MULTIMODAL NORFOLK

TRANSIT SYSTEM REDESIGN

Transit Concepts Report

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For THE CITY OF NORFOLK

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1 Introduction

Introduction

What is Multimodal Norfolk

The City of Norfolk is developing a Multimodal Transportation Master Plan to help define the direction that the City's transportation system will take over the coming years. This Plan will provide the framework for both large and small transportation decisions about projects, priorities, coordinated planning with respect to land use decisions, public/private initiatives, other infrastructure projects, and more.

What is the Transit System Redesign?

As part of Multimodal Norfolk, the City is studying a full redesign of the public transportation system. This study will evaluate and recommend important policies related to transit funding and stop spacing, and particularly recommend how and where transit services should be provided in the city. As part of the redesign many types of transit services will be considered, including traditional fixed route services and on-demand options.

What is the Purpose of this Report?

The City has already completed an initial round of analysis and engagement around understanding the existing system and asking the public about the overall goals for transit. In February, the City published a Choices Report, held four public meetings, and invited feedback through a paper and online survey about the transit goals in Norfolk.

Using feedback from the public and the assessment of the existing system in the Choices Report, the study team has developed two different concepts of what transit in Norfolk could look like. This report describes those two concepts, their outcomes, and the goals that inform their design.

The two concepts differ in the degree to which they emphasize different goals for transit. These concepts represent a spectrum of possibilities and they are not intended to be an either/or proposition. By showing the public, stakeholders, and decision-makers the range of possibilities, the City is asking the public to give an informed response about how they would balance these two goals. This Concepts Report begins the next round of engagement and thinking about how to redesign transit in Norfolk.

Ridership and Coverage Goals are in Conflict

Ridership and coverage goals conflict. Within a fixed budget, if a transit agency wants to do more of one, it must do less of the other.

Consider the fictional town in Figure 1. The little dots indicate dwellings and commercial buildings and other land uses. The lines indicate roads. As in many towns, most activity is concentrated around a few roads. A transit agency pursuing only ridership would run all its service on the main streets because many people are nearby and buses can run direct routes. A high ridership network allocates frequent service to areas with favorable urban development patterns, forming a connected network. This would result in a network like the one at top-right. If the transit agency were pursuing only coverage, it would spread out so that every street had some service, as in the network at top-left. All routes would then be infrequent, even on the main roads. These two scenarios require the same number of buses and cost the same amount to operate, but deliver very different outcomes. To run buses at higher frequency on the main roads, neighborhood streets will receive less coverage, and vice versa. An agency can pursue ridership and provide coverage within the same budget, but not with the same dollar. The more it does of one, the less it does of the other. These illustrations also show a relationship between coverage and complexity. Networks offering high levels of coverage—a bus running down every street—are naturally more complex. The choice between maximizing ridership and maximizing coverage is not binary. All transit agencies spend some portion of their budget pursuing each type of goal. A particularly clear way for cities and transit agencies to set a policy balancing ridership and coverage goals is to decide what percentage of their service budget should be spent in pursuit of each. The "right" balance of ridership and coverage goals is different in every community. It can also change over time as the values and ambitions of a community change.

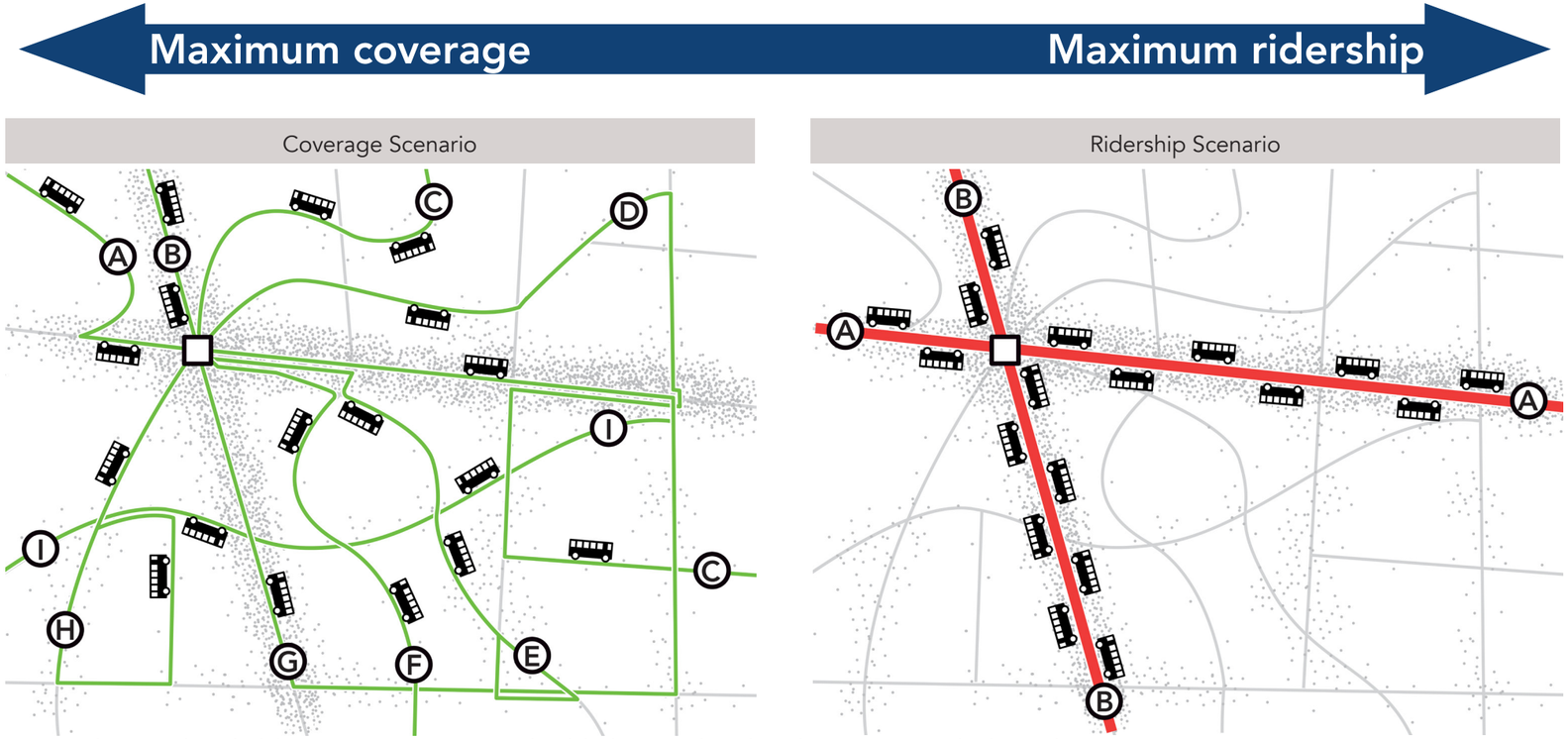


Figure 1: The network on the left is prioritizing coverage goals, while the network on the right is prioritizing ridership goals.

Round 1 Survey Results

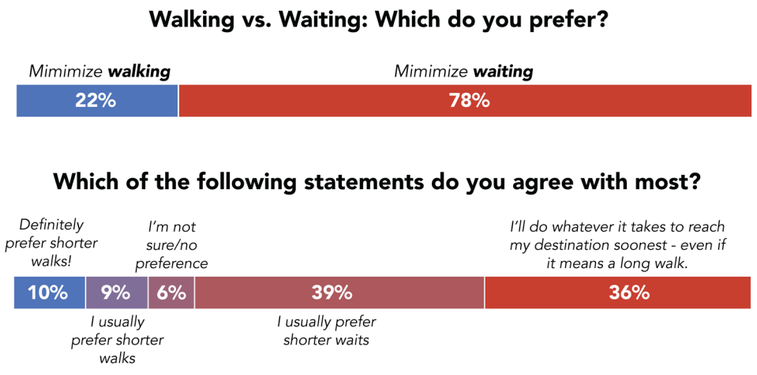
Survey Overview

To better understand the transit values of Norfolk residents, we surveyed bus riders and the public on several questions regarding the trade-offs discussed in the Choices Report. The survey received 262 responses, mostly online, due to COVID-19, although a few responses were collected in-person before the state of emergency was declared. While online surveys have higher response rates from people who are white and higher-income, responses in this survey were actually fairly similar across all demographic subgroups, showing a strong preference for less waiting time and a more frequent network. Any differences by respondent demographic is noted.

Walking vs. Waiting

As discussed above, transit services can be spread out on more streets, which means shorter walks to buses that come less often, as in the High Coverage scenario. Conversely, transit services could be more concentrated on a few streets, which can mean longer walks to buses that come more often, as in the High Ridership scenario. We asked respondents how they felt about this trade-off. Overall, a significant majority (78%) chose to "Minimize waiting: Walk farther, but have a shorter wait for your bus", while 22% chose "Minimize walking: Walk a shorter distance, but wait longer for your bus". See Figure 2 for results.

Figure 2: "Walking vs. Waiting" Survey Results



While there was variation, at least two-thirds of respondents in all sub-groups wanted to minimize waiting. Older respondents agreed, with 73% of those over 65 and 75% of those aged 55 to 64 favoring shorter wait times. Respondents across all income groups favored minimizing waiting times, including 67% of those in households earning under $15,000. Minority respondents agreed as well, with 78% of Hispanic/Latinx and 71% of African Americans favoring shorter wait times.

We also asked participants which statement most clearly aligned with their walking vs. waiting values. As shown in Figure 3, 75% said they preferred short waits and half of those preferred short waits even if it came with a longer walk. Conversely, only 20% would try to walk less even if it involved a longer wait.

This strong preference towards a system that gets people to their destination faster was apparent across all subgroups:

- **Race:** 68% of African Americans, and 78% Latinx/Hispanic
- **Age:** 74% of those over 65, 70% of those aged 45 to 54 and 88% of those aged 18-34.
- **Gender:** 71% of women, 84% of men
- **Household Income:** 64% of those in households earning less than $15,000, 79% of those in households earning between $30,000 and $49,999, 83% of those in households earning above $75,000 and 72% of those who preferred not to disclose their household income.
- **Frequent Riders:** Among those who currently use local transit more than 15 days in a typical month, 78% preferred waiting less.
- **Non-riders** indicate that they would strongly prefer shorter waits (84%).
- **Para-Transit Users:** Among those who used paratransit, 72% preferred waiting less even if it meant a longer walk.

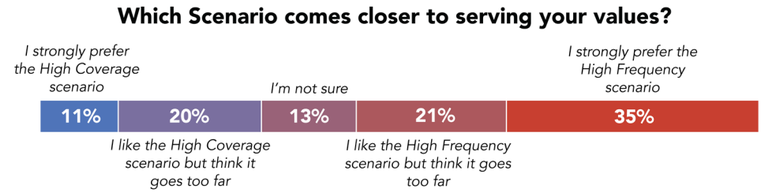
While there certainly is some variation among subgroups, there is a strong preference in these responses for less waiting, even if it means walking a bit more.

Ridership vs. Coverage Scenarios

The Walking s. Waiting is an important, but abstract trade-off. To provide a more concrete idea of what the trade-off might mean in practice, we provided two contrasting illustrative networks that show what service might actually look like with these trade-offs.

Next, we asked respondents which of the two scenarios they preferred. Overall, 56% preferred the High Frequency scenario while 31% preferred the high coverage one, with 13% saying they weren't sure. See Figure 3. Responses to this question had a lot more variability and uncertainty.

Figure 3: Ridership vs. Coverage Scenarios



- **Race:** While 66% of Hispanic/Latinx respondents and 59% of White respondents preferred the High Ridership scenario, that dropped to 36% among African American respondents, who were more divided, with 30% preferring the High Coverage scenario and 34% not being sure. This undecided rate was the third highest of any subgroup, after those aged 18-24 (38%) and those in households earning under $15,000 a year (36%).
- **Income:** Support for the High Frequency scenario was above 50% in all household income brackets over $25,000, and over 40% for those under $15,000 and those $15,000 to $24,999.
- **Ride Frequency:** Among riders taking more than 15 days per month in a typical month, 41% preferred the High Frequency scenario and 32% were unsure, while 56% of those who used transit between 5 and 15 days a month and 72% of those who used paratransit support the High Frequency scenario. Of non-riders, 62% prefer the High Frequency scenario.
- **Age:** At least 50% of respondents across all age groups preferred the High Frequency scenario except those in the 18-24 age group, who preferred the High Coverage scenario 38% to 25%, with 38% being unsure. The 18-24 age group was the only demographic across age, race, income or gender that did not prefer the higher ridership option, though the high undecided rate again suggests more outreach might help more people settle on a preference.

Though each group has a relatively small sample size, which reduces the confidence in any one subgroup, outreach to these communities might help them be able to settle on a preference.

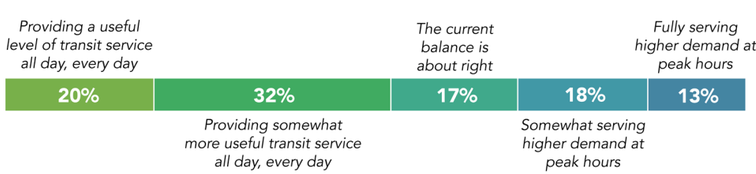
Round 1 Survey Results

Peak vs. All-Day Service

Lastly, we asked about the balance between prioritizing peak service and all-day service. Demand for transit service tends to be higher during weekday mornings and evenings, so HRT providing more service reduces crowding and waiting times for more people. However, this reduces the budget that can be spent on service at other times, such as midday, evenings and weekends. Further, it's expensive to have buses and drivers in service for just a few hours a day or to have to work a split shift.

On a scale of 1 to 5, we asked whether HRT should fully serve higher demand at rush hour, provide a useful level of service all day every day, or somewhere in the middle, with the current balance. See Figure 4.

Figure 4: Peak vs. All-Day



Overall, just over half of respondents preferred shifting more service to a consistent all-day schedule, while just under a third preferred more rush hour-oriented service and the remainder thought the current balance was about right.

- **Race:** White respondents closely mirrored overall response. African Americans were even more likely to prefer all day service, with 61% preferring more all-day service and only 23% preferring more rush hour service.
- **Frequent Riders:** Of those who rode between 5 and 15 days in a typical month 71% preferred more all-day service, as did 63% of those who rode more than 15 days.
- **Gender:** Women most preferred more all-day service, at 61%, to 25% who preferred more rush hour service, while for men that was 42% to 36%
- **Age:** Among all age brackets from 35 years old and up at least half of respondents preferred more all-day service, while at least 40% of those under 35 years old preferred shifting to more all-day service.
- **Income:** There was also broad support for more all-day service across income groups, from 76% of those in households earning under $15,000, 63% in households between $15,000 and $24,999, 53% in those from $25,000 to $49,999 and over half of those from households earning more than $75,000. However, among the $50,000 to $74,999 income group, which contains the median household income for Hampton Roads, only 30% preferred more all-day service compared to 44% who preferred more rush hour service, which may reflect a higher proportion of 9-to-5 jobs in this middle-income group.

Stakeholder Responses

In January, the team engaged 22 Norfolk stakeholders in a transit planning exercise where they were asked to design a system for a fictional city using limited resources. Participants divided into tables and each discussed their values and created independent maps. At the end of the exercise, they were all asked to decide which network would best meet various coverage and ridership goals and serve different parts of the city.

Stakeholders were also asked about their values. When asked about the walking vs. waiting trade-off, 57% selected "whatever gets me there soonest" and 33% selected "longer walk for a shorter wait", while only 10% selected "shorter walk for a longer wait".

When asked about how best to balance ridership and coverage goals, 48% selected "shift a bit towards higher frequencies/ridership" and 43% selected "shift a lot towards higher frequencies/ridership". Only 10% suggested shifting towards coverage goals.

When asked about how best to balance peak vs. all-day needs, 79% of respondents preferred shifting peak service to all-day service (37% of those favored some shift, 26% of those preferred a larger shift and 16% of those said that service should be constant, with no extra service at peaks). A further 16% said that the current peak vs. all-day balace was about right and 5% said that the peaks needed more service.

Overall, transit planning trade-offs proved challenging for the group. At the end of the exercise, nearly all respondents (84%) agreed that the excercise was "hard" or "very hard".

What are the outcomes of each concept?

The major outcomes of each concept are described in Chapters 2 and 3, but in general the concepts change proximity to service and the access provided by transit (see Figure 5 and Figure 6) in the following ways:

Compared to the Existing Network, the **Coverage Concept**

- Keeps the number of jobs the average resident can reach by transit in 45 minutes about the same.
- Keeps the number of people who can reach the average job location in 45 minutes about the same.
- Maintains the percent of people near frequent transit service at 22% and the percent of jobs near frequent transit service at 31%.
- Keeps the number of people and jobs near any transit service about the same.

Compared to the Existing Network, the **Ridership Concept**

- Increases by 35% the number of jobs the average resident can reach by transit in 45 minutes. That means the average resident would be able to reach about 11,000 more jobs in 45 minutes.
- Increases by 36% the number of people who can reach the average job location in 45 minutes.
- Dramatically increases the percent of people near frequent transit service from 22% to 85%, and increases the percent of jobs near frequent transit service from 31% to 85%.
- Reduces the percent of people within a 1/4 mile of transit, from 99% to 95%. Reduces the percent of jobs that are within a 1/4 mile of any transit from 96% to 89%.

Figure 5: Population and Jobs Acesssible Within 45 Minutes

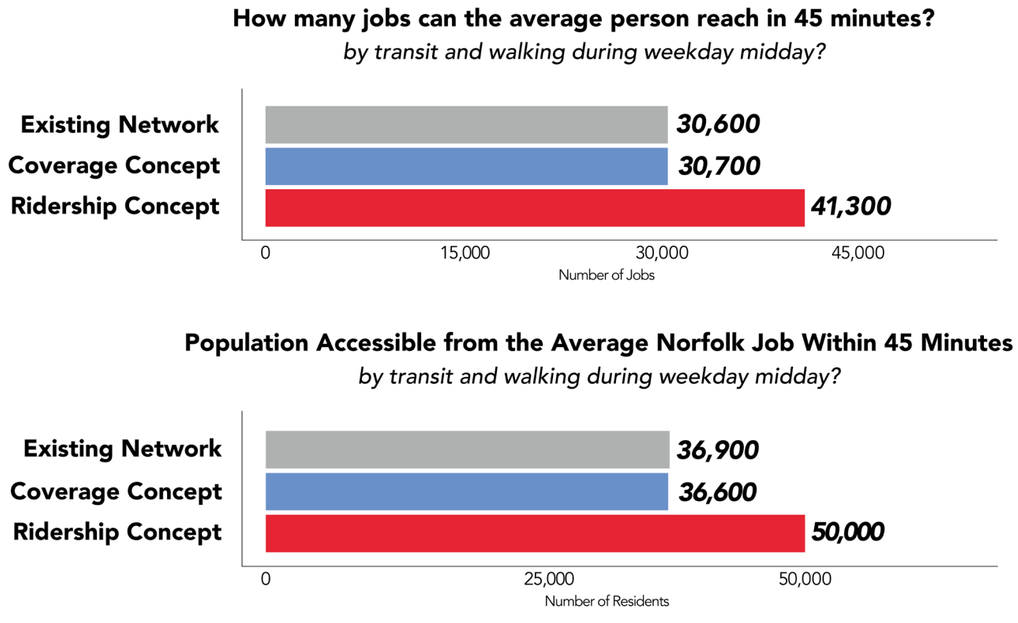
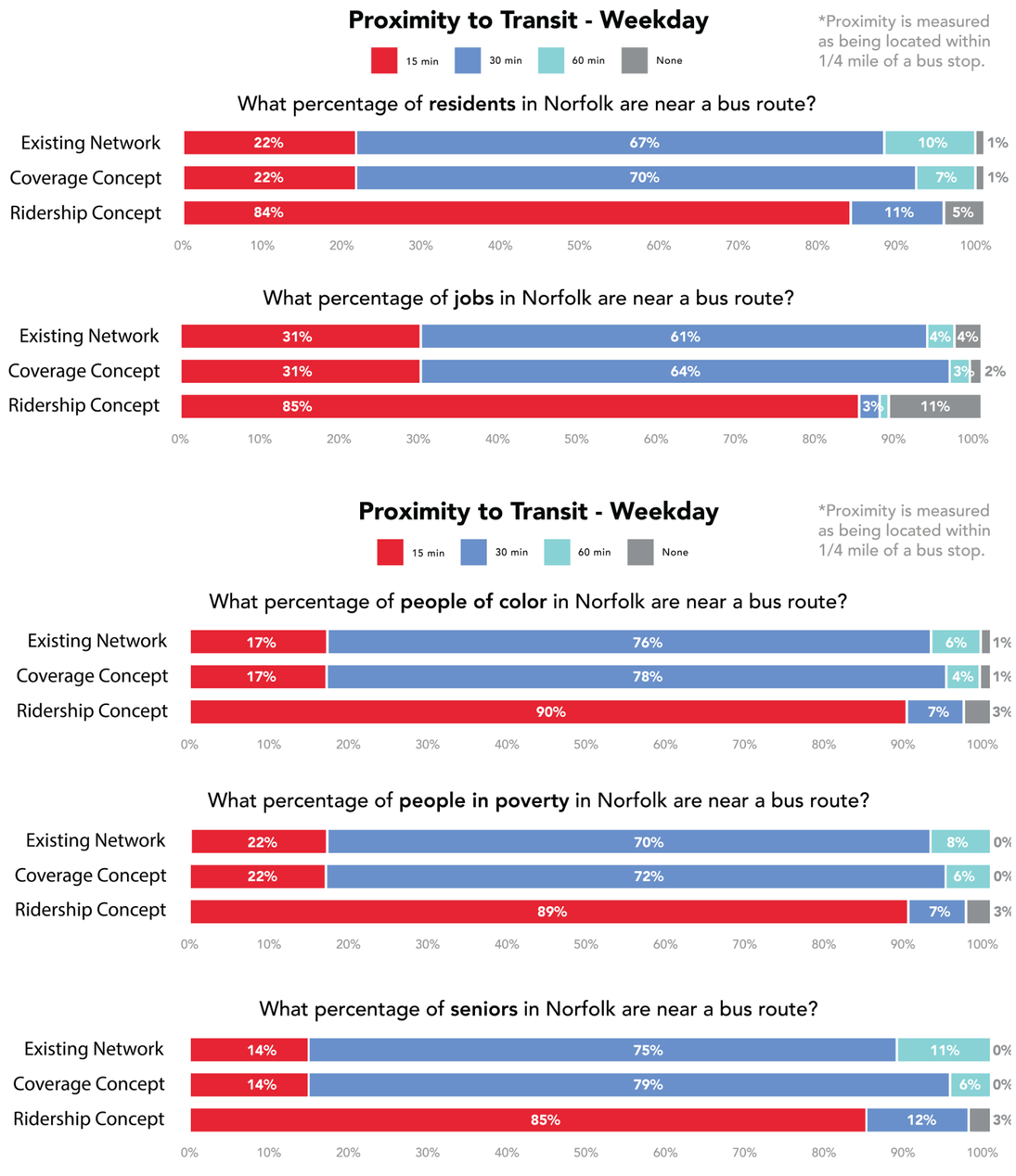


Figure 6: Weekday Proximity to Transit



What can I do?

How to use this Report?

This Concepts Report shows two different ways that transit could be designed for Norfolk in the future. To assess these concepts and how they fit your goals for transit, we suggest you:

- Consider the Ridership-Coverage trade-off described on page 4 and consider the other trade-offs described in the Choices Report.
- When looking at the concept maps starting on page 12, find the places you care about and note the nearby routes and their frequencies (as indicated by the color). Route numbers in the concept may not match existing route numbers.
- Consider how all the routes connect various parts of the city. Remember that no bus network can provide direct service to and from every origin and destination, so look at how routes connect with each other. Remember, where two red routes cross, that means frequency is high, so the connection will be easy.
- Frequencies (how often) and spans (how long) of every route in the concepts can be found in the tables starting on page 16. This tells you when the route(s) you care about run and at what frequencies.
- If you care about proximity to transit, look at the charts beginning on page 23, which show how many people and jobs are near any transit service and near frequent service.
- For travel times in each concept, look at the maps of travel time change starting on page 25.
- For more information about how the two concepts would affect access to jobs, look at the job access maps starting on page 29.

What is in the rest of this report?

In Chapter 2, we describe the two concepts and compare them to the Existing Network.

In Chapter 3, we review the outcomes of the two conceptual networks, including proximity to transit, and access to opportunity by people of different demographics.

In Chapter 4, we describe the next steps and engagement opportunities.

Appendix A provides provides additional maps that show travel time change for multiple locations around the city.

What's next?

This Concepts Report is meant to help the general public, existing transit riders, stakeholder, and elected officials understand the important transit-planning trade-off for Norfolk. We will be conducting surveys and other outreach efforts during the summer. We will ask you key questions about where along the spectrum of Ridership-Coverage trade-offs, Norfolk should design its bus network.

Responses from the public and stakeholders will guide elected officials, particularly the Norfolk City Council in determining the goals of the final network.

With direction from the elected officials, the study team will design a recommended network in the fall 2020. The recommended network, maps, and outcome measures will be summarized in a report for public and stakeholder review in the fall. The draft recommended network will then be the center of another public conversation to finalize the details.

The outreach process around these concepts will run from June through early August, and a survey will be available for public input.

For more information and to stay involved in the project, go to multimodalnorfolk.com and:

- take the Round 2 survey;
- email the team to ask questions;
- watch videos that summarize key choices and the network redesign process;
- find out more about meetings and events where you can learn more about the entire Multimodal Norfolk process; and
- generally stay up to date on the latest happenings with the network redesign process!

2 Network Concepts

A Range of Possibilities

Introduction to the Network Concepts

This chapter presents two network design concepts for Norfolk and compares them to the existing network. Both concepts have the same amount of service, but they show different ways to allocate these same resources.

The concepts differ in the degree to which they emphasize Ridership and Coverage goals, described on page 4. The existing system devotes about 60% of its resources toward Ridership goals and about 40% to Coverage goals and duplication. The Ridership Concept puts about 80% of its resources toward Ridership goals and 20% toward Coverage goals. The Coverage Concept in this report puts 50% of its resources toward Ridership goals and 50% toward Coverage goals.

The concepts shown in this chapter represent a spectrum of possibilities, and are not intended to be an either/or proposition. By showing the public, stakeholders, and decision-makers the range of possibilities, Norfolk is asking: "Now that you see the outcomes of emphasizing one goal over another, how should we balance the Ridership and Coverage goals? In other words, if you want better service, what is your definition of better?" When comparing these concepts and their outcomes, the choice is not "Pick one of these two"; rather, it is "Where on the spectrum of possibilities (illustrated in Figure 7) should the Norfolk network be?"

Concepts, Not Proposals

At this stage, the study team is not proposing any specific changes to the network. The public conversation about the concepts will help guide the development of an actual network proposal.

Some features are common to all conceptual networks, as outlined under the Key Assumptions section, but even these are not proposals yet. In designing the Concepts, we are highlighting the Ridership-Coverage trade-off, and to do this, we made a single choice about matters that were unrelated to that trade-off, and kept that choice constant across both concepts. Different choices could have been made, and we welcome public comment about these features of the plan.

None of the staff from HRT, Norfolk, nor the consultant staff have a preference among the concepts shown in this report.

The most important word to remember is **"if"**. The Ridership Concept shows what might happen **if** Norfolk chose to shift toward Ridership goals as the primary goal. No decision has been made yet. The Coverage Concept shows what might happen **if** Norfolk chose to maintain the same level of overall network coverage, but with consistent service design guidelines and variable transit service areas.

The Big Picture Matters More than Details

These concepts have not been refined to the point that they would be ready to implement, because their purpose is to illustrate choices at a high altitude. Based on public feedback to the concepts, a final plan will be developed, and details will be filled in in the coming months.

In general, these concepts are intended to be complete descriptions of the predominant midday pattern of services, seven days a week. The concepts also show frequencies changing throughout the day and week, but this is not meant to detail:

- Morning and evening peak services
- Specialized commute services consisting of only a few trips
- Local routing details such as turnarounds
- Scheduling—the concepts identify frequencies for each period of the day, but an actual schedule will include a transition from one frequency to another.
- Minor deviations affecting small numbers of trips

Some of these details will be added later in a final plan, but doing so now, at this conceptual stage, would be premature.

Concept Assumptions

In designing these concepts, a few key assumptions have been made regarding the future of transit in Norfolk. First, these concepts assume that The Tide light rail continues to run as it does today, with the current frequency and hours of operation.

No Additional Budget

This is a budget-neutral bus network redesign, meaning that both concepts assume the same amount of bus service as today. Specifically, this is quantified in the total service hours. Today, Norfolk pays for about 264,100 annual service hours operated by HRT.

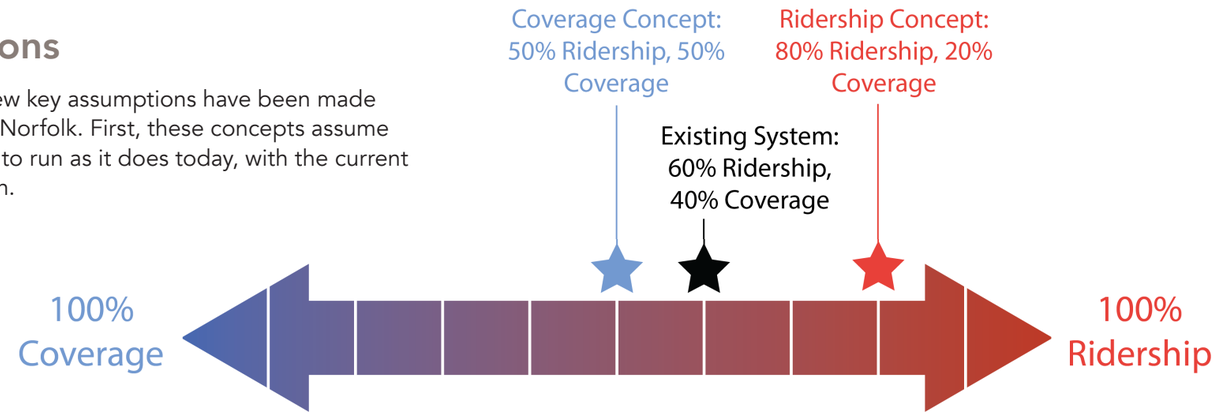
New Location for Evelyn T. Butts Transfer Center

A common feature of both concepts is relocation of the current Evelyn T. Butts Transfer Center. Figure 18 on page 19 shows the location of the existing transfer center and the potential future site area. A new location for this facility would mean more space for bays and amenities and a location closer to commercial activity and routes from the west. This new location would be essential to making easier connections between multiple routes in the northern part of Norfolk.

New regional MAX Route 962

Both concepts also assume a new MAX Route 962 that would start from the new Northern Transit Center and connect to Hampton and Newport News. This route is planned for in the most recent HRT Transit Development Plan (TDP) and would provide a useful connection to regional job centers from this key transit center in the northern part of Norfolk. Like other MAX routes, this route is assumed to be paid for through regional funding agreements, not from the Norfolk transit service budget.

Figure 7: Spectrum of Choices for Norfolk



Existing Network

To help the reader compare the Existing Network, the Coverage Concept, and the Ridership Concept, maps of each are shown on the following pages. A map of the Existing Network is shown in Figure 8.

In each network map, routes are color-coded by midday frequency. The choice of midday, rather than morning or evening rush hour, is intentional. While travel often peaks at rush hour, many people need to travel at midday. Retail and restaurant industries change shifts throughout the day, particularly in midday and later evening. Office workers may need to travel for meetings or personal appointments. College students often attend midday classes. Parents may need to pick up a sick kid from school. The maps only show what service is like at midday, but during morning and evening rush hours, frequency increases on some routes additional routes appear, notable express routes to park-and-ride lots. The frequency charts show this, starting on page 16.

In the network maps, colors make all the difference:

- **Red lines** represent routes that operate every 15 minutes.
- **Dark blue** lines every 25 to 30 minutes; and
- **Light blue** lines every 31 to 60 minutes.
- **Gold routes** represent peak-only service

The existing network is unusual in the near total lack of frequent service, outside of the Tide light rail line. This means that midday waiting times are long and transfers are difficult, limiting where people can get to in the time they have available.

The existing network is also unusual in that it features eight transfer centers across a relatively small geographic area.

