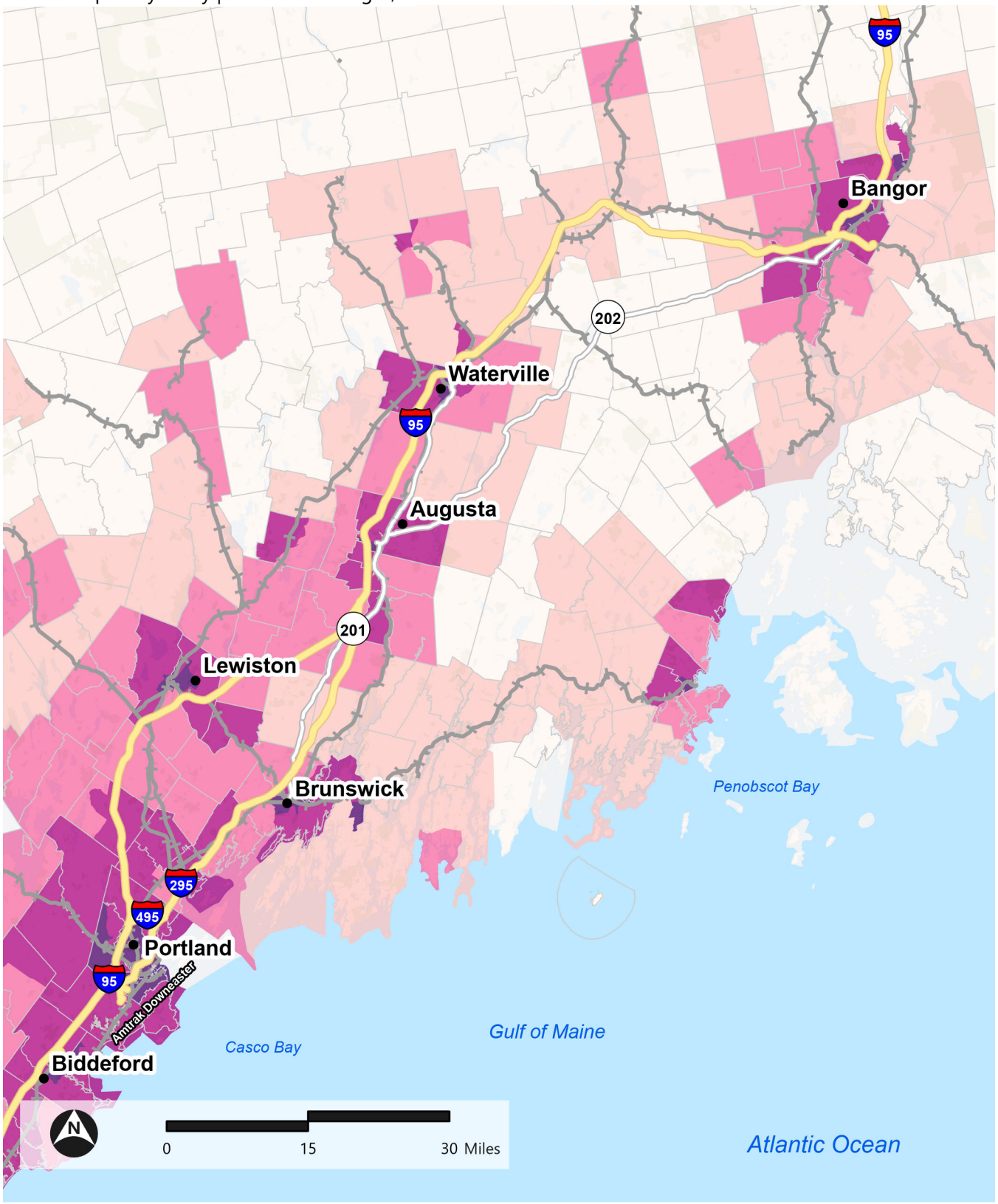
Population Density by Census Tract
- 0 - 35 People / Sq Mi
- 36 - 100 People / Sq Mi
- 101 - 200 People / Sq Mi
- 201 - 500 People / Sq Mi
- 500+ People / Sq Mi

- Railroad
- Town Boundaries

Source: MEGIS, ACS 2016-2020

Figure 3-2: Employment Density
Transit Propensity Study | Portland to Bangor, Maine



Employement Density by Census Tract

- 0 - 20 People / Sq Mi
- 21 - 50 People / Sq Mi
- 51 - 100 People / Sq Mi
- 101 - 500 People / Sq Mi
- 500 + People / Sq Mi

- Railroad
- Town Boundaries

Path: \\vhb\gis\proj\SPortland\55607.01 Transit Propensity Study\Project\Bangor-Portland Basemap\Bangor-Portland Basemap.aprx (kfrench, 6/22/2022)

Source: MEGIS, ACS 2016-2020

3.2.2 Demographics

While population and employment density demonstrate activities and potential trip generators overall, focusing on areas with higher rates of lower household income and zero-car households can indicate a higher need for transit. Together these can identify areas where there is both a need for mobility as well as a density of potential trip generators.

To identify a general area to focus on travel trip demand within the corridor, population density, employment density, median household income, and zero car household density by census tract are consolidated in Figure 3-3. A total "Demographic Score" for each tract was found by combining rankings across the four categories of demographics. Each category of demographic data was broken into five tiers, lending itself to a ranking from 5 (corresponding with highest transit demand) to 1 (corresponding with lowest transit demand). The maximum score one census tract could receive was 20 while the minimum was 4.

- For population density, a score of 5 represented 500 or more people per square mile and 1 represented 0 to 35 people per square mile.
- For employment density, a score of 5 represented 500 or more jobs per square mile and 1 represented 0 to 20 jobs per square mile.
- For median household income, a score of 5 represented less than $40,000 and 1 represented greater than $90,000.
- For zero car households, a score of 5 represented greater than 30 percent of households and 1 represented zero to 5 percent of households.

Figure 3-3: Study Area Demographics

Transit Propensity Study | Portland to Bangor, Maine

Path: \\vhb.com\gis\proj\SPortland\55607.01 Transit Propensity Study\Project\CensusAnalysis\CensusAnalysis.aprx (lburbank, 12/12/2022)

Source: MEGIS, ACS 2016-2020

3.2.3 Capture Areas

Based on an overlay of all these characteristics, capture areas were identified for analysis of potential trips. While the study area includes the entire corridor, feasible trips that would depend on and/or use enhanced or new transit services would primarily be those that are within walking or driving distance to their trip origin and walking distance from their trip destination.

To focus analysis on trips that could potentially shift to transit, further analysis of the growth and trip origin-destination were completed for specific capture areas. A map of the captures areas is provided in Figure 3-4. These areas were established around the Census tracts along the rail corridor that had the highest overlay of the demographics considered. Around these areas, the following catchment areas were established for this analysis[2][3]:

- Portland: 10 miles radius
- Brunswick: 10 miles radius
- Augusta: 10 miles radius
- Waterville: 10 miles radius, and up to 20-mile radius along I-95 corridor north
- Bangor: 10 miles radius, and up to 40-mile radius along major corridors north and northeast

Overall, catchment areas were generally larger to account for a range of potential station/stop locations that could be considered later in the planning process. Waterville and Bangor had larger catchment areas north to account for potential riders who may drive farther to stations/stops near the end of the line or stations/stops with longer distances in between them. These catchment areas to the north are focused on the roadway connectivity to potential station/stop areas.