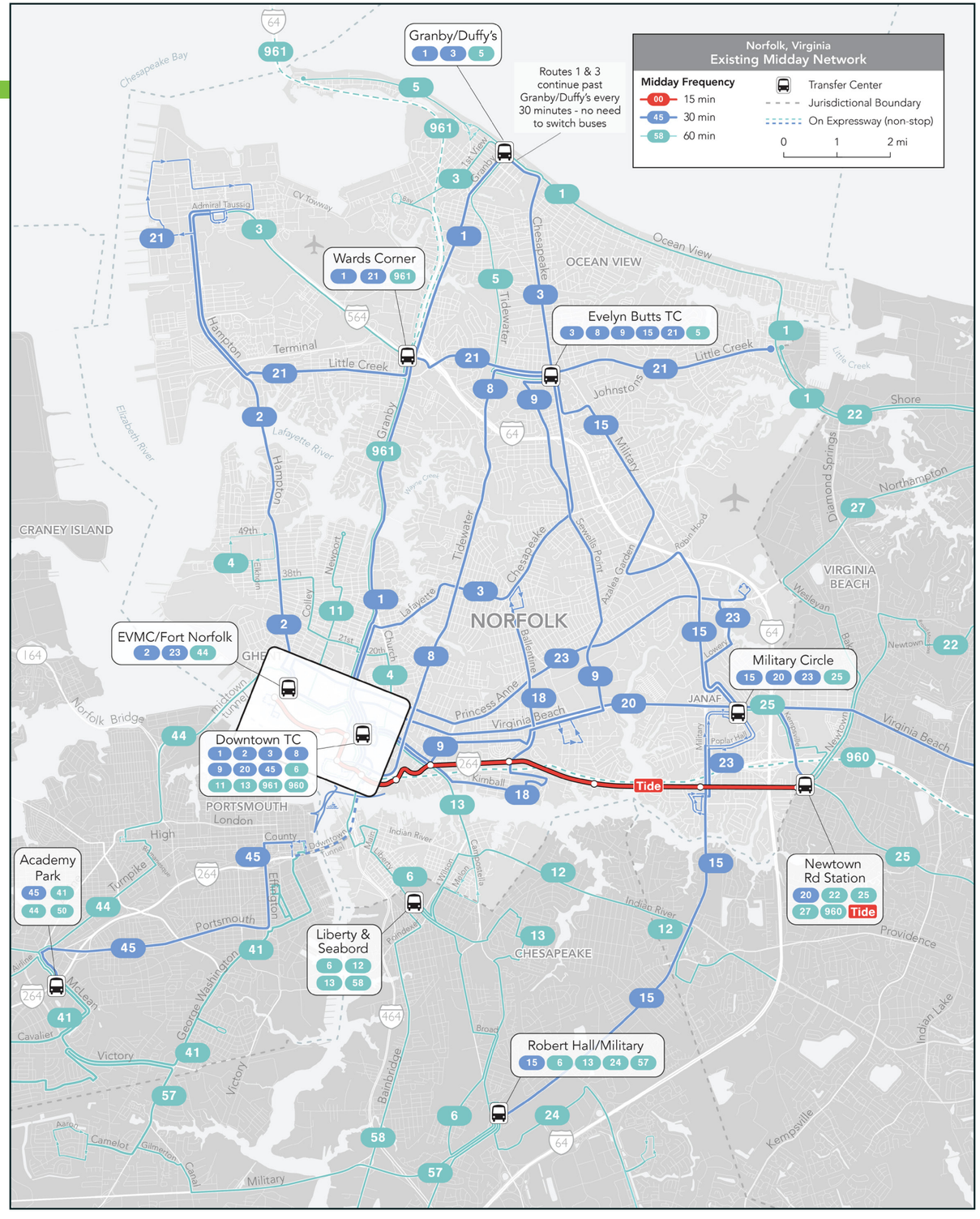
Pulsing

The existing network uses Military Circle and Evelyn Butts as locations for 30- and 60-minute "pulses" for some routes. These routes are scheduled to arrive and wait several minutes before departing together, to facilitate quicker, more convenient transfers at these locations.

Routes 20 and 23 pulse at Military Circle. Routes 3, 5, 8, 9 and 15 pulse at the current Evelyn Butts.

The existing network is unusual with the near total lack of frequent service, outside of the Tide light rail line.

Figure 8: Existing Midday Norfolk Transit Network



Coverage Network

In the Coverage Concept (shown in Figure 9), most areas served today would still be served, by fixed-route or variable service but this means service is spread thinly. The concept is designed to provide more coverage than the Existing Network, but some duplication of service has been removed and a new type of service, Variable Transit Zones, have been included to expand coverage. We have replaced routes 4 and 11 with variable transit zones. For more details on the Variable Transit services, see page 14.

The map to the right is meant to provide a high-level view of service available across the city and overall design of the network, rather than minor routing details.

To explore this network and its relevance to your life, you can:

1. Find a place you care about on the map using the labeled streets.

2. Note which routes are nearby, by number and by color.

3. Look at the legend to learn the weekday frequencies of these routes.

4. See where else the routes go. They may go farther than your routes do today. Changing line colors does not mean riders would have to change buses.

Other information about this concept that you may want to review:

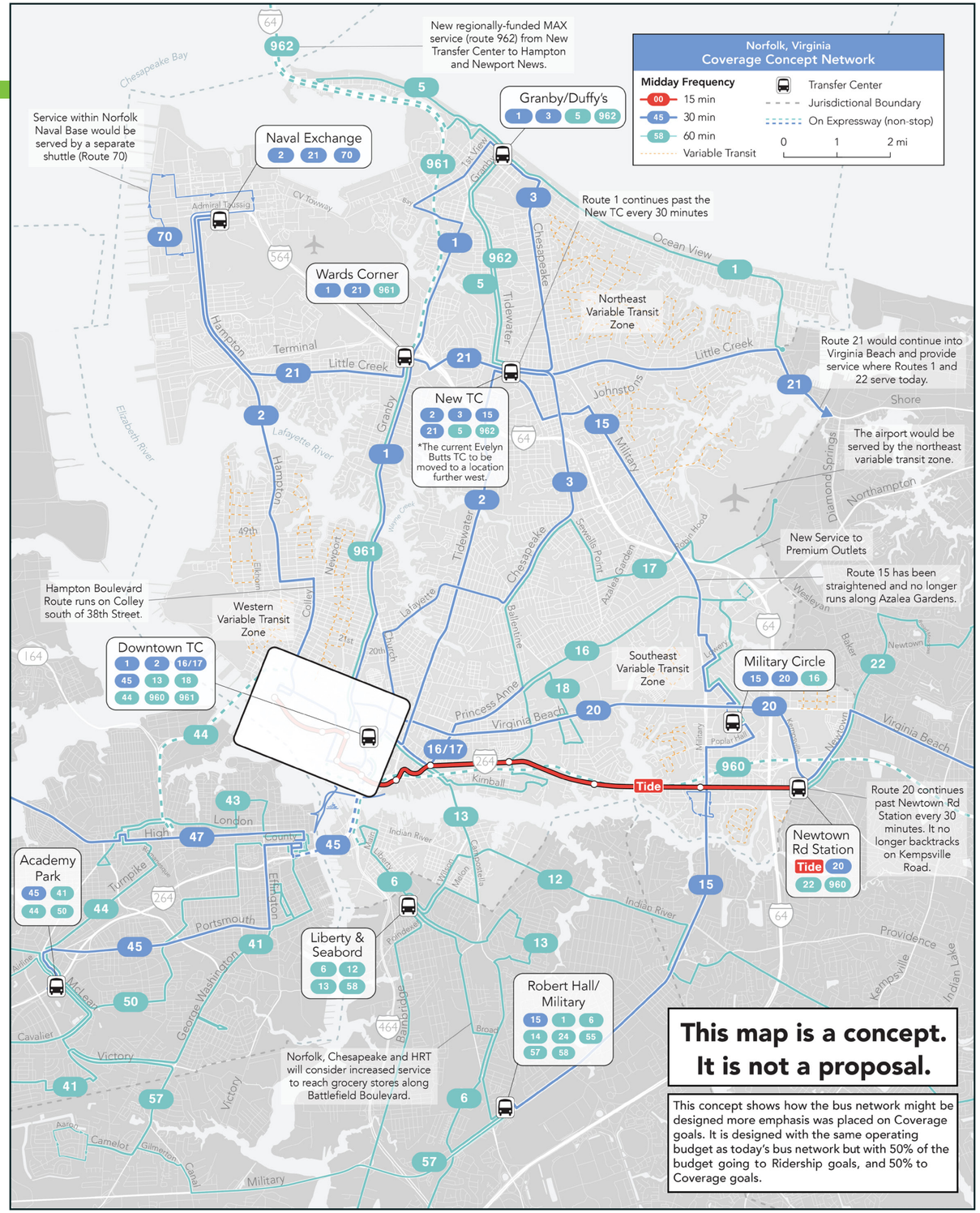
- The table on page 17 shows each route's frequencies, how they change throughout the day, during what hours each route operates, and whether a route runs on the weekend.
- The charts on page 23 show the number of residents and jobs served by frequent service and by any service in this concept.
- Maps illustrating how people's travel time would change from various locations around the city compared to the Existing Network, starting on page 25.

Pulsing

The Coverage Concept proposes using the Naval Base, Military Circle, the new Evelyn Butts transfer center (discussed further on page 19) as locations for 30- and 60-minute "pulses" for some routes. These routes would be scheduled to arrive and wait several minutes before departing together, to facilitate quicker, more convenient transfers at these locations. Route 21 and 70 would pulse at the Naval Base. Routes 16 and 20 would pulse at Military Circle. Routes 1/3, 2, 5, 15, 21 would pulse at the new Evelyn Butts.

In the Coverage Concept, more places have transit service, but frequency on most routes remains low, so service is less useful.

Figure 9: Coverage Concept for Midday Norfolk Transit Service



Ridership Network

The Ridership concept (shown in Figure 10) concentrates more frequent service where there are more people, jobs and opportunities. This dramatically increases how many useful destinations an average resident can reach in a given amount of time, which is the key to increasing ridership. Concentrating service into fewer but higher frequent routes means that some lower-demand areas would be a longer walk from transit service, or not have service at all, in this concept.

Most of the network is designed as a high frequency grid that allows for easy transfers between lines, where the street network and geography allow such a design. Wherever two red lines cross on this map, a quick and easy transfer would be possible because wait times would always be short. This means that connections downtown, at Military Circle, and Evelyn Butts Transfer Centers are now faster. The Ridership Concept proposes "pulsing" several routes in the evenings and weekends when frequencies are lower. However, pulsing is not necessary during the midday period because a high-frequency network already means quick connections.

The map to the right is not meant to be specific about the details. Instead, it is meant to provide a high level view of the overall picture of frequent and infrequent service available across Norfolk and the overall design of the network.

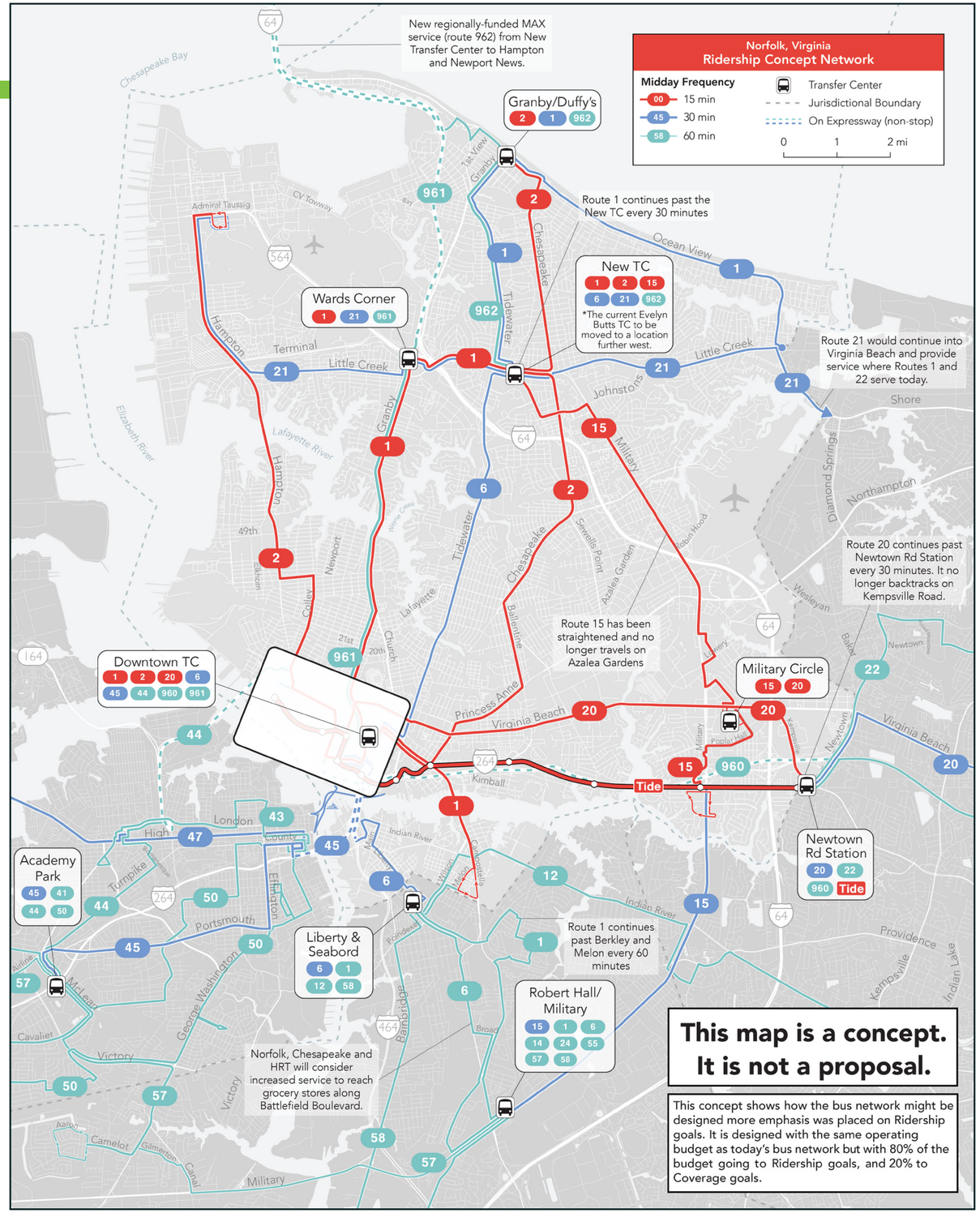
The project team is certain that, were the Ridership Concept to be implemented, it would get higher ridership than the Coverage Concept. Why are we so certain? Repeated, wide-scale research has shown that higher frequencies and longer spans of service are correlated with major increases in ridership. In other words, people choose transit if it is workable given their destination and their time constraints, so making more destinations accessible within less time for a large number of people is a straightforward way to attract more riders.

Other information about this concept that you may want to review:

- The table on page 18 shows each route's frequencies, how they change throughout the day, during what hours each route operates, and whether a route runs on the weekend.
- The charts on page 23 show the number of residents and jobs served by frequent service and by any service in this concept.
- Maps illustrating people's travel times from various locations compared to the Existing Network, starting on page 25.

In the Ridership Concept, there are fewer routes. However, more routes are frequent—which means there will likely be a bus coming when someone needs it.

Figure 10: Ridership Concept for Midday Norfolk Transit Service

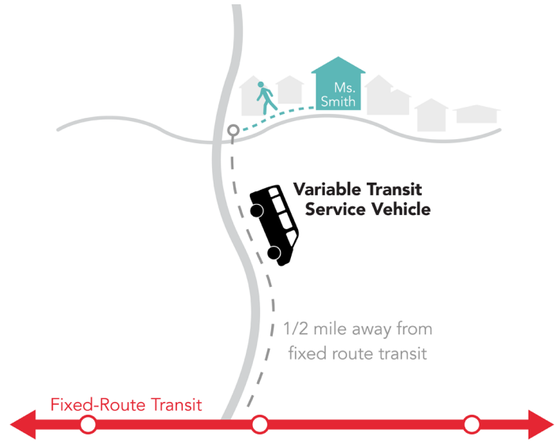


Variable Transit Zones

What is Variable Transit?

The Coverage Concept includes three "Variable Transit Zones" to serve areas that are relatively far from fixed route service, and therefore expand the coverage of transit in Norfolk. Variable transit, also known as on-demand transit or microtransit, uses technology to route a fleet of vehicles based on real-time passengers demand. It is similar to a bus in that passengers are asked to walk to meet a vehicle at a 'virtual bus stop' that may be up to ¼ of a mile from their requested location (see Figure 11). However, it is different from a bus in that there are no schedules or route maps. Instead, trips must start and end within zones that fill gaps in the bus network. Any type of vehicle can be used, but minivans or small cutaway buses are generally used in the zones included in the Coverage Concept.

Figure 11: Illustration of possible neighborhood walk to access variable route transit from a corner



How would you take a trip?

To use Variable Transit, riders could book a trip using a smartphone application ("app"), a website, or through a call center. To book a ride, a passenger starts by indicating the number of passengers in their party and their desired pickup and drop-off locations. When booking using the app, passengers will clearly see the zone in which service is offered on a map on their phone. Figure 12 illustrates the Northeastern zone (see page 15 for illustrations of the two other proposed zones). If a passenger requested a trip beyond the zone, the app would tell them that the trip would have to connect with fixed route transit or some other service to go beyond the zone.

Once the passenger submits a trip request, they are given a proposal that tells them when the vehicle will arrive and where to meet it. Typically, passengers must wait between 10–20 minutes for a trip, although this may vary depending on the level of demand and the number of vehicles available. Passengers can track the vehicle in real-time using the app. The passenger is provided with vehicle information—for example: license plate, driver name, driver photo, and vehicle ID number. Passengers can usually cancel a ride at any time before pickup, but as cancellations may negatively affect other passengers, a small fee is often charged to discourage cancellations.

Once the vehicle arrives, the driver confirms the passenger's details using the driver app. Passengers can pay using credit and debit cards, transit passes, cash, vouchers, and more. Most transit providers take care to include payment options for people without credit cards or bank accounts to ensure that the service is accessible to all. Details of payment and fare integration with existing HRT fare media would need to be worked out if the City of Norfolk decides to use Variable Transit Service as a tool to meet coverage needs.

The passenger is then taken to their destination. Along the way, the vehicle will pick up and drop off other passengers heading in the same direction, but care is taken to avoid lengthy detours for passengers already on board. The passenger can track their progress using the app. After each trip, passengers may be automatically emailed a receipt. Passengers may also be able to provide real-time and post-trip feedback through the app.

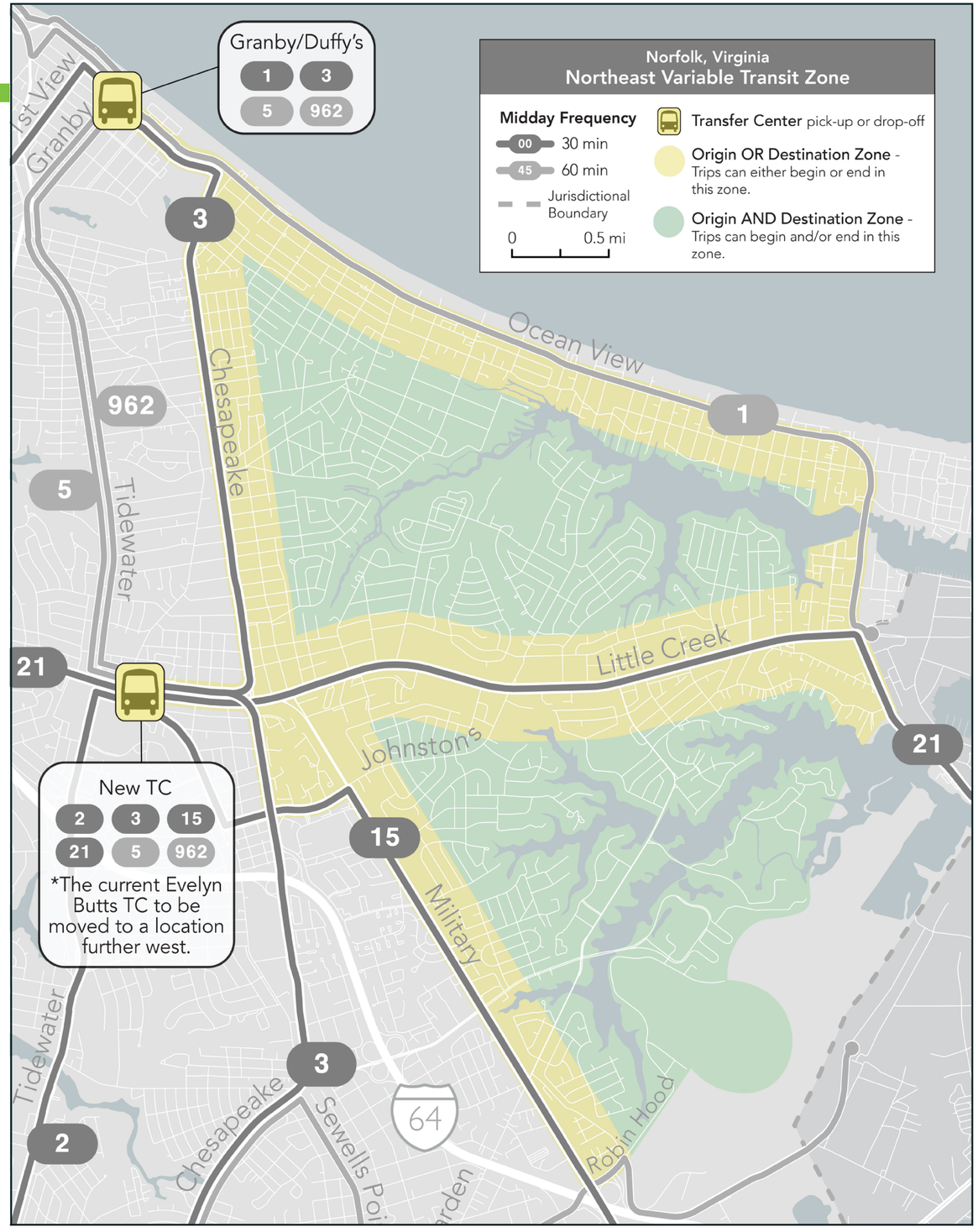


Figure 12: The Northeastern Norfolk Variable Transit Zone

Figure 13: The Southeastern Norfolk Variable Transit Zone

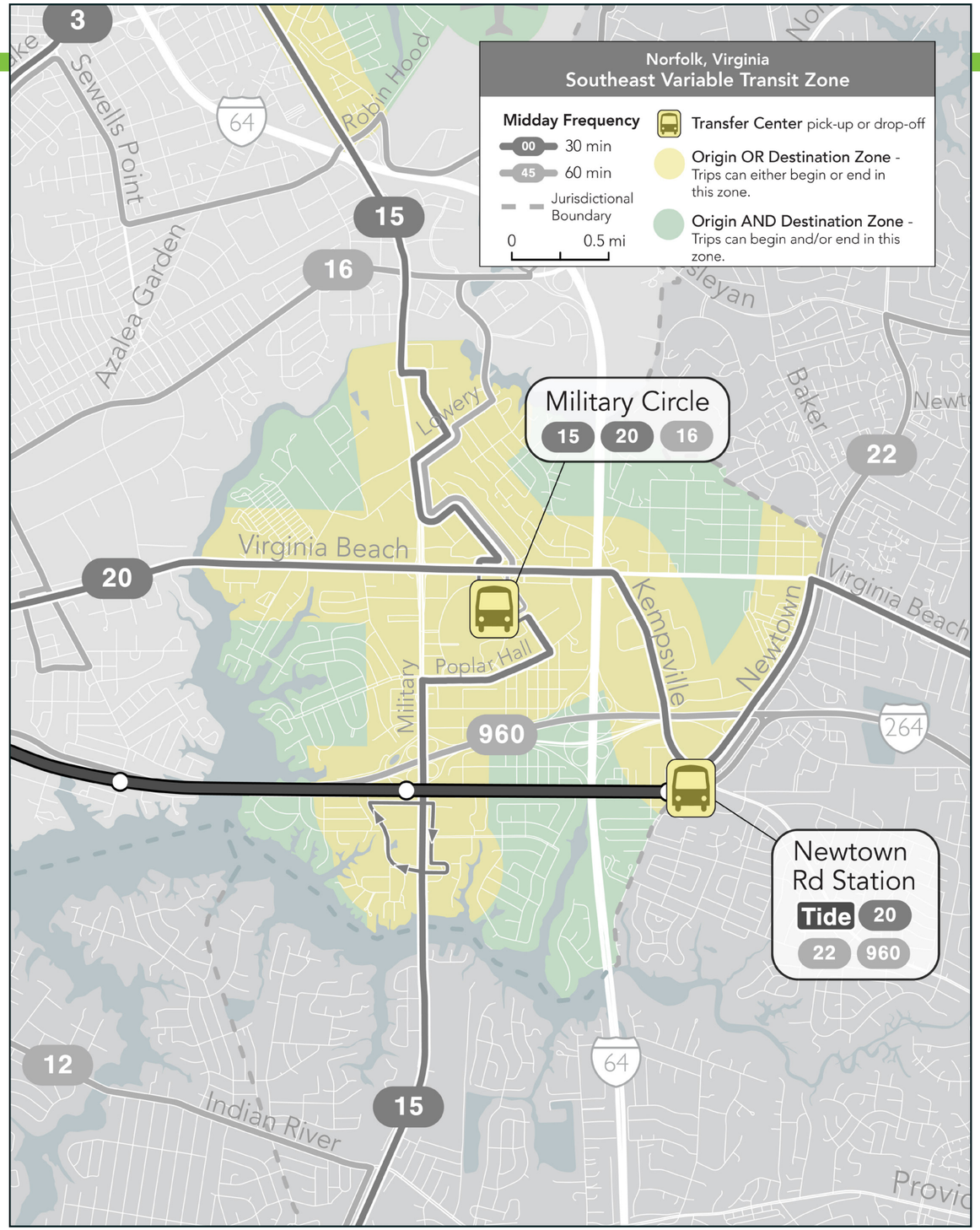
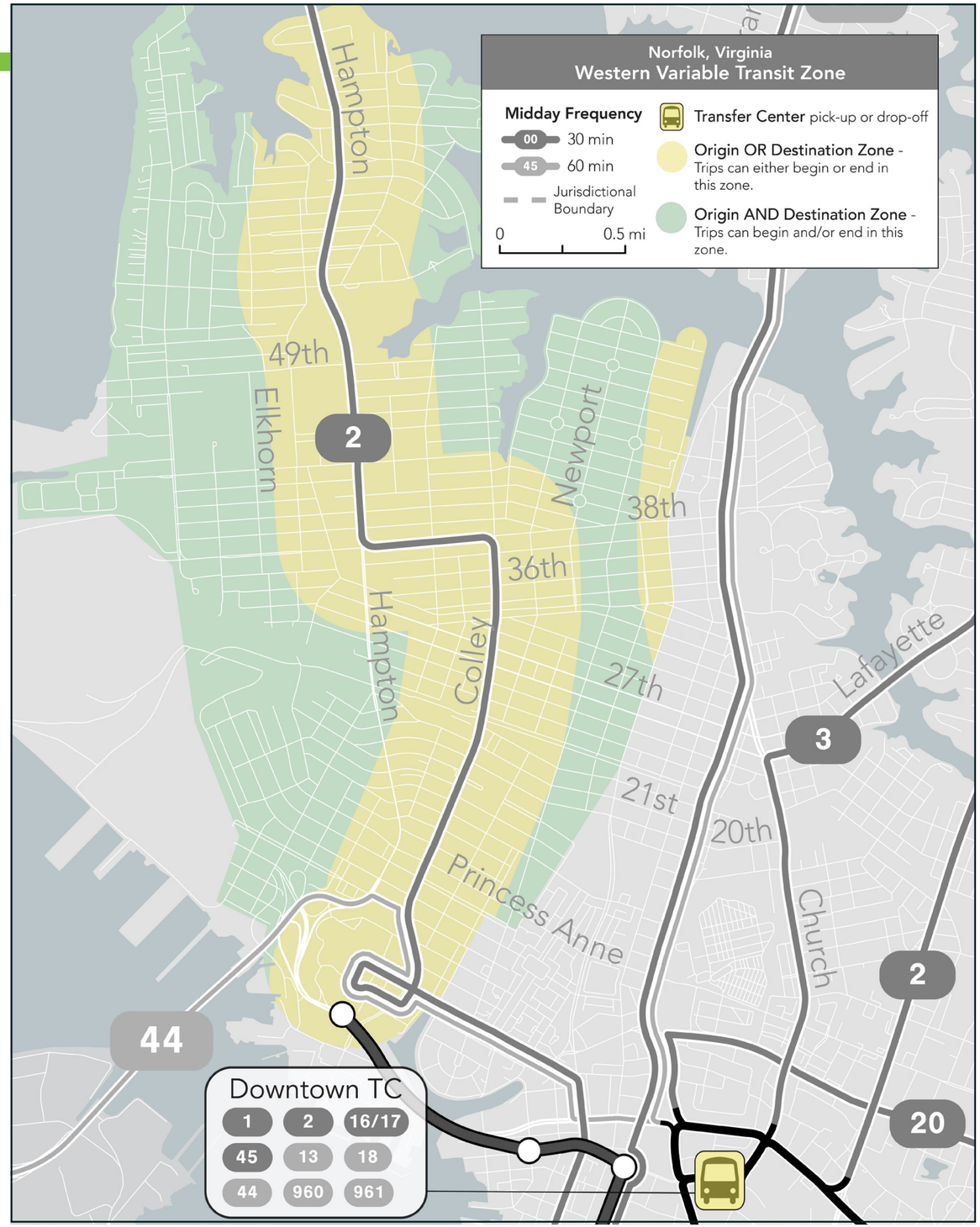


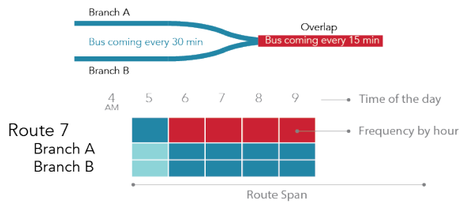
Figure 14: The Western Norfolk Variable Transit Zone



The Existing Network Spans of Service

Figure 15 shows the frequency by time of day for the routes in the existing Norfolk transit network.

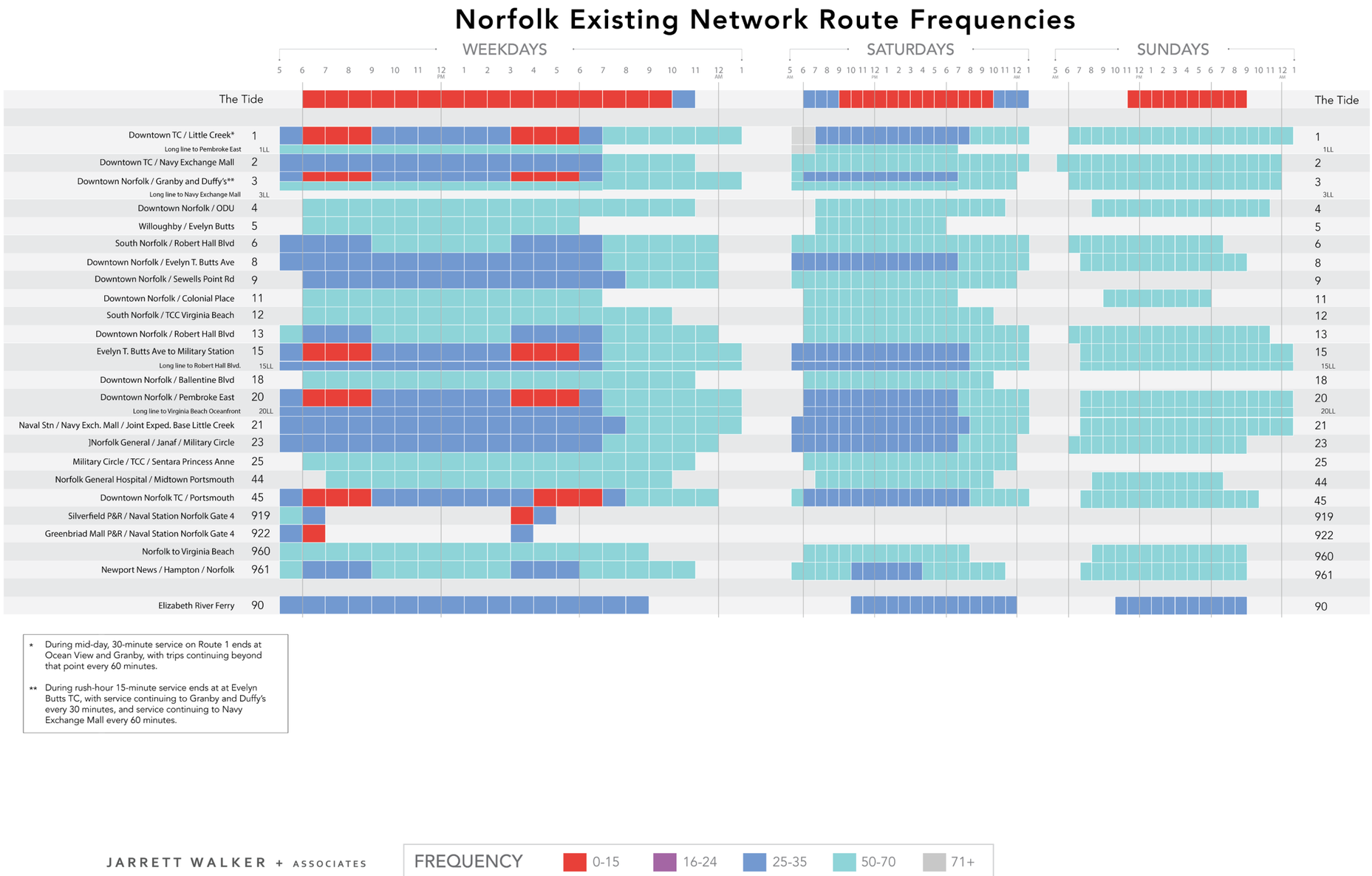
The example below shows a route with a bus every 15 minutes on the red "Overlap" portion and a bus every 30 minutes on "Branch A" and "Branch B". In this example, Route 7 starts operating at 5am, with service every 30 minutes on the "Overlap"—the dark blue square under 5am. Each branch operates hourly during this time. At 6am the branches are every 30 minutes and the "Overlap" is every 15 minutes.



For transit to be useful, it must be there at the times of day you need it. The times of day transit operates is called "Span of service". Most Norfolk routes start running at 5am or 6am. For several routes, service is provided until 1am but most service stops running at 10pm or 11pm.

The only service that provides 15-minute service all day is The Tide, which has 15-minute service from 6am–10pm weekdays, 9am–10pm Saturdays, and 11am–9pm on Sundays. At peak times on weekdays routes 1, 3, 15, 20, 45, and 922 provide a few hours of 15-minute service. While this is useful for people traveling during those times, it does not provide the reliable, consistent access and freedom that all-day frequent service affords.

Figure 15: Existing Network Frequency



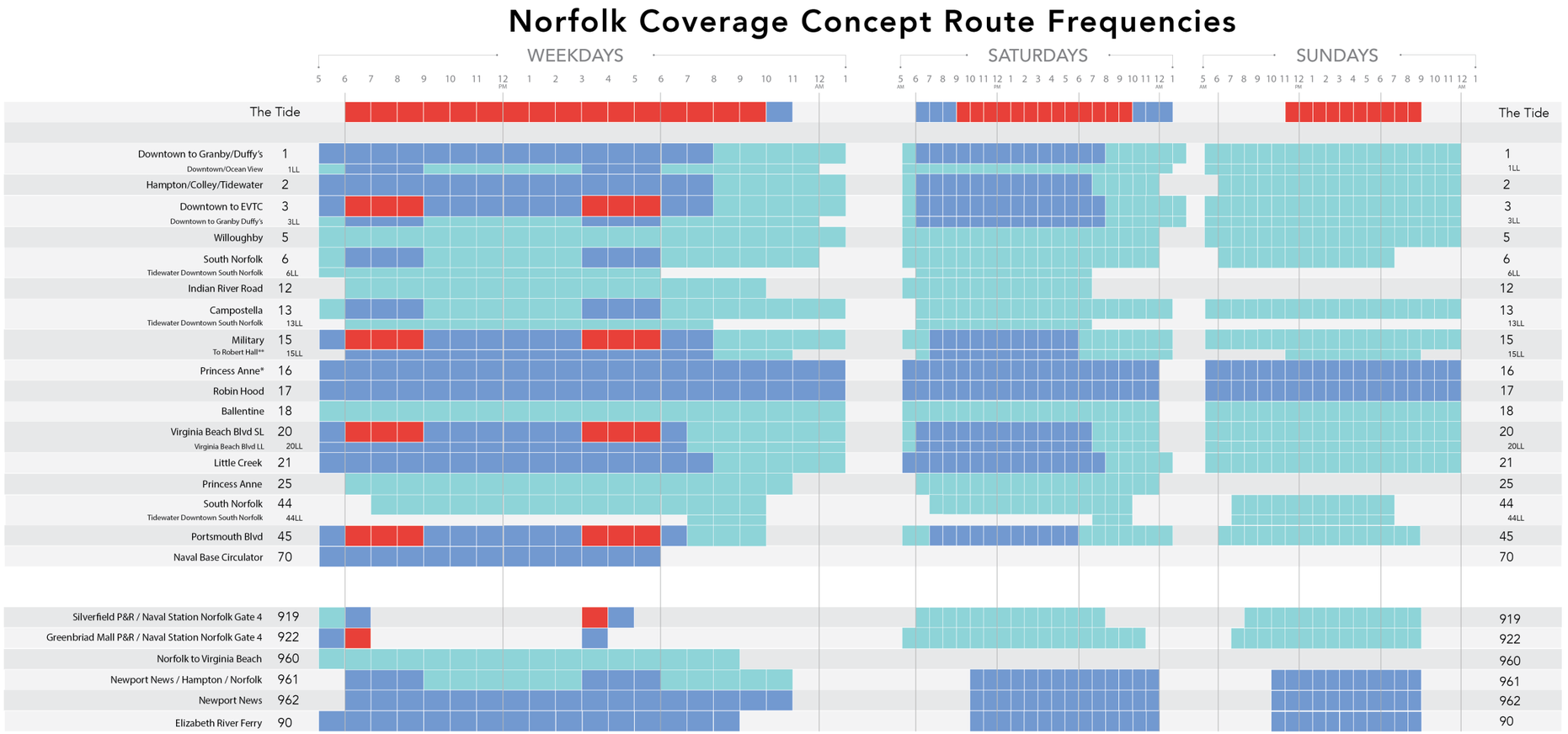
The Coverage Concept Spans of Service

Figure 16 shows the frequency by time of day for the routes in the Coverage Concept. It is intended to closely reflect the frequency of the existing network.

Just as in the Existing Network, The Tide is the only 15-minute service proposed for all-days service. In the coverage network, routes 3, 15, 20, 45, 919 and 922 would provide service every 15 minutes during weekday peaks. No 15-minute service is proposed on weekends or outside of weekday peaks.

Both concepts have been designed with more consistent and more frequent service in the evening and on weekends across the entire system. In the Coverage Concept, most of the routes would run consistently from 5 AM until 10 PM, with many routes running until midnight. The Coverage Concept also features more consistent frequency during the weekend.

Figure 16: Coverage Network Frequency and Span of Service



* Some early morning and late evening trips do not serve Ikea because Ikea is closed.

** Some evening trips serve Greenbrier Mall instead of Robert Hall.

The Ridership Concept Spans of Service

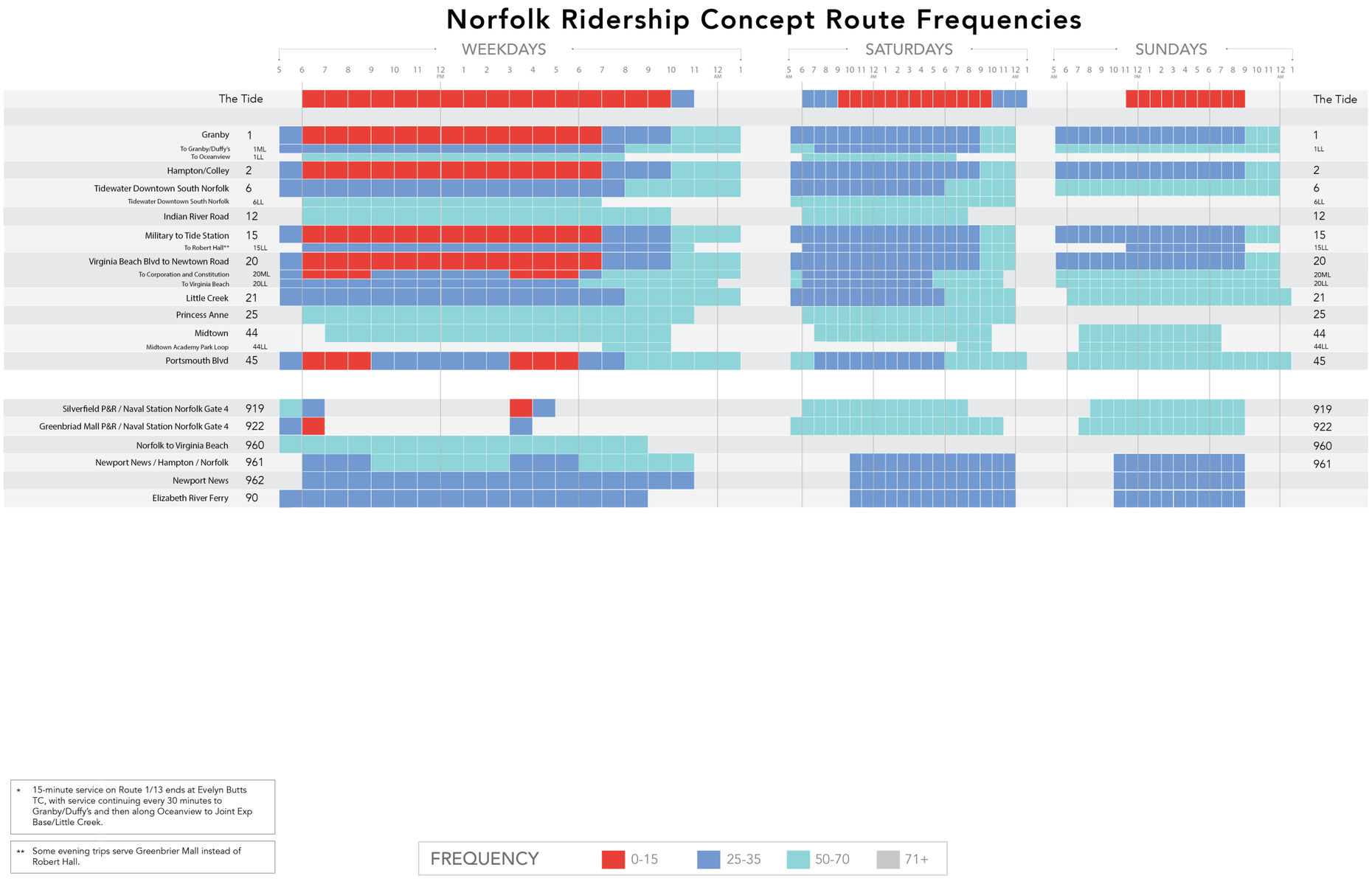
Figure 17 shows the frequency by time of day for the routes in the Ridership Concept. It is intended to closely reflect the span of the existing network however, it consolidates service into fewer routes and proposed higher frequencies on many of those routes.

The Ridership Concept would include 15-minute service throughout most of the day on routes 1, 2, 15 and 20 with peak 15-minute service on the 20 (medium line), 45, 919 and 922. No 15-minute service would be provided on weekends but the high-frequency network would run every 30 minutes instead, still a significant improvement over weekend frequencies in the Existing Network.

This increase in all-day and weekend frequencies reflects the fact that more and more jobs are on nontraditional schedules requiring shifts on weekends or that start in the midday and end later than 6 PM. This trend is especially pronounced for lower-wage jobs in retail, healthcare, restaurants and personal services, so improving weekend and evening service helps improve the lives of people with lower incomes.

Many people may be reluctant to use transit because of its inconsistent availability. If someone buys a car to get home after evening or weekend work shifts when transit is unavailable, they may feel that they might as well drive on weekdays too. They are also are much less likely to take transit at all, even if their bus comes every 15 minutes then.

Figure 17: Ridership Network Frequency and Span of Service



A New Transfer Facility

A common feature of both concepts is relocation of the current Evelyn T. Butts Transfer Center. In Figure 18, the existing transfer center is indicated with a star.

The new center location would be:

- **More central** by being further west and closer to more routes.
- **Closer to commercial and retail** activity in the area.
- **More Useful for connections** in the northern part of Norfolk, particularly in the Ridership Concept where people and jobs along Granby are more easily reached from this new transit center.
- **Larger** with more space and bays for enough buses and better amenities for riders. More space would be needed at this transfer center to accomodate pulsing proposed by either concept. Pulsing would need more space because all buses arrive, depart and occupy a bay at the same time.
- **A potential location** for a regional park and ride for new MAX service and future light rail.

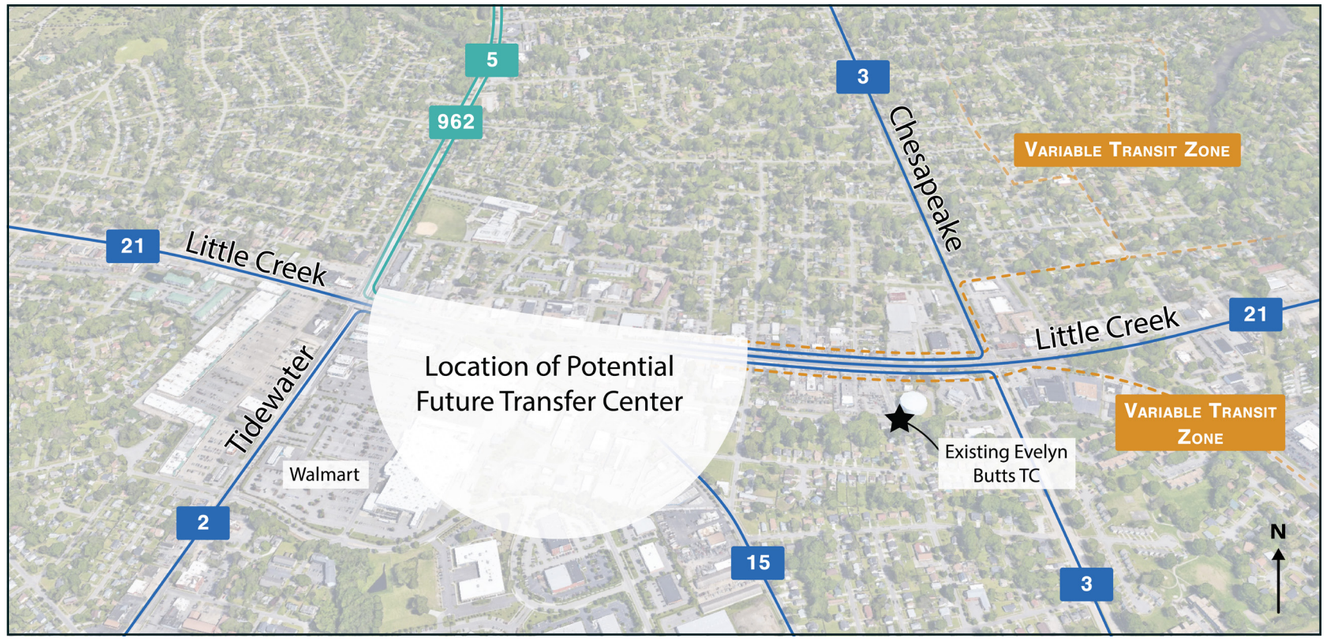
This new location would also be particularly useful for the Ridership Concept, where the riders would benefit from shorter waits and more access from the three high frequency routes that meet here.

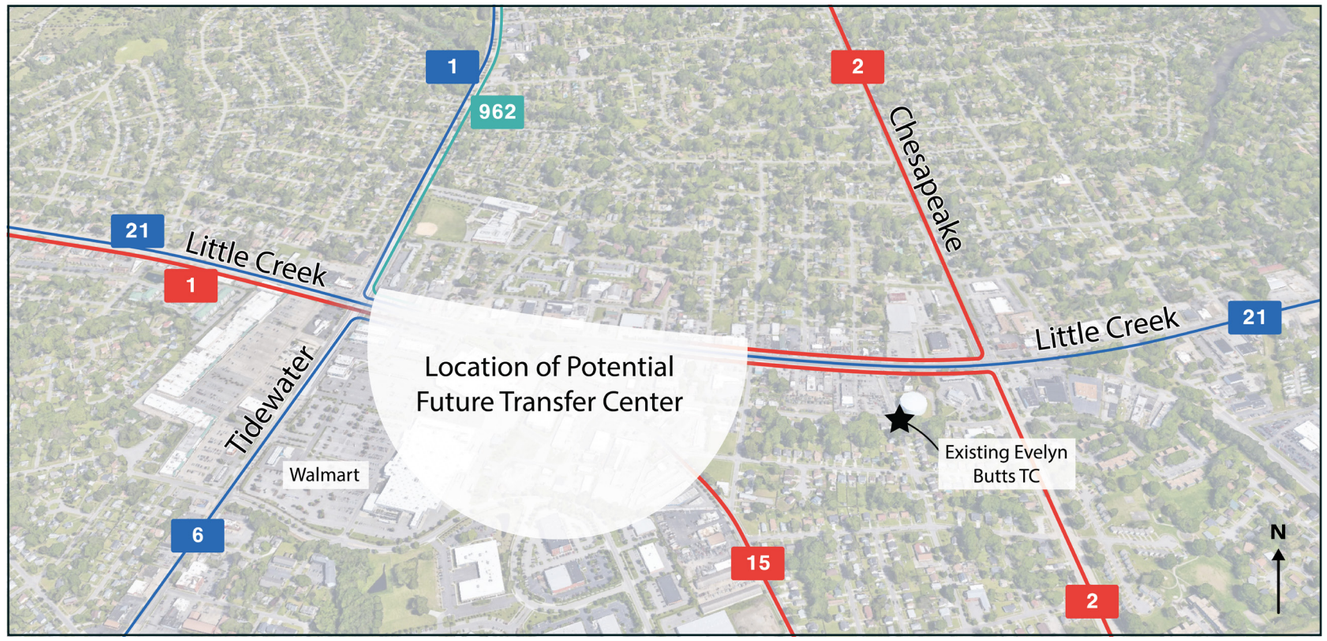
Finding space and building a new transit center can take years, so this new facility may not be available when a new bus network is implemented in Norfolk. If the existing Evelyn Butts facility must be used on an interim basis, then it will be necessary to temporarily increase capacity by creating overflow space on Avenue J. On the northside of Avenue J, in the westbound direction, it is possible to fit two or three temporary bus bays to provide the necessary capacity for all routes in either of these concepts to function adequately.

In the Coverage Concept, the 2, 5, 15 and 962 terminate at the transfer center. The 3 and 21 stop at the center before continuing on. In addition, vehicles serving the Northeast Variable Transit Zone and paratransit vehicles would need a bay at the facility. Based on this, we estimate the need for 5 bays.

In the Ridership Concept, the frequent short line of Route 1 and Routes 6, 15 and 962 terminate at the transfer center. The long line of Route 1 and Routes 2 and the 21 stop at the center before continuing on. In addition, paratransit vehicles would need a bay at the facility. Based on this, we estimate the need for 7 bays.

Figure 18: The Existing Evelyn Butts Transit Center and Future New Transit Center Site in the Coverage Concept (above) and Ridership Concept (below).





What Happens Downtown

Changes from Existing Downtown Routing

The two concepts propose changing downtown bus circulation so that most riders can more easily reach the major destinations within the core of downtown. Both concepts propose:

- **Through-routing** - In the Existing network, all routes serving downtown terminate there but in both concepts, several routes (1, 2 and 6) flow through downtown and out the other side as the same or as different routes (such as the 1 that becomes the 13 in Coverage). Through-routing means **fewer transfers.** Many trips start or end downtown but through-routing would give riders coming from South Norfolk to the new Transfer Center north of downtown a one-seat ride on the 6. Through-routing also reduces facility needs downtown, reduces "end of line" costs and means that fewer vehicles can often be used to provide the same service.
- **More Buses Reaching Central Downtown** rather than terminating at the downtown transfer center, which is nearly half a mile from many central downtown destinations. Both concepts propose adding bus service along Boush and Monticello to bring people closer to destinations on and near those streets. Running more bus service through central downtown would reduce long walks from the transfer center to destinations like City Hall, the MacArthur Center, the Granby retail district, and Waterside as well as the downtown Tide stations - Monticello and MacArthur Square.
- **More Frequency in Central Downtown** - Today, only 5 buses per hour serve central downtown. In the Coverage concept, this increases to 7, and in the Ridership concept, jumps to 12 (not counting MAX routes).
- **Removing the Fort Norfolk loop** will save significant time for riders coming downtown from Ghent or ODU but will mean longer walks for those in Fort Norfolk.
- **Shortening the downtown loop for the 6 and 45** south of City Hall will save time for riders coming downtown from South Norfolk. In both concepts, the 6 and 45 are proposed to exit the I-264 and take a shorter loop via Plume Street, Bank Street, and City Hall Avenue and then proceed to the downtown transfer center.

Differences Between the Concepts

The main difference between the two ceoncepts is service frequencies. This has been discussed on the concept pages beginning on page 12. There are several additional differences:

- The 2 through-routes in both concepts but in the Coverage concept, the 2 travels up Tidewater. In the Ridership concept, it travels out along Virginia Beach Boulevard.
- In Ridership, the 6 is flows through downtown to provide a continuous ride between South Norfolk and the new Evelyn Butts Transfer Center.

Figure 19: The Existing Network's downtown network

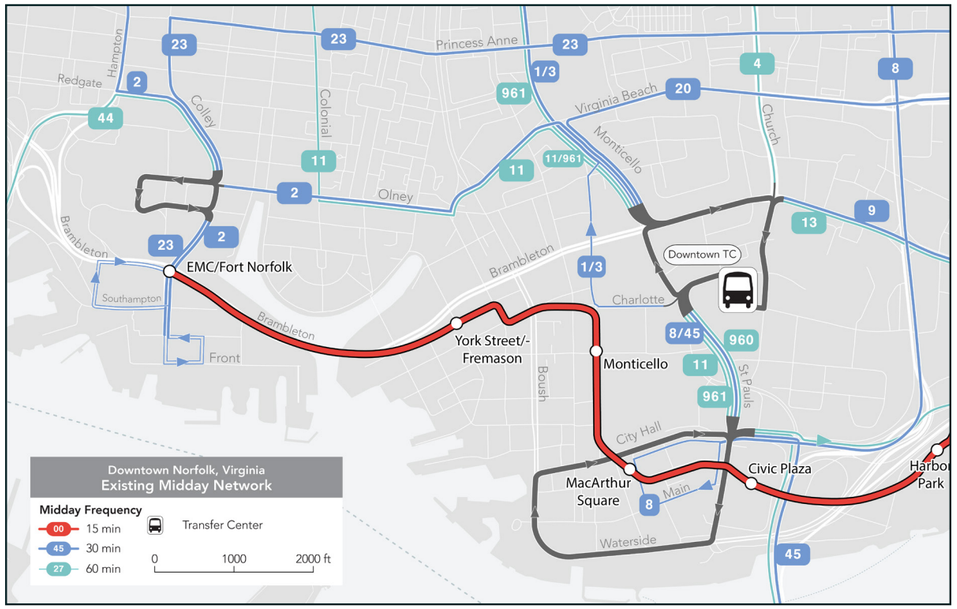


Figure 20: Downtown Inset for the Coverage Concept

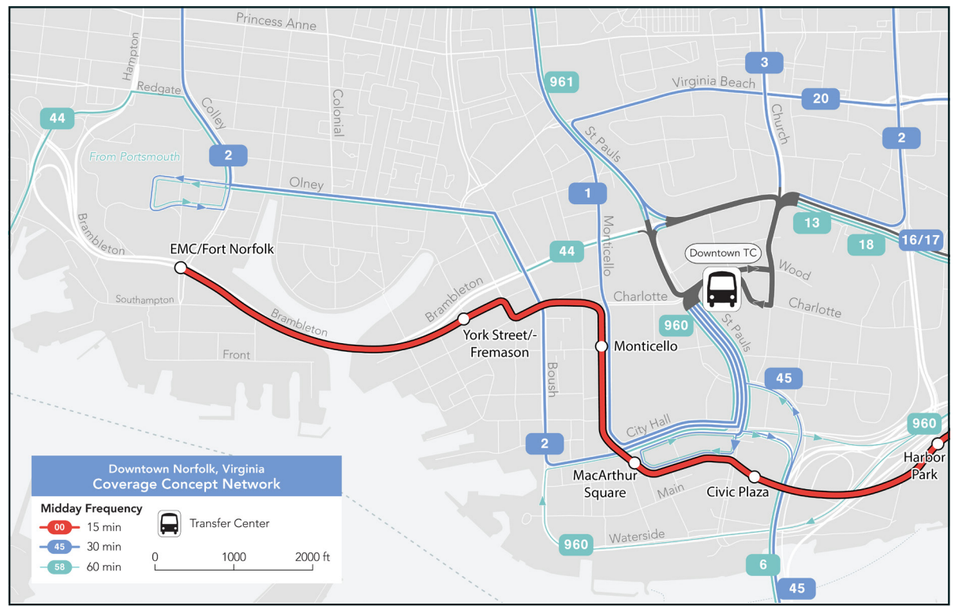
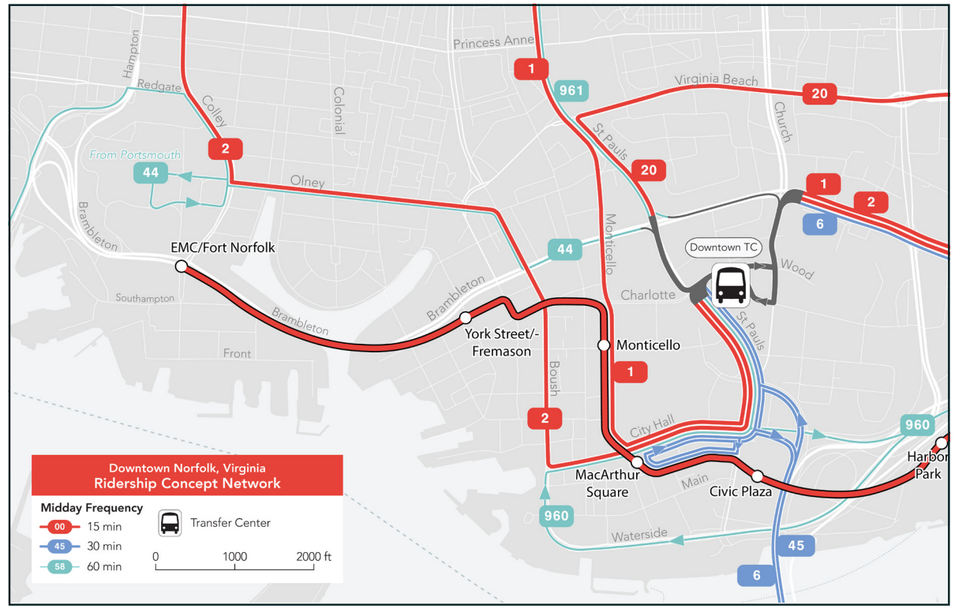


Figure 21: Downtown Inset for the Ridership Concept



3 Comparing Outcomes

Comparing Outcomes

This chapter reports on three different ways of measuring the potential outcomes of the Concepts. These measurements are not forecasts. They do not make assumptions about how culture, technology, prices or other factors will change in the next few years. These are simple arithmetic measures that combine existing distance, time and population information to show the potential of each Concept and how they each differ from the existing network.

Proximity

The first measure reported, on the next page, is very simple: *How many residents and jobs are near transit?*

Proximity does not tell us how useful people will find transit service, only that it is nearby to them. We also report on proximity to frequent transit service, to provide a little more information about how many people are near service that they are more likely to use.

Wall Around Your Life

To understand the benefits of a network change, consider this simple question: *Where could I get to, in a given amount of time, from where I am?*

This question refers to the physical dimension of liberty and opportunity. If you can get to more places in a given amount of time, you will be more free and have more opportunities outside your neighborhood.

Isochrones provide a visual explanation of how a transit network changes peoples' freedom to travel, on foot and by transit, to or from a place of interest. A few examples are included in this report beginning on page 25. Further examples are available in Appendix A on page 39

Access

Isochrones display the change in access that a person would experience to or from a particular place. By summing up the isochrones for every single part of Norfolk, we can describe how access to jobs would change for all residents of the service area.

This is a good proxy for a ridership forecast, because it describes the part of ridership forecasting that is basic math and highly predictable: *Could more people access more jobs (and other opportunities) by transit, in less time?* If the answer is "Yes," that implies higher ridership potential.

Summary of Outcomes

The Concepts would likely have these effects on transit outcomes:

- **Ridership potential** would be similar to the Existing Network in the Coverage Concept, and would increase a great deal in the High Ridership Concept.
    - *In the Ridership Concept, more people can reach more opportunities in a given amount of time.* This is even more the case for low-income people.
    - Other factors would affect whether or not people choose to ride, such as fares, parking pricing, gas prices, employment levels, etc. Holding all of these other factors constant, however, when more people can make more of their trips faster, by transit, more people will choose to ride.
- *The Coverage Concept would maintain the number of jobs and residents near any all-day service, and near frequent service.*
- *The number of people and jobs near frequent transit would increase by nearly 200% in the Ridership Concept.* Frequency correlates strongly with high ridership, especially when multiple frequent services are combined into a connected network.
- *The Coverage Concept would keep overall job access about the same, and therefore would be about as useful as the Existing Network on average.*
- *The Ridership Concept would increase the overall usefulness of the transit network by connecting more people to more jobs and opportunities in less time.* The Ridership Concept increases the number of jobs that the average resident could reach in 45 minutes by 35%. For residents of color, the Ridership Concept increases the number of jobs reachable in 45 minutes by 38%

The Coverage Concept keeps overall usefulness about the same as today. The Ridership Concept expands usefulness dramatically: the average resident could reach 35% more jobs in 45 minutes.

- *The Coverage Concept is somewhat simpler than the existing network and the Ridership Concept is even simpler.* Simplicity is important to attract spontaneous and new riders. Fewer lines mean a network is easier to remember, and more frequent lines with more consistent spans make trip-planning easier. Spans of service throughout the days of the week also get simpler.
- *The number of places where cities could justify encouraging transit-oriented development, including affordable housing, is higher in the Ridership Concept.* Dense developments and neighborhoods around them benefit from frequent transit service, and some cities have policies allowing more density, less parking, and greater affordability around frequent bus lines.

Proximity to Transit

The number of people and jobs within a certain distance from transit is the simplest measure of transit outcomes. In this report we call this measure "proximity to transit". Many people have varying levels of willingness to walk to transit, but most research shows that most people are willing to walk up to ¼ mile to reach a transit stop.

The bar charts in Figure 22 show how many residents and jobs would be "close enough" to frequent service, 30-minute, or 60-minute transit service for the Existing Network and the Coverage and Ridership Concepts. These charts assume that someone is near transit service if they are within ¼ mile of a bus stop as the crow flies. Walking ¼ mile over flat ground takes the average person about 5 minutes.

Compared to Existing, the Coverage Concept would

- maintain the number of residents near service at 99%;
- increase the number of jobs near service from 96% to 98%;
- maintain the number of residents near frequent service at 22%;
- increase the number of jobs near frequent service from 31%;

Overall the Coverage Concept and the Existing Network reach the greatest percent of residents and jobs - with 99% of people and 96-98% of jobs within 1/4 mile of some transit. Yet because service is spread thinly, only 22% of people and 31% of jobs are near a frequent route.

Compared to Existing, the Ridership Concept would

- increase the number of residents near frequent service from 22% to 84%;
- increase the number of jobs near frequent service from 31% to 85%;
- decreases the percent of people who are within a ¼ mile of any transit service, from 99% to 95%;
- decreases the percent of jobs that are within a ¼ mile of transit from 96% to 89%.

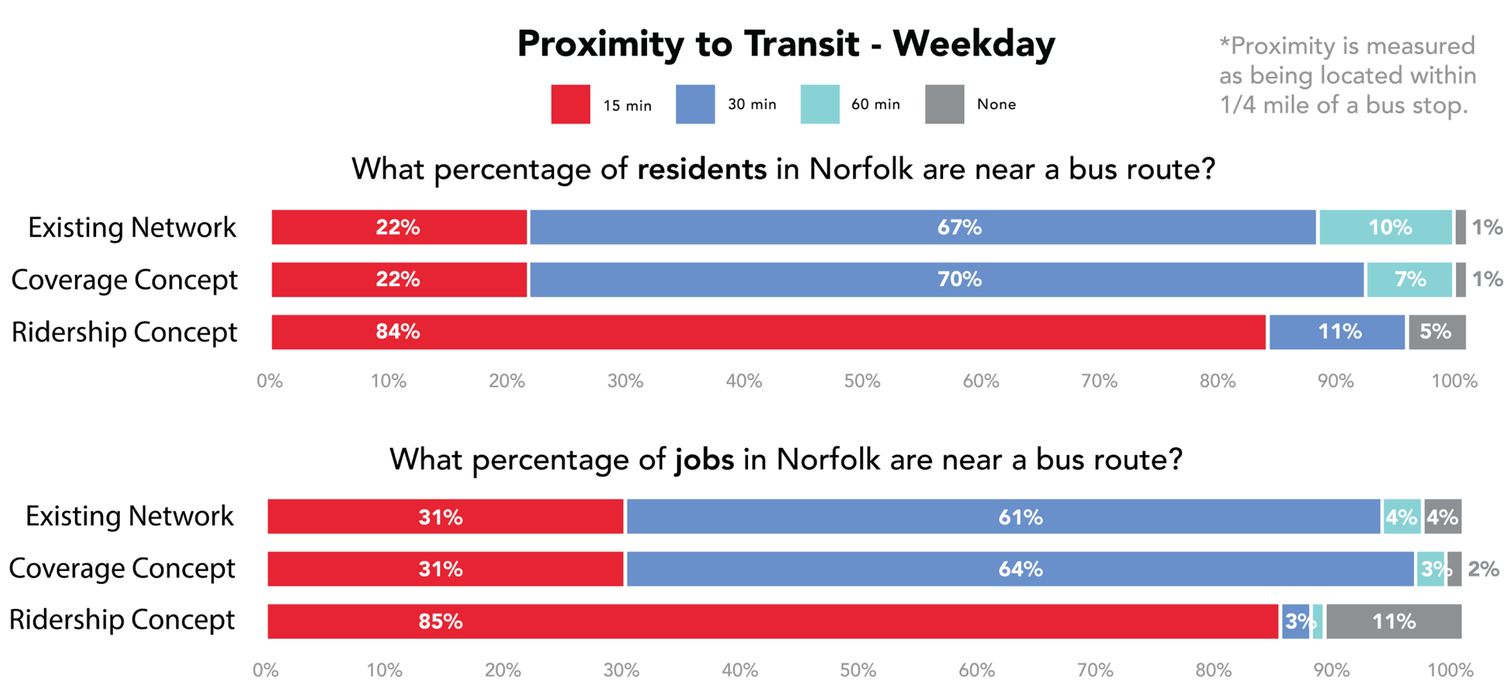
In the Ridership Concept more people and jobs are near frequent service, but fewer total people and jobs are within ¼ mile of any service. This difference reflects the basic geometric trade-off: this concept focuses the highest frequency and most useful transit service to the best markets for transit with the goal of reaching the most jobs and places most likely to generate high ridership relative to cost.