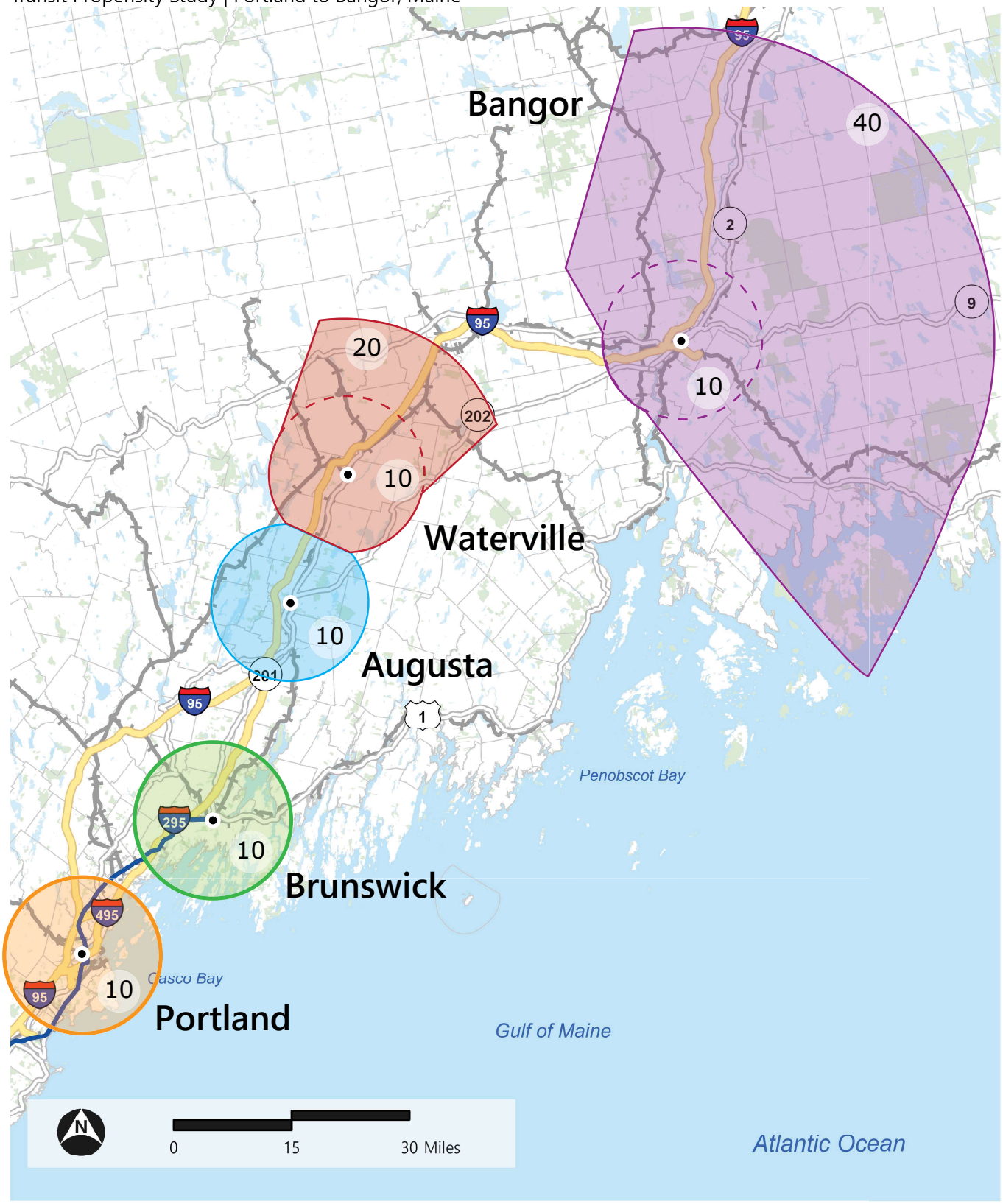
Within these more focused areas, additional historical population evaluation was conducted. Table 3-2 documents historical population counts and change from 2000 to 2020 by catchment area. These capture areas include 53% of the population in the overall study area with a similar growth of 3.5% between 2000 and 2020, as compared to the whole study area's rate of 3.9%.

[2] Trips to access end-of-the-line stations tend to be longer than average. On Tri-Rail (Miami's commuter rail service), 56 percent of trips were 5 miles or less, 30 percent were 6 to 10 miles, 10 percent were 11 to 20 miles, and 4 percent were 21 to 40 miles (Turnbull & Pratt, 2004, pp. 3-8).

[3] It is estimated that 50 percent of a park and ride lot's demand is generated within a 2.5-mile radius of the lot and an additional 35 percent come from a parabolic area extending 10 miles upstream of the lot (Parsons Brinckerhoff Quade & Douglas, Inc. (1995). Park-and-Ride Demand Estimation Study: Final Report and User's Manual. Seattle: King County Department of Metropolitan Services.).

Figure 3-4: Capture Areas

Transit Propensity Study | Portland to Bangor, Maine



Path: \\vhb.com\gis\proj\Portland\55607.01 Transit Propensity Study\Project\CensusAnalysis\CensusAnalysis.aprx (krasmussen, 12/2/2022)

Source: MEGIS, ACS 2016-2020

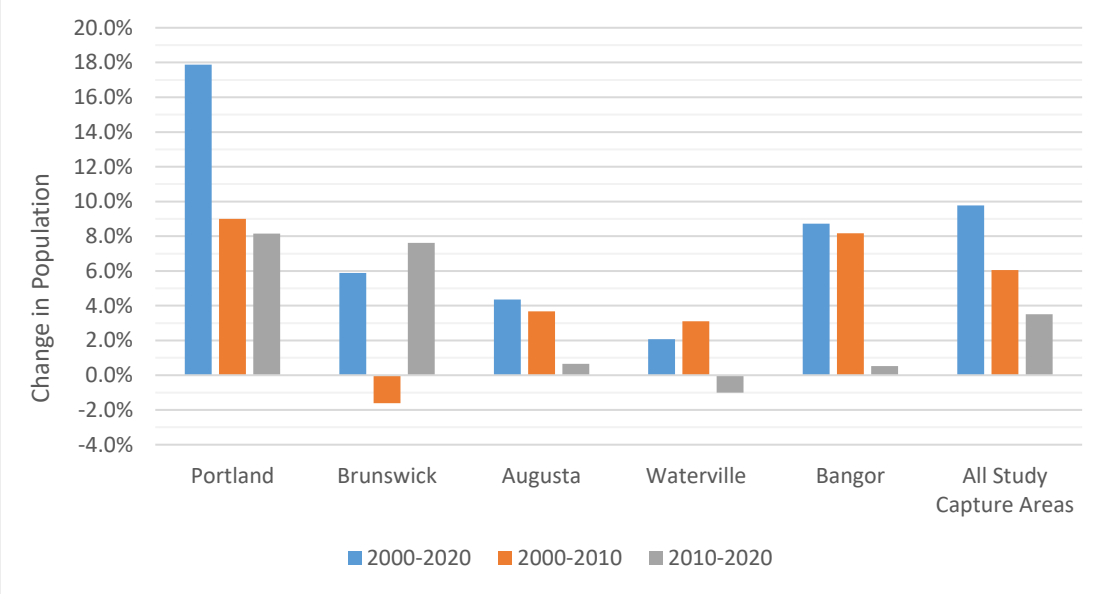
Table 3-2 Historical Population Growth (2000, 2010, and 2020)

	Population			Change	
	2000	2010	2020	2000-2020	2010-2020
Portland Area	140,013	152,625	165,055	17.9%	8.1%
Brunswick Area	52,623	51,775	55,718	5.9%	7.6%
Augusta Area	50,196	52,041	52,383	4.4%	0.7%
Waterville Area	66,655	68,730	68,038	2.1%	-1.0%
Bangor Area	142,951	154,624	155,424	8.7%	0.5%
All Study Capture Areas	452,438	479,795	496,618	9.8%	3.5%

Source: US Census Bureau – 2000, 2010, and 2020 Decennial Censuses

Figure 3-5 depicts the relative change in population for each Study capture area between 2000 to 2020, as well as from 2000 to 2010 and 2010 to 2020. The capture area around each municipality experienced an overall increase in residents from 2000 to 2020. The population surrounding Bangor grew at a rate of 9.8% from 2000 to 2020, approximately half of Portland's growth rate during the same period. The Portland, Augusta, and Bangor areas grew in population during both periods of ten years (2000 to 2010 and 2010 to 2020). Brunswick and Waterville experienced slight population decline from 2000 to 2010 and 2010 to 2020, respectively. Excluding Brunswick, all towns grew more rapidly between 2000 and 2010 than they did between 2010 and 2020.

Figure 3-5 Percentage Change in Population (2000-2020, 2000-2010, and 2010-2020)



Source: US Census Bureau – 2000, 2010, and 2020 Decennial Censuses

3.3 Travel Data

3.3.1 MaineDOT Traffic Volume Data

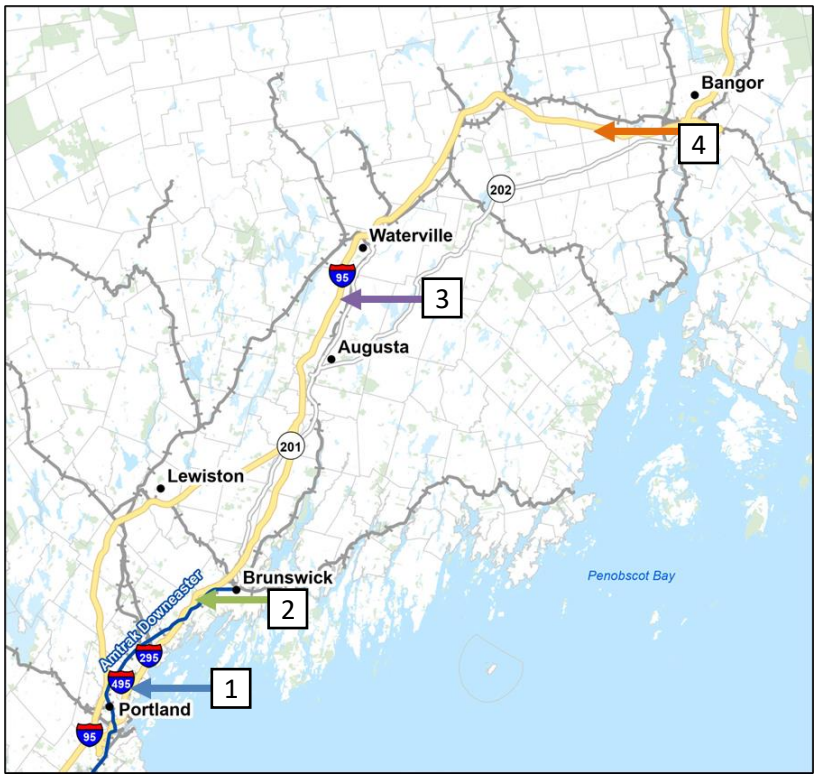
Average Annual Daily Traffic (AADT) data from 2021 along major roadways parallel to the study rail corridor, including I-95 and I-295, were summarized at key locations using MaineDOT publicly available traffic counts. For the purposes of this study, the AADT data were collected to use as an input to calibrate overall trip estimates in the corridor and consider trips within the corridor using parallel highways. AADT values are shown in Table 3-3 and approximate count locations are shown in Figure 3-6. These locations were selected to capture trips traveling between key cities within the study corridor, along I-95 and I-295.

Table 3-3 AADT Traffic Counts

Count Location Number/Direction	2021 AADT
Alignment 1 I-295 Southbound	23,130
Alignment 1 I-295 Northbound	24,260
Alignment 2 I-295 Southbound	22,890
Alignment 2 I-295 Northbound	22,800
Alignment 3 I-95 Southbound	15,650
Alignment 4 I-95 Southbound	10,340
Alignment 4 I-95 Northbound	10,220

Source: Maine Turnpike Traffic Count Data, accessed at https://www.maineturnpike.com/About-MTA/Traffic-Statistics.aspx

Figure 3-6 AADT Traffic Count Locations



3.3.2 Streetlight Trip Origin-Destination Data

Streetlight is a data platform that provides detailed multimodal trip data, including origin-destination data, trip volume data, and visualization tools. For this study, the origin-destination data was used to understand the magnitude of trips made within the study area, specifically between the cities of Portland, Brunswick, Augusta, Waterville, and Bangor near areas most likely to have an intercity transit stop due to higher densities, including those located along the potential rail alignments. Streetlight data captures trip information from Bluetooth and GPS signals. Using this data, origin areas, destination areas, and the path traveled can be identified. This data includes all modes traveling through the roadway network.

The data provided included all trips originating and/or ending within the study area. Trips used for the analysis included those that:

- Originated in the larger catchment areas in Figure 3-4 and ended within the destination catchment areas.
- Originated in the larger catchment areas in Figure 3-4 and left the study area south via I-95.
- Trips from south of the study area via I-95 and ended within the destination catchment areas in Figure 3-4.

Streetlight analyzes traffic flows between user defined geographic areas. For this analysis, zones were defined around the cities of Portland, Brunswick, Augusta, Waterville, and Bangor for origins and destinations so that only potential trips were captured for analysis. Origin capture areas are larger, assuming that potential riders could use a vehicle either driving or getting dropped off to access the service. Destination capture areas are smaller, assuming riders would have to walk or connect to a local shuttle or bus service to access their final destination.

It is estimated that 80% of park and ride users travel less than 10 miles. However, longer than average trips in the upstream direction tend to be made to access end-of-the-line stations[4]. Within the corridor of analysis, upstream is considered as to the northeast or away from Portland. The directional axes of capture areas are assumed to orient in the direction of the primary roadway network that would be used to access the central business district[5].

Origin capture areas for Portland, Brunswick, and Augusta are defined by a 10-mile radius from the center of each municipality. The origin capture area for Waterville is defined by 10-mile radius to the south and a 20-mile radius to the north. The extended capture area to the north is adopted on the basis of the relatively longer distance between Waterville and Bangor compared to other Study Area municipalities and ease of access via I-95. The origin capture area for Bangor consists of a 10-mile radius to the west and a 40-mile radius to the north, east, and south. Its orientation encompasses I-95, U.S. Route 2, U.S. Route 1A, and State Highway 9. These key highways are assumed to correlate with easier access to a Bangor station and thus draw more riders from adjacent areas. The 40-mile radius was used because Bangor would be a terminus of additional transit service and would result in a larger capture area than is typical at other stations in the corridor.

Destination capture areas were defined by a 1-mile radius from the area nearest the center of activity along the rail line in all five municipalities. These smaller destination-specific areas are a result of the assumption that at the endpoint of the trip, passengers will most likely not have access to a personal vehicle.

[4] Turnbull, K. F., & Pratt, R. H. (2004). TCRP Report 95: Chapter 3 Park-and-Ride/Pool. Washington: Transportation Research Board: p. 3-8.

[5] Spillar, R. J. (1997). Park-and-Ride Planning and Design Guidelines. New York: Parsons Brinckerhoff Quade and Douglas Inc.: p. 59.

3.3.3 Concord Coach Lines Bus Service

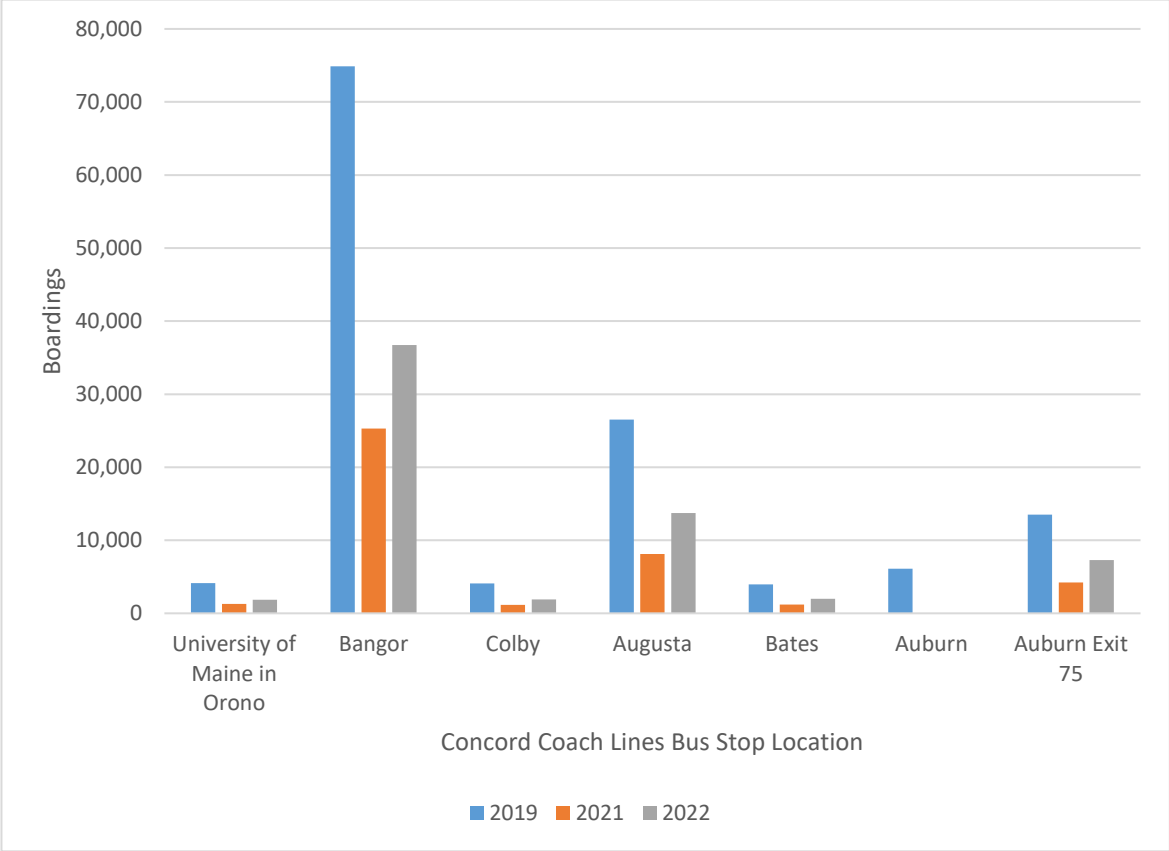
Concord Coach Lines operates bus service from Bangor to Augusta, Portland, and Boston. Currently, three Concord Coach buses per day make the trip from Bangor to Portland, with two of them stopping at Augusta. These buses also make stops at several Maine colleges during the school year. All of these buses continue through Portland to Boston, and one bus per hour travels from Portland to Boston. In 2019, the total ridership was over 130,000 within the corridor, averaging approximately 360 riders per day over a year, not considering seasonality and schedule changes. A summary of Concord Coach Lines bus trips between Bangor and Boston, including ticket costs, is provided in Table 3-4. The range in the price of ticket to Boston represents the two Boston destinations served, South Station and Logan Airport.