Proximity does not tell us how useful the service is to people—only that it is nearby. In pursuit of a maximum coverage goal, an agency will spread service thinly, to cover as many people as possible. Spreading transit thinly means routes have low frequencies, short spans, and circuitous routing that might now be useful but help an agency meet a coverage goal.

Proximity to frequent service is a key measure of ridership potential. Frequent service is more expensive relative to the area it covers, but it is more useful by offering travel times more competitive with driving and therefore tends to attract higher ridership. Thus, the more people and jobs near frequent service, the more a network is achieving a ridership goal. Or, another way to think about the Ridership Concept, is that it network provides highly useful service to most people, at the expense of providing service to fewer people and places.

The Ridership Concept dramatically expands people and jobs near frequent service, which is a strong predictor of usefulness and ridership potential.

Figure 22: Change in Weekday Access to Transit



Proximity to Transit: Disadvantaged Populations

Transit is often tasked with providing affordable transportation for low-income residents, which is why agencies provide service to some people and areas, regardless of ridership potential. Federal laws also protect those with low incomes from disparate transportation impacts, which is why agencies sometimes provide transit service in places where poverty is high, even if this does not maximize ridership. Similarly, federal civil right laws require that transit agencies assess the impacts of changes to service on racial and ethnic minority residents to ensure there are no disproportionate negative impacts.

The charts in Figure 23 show the differences in proximity to service for residents of color, residents in poverty, and seniors.

Compared to Existing, the Coverage Concept would

- maintain the percent of residents of color, residents in poverty and seniors near service and near frequent service at the same level as the Existing Network;
- slightly increase the percent of residents of color, residents in poverty and seniors near 30-minute service

Compared to Existing, the Ridership Concept would

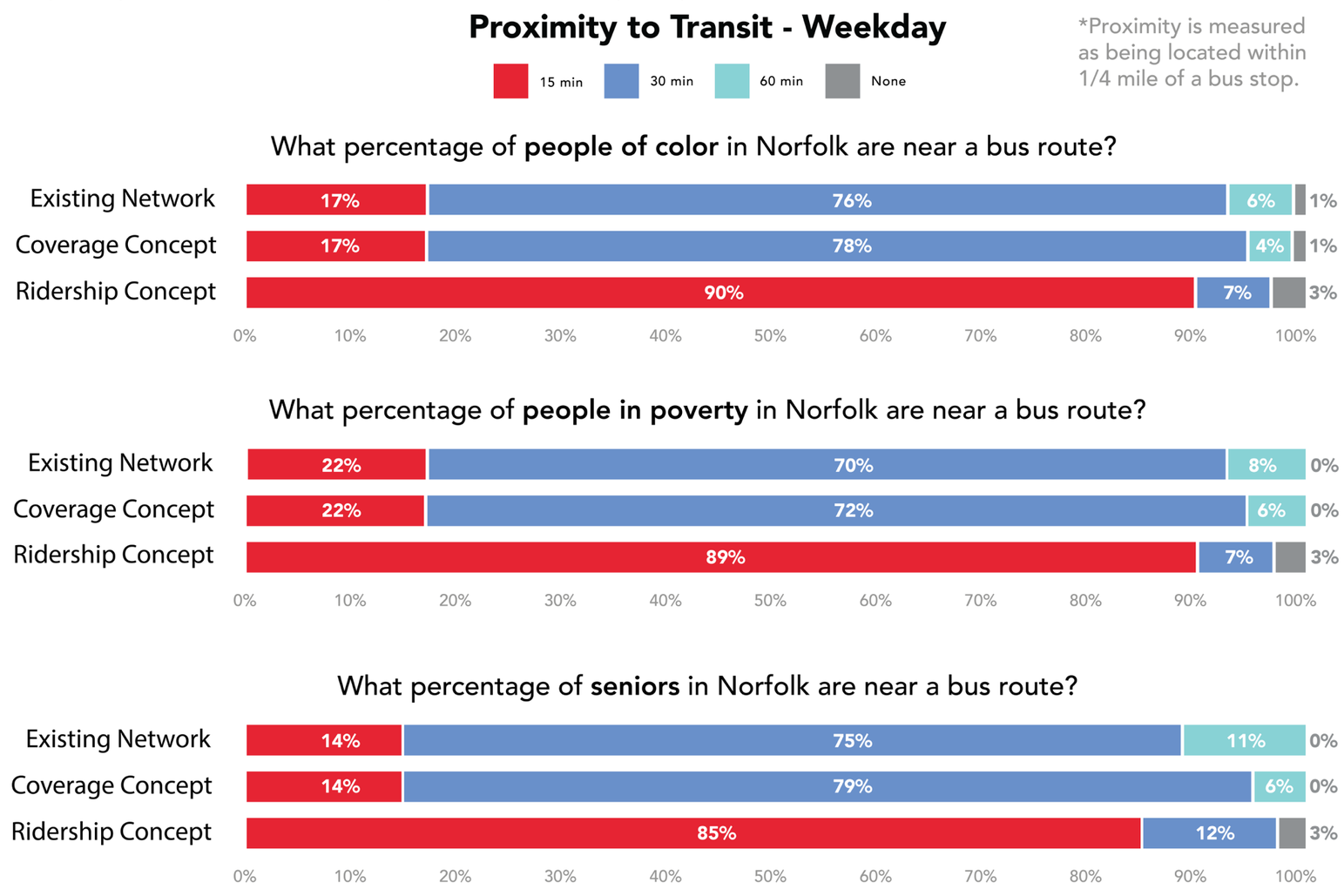
- slightly decrease the percent of residents of color, residents in poverty and seniors near any transit
- dramatically increase the percent of residents of color near frequent transit from 17% to 90%
- dramatically increase the percent in poverty near frequent transit from 22% to 89%
- dramatically increase the percent of seniors near frequent transit from 14% to 85%

Of note is that today 22% of all residents are near frequent service, while only 17% of residents of color are near frequent service. Thus, today non-minoirty residents are more likely to be served by frequent transit than minority residents. The Ridership Concept flips this condition and puts 90% of people of color near frequent service, compared to only 84% of all residents.

The most important takeaway from these charts, is that the changes in proximity to any service and to frequent service from the existing network to the concepts appears to have a similar effect on people of color, people in poverty and seniors as on the general population. More people in disadvantage are within a quarter mile of any transit service compared to the general population.

The Ridership Concept puts frequent service closer to people of color and people in poverty at a higher rate than the Existing Network.

Figure 23: As with all residents, more people of color and people in poverty have access to any service in the Coverage Concept, but far more have access to frequent service with the Ridership Concept.



Freedom, Access, Usefulness

Where can I go in 45 minutes?

People ride transit if they find it useful. High transit ridership results when transit is useful to large numbers of people. A helpful way to illustrate the usefulness of a network is to visualize where a person could go using public transit and walking, from a certain location, in a certain amount of time.

The maps in Figure 24 show someone's access to and from The Berkley Community Center in 45 minutes, at noon on a weekday in the Ridership and Coverage Concepts. Each concept is compared to the Existing Network. The technical term for this illustration is isochrone. A more useful transit network is one in which these isochrones are larger, so that each person is likely to find the network useful for more trips.

The dark blue represents areas that are reachable today and would be newly-reachable in the corresponding concept. Areas that are newly reachable are shown in light blue, and areas that would no longer be reachable are shown in gray. The maps show that for trips begining at the Berkley Communty Center, the Ridership Concept would increase access to residents and jobs over the existing network by over 200%. The Coverage Concept would slightly reduced access to residents and jobs (by 8% and 18% respectively).

Not Just the Area – Also What is Inside the Area

The real measure of usefulness is not just how much geographic area we can reach, but how many useful destinations are in that area.

Ridership arises from service being useful, for more people, to get to more busy places. That's why predictive models of ridership do this very same analysis behind-the-scenes.

When reviewing these maps remember that waiting time counts, and in most cases, a longer walk to a high-frequency route can get people farther and faster, than a shorter walk to an infrequent route. Also remember that some of the access shown in these maps isn't reached on a single route, but requires a transfer. Especially in the Ridership Concept, some places are reachable quickly even when the trip involves a transfer.

We've included three more examples of these isochrones on the following pages. These isochrones show the change in the numbers of jobs and residents within each isochrone, relative to the existing network for key locations around Norfolk. Isochrone maps from additional locations are available in Appendix A on page 39.

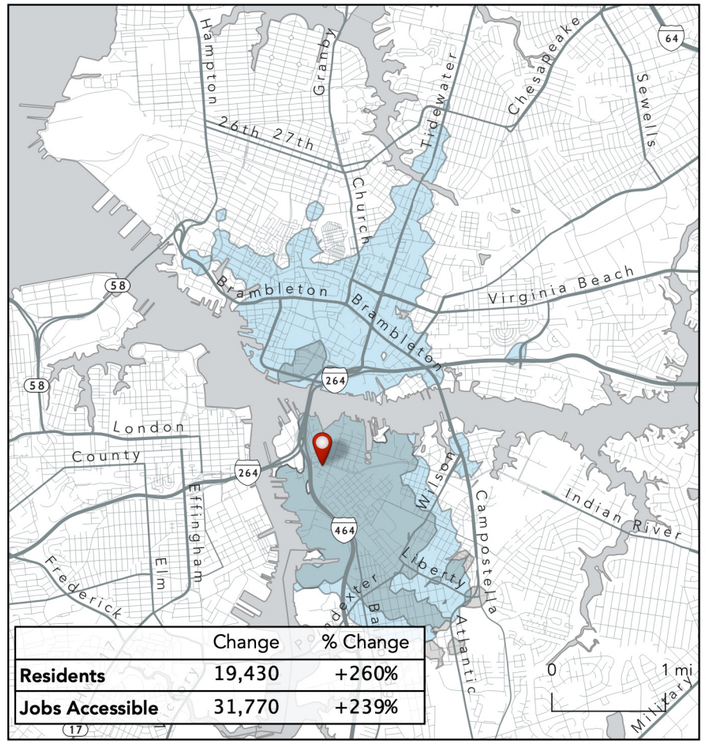
Figure 24: An isochrone shows how far someone can go, in a given amount of time, by walking and transit. This isochrone map from The Berkley Community Center shows change in access in 45 minutes for the Coverage and Ridership Concepts.

How far can I travel in **45 minutes** from

Berkley Community Center

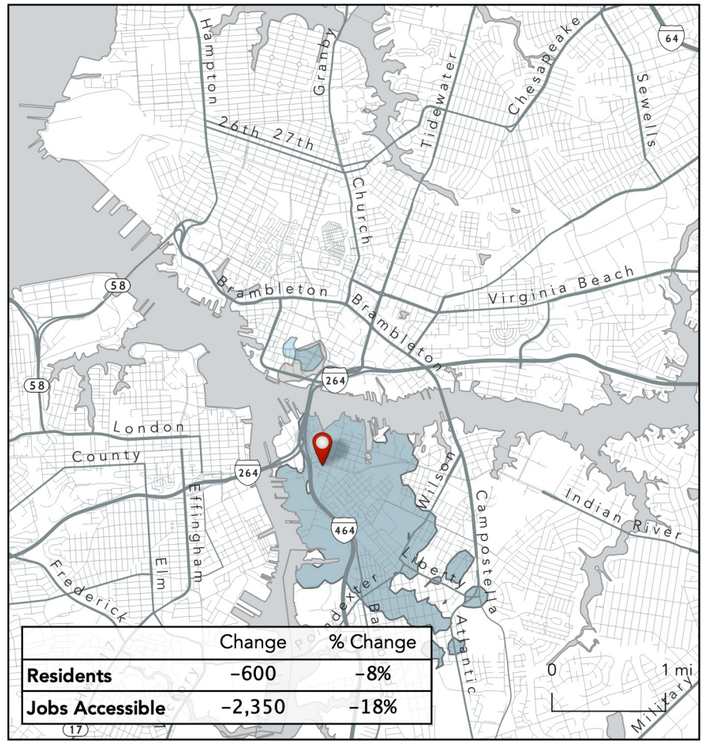
on weekdays at noon using the:

Ridership Concept?*



	Change	% Change
Residents	19,430	+260%
Jobs Accessible	31,770	+239%

Coverage Concept?*



	Change	% Change
Residents	-600	-8%
Jobs Accessible	-2,350	-18%

*compared with the HRT network as of February 2020.

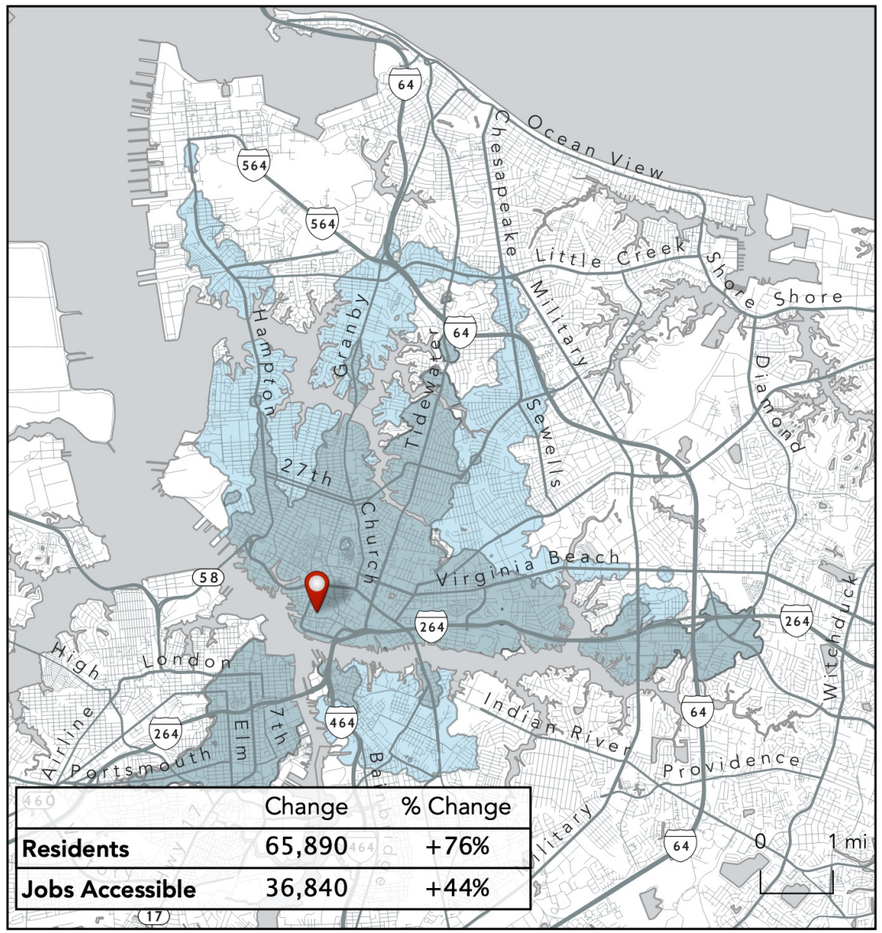
Access From MacArthur Square

How far can I travel in **45 minutes** from

Downtown Norfolk - MacArthur Square

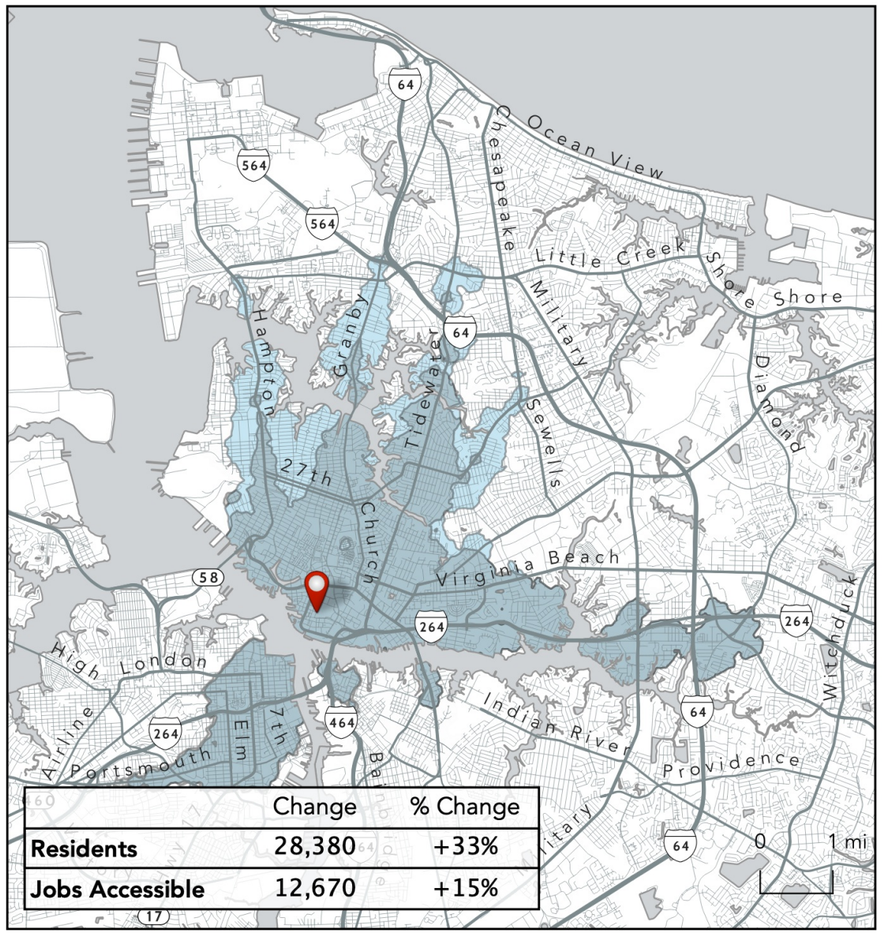
on weekdays at noon using the:

Ridership Concept?*



	Change	% Change
Residents	65,890	+76%
Jobs Accessible	36,840	+44%

Coverage Concept?*



	Change	% Change
Residents	28,380	+33%
Jobs Accessible	12,670	+15%

Both concepts improve access to and from downtown by bringing routes through the core more directly.

*compared with the HRT network as of February 2020.

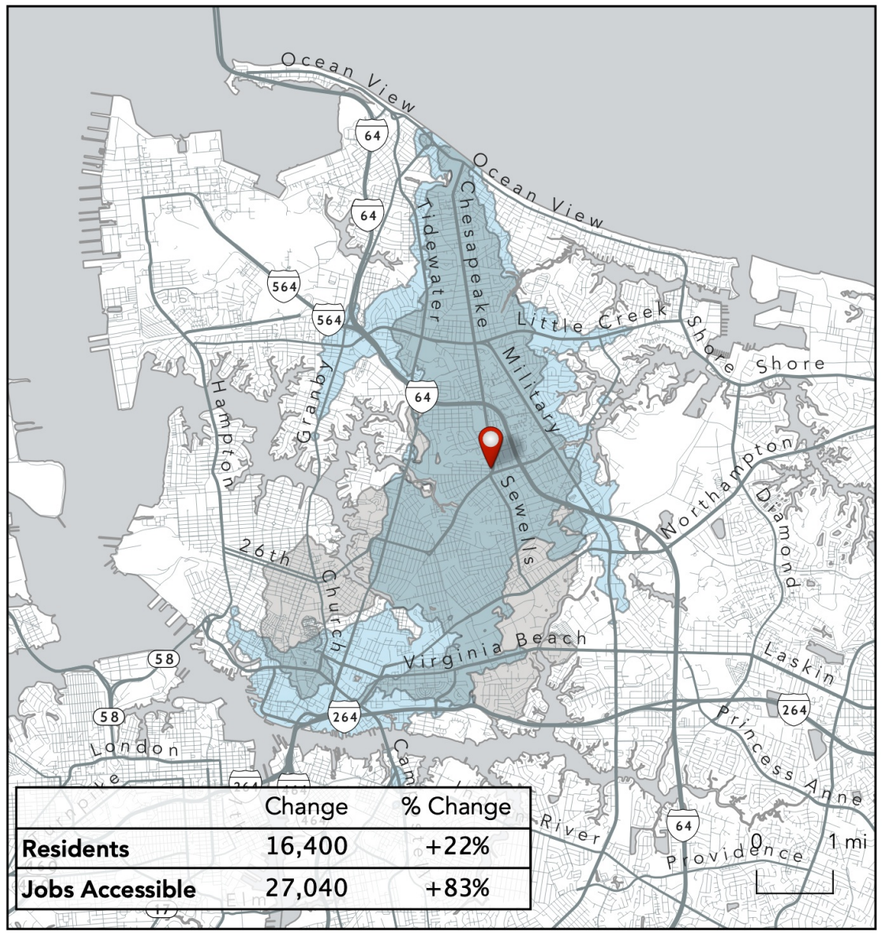
Access from Chesapeake at Norview

How far can I travel in **45 minutes** from

Chesapeake at Norview

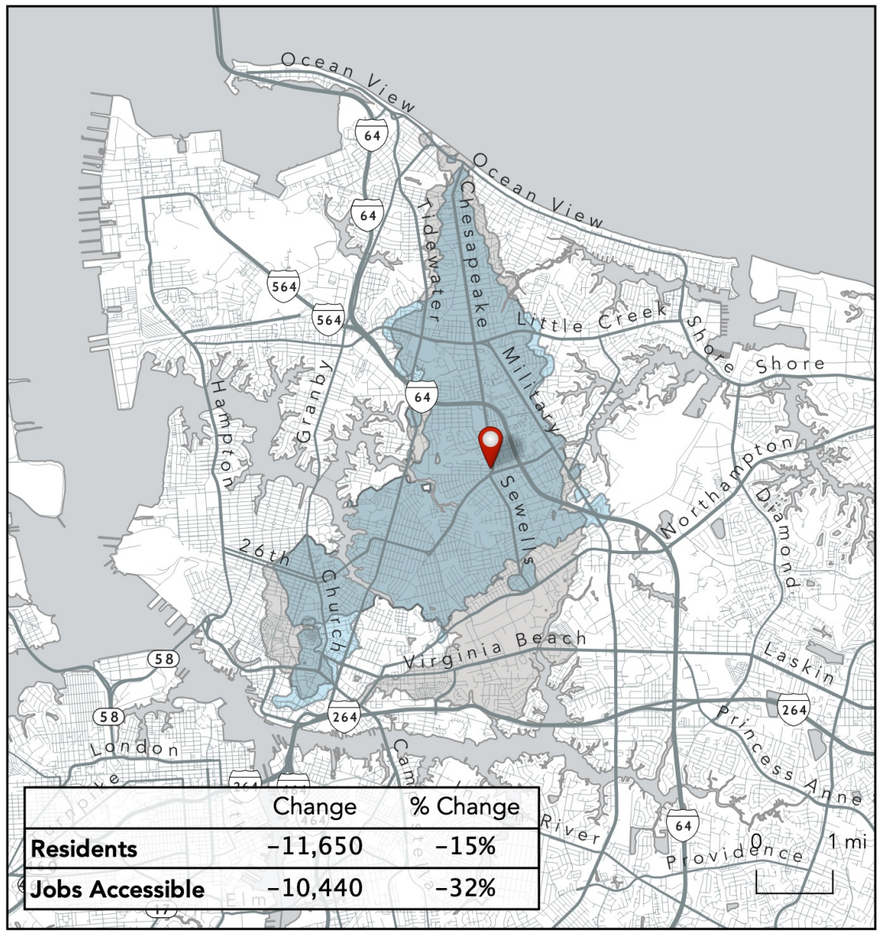
on weekdays at noon using the:

Ridership Concept?*



	Change	% Change
Residents	16,400	+22%
Jobs Accessible	27,040	+83%

Coverage Concept?*



	Change	% Change
Residents	-11,650	-15%
Jobs Accessible	-10,440	-32%

*compared with the HRT network as of February 2020.

Both concepts reduce access to some areas from Chesapeake and Norview, but the Ridership Concept expands access to many areas because service is more frequent on Chesapeake Boulevard.

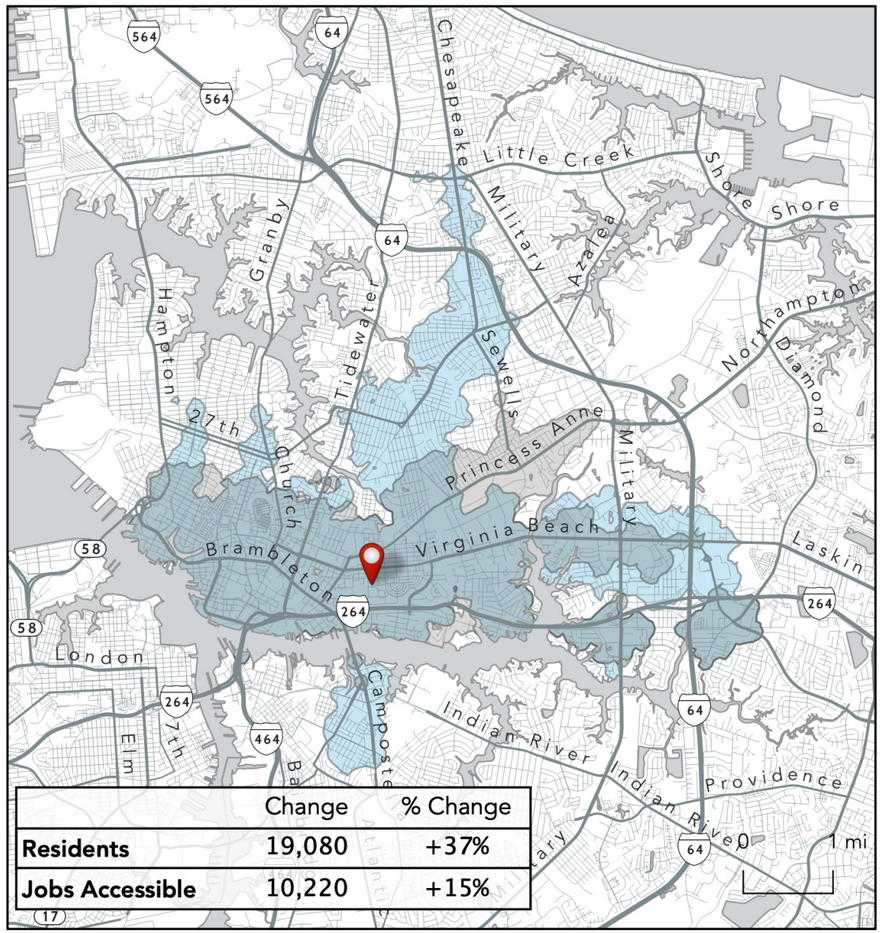
Access from Norfolk State University

How far can I travel in **45 minutes** from

Norfolk State University

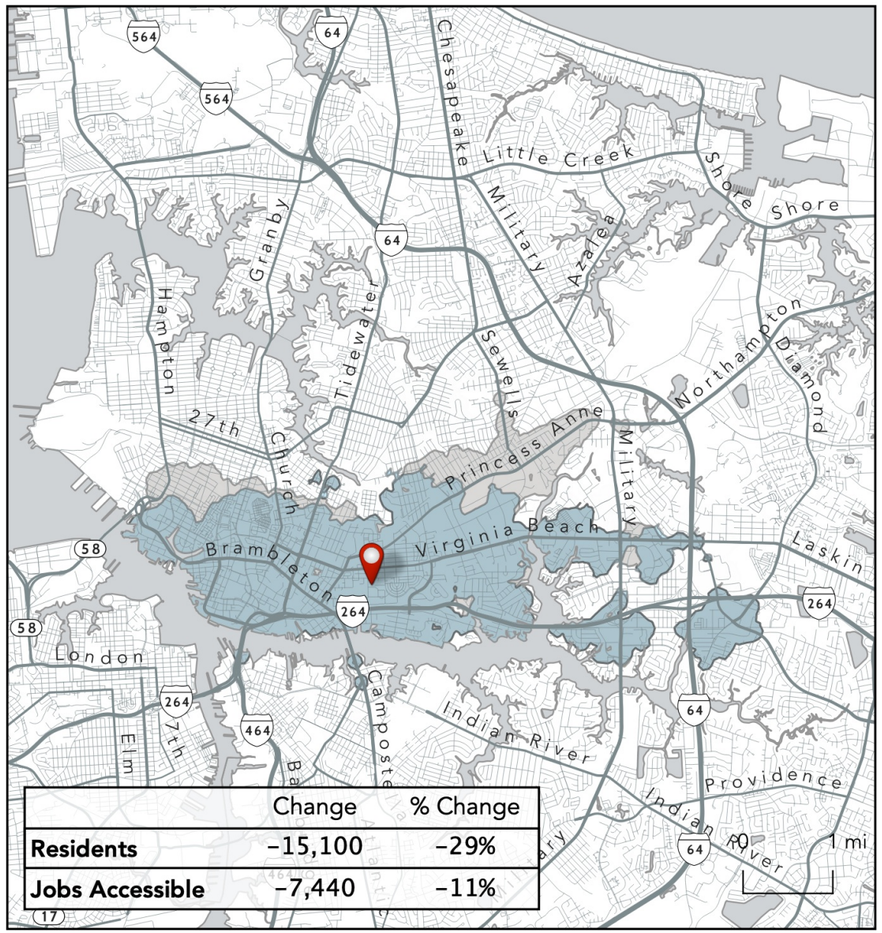
on weekdays at noon using the:

Ridership Concept?*



	Change	% Change
Residents	19,080	+37%
Jobs Accessible	10,220	+15%

Coverage Concept?*



	Change	% Change
Residents	-15,100	-29%
Jobs Accessible	-7,440	-11%

*compared with the HRT network as of February 2020.

Both concepts reduce access from NSU to the Pricness Anne Corridor, but the Ridership Concept expands access to South Norfolk, northern parts of Chesapeake Boulevard, and other parts of the city due to higher frequency on multiple routes in the vicinity of NSU.

Citywide Change in Access to Jobs

The previous maps show how the concepts expand where people could go in a given time, from certain places. (Again, access to other opportunities, like education on shopping would likely change in a similar way.) We can run the same analysis on a grid of locations throughout the city to estimate the acccess impacts of the Conceptual Networks on jobs access for different areas of the city.

The map on this page and the next summarize the same thing for every part in the city. In this map, every hexagon represents the number of jobs that can be reached in 45 minutes as compared to the existing network. Green hexes represent more jobs accessible and pink hexes represent fewer jobs available. Hexes are also sized by the number of people who live in each hexagon.

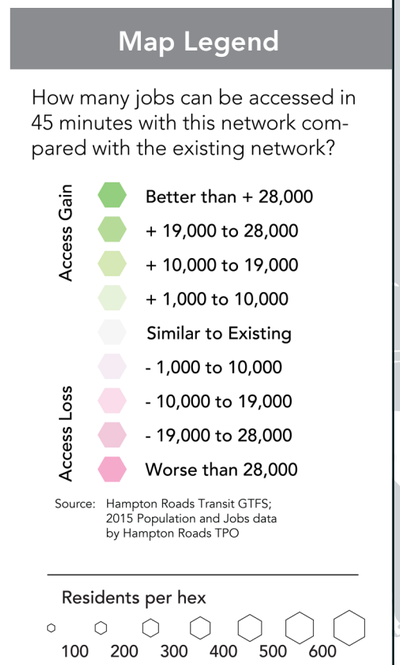
Coverage Concept

The Coverage Concept shows an increase in job access in a few parts of the city and some areas where job access would decrease. The greatest increase is in Ghent and along main corridors that have more frequent service than in the existing system such as Granby, Tidewater, Azalea, Military, and Little Creek.

There is a decrease in access along Princess Anne and Sewells Point as a result of reducing the frequency of service along Princess Anne. Route 23 in the existing network runs every 30 minutes, but Route 16 in the Coverage Concept run every 60 minutes. Also, no service runs along Sewells Point south of Robin Hood in the Coverage Concept. The area south of Princess Anne and west of Military would be served by a Variable Transit Zone in the Coverage Concept.