Table 3-4 Concord Coach Lines Trip Summary

Concord Coach Lines Bus	
Trip	Bangor to Portland to Boston
2019 Round Trips per Day	5
2022 Round Trips per Day	4
2022 Ticket Price	$30 (to Portland) $47-$50 (to Boston)
2019 Ridership	130,000

Boardings by Concord Coach Lines bus stop location in 2019, 2021, and 2022 are shown in Figure 3-7. Ridership on the line dropped during the beginning of the Covid-19 pandemic, and service was not offered from March through August 2020. While service returned in September 2020, ridership through December of the same year was minimal. Ridership numbers began to climb again in 2021, and available numbers for 2022 show a steady return towards pre-pandemic ridership.

Figure 3-7 Concord Coach Lines Annual Ridership – Maine Boardings by Stop Location



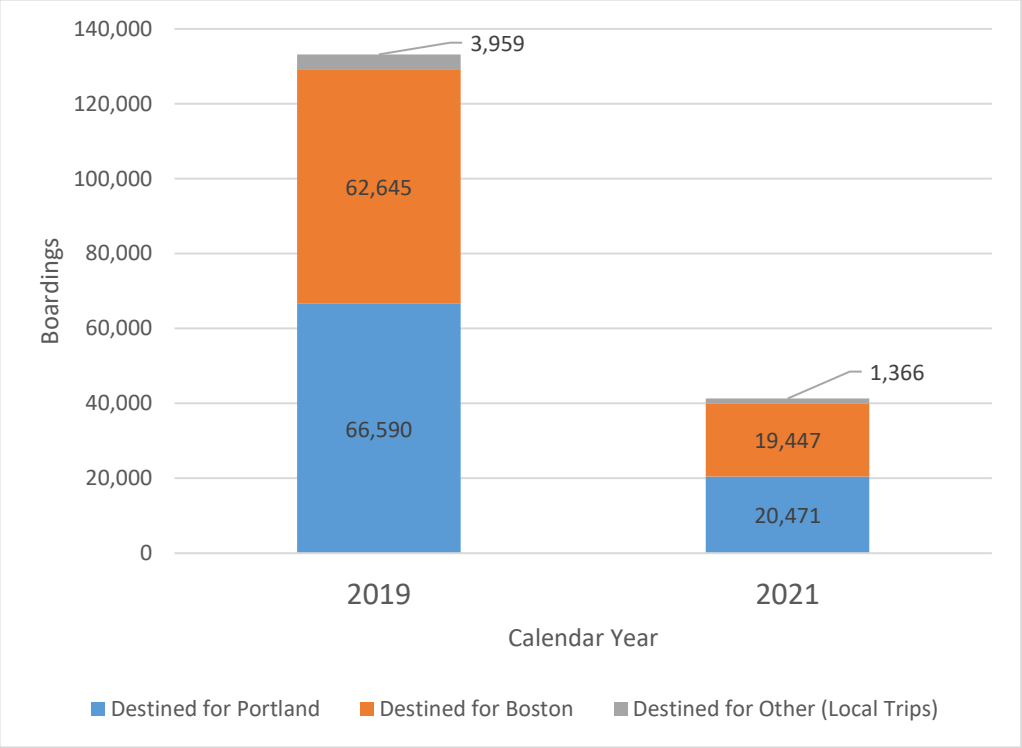
Source: Concord Coach Lines

Note: Ridership numbers for 2020 were not included due to service suspension and negligible ridership. 2021 and 2022 boardings at the Downtown Auburn location are absent due to suspension of service at the stop.

In 2019, nearly half of the boardings were in Bangor, with almost 20% in Augusta. In 2021, ridership had recovered to approximately 50% of 2019 ridership indicating demand for access in the corridor at these locations.

Figure 3-8 categorizes Concord Coach Lines boardings at Maine bus stops for calendar years 2019 and 2021 by destination. Passengers destined for Portland and Boston were relatively evenly split each year, with the slight majority of boardings going to Portland. In both years, passengers using the service for other travel within Maine were approximately 3 percent of total riders. Overwhelmingly, 2019 and 2021 Concord Coach Lines riders within the Portland to Bangor study corridor were generally using the transit option to travel long distances to relatively dense urban areas.

Figure 3-8 Concord Coach Lines Annual Ridership – Maine Boardings by Destination



Source: Concord Coach Lines

Note: Ridership numbers for 2020 were not included due to service suspension.

3.3.4 Concord Coach Lines Bus Service

Greyhound buses run from Bangor to Portland and continue on to Boston. One Greyhound bus per day makes the trip from Bangor to Boston. These buses also make stops at Waterville, Augusta, Bates College in Lewiston-Auburn, Portland, Wells, and Portsmouth, New Hampshire. A summary of Greyhound bus trips between Bangor and Boston, including ticket costs, is provided in Table 3-5. The range in the price of tickets is attributed to variation by day of the week.

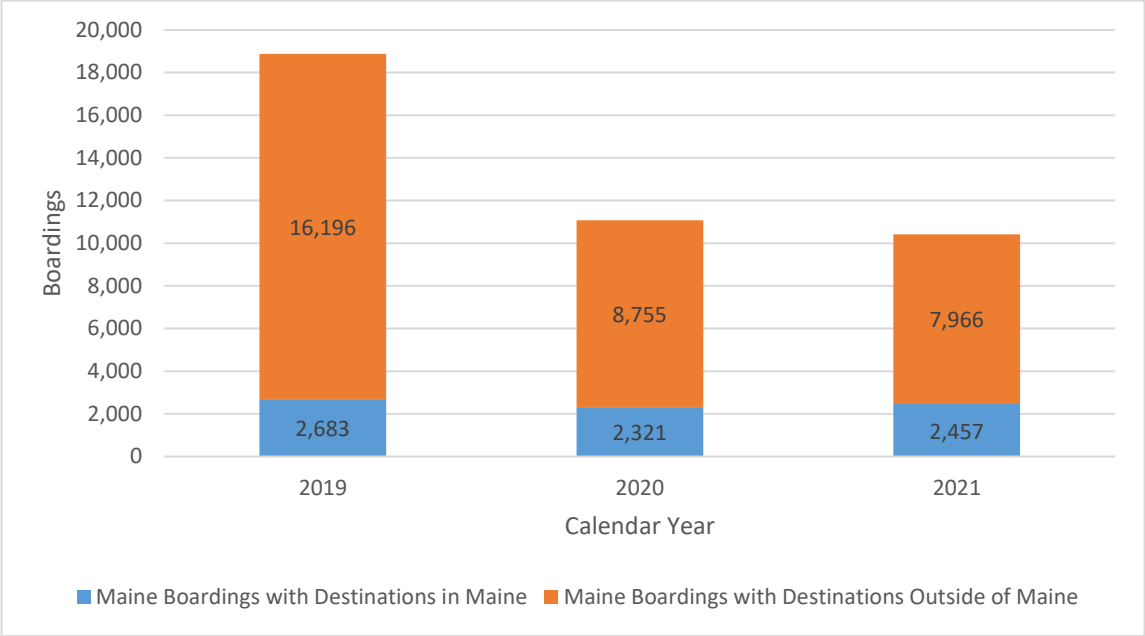
Table 3-5 Greyhound Trip Summary

Greyhound Bus	
Trip	Bangor to Portland to Boston
2019 Round Trips per Day	1
2022 Round Trips per Day	1
2022 Ticket Price	$15-$21 (to Portland) $32-$43 (to Boston)
2019 Ridership	19,000

Ridership on the line dropped during the beginning of the Covid-19 pandemic, though Greyhound never fully suspended service.

The values in Figure 3-9 reflect the total number of Maine Greyhound boardings from 2019 to 2021.

Figure 3-9 Greyhound Annual Ridership – Maine Boardings by Destination



Source: Greyhound

While the number of boardings that had destinations within Maine stayed relatively constant throughout Covid, the number of boardings that had destinations outside of Maine was almost halved from 2019 to 2020.

3.3.5 Downeaster Ridership Data

To better understand how passengers currently utilize Downeaster service, ridership data by train number, station, and station pairs was analyzed.

3.3.5.1 Historical Ridership Data

This section offers an overview of historical Downeaster ridership, including service improvements and route extensions that led to the high ridership experienced on the system prior to the Covid-19 pandemic.

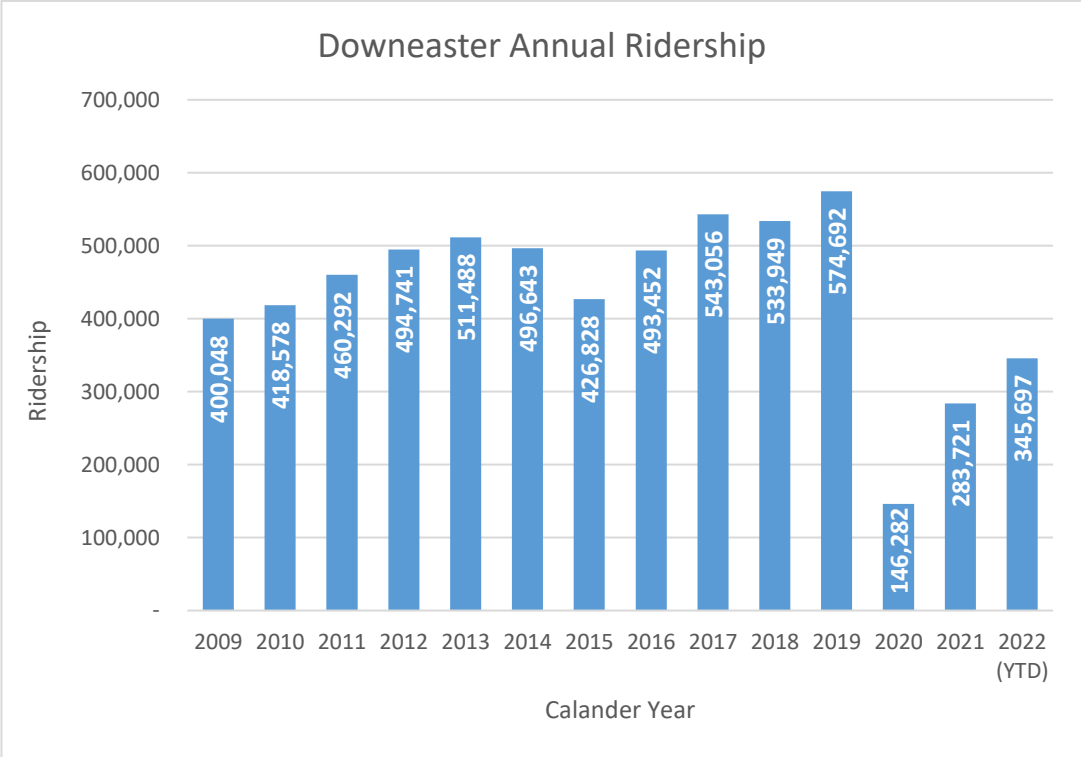
Downeaster service began in December of 2001, bringing service to a corridor that had not offered passenger service since 1965. With track improvements made in 2007 allowing an increase in maximum travel speed from 60 to 79 mph, and the addition of another daily round trip bringing the total to five, ridership increased significantly between 2007 and 2012.

Extended service to Freeport and Brunswick began in 2012. Ridership dipped slightly from 2013 to 2015 but continued to climb steadily to approximately 570,000 annual riders in 2019.

The Covid-19 pandemic led to a significant drop in ridership, which decreased approximately 75% from the 2019 annual ridership peak to approximately 140,000 annual riders in 2020. Service has continued to climb back to 2019 levels since 2020. Ridership in June-August 2022 was approximately 150,000, not far from the 165,000 riders on the Downeaster in June-August 2019.

Annual Downeaster ridership for calendar years 2009-2022 is shown in Figure 3-10.

Figure 3-10 Amtrak Downeaster Annual Ridership (2009-2022)



Source: NNEPRA Downeaster Monthly Ridership History, accessed at https://www.nnepra.com/wp-content/uploads/2020/06/2022-Ridership-Chart-Aug-2022.pdf

Note: The ridership value for 2022 is year-to-date (YTD), from January 2022-September 2022

3.3.5.2 Ridership Data by Train Number

The Downeaster offers five round trips per day every day of the week. During the week, the busiest southbound trains leave Brunswick at 4:30 am, and the busiest northbound trains depart Boston's North Station at 5:00 pm. Ridership on weekends is more evenly spread out in the northbound direction, with the 9:45 am and 4:50 pm trains having the highest ridership. Southbound weekend trips departing Brunswick at 7:00 am and at 12:20 pm have the highest ridership.

Average ridership by train number, direction, and time of week is provide in Figures 3-11 through 3-14. The ridership quantities reflect average ridership values from 2019.

Figure 3-11 Amtrak Downeaster Average Weekday Daily Ridership by Train (Northbound)

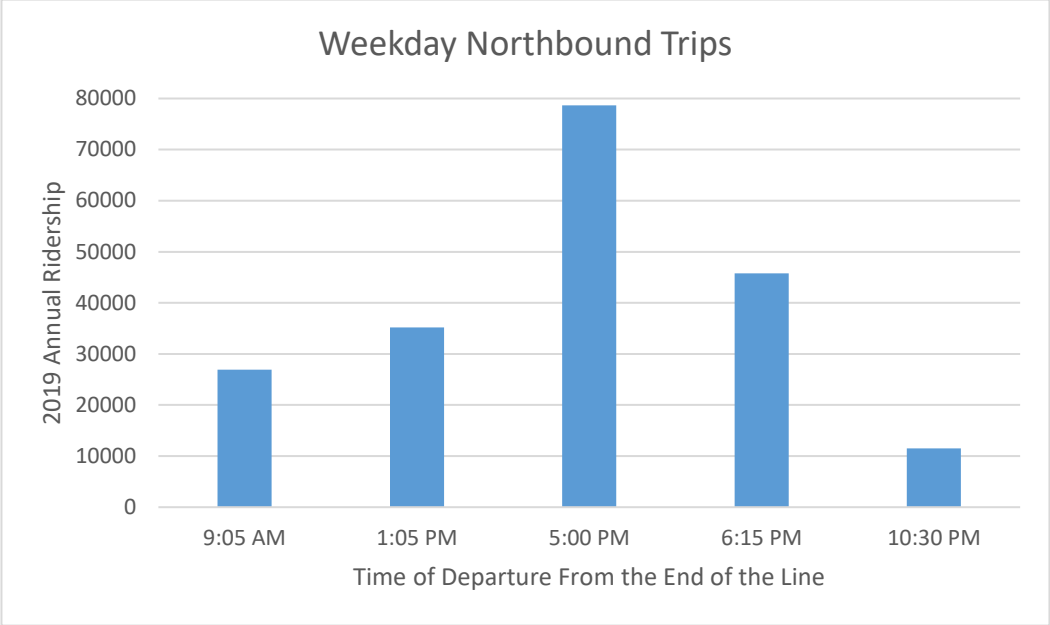


Figure 3-12 Amtrak Downeaster Average Weekend Daily Ridership by Train (Northbound)

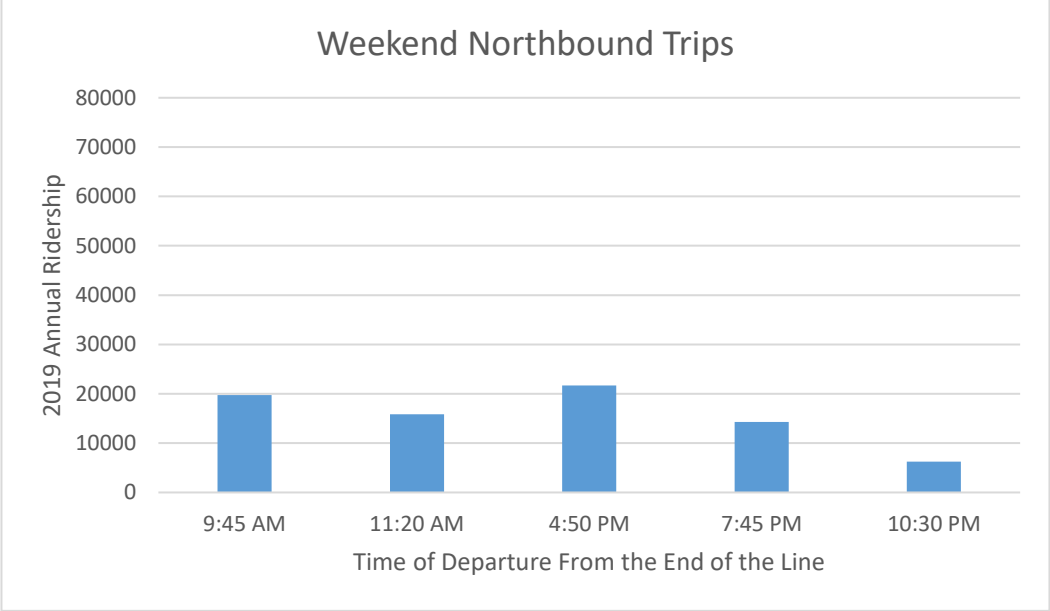


Figure 3-13 Amtrak Downeaster Average Weekday Daily Ridership by Train (Southbound)