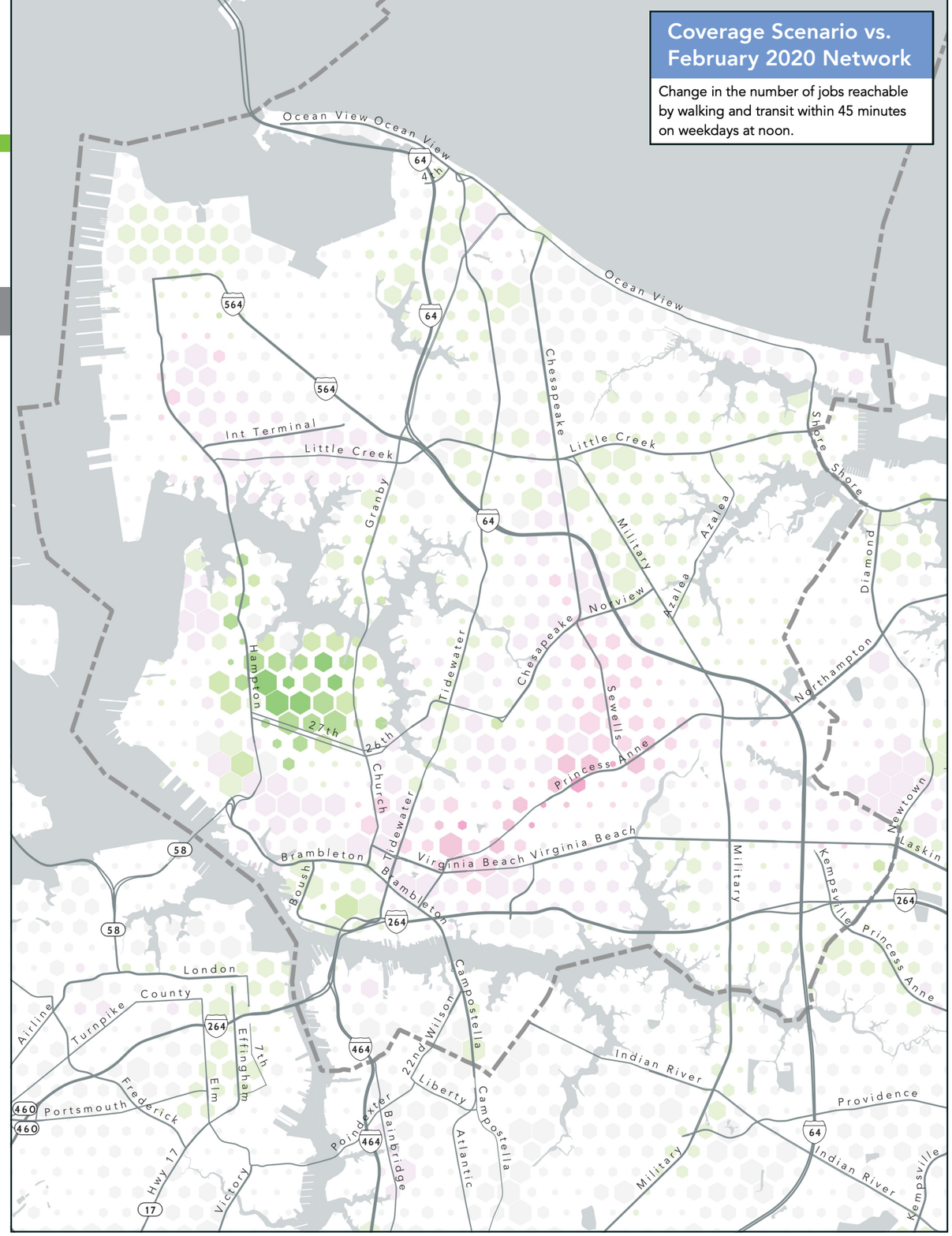
There would be a slight decrease in access near the Naval Station Norfolk but this area has few residents. Access has decreased for the Ikea at US Rotute 13 and I-64 because existing 30-minute service is every 60 minutes in the Coverage Concept. These results highlight one of the downsides of the Coverage Concept, in that increasing the coverage of the city requires reducing frequency of service in some areas, which reduces the number of jobs reachable in a reasonable amount of time.

Figure 25: Change in Jobs Reachable in 45 minutes for the Coverage Concept Compared to Existing Network.



The Coverage Concept would spread service throghout the city, and would, on balance, maintain the number of jobs reachable by the average resident in 45 minutes.

Note: This is a straight-line distance calculation, not one using the street network.



3 COMPARING OUTCOMES

Change in Access: Ridership

Ridership Concept

With more frequent routes across most of the city, the Ridership Concept increases access to jobs and opportunity across much of Norfolk. Traveling across large parts of the city, particularly in the most dense areas, would be much faster, because waiting times would be much shorter, both for the initial wait for a bus and for a connection. The Ridership Concept would require people to walk longer distances, but it will get most people farther and faster to their destinations, primarily due to shorter waits.

There are large increases in access to jobs throughout Norfolk. Areas like Ghent, Glenwood Park, Ward's Corner and downtown would see large access benefits due increases in frequency. Increased frequency on corridors such as Hampton, Granby, Chesapeake, Ballentine, Campostella, and Brambleton would drastically improve access for these areas. Even residents in farther out places like Ocean View, Diamon Springs and Westview Village see job access benefits from the Ridership Concept.

The most substantial decrease in access would be experienced near where Sewells Point and Princess Anne meet. This is the result of Route 2 (15 min) being rerouted to serve Chesapeake and Ballentine. In this area, service has been shifted to serve more mixed-use density and jobs better suited to transit access along Ballentine. In the Ridership Concept, the average resident along Chesapeake and Ballentine can reach more than 28,000 more jobs in 45 minutes in the Ridership Concept.

The Ridership Concept would increase the number of jobs reachable by the average resident in 45 minutes by 35%.

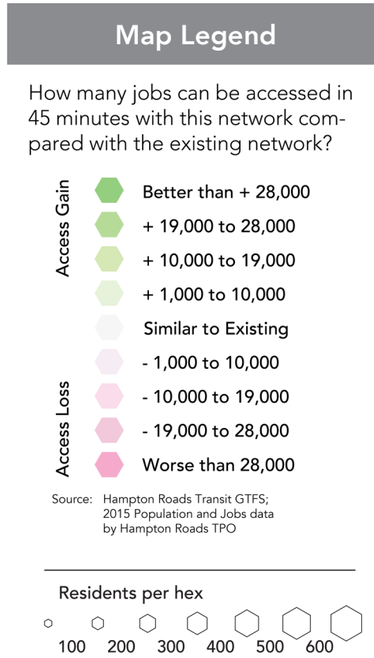
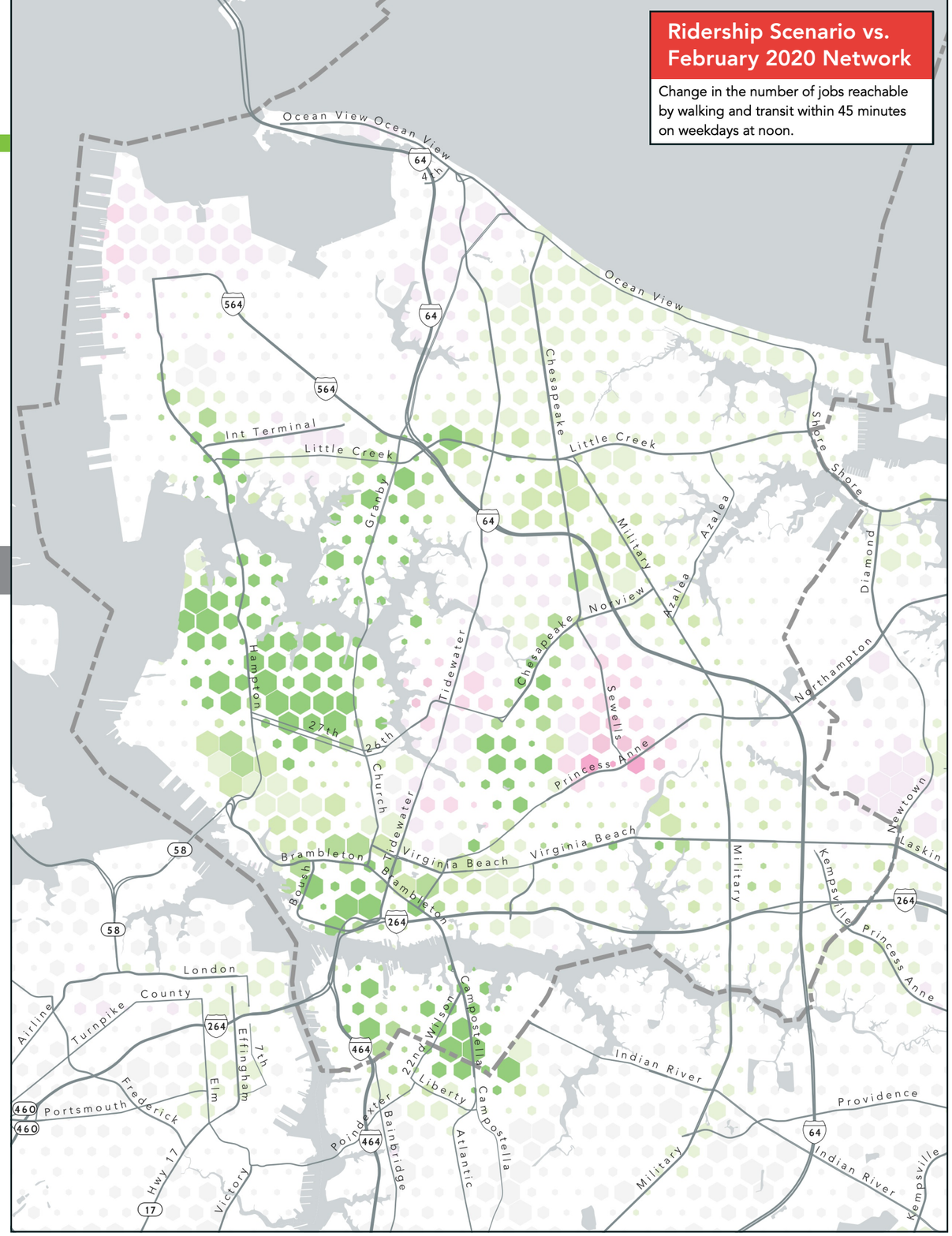


Figure 26: Change in Jobs Reachable in 45 minutes for the Ridership Concept Compared to Existing Network.



3 COMPARING OUTCOMES

Change in Access: Disadvantaged Populations

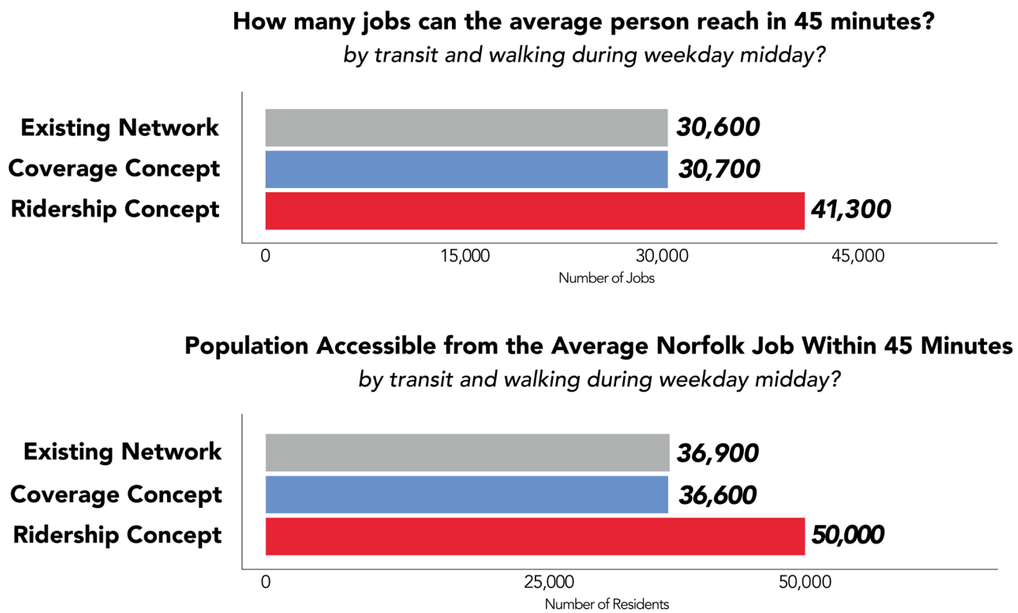
The maps on the previous pages show the two concepts change access to jobs for different parts of the city. By adding up all the increases and decreases across the city, we can estimate how each concept changes the access to jobs for the average person in Norfolk.

Figure 27 shows the change in how many jobs the average person could reach by walking and transit in 45 minutes. **With the Existing Network, the average person can reach about 30,600 jobs. In the Coverage Concept this would increase slightly to 30,700, a less than 1% increase.**

In the Ridership Concept, the improved frequency of service substantially **increases the number of jobs the average person could reach to 41,200, a 35% increase.**

It is also important to consider how many people can reach the average job location. This is sometimes called workforce access as it tells us about how many potential workers can reach an employment location. Yet, it is also telling us about how many potential customers could reach a grocery store, medical office, or library. In the Existing Network, the average job location can be reached by about 36,900 people. In the Coverage Concept, this would actually go down to 36,600, about a 1% decrease. The Ridership Concept would increase the number of people who could reach the average job location to 50,300, a 36% increase.

Figure 27: Population and Jobs Accessible Within 45 Minutes

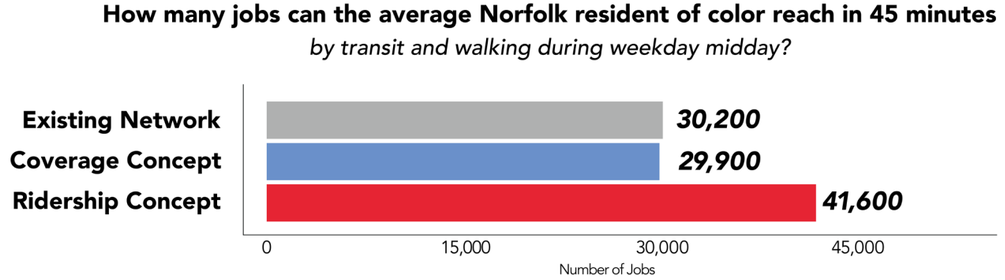


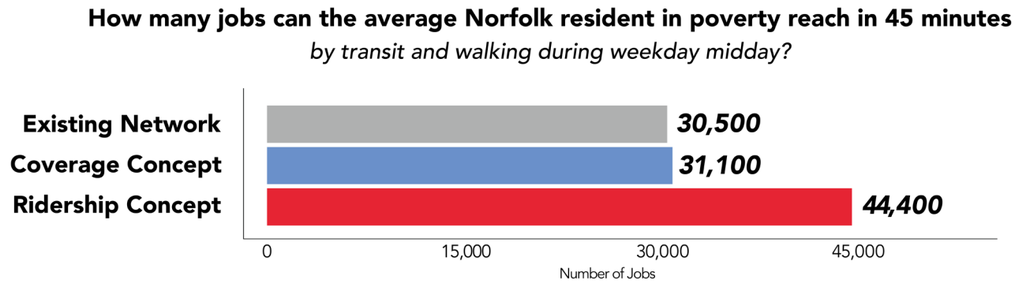
It is also worth considering how these job access factors change for people in disadvantaged situations. Figure 28 shows the change in jobs accessible for people of color, people in poverty, and seniors. The Coverage Concept would reduce access to jobs for people of color by about 1% because it spreads resources around to lower density areas of the city that have fewer residents of color. In contrast, for people in poverty, the Coverage Concept increases job access by about 2%. This increase is largely driven by the significant increase in access around Old Dominion University, where many students are considered to be in poverty by Census definitions of income. For seniors, the Coverage Concept reduces access to jobs slightly, by less than 1%.

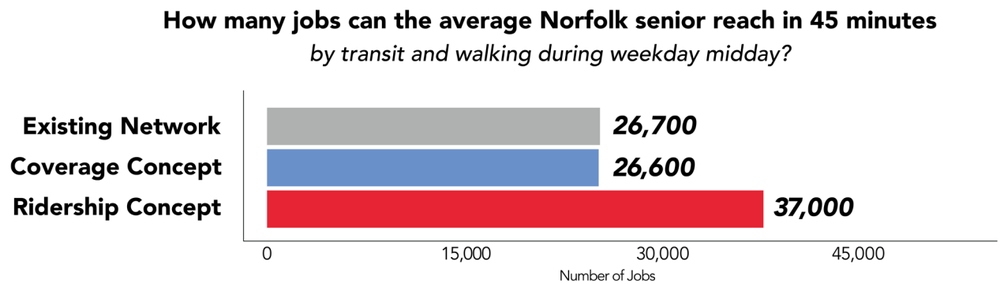
The Ridership Concept substantially increases the access to jobs for all three disadvantaged population groups. **For people of color, the Ridership Concept increases access to jobs by 38%.** Furthermore, under the Ridership Concept, the average person of color could reach about 1% more jobs than the average resident, whereas under the Existing Network, the average person of color can reach about 1% fewer jobs than the average resident.

For people in poverty, the Ridership Concept increases the number of jobs accessible by 46% and for seniors the Ridership Concept increases the number of jobs accessible by 39%. The Ridership Concept improves job access for all disadvantaged population groups more than it does for the average resident.

Figure 28: Population and Jobs Accessible Within 45 Minutes for the Average Resident of Color, Resident in Poverty and Senior







4 Key Choices and Next Steps

Key Choice: Ridership or Coverage

The most important question governing the design of any transit network: should the service be designed to generate the most ridership (and in doing so, serve a range of other associated goals), or to reach more people?

Ridership-oriented networks serve several popular goals for transit, including:

- Reducing environmental impact through fewer Vehicle Miles Travelled.
- Achieving low public subsidy per rider, by serving more riders with the same resources, and by fares collected from more passengers.
- Allowing continued urban development, even at higher densities, without being constrained by traffic congestion.

On the other hand, coverage-oriented networks serve a different set of goals, including:

- Ensuring that everyone has access to some transit service, no matter where they live.
- Providing lifeline access for those who cannot drive.
- Providing access for people with severe needs.
- Providing a sense of political equity, by providing service to every municipality or electoral district.

Success is defined differently depending upon the goal. A network focused on coverage is not seeking to generate high ridership, so its success should not be evaluated based on its productivity; what matters is the degree to which service is available to the population. On the other hand, when ridership is the explicit goal, the key measure of success is return on investment (in terms of ridership) of every unit of service deployed.

Ridership and coverage goals are both laudable, but they lead us in opposite directions. Within a fixed budget, if a transit agency wants to do more of one, it must do less of the other. Many agencies act as though these goals were not in conflict, promising that they will "increase ridership while ensuring that all residents have access," or "run efficiently" and "provide access for all." This generally leads to a feeling among the public, elected officials and even transit staff themselves that no matter what they do, they are failing to achieve their goals.

This is the natural result when major goals are in conflict. If a high-ridership bus line is crowded, a transit agency is criticized for not offering enough frequency; yet if they remove buses from a low-ridership line to reallocate them to the high-ridership line, they are criticized for cutting someone's lifeline transit access. Only by acknowledging the conflict between these goals, and explicitly deciding how much effort to use pursuing each, can a transit agency succeed at both.

It is often said about public and private organizations alike that if you want to know what really matters, look at their budgets. High-level policies are valuable, but when they are vague or in conflict, the real evidence of a community's values is in its budget. Thus we suggest that the City of Norfolk think about this choice not as black-and-white, but as turnable dial that the community can help to set:

What percentage of the available budget for transit should be dedicated to generating as much ridership as possible, and what percentage should be spent providing transit where ridership is predictably low, but needs are high?

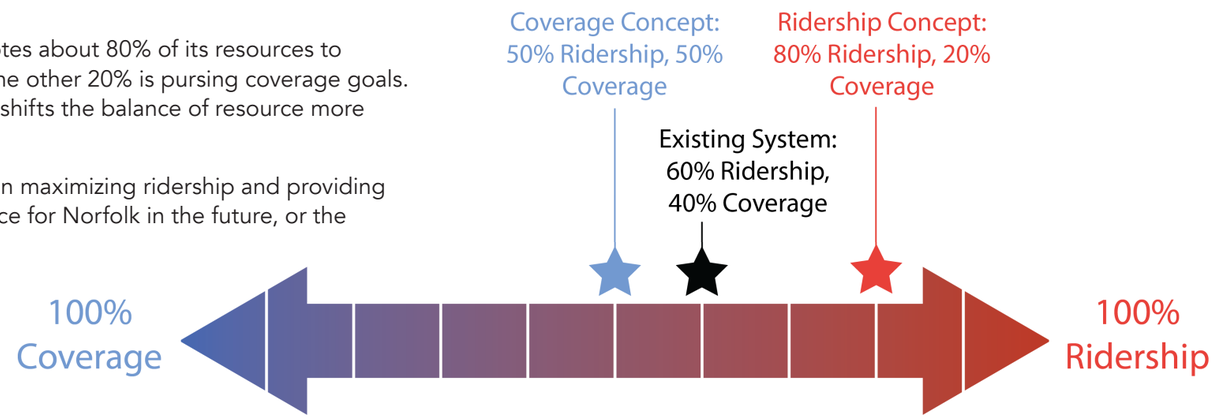
The Coverage and Ridership Concepts, along with the Existing Network, represent a spectrum of possibility on the key policy questions including the ridership-coverage trade-off:

- The Existing Network devotes about 60% of its resources to maximizing ridership and while the other 40% has predictably low-ridership, because of where or when it runs, or other factors that make it useful to predictably-small numbers of people.
- The Coverage Concept devotes about 50% of its resources to maximizing ridership while the other 50% is pursing coverage goals. Thus the Coverage Concept shifts the balance of resources more toward coverage goals.
- The Ridership Concept devotes about 80% of its resources to maximizing ridership while the other 20% is pursing coverage goals. Thus the Ridership Concept shifts the balance of resource more toward ridership goals.

A existing 60/40 balance between maximizing ridership and providing coverage may be the right balance for Norfolk in the future, or the community may wish for a shift in the balance between these goals. The initial input from the community and stakeholders during the workshops and surveying completed in Round 1 suggests that people would like to shift in the direction of ridership goals.

The Coverage and Ridership Concepts give people clearer pictures of what turning that dial in different directions would look like and the outcomes it would achieve. With a clearer picture of the effects of shifting the balance of goals, whether to make a shift, in what direction—either towards higher or wider coverage—and how fast Norfolk should make such a shift are key questions that will be put to the public, stakeholders and elected officials in the second round of outreach for the Multimodal Norfolk: Transit System Redesign.

Figure 29: Spectrum of Choices for Norfolk



Key Choice: Stop Spacing

There is a geometric trade-off between closer stop spacing and faster bus speeds. Figure 30 shows the basic trade-off in conceptual terms. As stops are placed farther apart, buses can travel faster and cover more distance in the same time.

This is because most of the time required at a stop is not proportional to the number of passengers served. When there are many stops, passengers spread themselves out among them, so the bus stops more for the same number of people. When passengers gather at fewer stops, stopping time is used more efficiently, resulting in faster operations.

This increased speed has two benefits. First, riders can get farther faster and reach their destinations sooner. Also, as speeds increase across the entire transit system, more service can be provided for the same cost. Since the primary cost of transit service is the cost for labor which is paid based on time worked, the faster buses operate, the more service that can be provided for the same cost. So, higher frequency can be provided or routes can be extended to go farther for the same cost.

This is why standards for stop spacing in the US are generally in the range of 750 to 1,500 feet on high-frequency bus routes. HRT policy is that stops should be a minimum of 2/10 of a mile (1,052 feet) and maximum of 1/4 mile (1,320 feet) apart. Currently, this policy is not fully implemented on all routes in Norfolk. One challenge with implementing this policy is that the high end of the range for how far apart stops can be is relatively low, leaving the range between the low end and high end so close together that it can be hard to place stops within that range in some locations, particularly where water barriers mean that stops would naturally be far apart. If the City and HRT wish to place stops about 1/4 mile apart on average, the range of acceptable spacing should be between 2/10 of a mile and 1/2 mile (1,052 feet and 2,640 feet).

Figure 30: Trade-off between stop spacing and travel time.

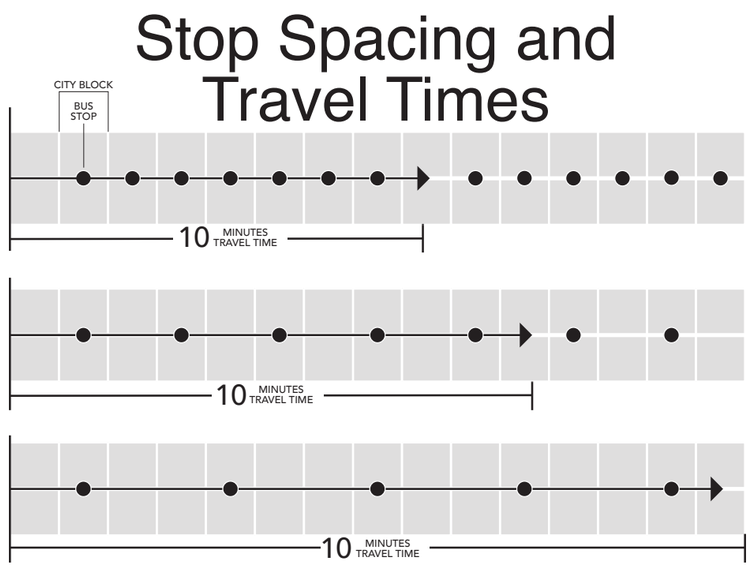


Figure 31 shows the pattern of distance between stops for all local routes and for Route 3 in Norfolk. The patterns show that there are many stops that are closer than 1,000 feet.

It is not always possible to space stops in a perfectly consistent pattern due to safety issues with street crossings or disruptions in development patterns from water features or railroad corridors. Nevertheless, the patterns shown in Figure 31 suggest that a more consistent stopping pattern for Route 3 and similar routes could reduce the number of stops and speed up service, as there are approximately 60 stops along Route 3 that are less than 1,000 feet apart.

To help visualize what stop spacing changes could look like in Norfolk, Figure 32 on the following page shows the potential changes in stop spacing along Chesapeake Boulevard from Ballentine Boulevard to Ocean View Avenue. Currently Route 3 traverses this corridor with service every 30 minutes. In the Ridership Concept, this corridor would have frequent, 15-minute service. As frequency increases and draws more riders, a bus is more likely to stop to pickup or alight passengers at every stop. Therefore, with higher ridership and close stop spacing, total travel time can begin to decline unless stop spacing is widened.

Currently in this section of Chesapeake Boulevard there is a stop about every 1,300 feet (median distance). The second map on the follow page shows where stops would be located in a condition where stop spacing has been widened to a median of every 1,750 feet. There are two fewer stops, which would increase the speed and reliability of transit service in this corridor. This example is not a recommendation, but an example of how stop spacing might affect one corridor in Norfolk.

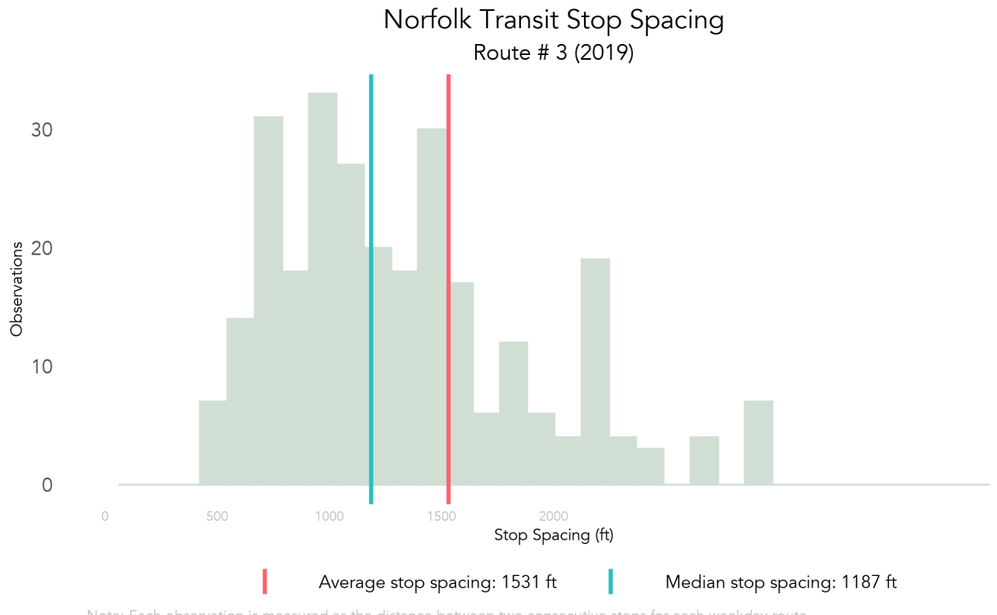
There are two major downsides to wider stop spacing. First, some people have difficulty walking and will be inconvenienced by a longer walk, particularly seniors, and people with disabilities. Second, as stops are spaced farther apart, transit becomes less useful for very short trips. This is because walking distances at each end of the trip increase to the point that very short trips would be faster by walking or biking. Some cities and agencies view this as a good thing, arguing that the point of transit is to provide an alternative to driving, not an alternative to walking.

As always, the key to a successful revision of stop spacing is for it to be a consistent policy applied in all comparable circumstances across the city, and tied to a clear citywide benefit in travel times. Many transit agencies have successfully widened stop spacing where these benefits were clear.

Most transit agencies and cities have transit networks that draw some compromise between maximizing the number of people who have short walks to a bus stop and maximizing the speed of service by having stops farther apart. It is worth asking the question:

What is more important: Having short walks to a stop, even if it means slower service and longer trips? Or having longer walks to a stop and having faster bus trips and, potentially, more bus service?

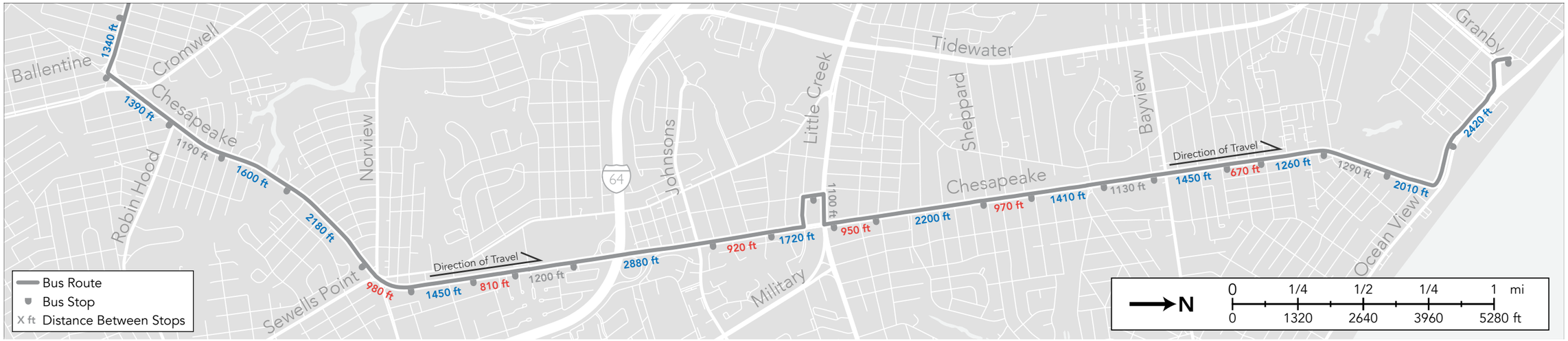
Figure 31: Stop Spacing patterns for Route 3 show many stops are closer together than every 1,000 feet.



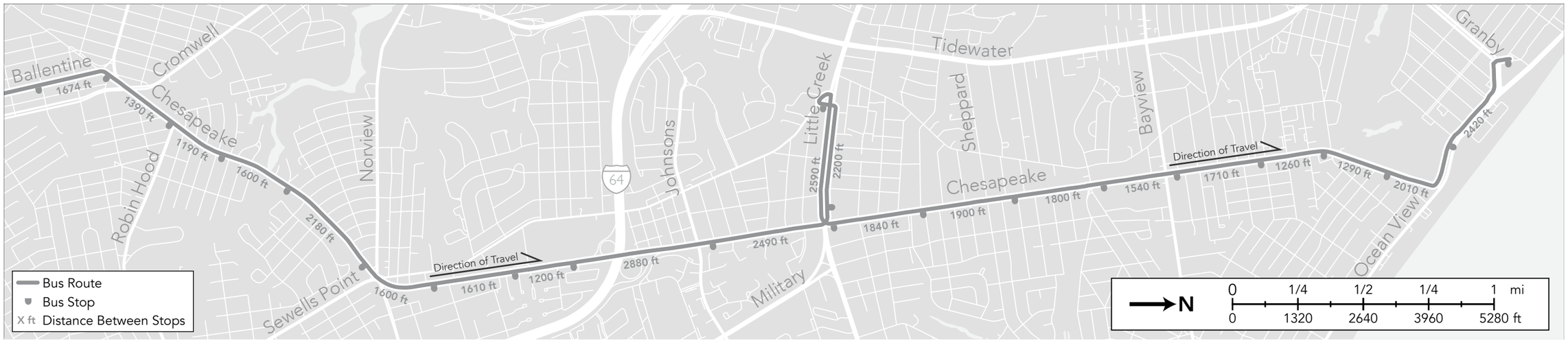
Note: Each observation is measured as the distance between two consecutive stops for each weekday route

Figure 32: Existing stop spacing on Chesapeake Boulevard (above) and conceptual changes to stop spacing (below).