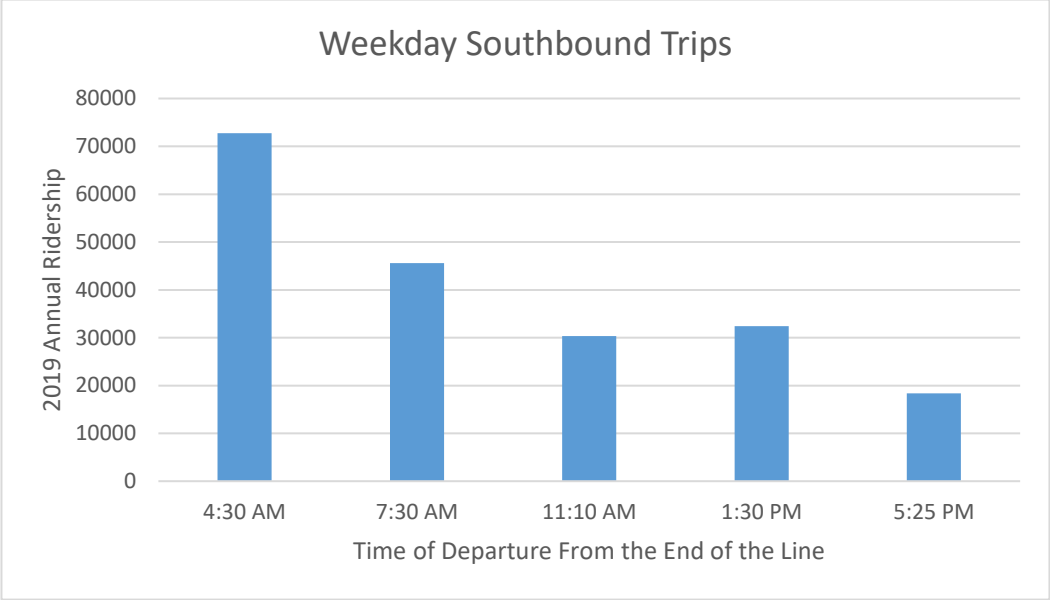
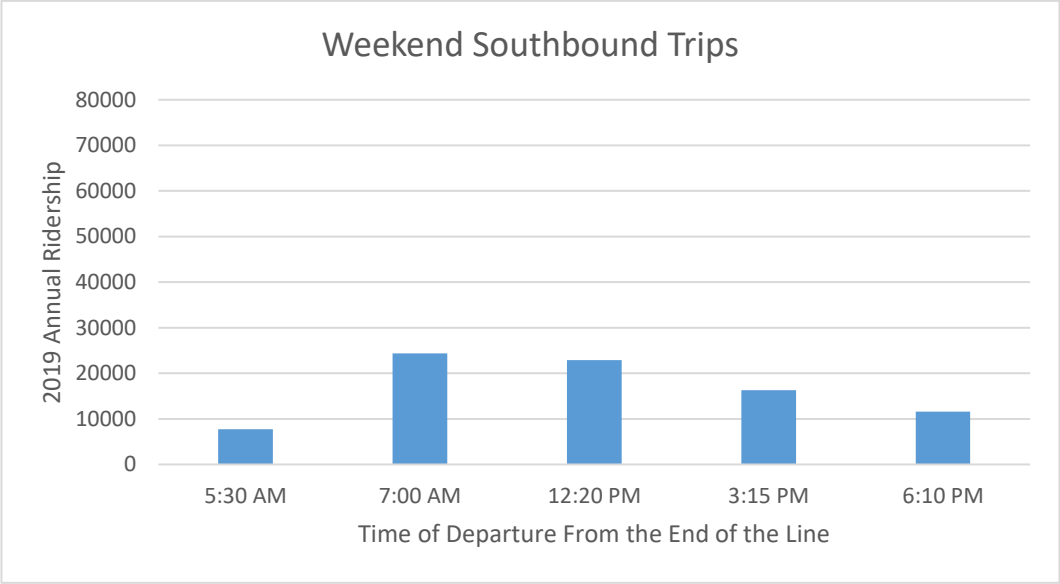


Figure 3-14 Amtrak Downeaster Average Weekend Daily Ridership by Train (Southbound)



On weekdays, the trips with the highest ridership correspond with a standard commuting schedule based on arrival in Boston around 8 am and departing Boston around 5 pm. On the weekend the most popular trips correspond with day trips to Maine or evening return trips to Maine in the northbound direction, and day trips to Boston or evening return trips to Boston. As potential service to Brunswick hopes to cater to event/overnight trips, these trips specifically would be important to replicate in the proposed schedule.

3.3.5.3 Ridership Data by Station

Table 3-6 shows the average monthly ridership by station at each stop on the existing Downeaster Amtrak service. The years compared are 2019 and 2021, chosen to provide a sense of both pre-Covid and current stop ridership conditions.

Table 3-6 Average Monthly Downeaster Ridership by Station (2019 and 2021)

	Average Monthly Ridership		Share Percentage	
	2019	2021	2019	2021
Brunswick	2,496	1,710	5.2%	7.3%
Freeport	942	708	2.0%	3.0%
Portland	6,789	4,036	14.3%	17.2%
Saco	646	608	1.4%	2.6%
Old Orchard Beach	2,191	1,296	4.6%	5.5%
Wells	2,452	1,163	5.2%	4.9%
Dover	2,593	1,246	5.5%	5.3%
Durham	2,533	1,327	5.3%	5.6%
Exeter	3,936	1,246	8.3%	5.3%
Haverhill	1,632	708	3.4%	3.0%
Woburn	562	368	1.2%	1.6%
Boston	20,765	9,114	43.7%	38.7%
Total	47,537	23,531	100.0%	100.0%

Source: Amtrak Downeaster Ridership by Station

In 2019, nearly half of all boardings were recorded at Boston's North Station, and the highest number of boardings at non-Boston stations were recorded at Portland and Exeter. The total number of boardings recorded in 2021 was approximately half that recorded in 2019. While the share of riders accessing service at each station stayed relatively constant, the share of boardings at Exeter and Boston decreased slightly, and the share of boardings at all other stations increased slightly.

3.3.5.4 Ridership Data between Station Pairs

Station pair data for Downeaster ridership was available for 2016. This data provided the annual magnitude of trips taken between station pairs at existing Downeaster stops. The station pair value for Brunswick and Portland was recorded as 2,720 riders and the station pair value for Brunswick and Boston was recorded as 17,580 riders. These values in combination with Downeaster boardings information was used in the analysis to determine a ratio of projected trips that began or terminated outside of the study area.

3.3.6 Travel Time

Estimated travel times and average speeds for existing travel options from Brunswick to Portland, Bangor to Portland, and Bangor to Boston are listed in Table 3-7. Travel times for the Greyhound Bus are longer than the Concord Coach Lines service primarily as a result of it making a greater number of stops along its journey. Routes between Augusta

and Portland, Maine varied slightly across modes. Personal vehicles were assumed to use I-295 in the estimate. On the same segment, Concord Coach Lines uses I-95 while Greyhound uses I-95 until Lewiston and then transfers to I-295. The average speed of the Amtrak Downeaster from Brunswick to Portland is 40 mph.

Table 3-7 Average Monthly Downeaster Ridership by Station (2019 and 2021)

	Personal Vehicle (Cars)	Average Speed (mph)	Concord Coach Lines Bus Service	Average Speed (mph)	Greyhound Bus Service	Average Speed (mph)	Amtrak Downeaster Service	Average Speed (mph)
Brunswick to Portland Peak Hour	32m	50	35m	50	-	-	44m	40
Brunswick to Portland Off-Peak Hour	30m	50	35m	50	-	-	44m	40
Bangor to Portland Peak Hour	1h 50m	70	2h 10m	60	2h 55m	50	-	-
Bangor to Portland Off-Peak Hour	1h 50m	70	2h 10m	60	2h 55m	50	-	-
Bangor to Boston Peak Hour	3h 30m – 3h 40m	70	4h 25m	50	5h 35m	40	-	-
Bangor to Boston Off-Peak Hour	3h 25m – 3h 30 m	70	4h 25m	50	5h 35m	40	-	-

Source: Microsoft Bing Maps, Greyhound.com, and ConcordCoachLines.com.

Note: Average speeds rounded to the nearest 10 mph.

4

TRANSIT PROPENSITY

4.1 Introduction

The goal of this analysis was to assess the potential for intercity and local trips that could shift to transit within the corridor between Portland and Bangor. The analysis provided an assessment of how people travel within the corridor and identified existing trips that could potentially be served instead by new or enhanced transit service. The analysis considered a potential future condition based on growth rates from the Maine Statewide Travel Demand model.

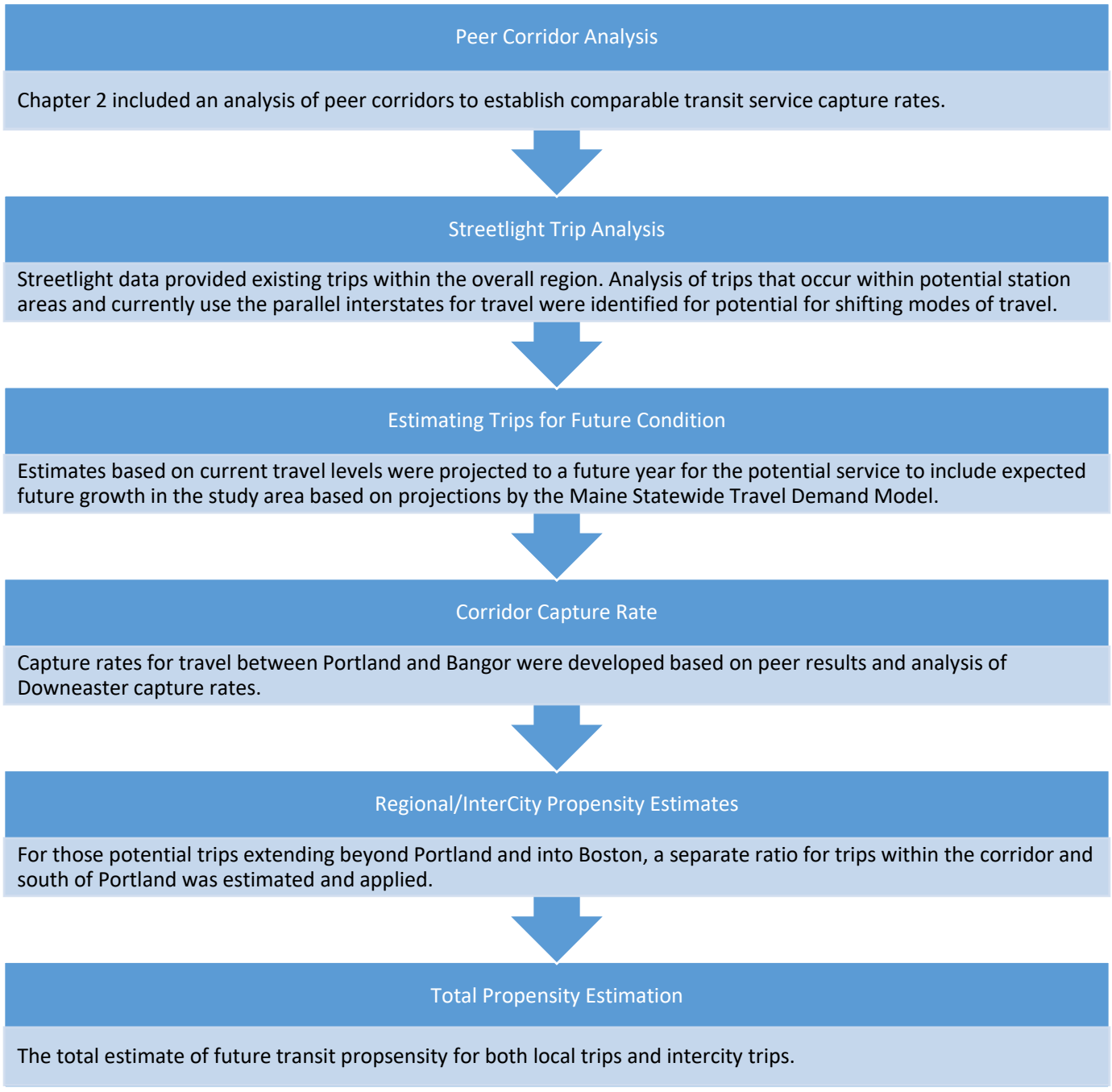
Bangor is approximately 100 miles north of the terminus of existing Downeaster service, Brunswick and 130 miles north of Portland. This corridor is connected primarily by I-295 and I-95. The transit propensity was estimated as a range of the existing trips made within this corridor that would be most likely to experience a modal shift to transit service if new transit service were available.

This transit propensity identification reflects the general potential for transit use based on trip patterns and similar capture rates within peer travel corridors and the Downeaster. Many variables would affect this propensity including alignment, frequency, vehicle type, travel time, station locations, population change, and other factors. These factors could increase or decrease potential transit propensity and future ridership estimates. If additional transit service is advanced for further evaluation in the future, more refined ridership modeling based on service, alignment, and specific station location would be required for detailed ridership estimates should the project pursue federal funding.

4.2 Methodology

The figure below provides an overview of the methodology used to estimate the potential for trips to shift within the corridor and for intercity trips. The chapter provides details about the analyses performed to develop the propensity estimates.

Figure 4-1 Transit Propensity Methodology



4.2.1 Peer Corridor Analysis

As described in Chapter 2, three peer services were identified to consider corridor capture rates:

- Amtrak Ethan Allen Express – Vermont and Eastern New York
- Amtrak Illinois Corridors – Illinois Zephyr and Carl Sandburg – Quincy to Chicago
- Amtrak Illinois Corridors – Illini, Saluki, and City of New Orleans – Carbondale to Chicago

These transit services, similar to the proposed transit service to Bangor, provide connections from a rural terminus to an urban core, as well as connections to additional Amtrak services at the urban core. The analysis was applied to the segments of these corridors that most closely resemble the proposed service to Bangor.

For each peer service, a capture rate percentage estimated based on the boardings for each segment and population of the service area. A summary of the applicable segments, 2019 boardings, and 2019 population for each peer study is presented in Table 4-1.

Table 4-1 Peer Study Area Boardings and Population (2019)

Peer Service	Segment Station Range	Average Daily Segment Boardings (2019)	Segment Municipality Populations (2019)	Capture Rate Percentage
Amtrak Ethan Allen Express Service	Rutland, VT-Schenectady, NY	140	127,586	0.109%
Amtrak Illinois Zephyr and Carl Sandburg Service	Quincy, IL-Chicago, IL	565	127,785	0.442%
Amtrak Illini, Saluki, and City of New Orleans Service	Carbondale, IL-Chicago IL	1,045	244,905	0.427%

The average of the three peer study capture rates is 0.326%. Applied to the study area populations around potential station areas, and escalated to 2040 based on provided growth rates, Table 4-2 shows estimate of trips in the area.

Table 4-2 Peer Service Capture Rate Transit Propensity Estimates

	Capture Rate %	Monthly Trips (2019)	Monthly Trips (2040)
Peer Rate	0.326%	6,600	7,200

4.2.2 Streetlight Trip Analysis

Based on the review of the existing trips and travel patterns, there are two types of trips that could be served by transit in this corridor:

- Local corridor trips between identified activity centers between Portland and Bangor
- Regional trips between the study corridor and south of Portland into Boston

Due to the different patterns and volumes of these different trips, different estimates for each were developed for the overall transit propensity in the corridor.

4.2.2.1 Local Corridor Trips

Existing trips were analyzed using Streetlight software. Based on the analysis of population and employment density, as well as the demographics that indicate higher propensity for transit, key origins and destinations were identified within the corridor. This included Augusta, Waterville, and Bangor as new potential service areas and Brunswick and Portland as areas with existing rail service.

Streetlight data[6] provides information for travel volumes and paths of travel. Based on the analysis of Average Annual Daily Traffic (AADT) on parallel highway corridors and trips between the activity centers, the trips considered as having the potential to shift from automobiles to transit had the following characteristics:

- Has an origin within the larger capture area around each major city in the study area (10-mile radius around Portland, Brunswick, and Augusta, 10/20-mile radius around Waterville, and the 10/40-mile radius around Bangor, as described in Chapter 3);
- Has a destination within the smaller capture area at the center of each major city in the study area (1-mile radius around Portland, Brunswick, Augusta, Waterville, and Bangor);
- Passes through AADT counting locations along I-295 or I-95 to account for parallel travel.

Trips that occur between these areas, excluding those between Brunswick and Portland that are already served by the Downeaster service, totaled 1,494,000 when escalated to 2040 using projected growth rates from the Maine State Travel Demand Model. The model provides projected growth rates on a county-to-county level, therefore different growth factors were applied to different city pair trips. Based on the current capture rate of Downeaster service for local service between Brunswick, Freeport, and Portland as well as these overall volumes, Table 4-3 shows the potential for transit trips between cities within the study area.

Table 4-3 Projected Streetlight Portland to Bangor Transit Propensity (2040)

	Total Trips	Potential Local Transit Trips (Low)	Potential Local Transit Trips (High)
Annually	1,494,000	10,350	12,650
Monthly	123,000	850	1,050

[6] Streetlight data included all trips from 2021, as the most recent year of complete trip data available. Comparison with previous years indicates that trip volumes in 2021 have mostly recovered from lower volumes experience in 2020. Traffic volume data from I-295 and I-95 were also collected during 2021.