Existing Network Stop Spacing Example - Route 3 Northbound



Ridership Network Stop Spacing Example - Route 2 Northbound



Next Steps

What happens next?

If you're interested enough to read this far, we'd love to have you more involved in this project!

This report is part of Round 2 of the Multimodal Norfolk: Transit System Redesign project. It kicks off a second round of public involvement in the City's decision of whether to continue providing high coverage, or to spend more of its budget attracting high ridership.

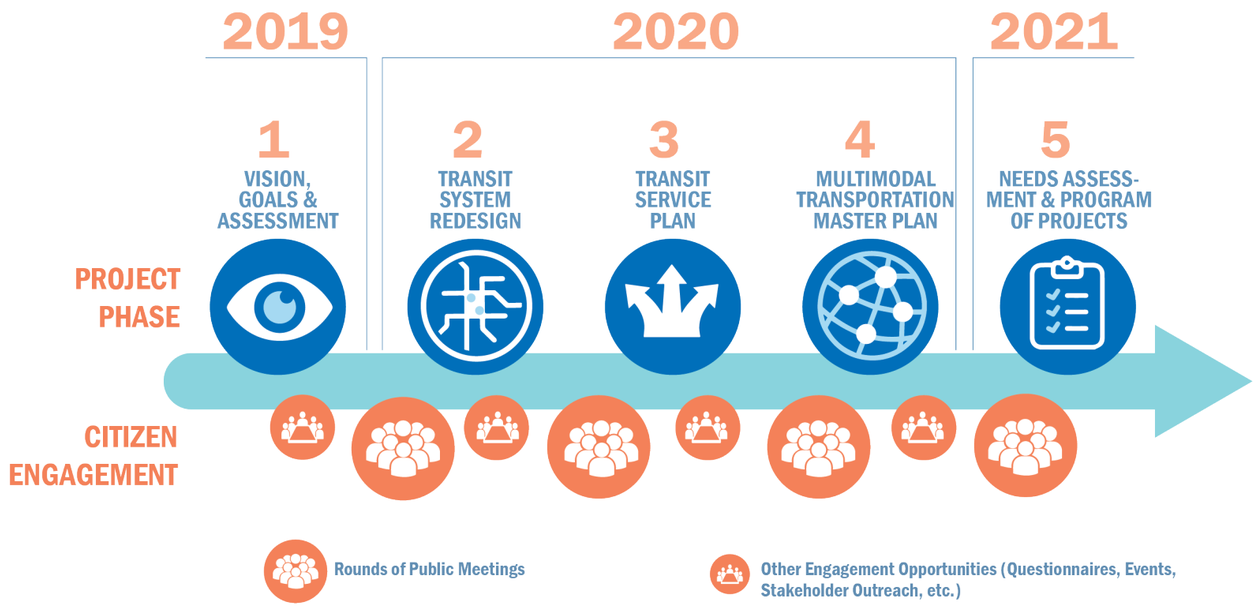
In the fall of 2020, this process will produce a Network Plan, incorporating input from the public and guidance from the City Council. The Network Plan will include maps of the new routes, and measures like job access change and proximity to service will be summarized in a report for the public and stakeholder to review in the fall of 2020. If the City decides to move ahead with any of the recommendations of that Network Plan, then there will be additional community notification before any actual service changes are made.

The outreach process around these conceptual networks will start in June and a new survey will be available at that time to provide the public an opportunity for input on these Concepts to help guide the eventual proposal.

For more information and to stay involved in the project, go to multimodalnorfolk.com to

- take the Round 2 survey;
- email the team to ask questions;
- watch videos that summarize key choices and the network redesign process;
- find out more about meetings and events where you can learn more about the entire Multimodal Norfolk process; and
- generally stay up to date on the latest happenings with the network redesign process!

Figure 33: Timeline of the Multimodal Norfolk Plan.



Appendix A: Isochrone Maps

Isochrone Locations

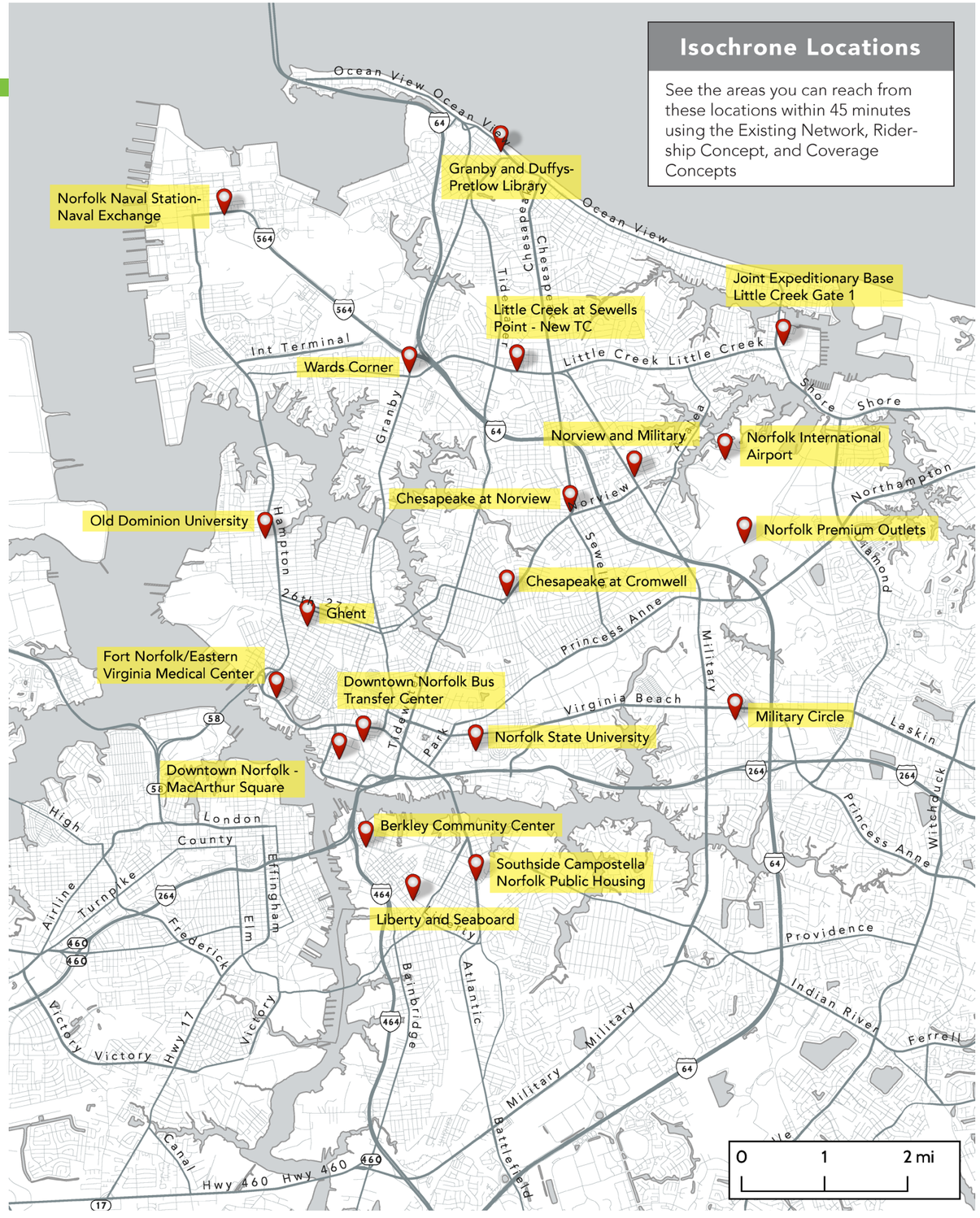
People ride transit if they find it useful. High transit ridership results when transit is useful to large numbers of people. A helpful way to illustrate the usefulness of a network is to visualize where a person could go using public transit and walking, from a certain location, in a certain amount of time.

The map at the right shows the locations where we have calculated this access for various places around Norfolk. The maps on the following pages show someone's access to and from each of these locations in 45 minutes, at noon on a weekday in the Ridership and Coverage Concepts. Each concept is compared to the Existing Network. The technical term for this illustration is isochrone. A more useful transit network is one in which these isochrones are larger, so that each person is likely to find the network useful for more trips.

Not Just the Area – Also What is Inside the Area

The real measure of usefulness is not just how much geographic area we can reach, but how many useful destinations are in that area. Each map includes a table showing the change in the number of jobs and residents within each isochrone, relative to the existing network.

Ridership arises from service being useful, for more people, to get to more busy places. That's why predictive models of ridership do this very same analysis behind-the-scenes.

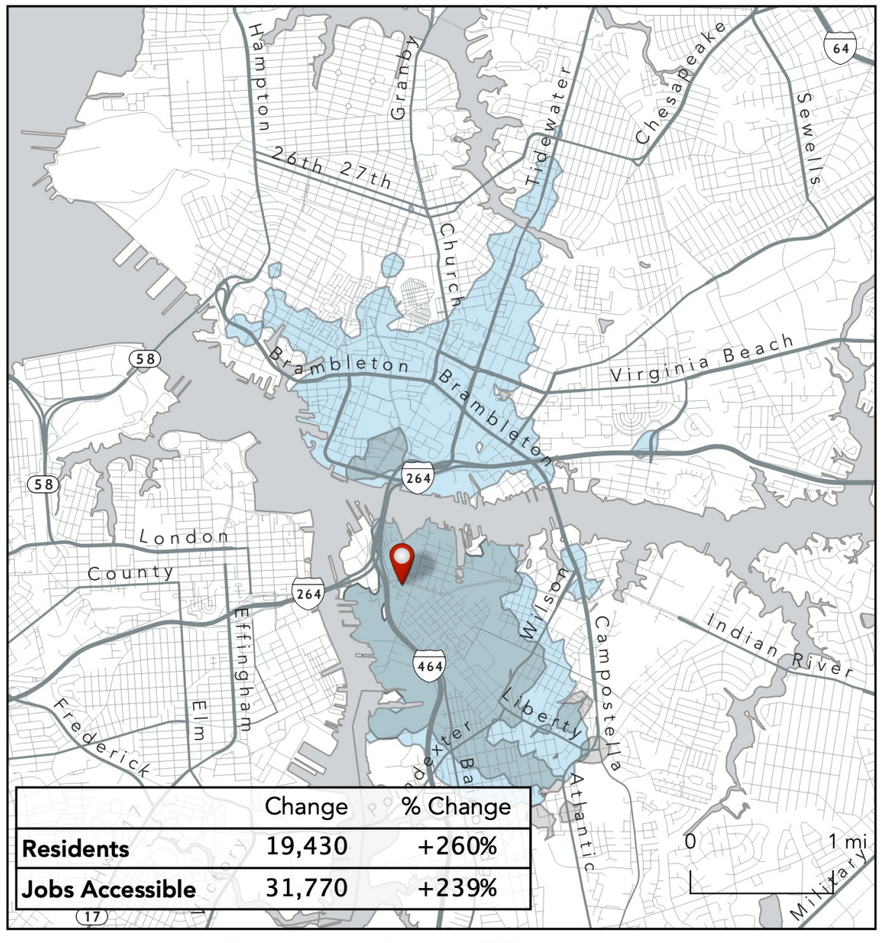


How far can I travel in **45 minutes** from

Berkley Community Center

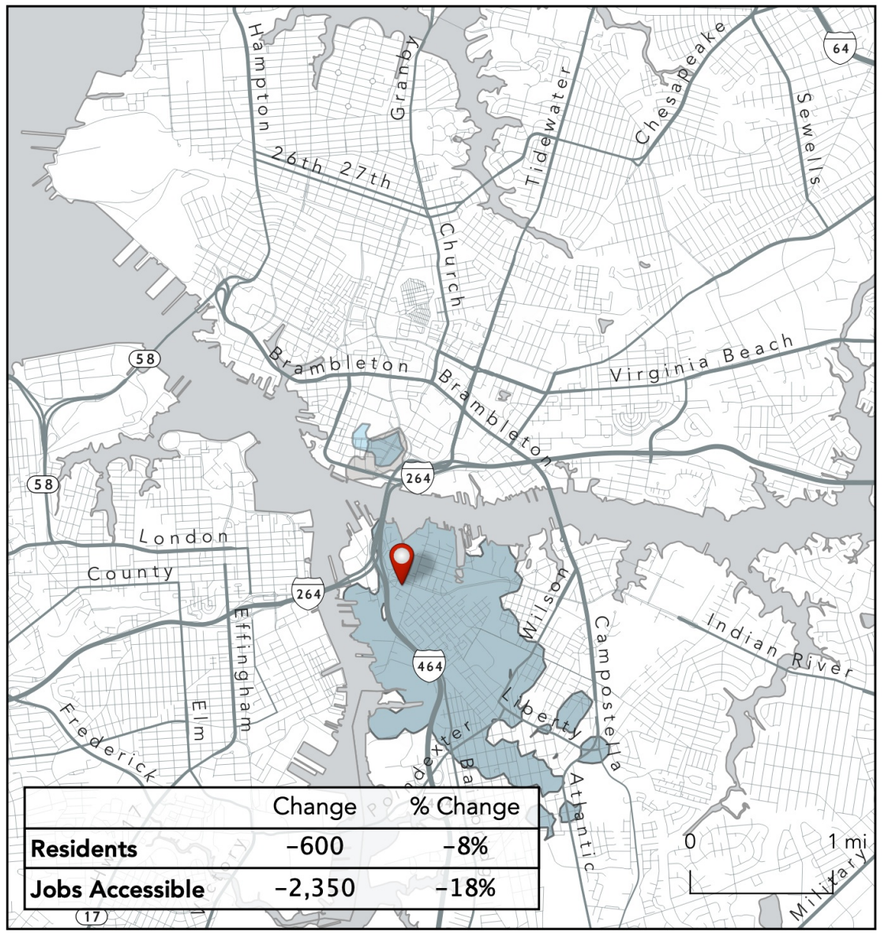
on weekdays at noon using the:

Ridership Concept?*



	Change	% Change
Residents	19,430	+260%
Jobs Accessible	31,770	+239%

Coverage Concept?*



	Change	% Change
Residents	−600	−8%
Jobs Accessible	−2,350	−18%

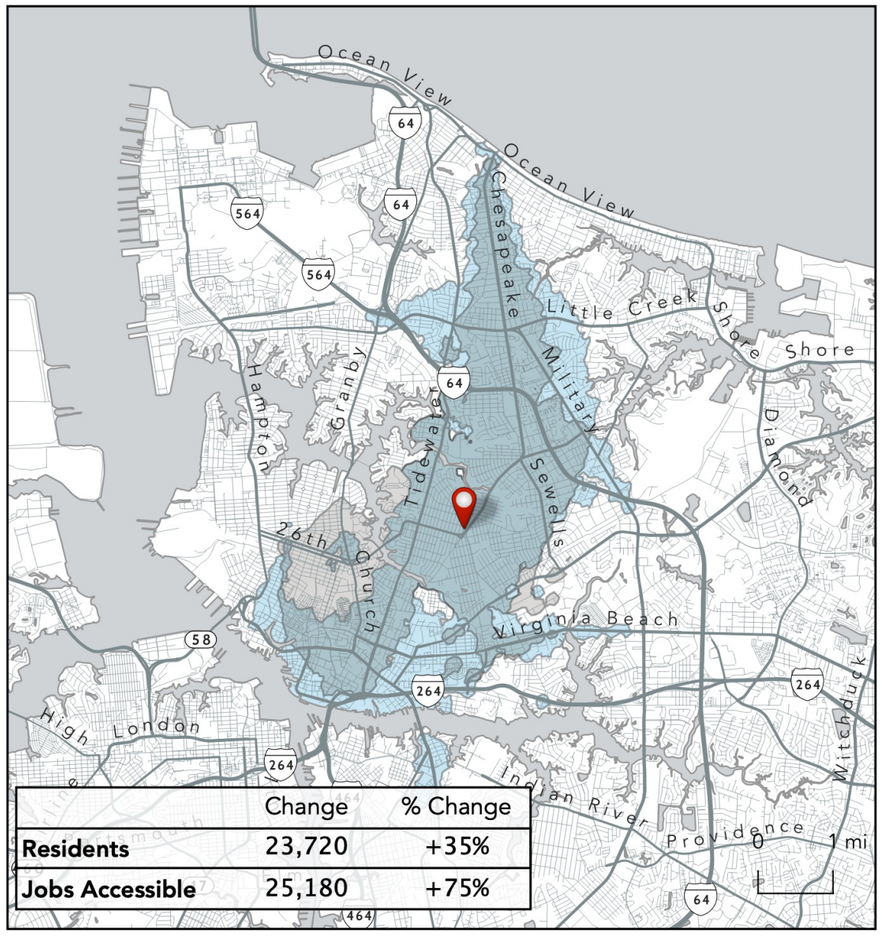
*compared with the HRT network as of February 2020.

How far can I travel in **45 minutes** from

Chesapeake at Cromwell

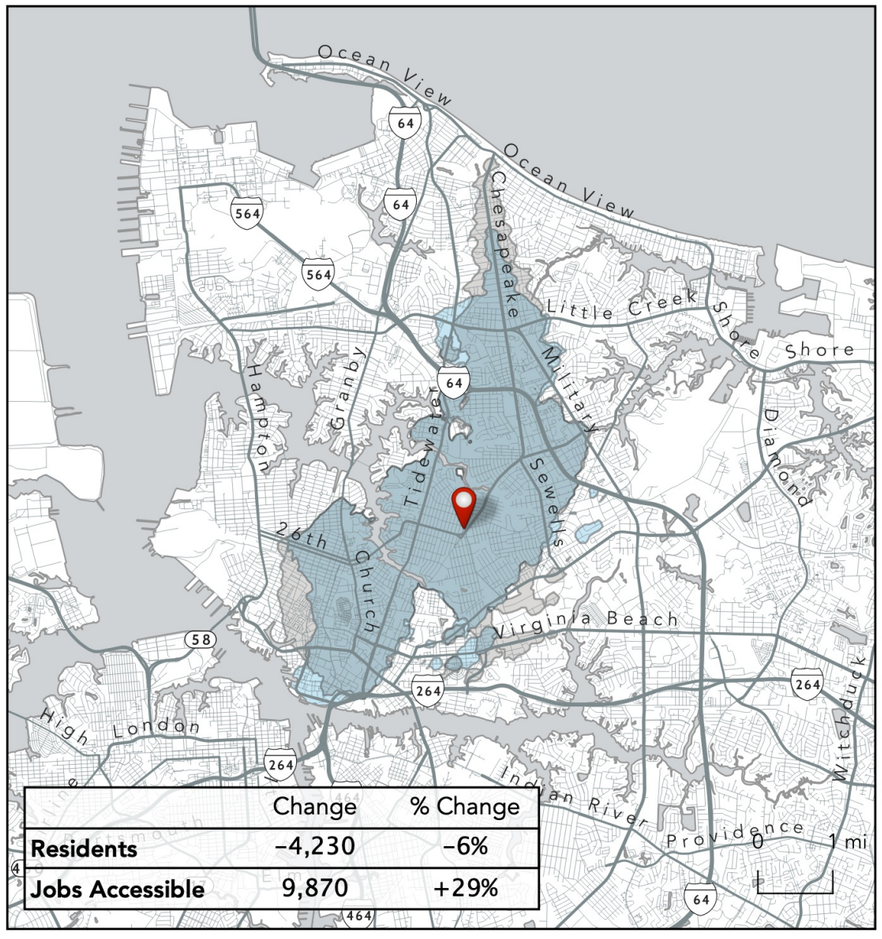
on weekdays at noon using the:

Ridership Concept?*



	Change	% Change
Residents	23,720	+35%
Jobs Accessible	25,180	+75%

Coverage Concept?*



	Change	% Change
Residents	-4,230	-6%
Jobs Accessible	9,870	+29%

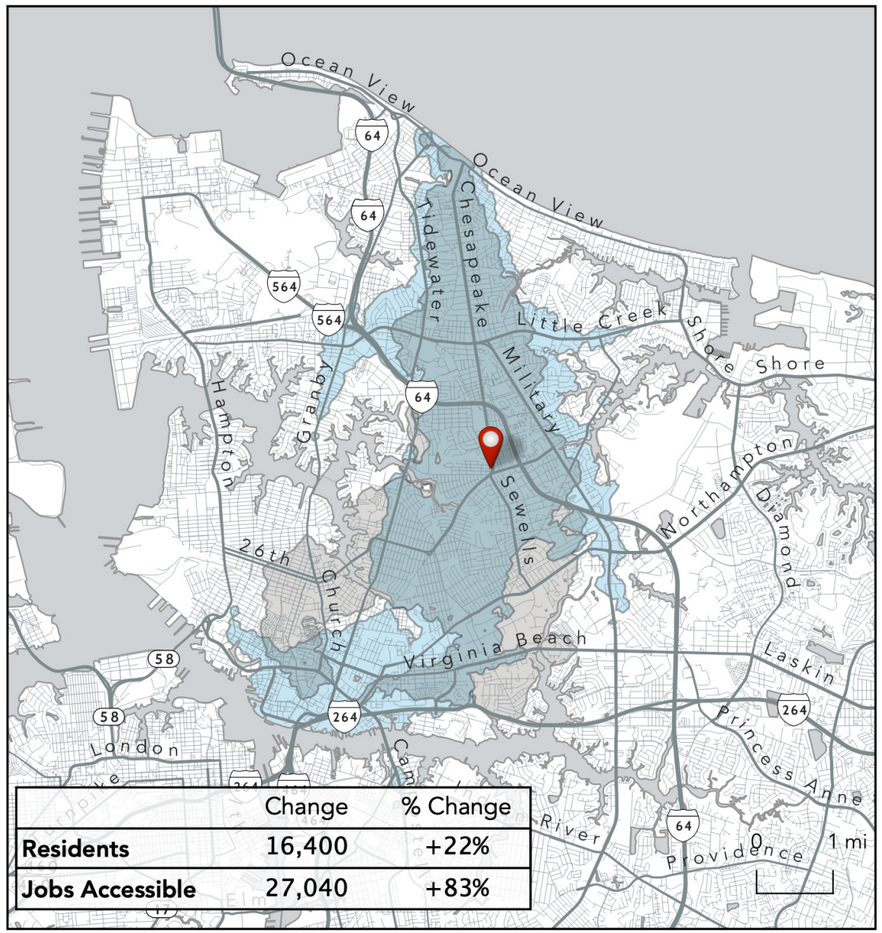
*compared with the HRT network as of February 2020.

How far can I travel in **45 minutes** from

Chesapeake at Norview

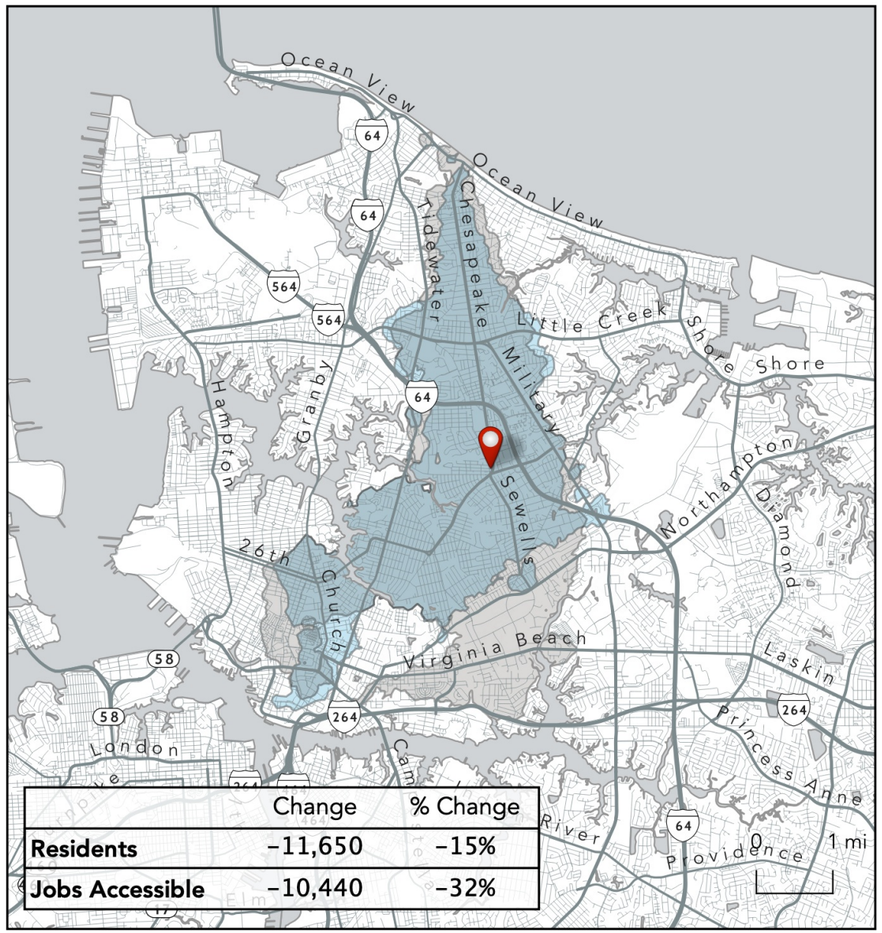
on weekdays at noon using the:

Ridership Concept?*



	Change	% Change
Residents	16,400	+22%
Jobs Accessible	27,040	+83%

Coverage Concept?*



	Change	% Change
Residents	-11,650	-15%
Jobs Accessible	-10,440	-32%

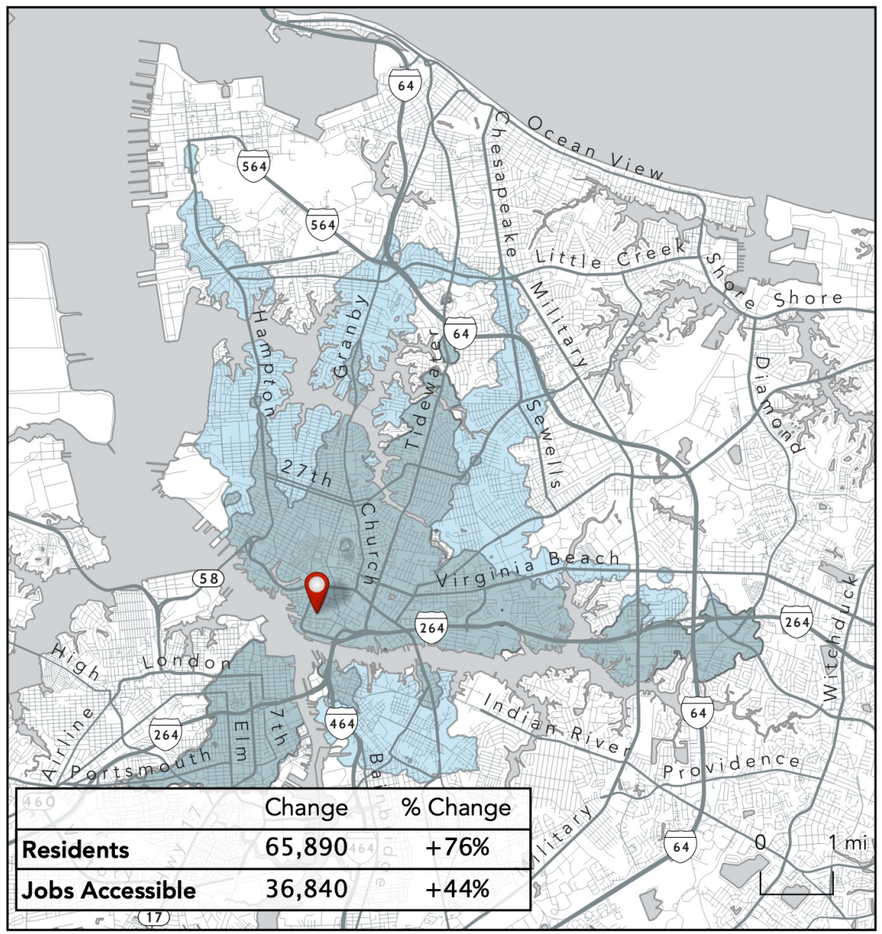
*compared with the HRT network as of February 2020.

How far can I travel in **45 minutes** from

Downtown Norfolk - MacArthur Square

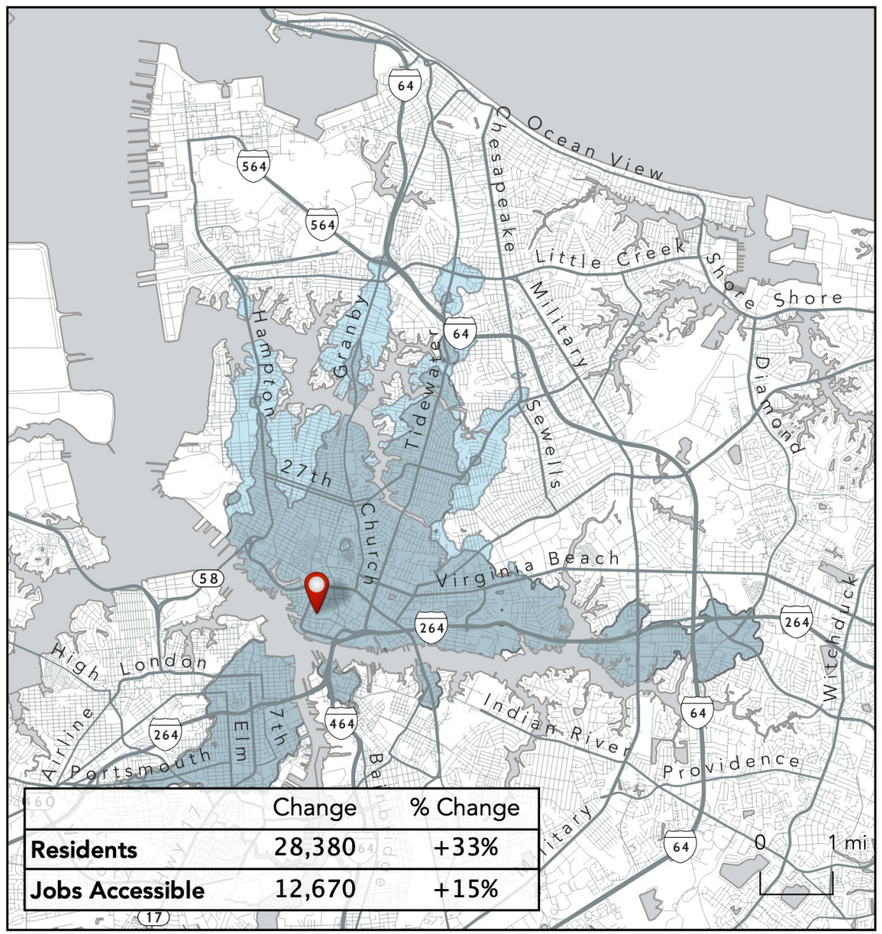
on weekdays at noon using the:

Ridership Concept?*



	Change	% Change
Residents	65,890	+76%
Jobs Accessible	36,840	+44%

Coverage Concept?*



	Change	% Change
Residents	28,380	+33%
Jobs Accessible	12,670	+15%

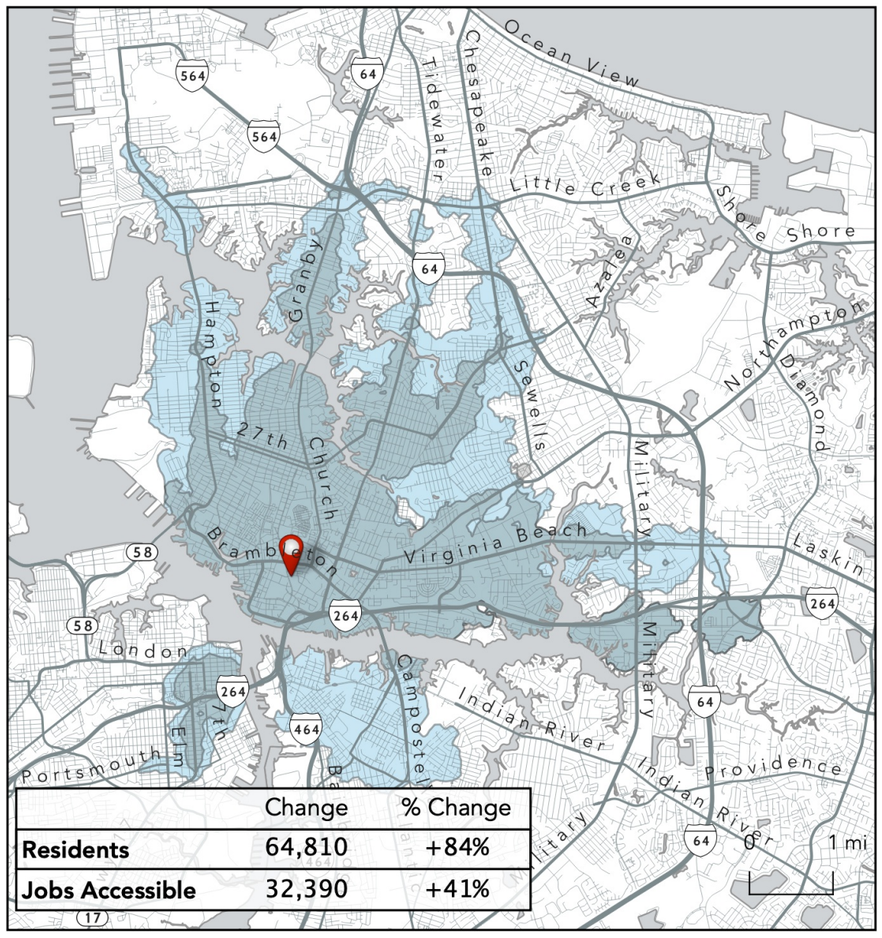
*compared with the HRT network as of February 2020.

How far can I travel in **45 minutes** from

Downtown Norfolk Bus Transfer Center

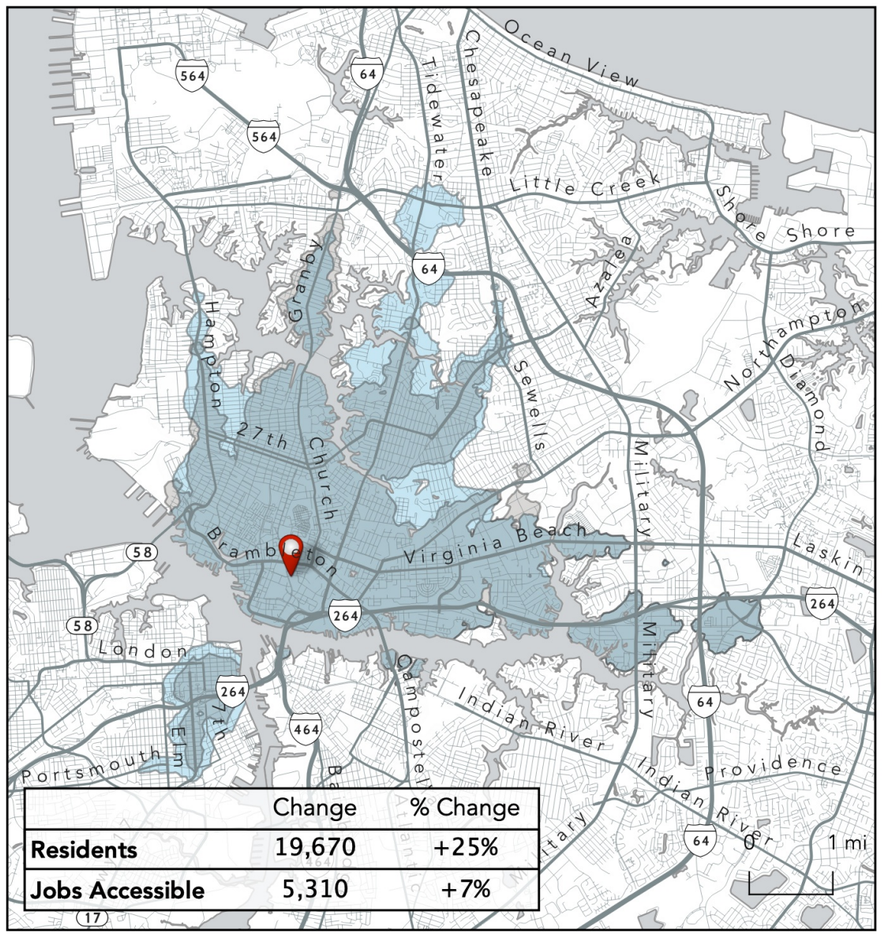
on weekdays at noon using the:

Ridership Concept?*



	Change	% Change
Residents	64,810	+84%
Jobs Accessible	32,390	+41%

Coverage Concept?*



	Change	% Change
Residents	19,670	+25%
Jobs Accessible	5,310	+7%

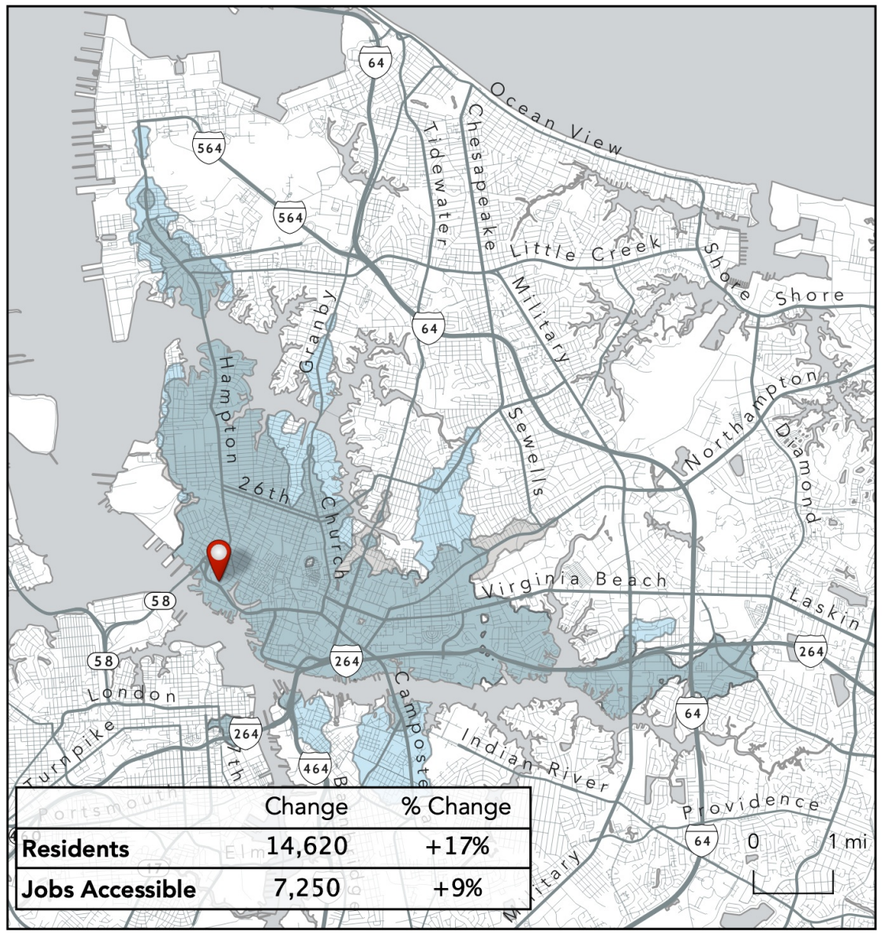
*compared with the HRT network as of February 2020.

How far can I travel in **45 minutes** from

Fort Norfolk/Eastern Virginia Medical Center

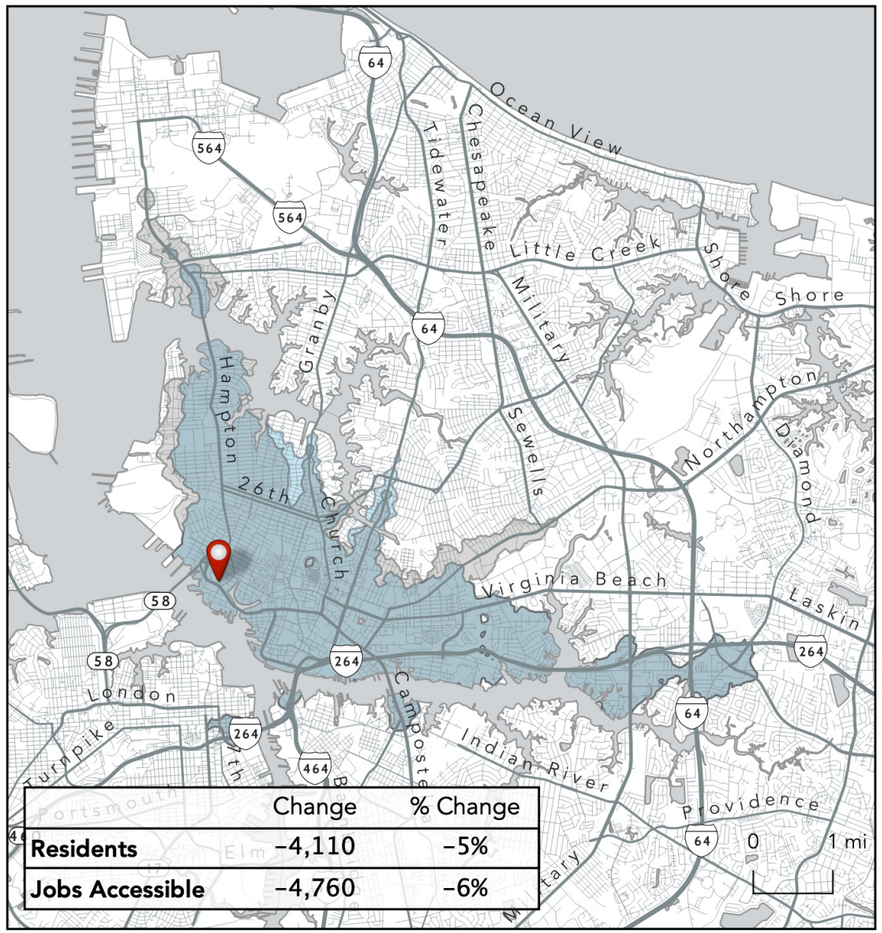
on weekdays at noon using the:

Ridership Concept?*



	Change	% Change
Residents	14,620	+17%
Jobs Accessible	7,250	+9%

Coverage Concept?*



	Change	% Change
Residents	-4,110	-5%
Jobs Accessible	-4,760	-6%

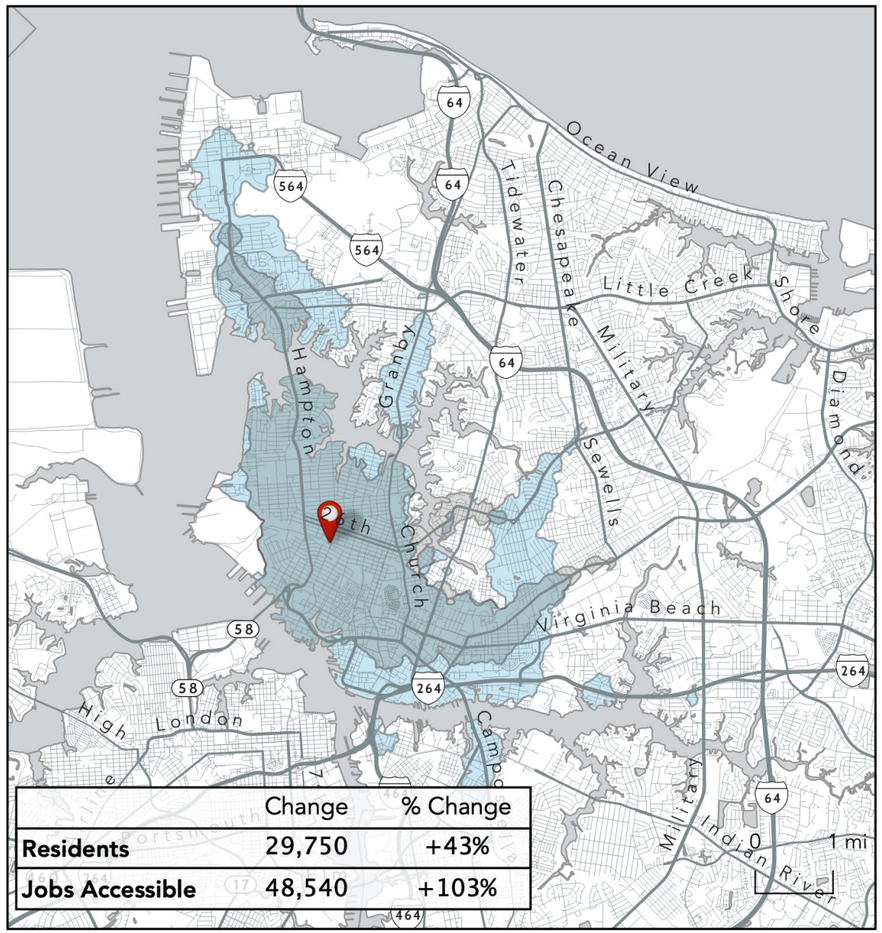
*compared with the HRT network as of February 2020.

How far can I travel in **45 minutes** from

Ghent

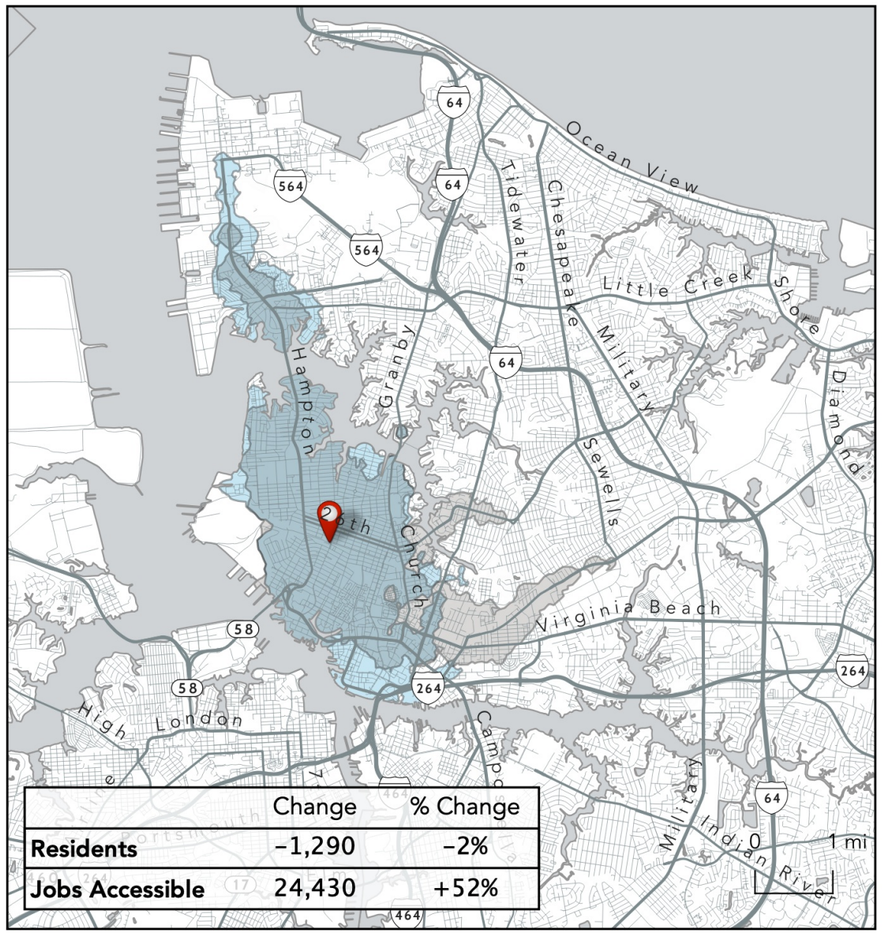
on weekdays at noon using the:

Ridership Concept?*



	Change	% Change
Residents	29,750	+43%
Jobs Accessible	48,540	+103%

Coverage Concept?*



	Change	% Change
Residents	-1,290	-2%
Jobs Accessible	24,430	+52%

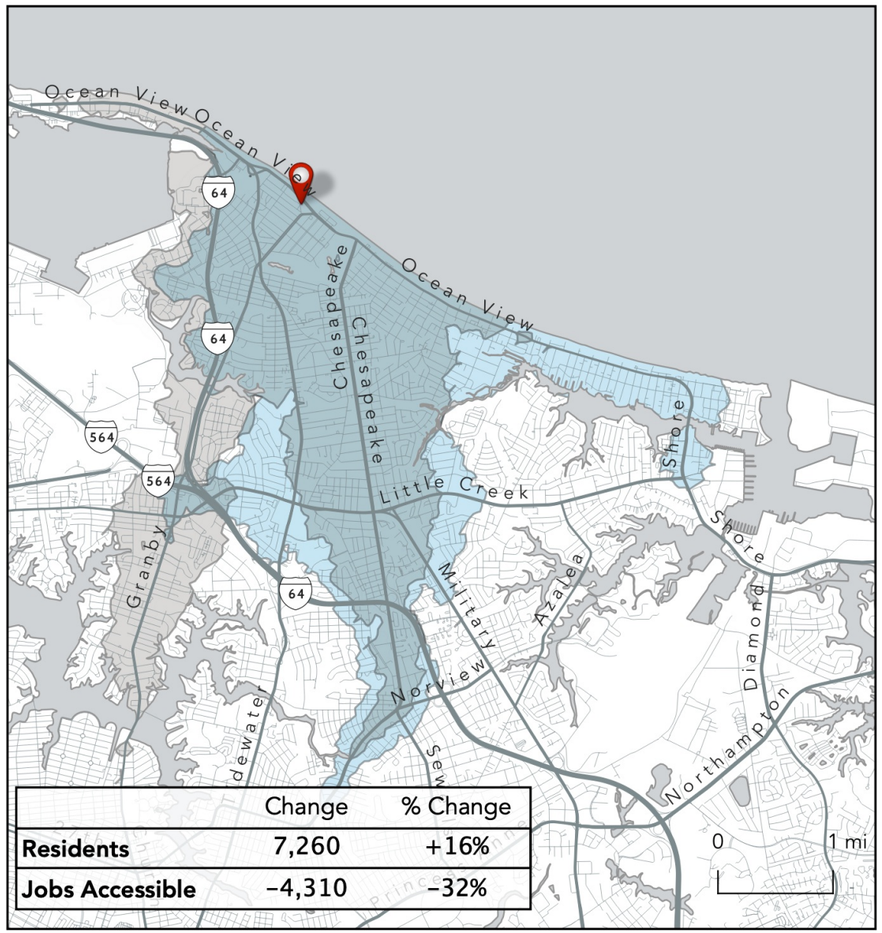
*compared with the HRT network as of February 2020.

How far can I travel in **45 minutes** from

Granby and Duffys - Pretlow Library

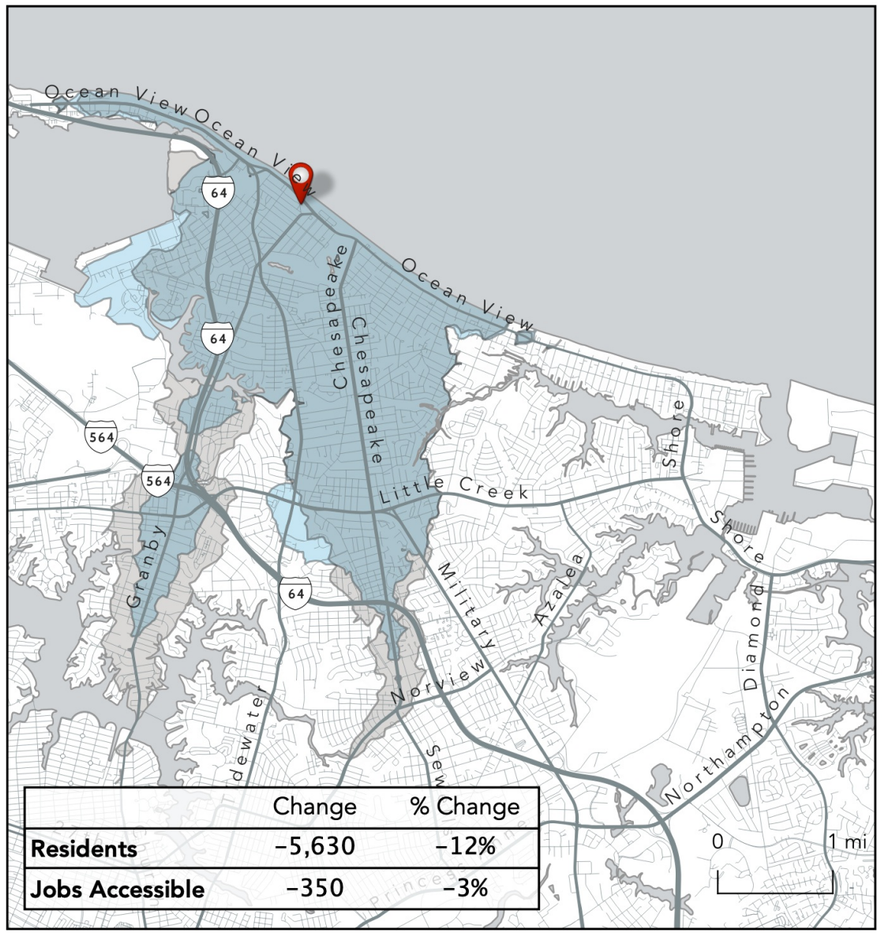
on weekdays at noon using the:

Ridership Concept?*



	Change	% Change
Residents	7,260	+16%
Jobs Accessible	-4,310	-32%

Coverage Concept?*



	Change	% Change
Residents	-5,630	-12%
Jobs Accessible	-350	-3%

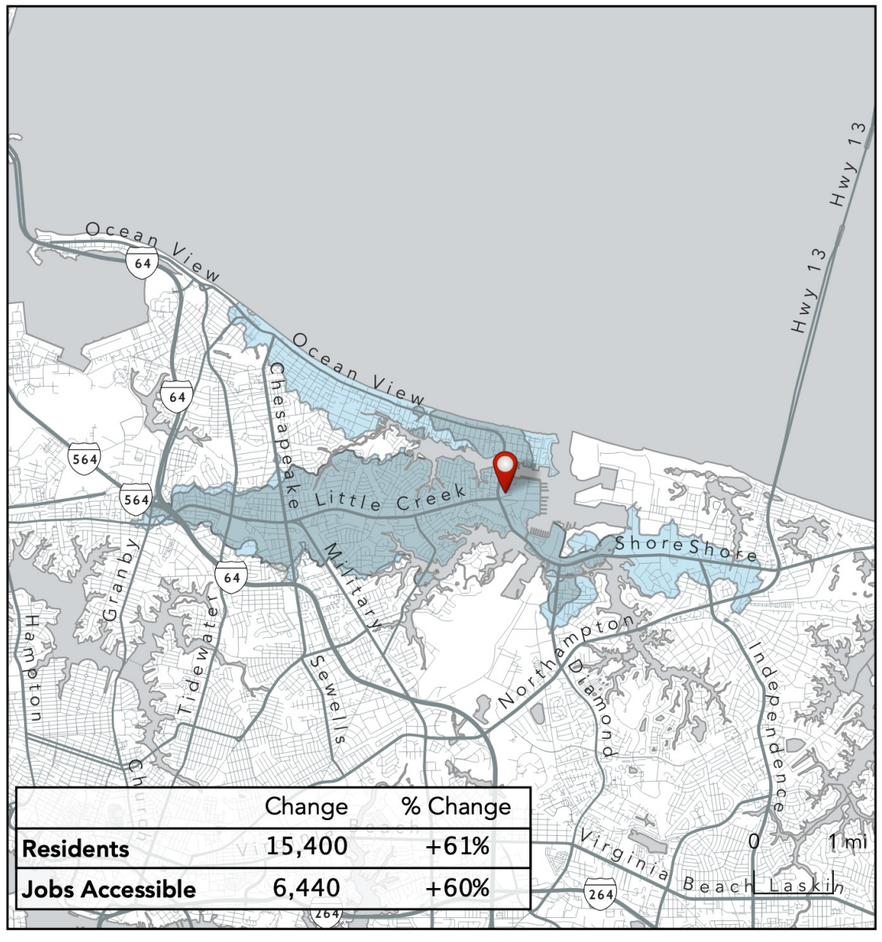
*compared with the HRT network as of February 2020.

How far can I travel in **45 minutes** from

Joint Expeditionary Base Little Creek Gate 1

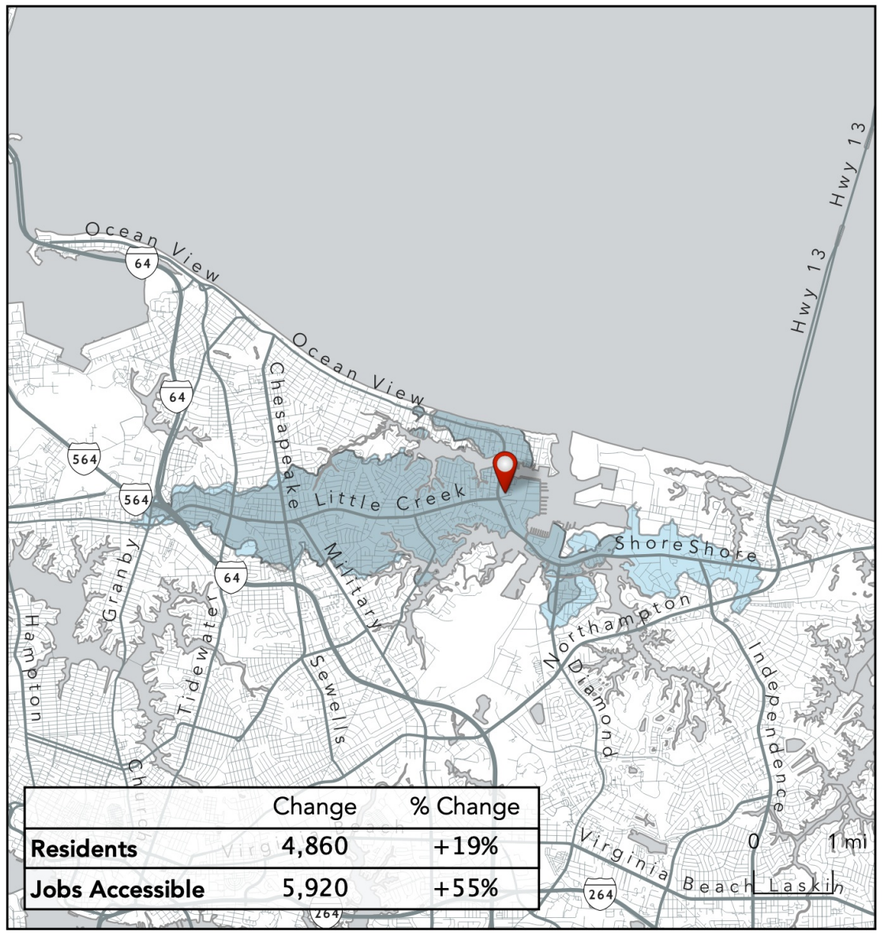
on weekdays at noon using the:

Ridership Concept?*



	Change	% Change
Residents	15,400	+61%
Jobs Accessible	6,440	+60%

Coverage Concept?*



	Change	% Change
Residents	4,860	+19%
Jobs Accessible	5,920	+55%

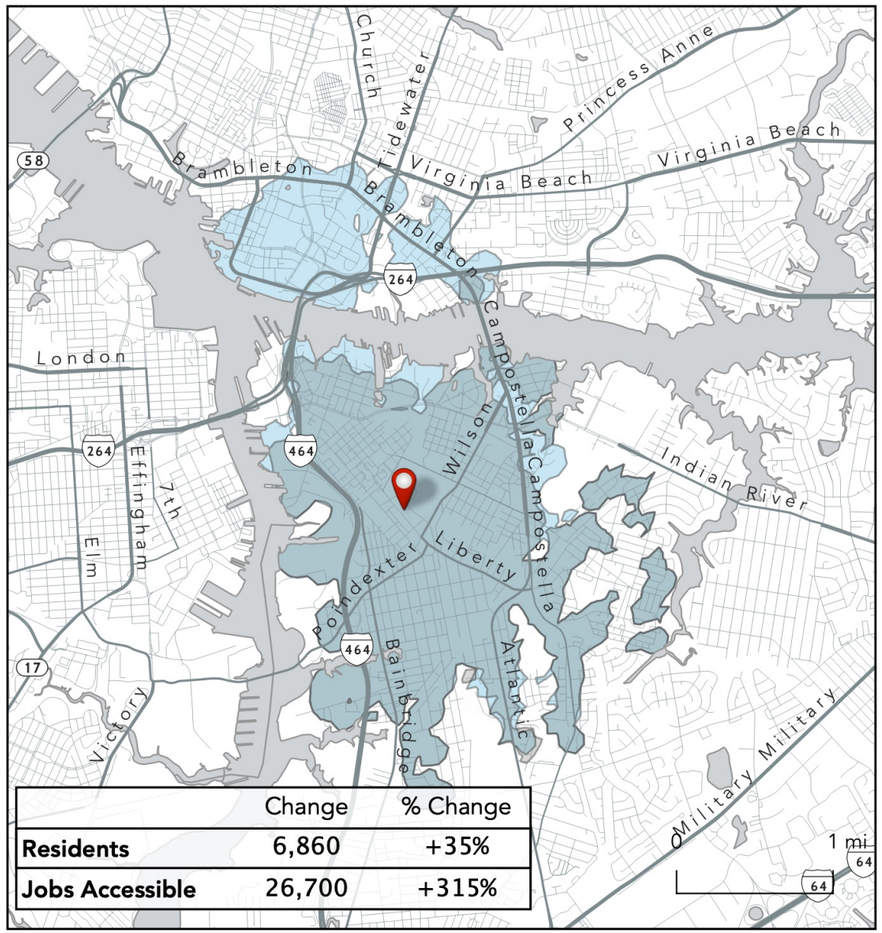
*compared with the HRT network as of February 2020.

How far can I travel in **45 minutes** from

Liberty and Seaboard

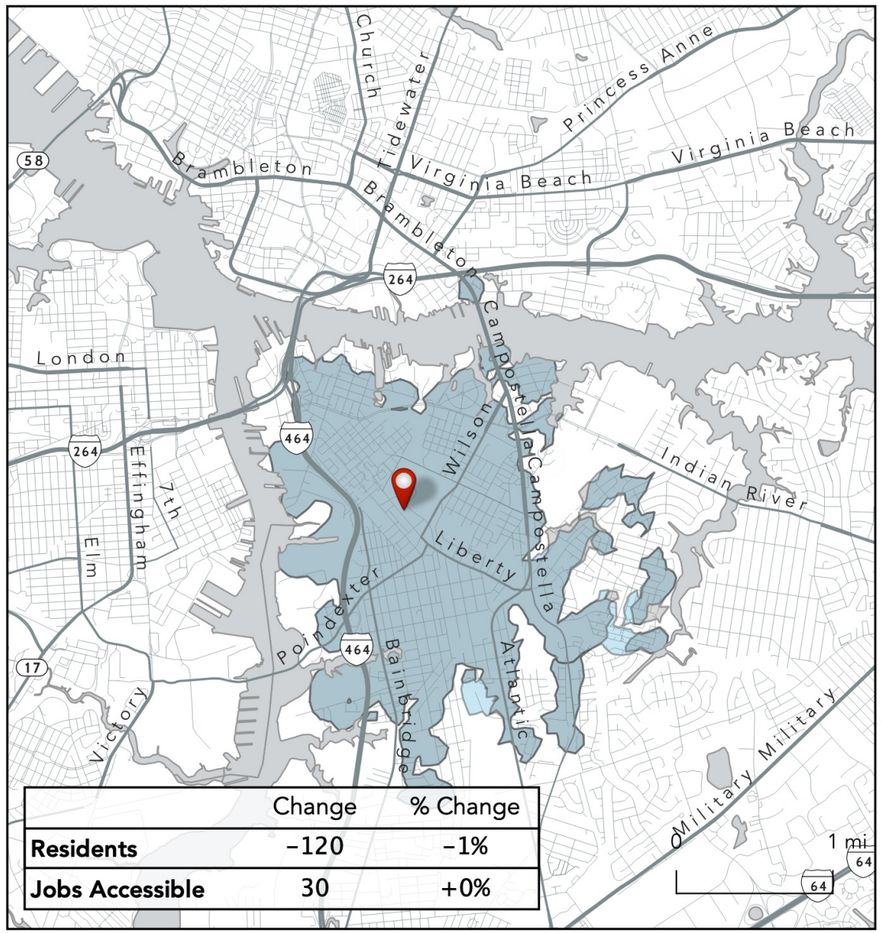
on weekdays at noon using the:

Ridership Concept?*



	Change	% Change
Residents	6,860	+35%
Jobs Accessible	26,700	+315%

Coverage Concept?*



	Change	% Change
Residents	−120	−1%
Jobs Accessible	30	+0%

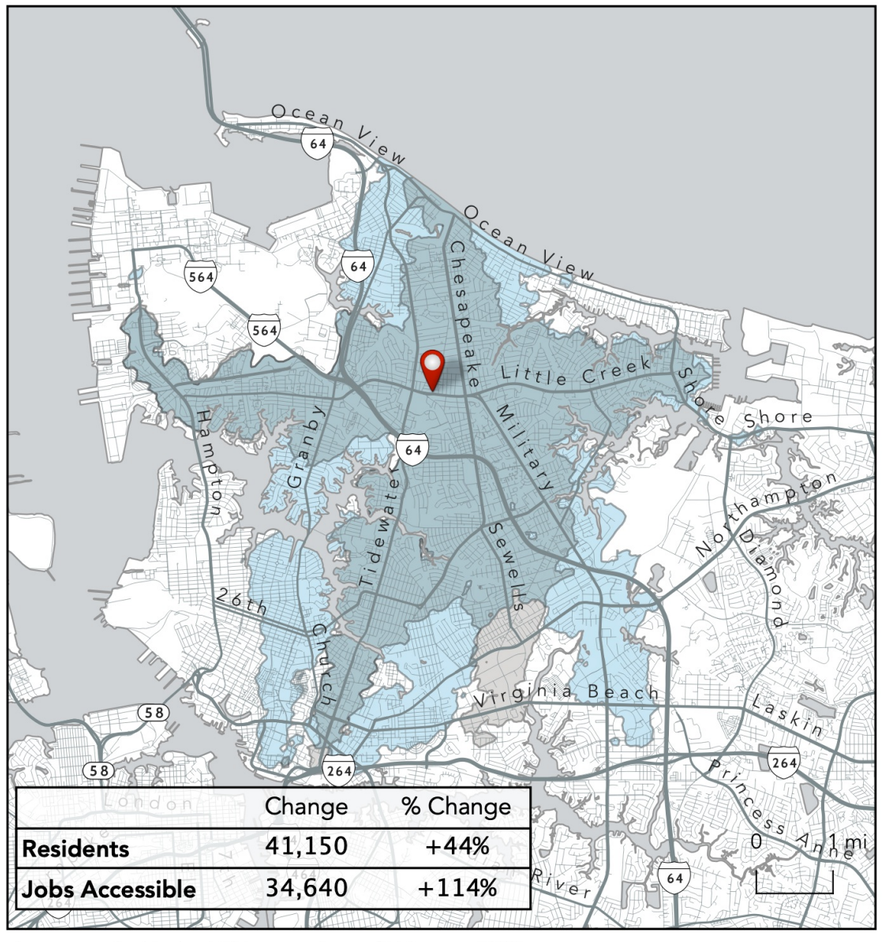
*compared with the HRT network as of February 2020.