4.2.2.2 Regional Trips

Based on analysis of travel data for existing trips and bus ridership, there is a significant desire to travel south of Portland, particularly on existing bus and rail services. To estimate the propensity for transit trips between the study corridor catchment areas, and destinations along the Downeaster corridor to Boston, the analysis considered Downeaster origin-destination data south of Portland, available bus service travel data, and Streetlight trip volumes leaving the study area south via I-95. Comparing volumes of these trip types with the trips taken within the corridor yielded a range of ratios for the proportion of regional trips to local ones for transit demand.

Table 4-4 shows the potential propensity for transit trips connecting from the study area to south of Portland based on these different ratios.

Table 4-4 Projected Streetlight Transit Propensity South of Portland (2040)

Ratio of Regional Trips to Local Trips	4.5	6.5
Annually	51,900	75,000
Monthly	4,300	6,200

Together, these provide a high and low range for potential transit trip demand for regional connections south of the study area.

4.2.3 Total Transit Propensity

Table 4-5 shows the total propensity for local trips within the corridor and those with demand to continue into the transit corridor south of Portland, including both local and regional trips.

Table 4-5 Total Projected Streetlight Transit Propensity (2040)

	Local Trips	Regional Trips	Total Trips
Annually	10,350 – 12,650	51,900 – 75,000	62,250 – 87,650
Monthly	850 – 1,050	4,300 – 6,200	5,150 – 7,250

Considering the two approaches to estimating transit propensity, applying peer capture rates from population and analysis of streetlight data, Table 4-6 summarizes the potential transit propensity in the corridor.

Table 4-6 Total Projected Transit Propensity (2040)

	Peer Corridor Analysis	Streetlight Trip Analysis
Annually	87,300	62,250 – 87,650
Monthly	7,200	5,150 – 7,250

The Streetlight analysis provided a more conservative future transit propensity estimate of 62,250 to 87,650 annually. These estimates are based on data averaged over the year, and do not consider seasonal changes in demand.

5 PLANNING LEVEL COST ESTIMATE

5.1 Introduction

Planning-level cost estimates were developed for two scenarios of new or enhanced transit service in the Portland to Bangor, Maine corridor. A conceptual capital cost estimate was derived for railroad infrastructure improvements necessary to support the extension of passenger rail service to Bangor. An operating cost estimate was developed for a new commuter bus service between Portland and Bangor. No field visits were conducted as part of this effort. Potential service unknowns not factored into the estimates included layover space, vehicles, property acquisition, parking, and station buildings or stop shelters. A detailed cost estimate would be required as part of a future analysis if an alternative is selected for further study.

5.2 Cost Estimate for Rail Service

A high-level cost estimate for a rail corridor investment project between Portland and Bangor was developed for a rail service transit alternative. The magnitude of the costs associated with implementing a future passenger service depends upon the relative condition of the existing assets as well as ability to potentially expand and install multiple tracks to support all proposed operations, both passenger and freight. Inspection of the existing railroad infrastructure was not performed as part of this study and would require further evaluation as part of a more comprehensive cost evaluation in the future.

Cost estimates assume that locations where there is an existing active freight rail service would have a lower capital cost per mile to be improved to support passenger rail service than corridors that have been out of service for long periods of time or where the right of way is constrained.

This analysis assumed a range to account for various rail alignment options that could be pursued if an initiative in the corridor is advanced. Cost estimates for two potential alignments using existing rail infrastructure connecting Portland and Bangor were estimated. The first alignment would connect Lewiston, Waterville, and Bangor along the active CSX Freight Maine Line (FML) corridor. This alignment would potentially extend the potential passenger rail corridor between Portland and Lewiston currently being investigated as part of the Lewiston-Auburn Passenger Rail study. The second alignment would connect Brunswick, Augusta, Waterville, and Bangor along the less active or inactive Lower Road and East Augusta Running Track corridors, joining the FML corridor at Waterville. This alignment would extend the existing Amtrak Downeaster service from Brunswick. A map of the two alignments with associated corridors and unit costs per mile are shown in Figure 5-1.

Ranges of conceptual per mile unit costs for rail service expansion to Bangor were developed using data available from similar railroad infrastructure improvement projects, the MassDOT Knowledge Corridor – Restore Vermonter project between Springfield and East Northfield, Massachusetts and the South Coast Rail project between Boston and southeastern Massachusetts. A cost factor of $3.5M to $5.3M per mile was used to project cost ranges for infrastructure improvements along active corridors and a cost factor of $8.5M to $12.0M per mile was used for improvements along less active or inactive corridors. Station platform costs were based on recent MaineDOT costs for platforms installed at Freeport and Brunswick. Costs were escalated to 2022 dollars. The cost estimate assumed two platforms at each station with a cost factor of $2.5M per station. CSX has indicated that they will be installing Positive Train Control (PTC); therefore, it was assumed that a signal system would not need to be installed on the FML. A summary of the cost estimate for each rail alignment is documented in Table 5-1.

Figure 5-1: Estimated Cost Per Mile by Railroad Segment

Transit Propensity Study | Portland to Bangor, Maine

Amtrak Downeaster

Railroad

Town Boundaries

Interstate Route

State/US Route

Source: MEGIS, ACS 2016-2020

Table 5-1 Summary of Potential Rail Alignment Cost Estimates

Alignment	Approximate Length	Low Estimate	High Estimate
Downeaster Extension from Brunswick	100 miles	$628M	$902M
L-A Extension from Lewiston	100 miles	$375M	$538M

5.3 Cost Estimate for Bus Service

A high-level estimate for operating costs associated with a new commuter bus in the Portland to Bangor corridor was developed. Two potential bus trips were assessed as part of the cost estimate, Bangor to Brunswick (Route 1) and Bangor to Portland (Route 2). Both were routed along I-95 to I-295 traveling south from Bangor. Route 1 is approximately 109 miles one-way with an estimated travel time of 2 hours including stops. Route 2 is approximately 133 miles one-way with an estimated travel time of 2 hours and 15 minutes including stops. Both trips were assumed to operate similarly to the current Downeaster schedule, five times a day for 365 days a year.

The average operating expense per revenue mile and revenue hour for commuter bus agencies in the Northeast region were obtained from the National Transit Database (NTD) and used to calculate a range of potential operating cost for each bus route. In 2020, the average operating expense per revenue hour was $130 and the average operating expense per revenue mile was $4.58. These unit costs were used along with an average of 5 round trips per day to estimate a range of potential operating costs.

An inflation factor was applied to each estimate to account for inflation between 2020 and 2022.[7] Table 5-2 shows the resulting estimated ranges of annual operating costs for potential bus service from Bangor to Brunswick and Bangor to Portland.

Table 5-2 Commuter Bus Annual Operating Cost Estimates

Route	Low	High
Route 1 (Bangor to Brunswick)	$1,100,000	$2,100,000
Route 2 (Bangor to Portland)	$1,200,000	$2,500,000

[7] 1.14% Bureau of Labor Statistics CPI Inflation Calculator (https://www.bls.gov/data/inflation_calculator.htm).

6

CONSIDERATIONS & NEXT STEPS

This goal of this study was to identify the overall propensity for transit use in the Bangor to Portland corridor. At this early phase of project planning the study focused on the possible intercity service absent specific details on mode, alignment, stations/stops, and service frequency. Given the wide range of potential use of transit service due to these variables that contribute to travel demand, rather than predicting future ridership this assignment was intended to identify a reasonable range of demand that can be expected.

The total volume of trips potentially served by new or enhanced transit service in the Bangor to Portland corridor is estimated to be relatively modest at approximately 5,150 – 7,250 per month. Factors which could influence these propensity estimates include:

- Service plan and frequency
- Connection to existing Downeaster service
- Enhancement of existing bus service
- Travel time of the service
- Attractiveness of alternative modes, such as levels of congestion, airline prices
- Changes to the anticipated growth volumes and development in the corridor activity centers
- Fares
- Station/stop locations

Transit demand is but one factor that decision-makers consider when making transit investment decisions. Other considerations can include priorities such as cost, supporting higher density transit-oriented development, providing for additional alternatives in travel, and encouraging more sustainable and equitable modes of travel. In determining

the potential for enhancing transit service in this corridor it will therefore be important to define what constitutes success in this study area in terms of ridership, financial performance, and regional benefits.

If there is interest in pursuing transit enhancements in this corridor given this amount of potential propensity, future efforts would require evaluation of various factors necessary to refine the definition of the service such as alignment, stations/stops, vehicle type, integration/interface with Amtrak Downeaster service and existing intercity bus services, operating frequency/headings, capital costs, operating costs, fare/revenues, environmental impacts, funding, and financial considerations.