How far can I travel in **45 minutes** from

Little Creek at Sewells Point - New Evelyn Butts TC

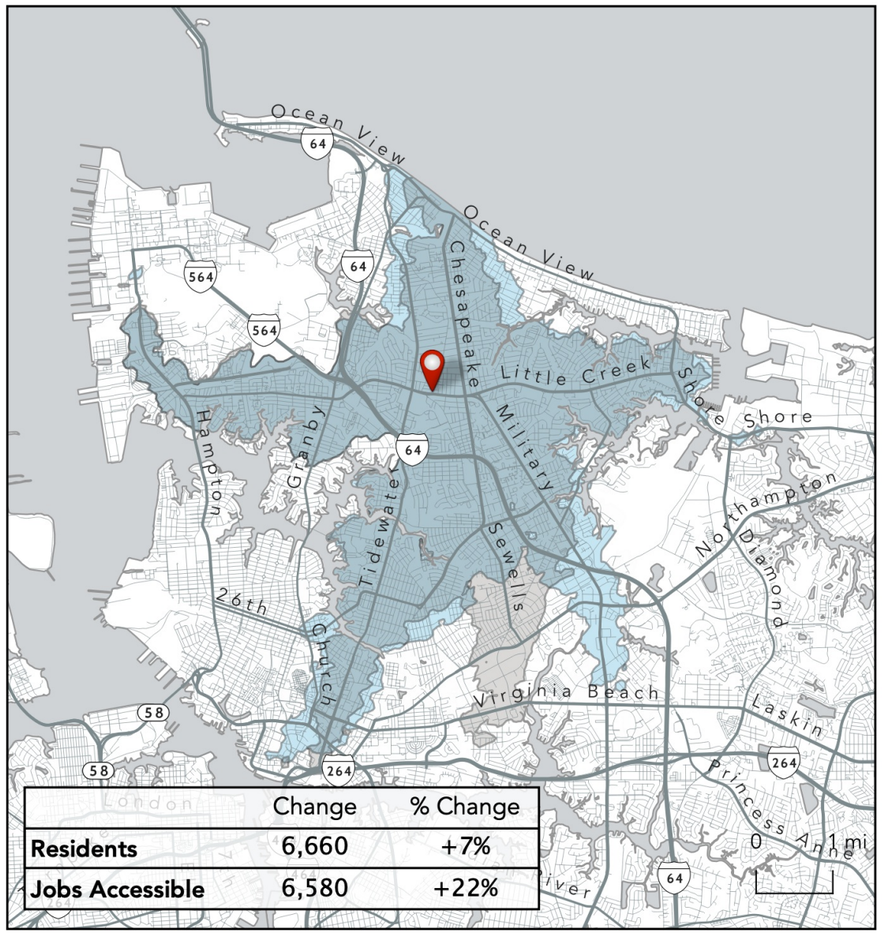
on weekdays at noon using the:

Ridership Concept?*



	Change	% Change
Residents	41,150	+44%
Jobs Accessible	34,640	+114%

Coverage Concept?*



	Change	% Change
Residents	6,660	+7%
Jobs Accessible	6,580	+22%

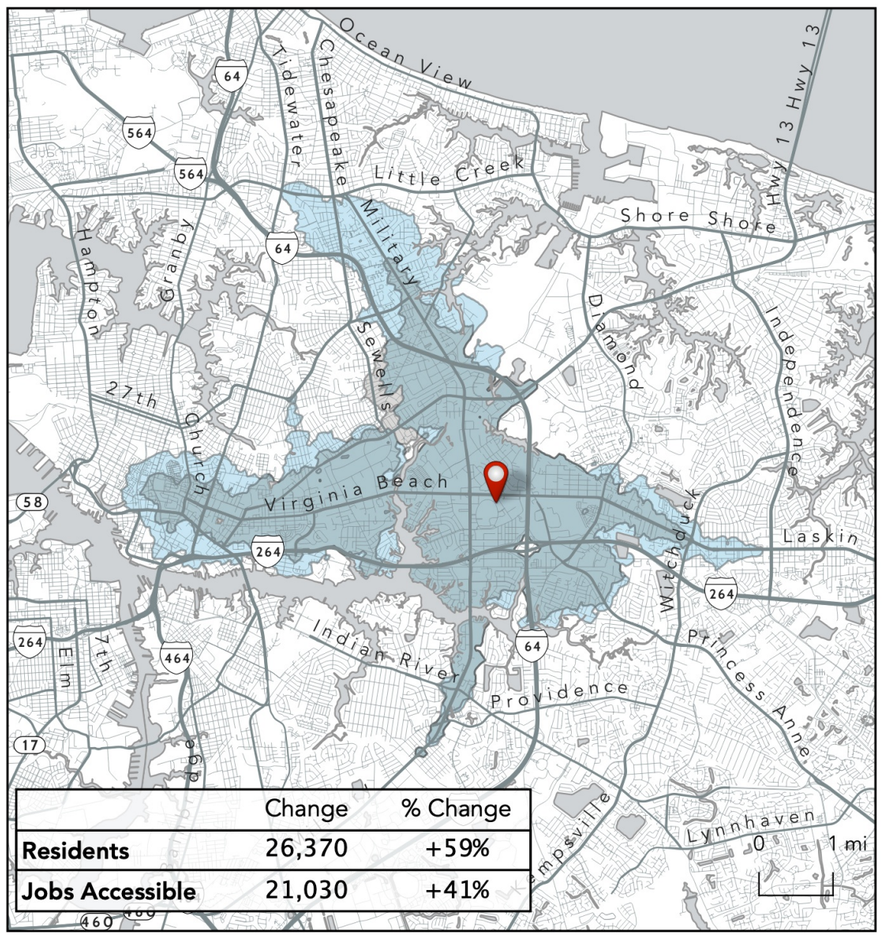
*compared with the HRT network as of February 2020.

How far can I travel in **45 minutes** from

Military Circle

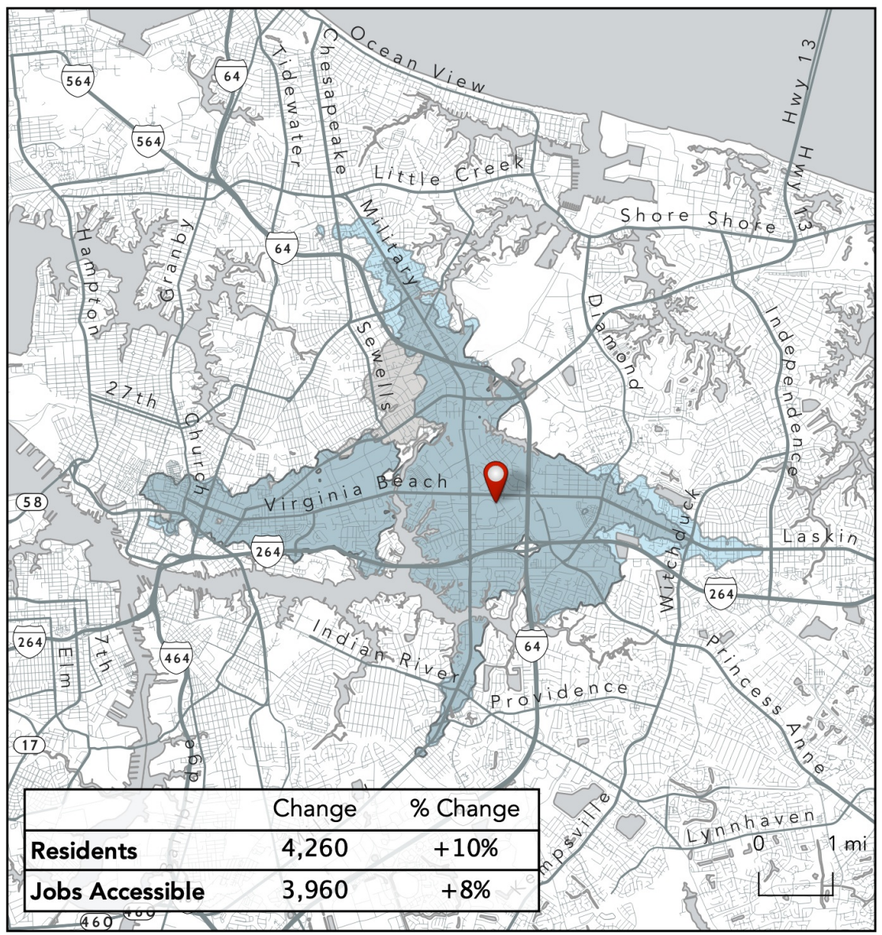
on weekdays at noon using the:

Ridership Concept?*



	Change	% Change
Residents	26,370	+59%
Jobs Accessible	21,030	+41%

Coverage Concept?*



	Change	% Change
Residents	4,260	+10%
Jobs Accessible	3,960	+8%

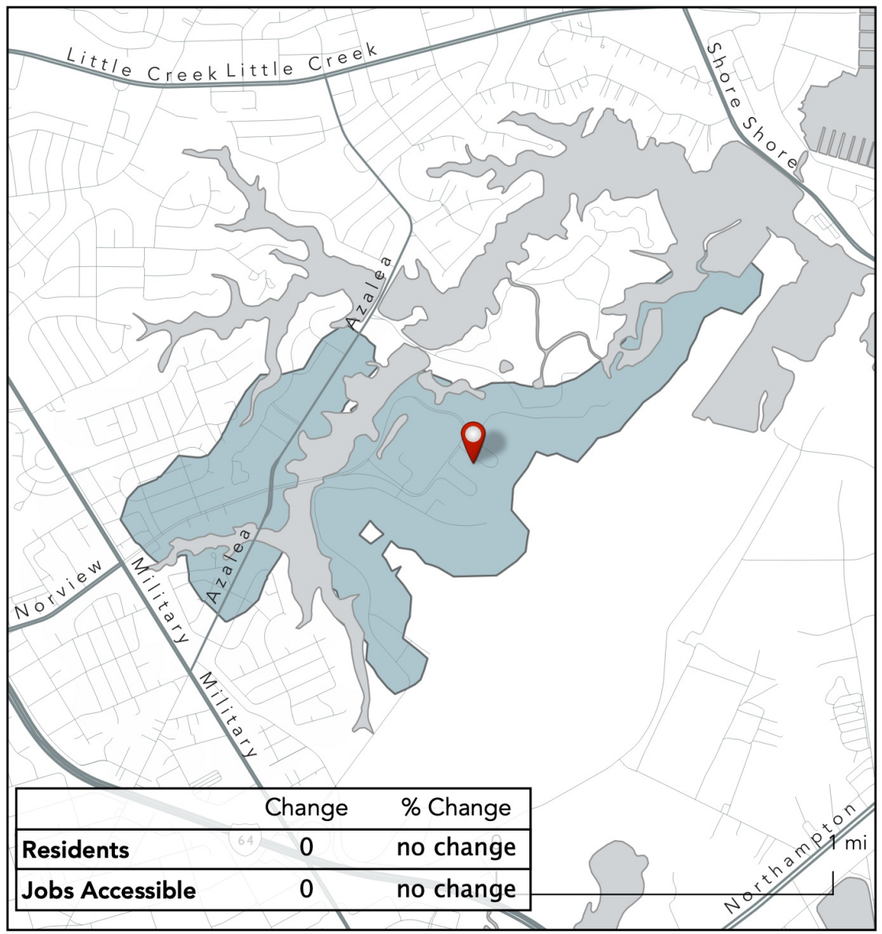
*compared with the HRT network as of February 2020.

How far can I travel in **45 minutes** from

Norfolk International Airport

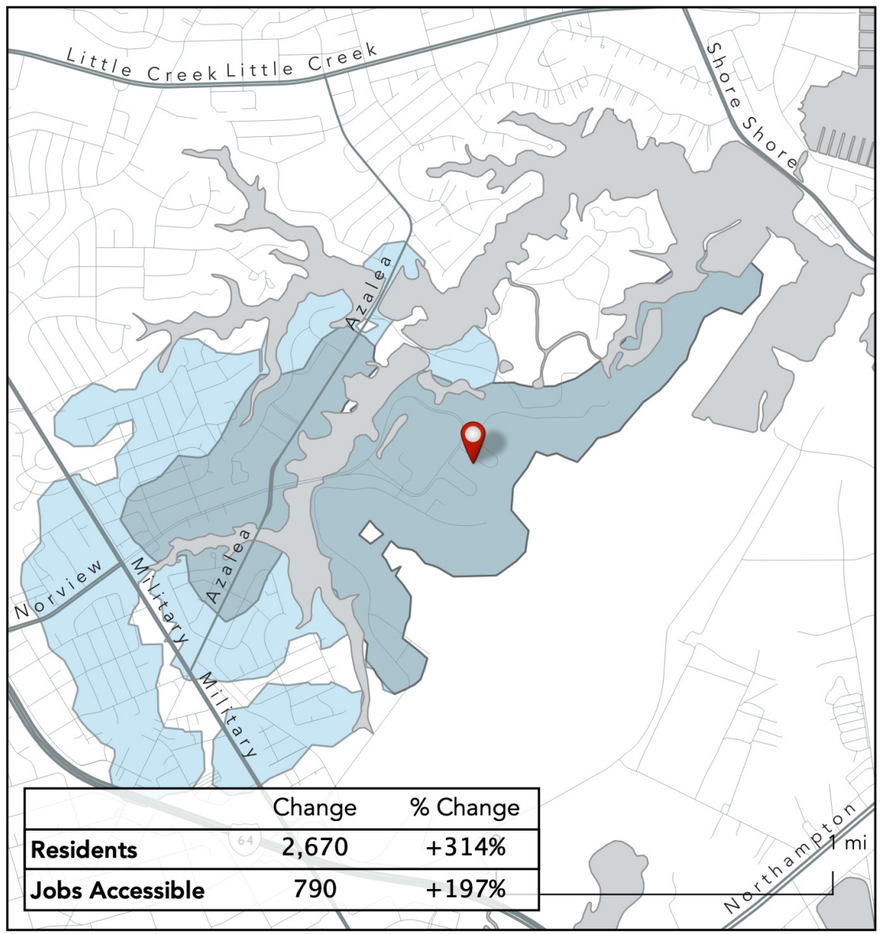
on weekdays at noon using the:

Ridership Concept?*



	Change	% Change
Residents	0	no change
Jobs Accessible	0	no change

Coverage Concept?*



	Change	% Change
Residents	2,670	+314%
Jobs Accessible	790	+197%

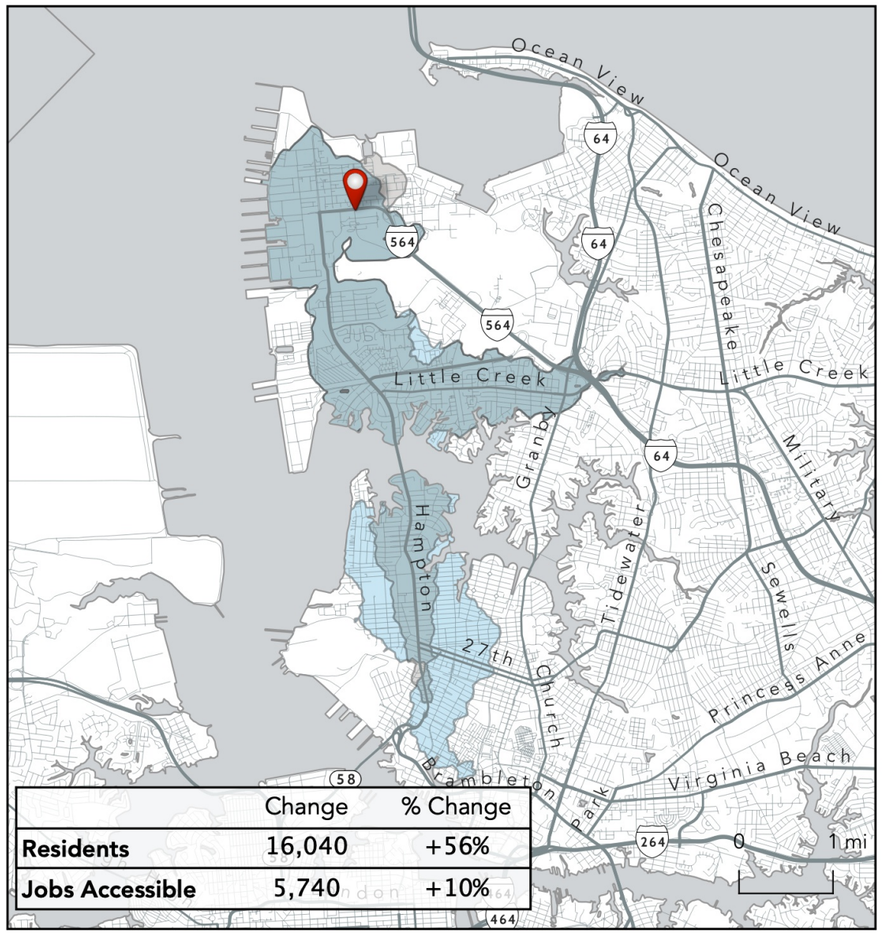
*compared with the HRT network as of February 2020.

How far can I travel in **45 minutes** from

Norfolk Naval Station - Naval Exchange

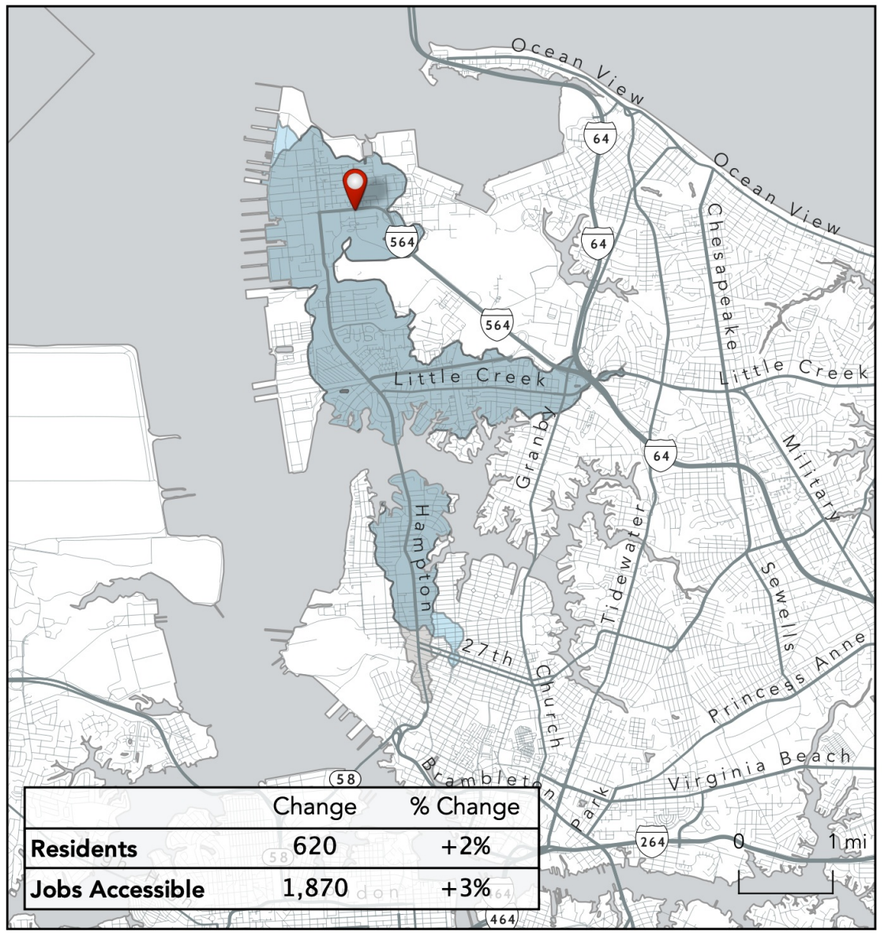
on weekdays at noon using the:

Ridership Concept?*



	Change	% Change
Residents	16,040	+56%
Jobs Accessible	5,740	+10%

Coverage Concept?*



	Change	% Change
Residents	620	+2%
Jobs Accessible	1,870	+3%

*compared with the HRT network as of February 2020.

How far can I travel in **45 minutes** from

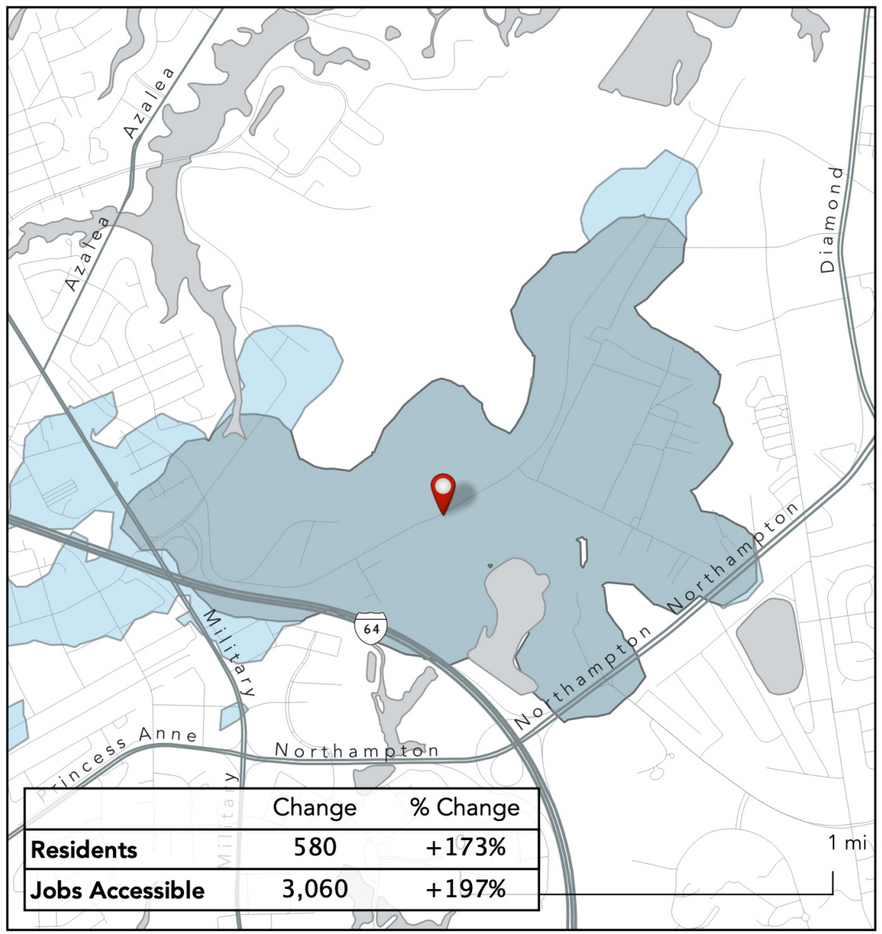
Norfolk Premium Outlets

on weekdays at noon using the:

Ridership Concept?*

	Change	% Change
Residents	0	+0%
Jobs Accessible	80	+5%

Coverage Concept?*



	Change	% Change
Residents	580	+173%
Jobs Accessible	3,060	+197%

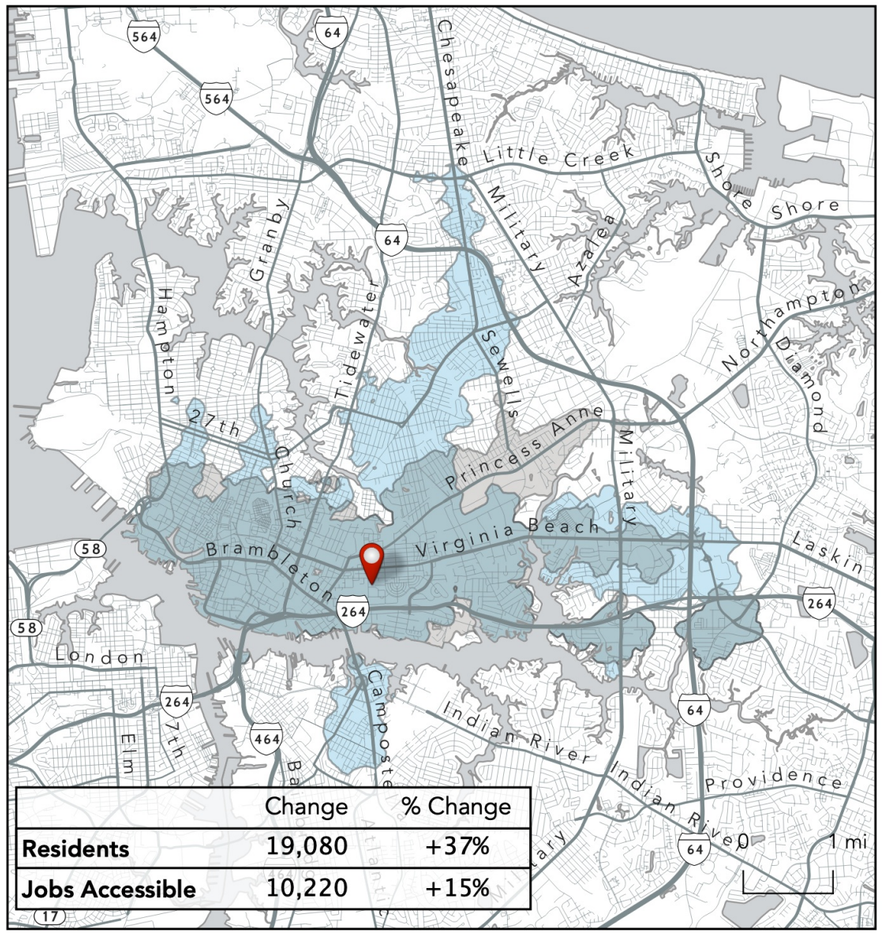
*compared with the HRT network as of February 2020.

How far can I travel in **45 minutes** from

Norfolk State University

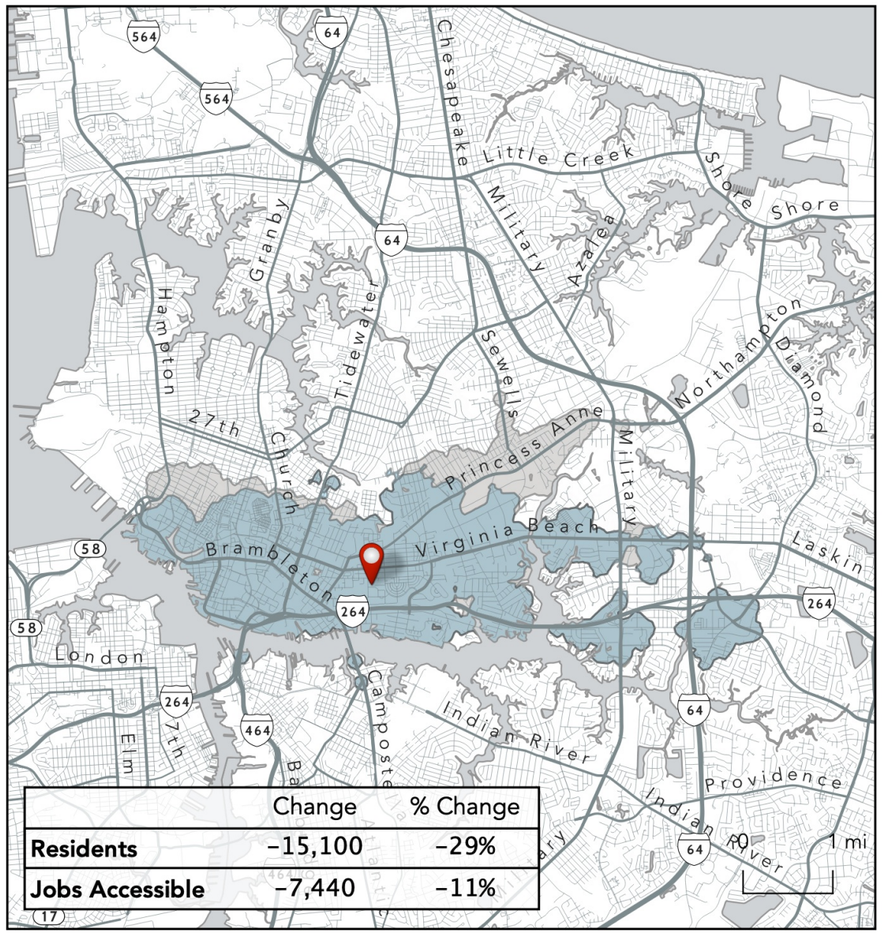
on weekdays at noon using the:

Ridership Concept?*



	Change	% Change
Residents	19,080	+37%
Jobs Accessible	10,220	+15%

Coverage Concept?*



	Change	% Change
Residents	-15,100	-29%
Jobs Accessible	-7,440	-11%

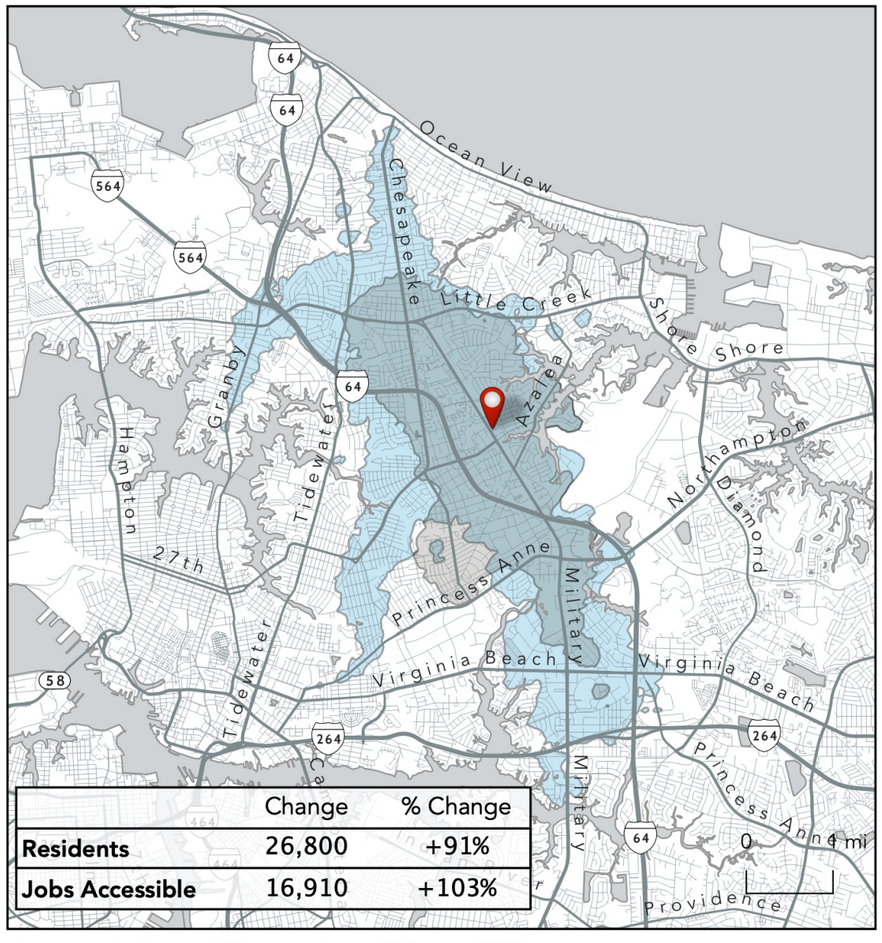
*compared with the HRT network as of February 2020.

How far can I travel in **45 minutes** from

Norview and Military

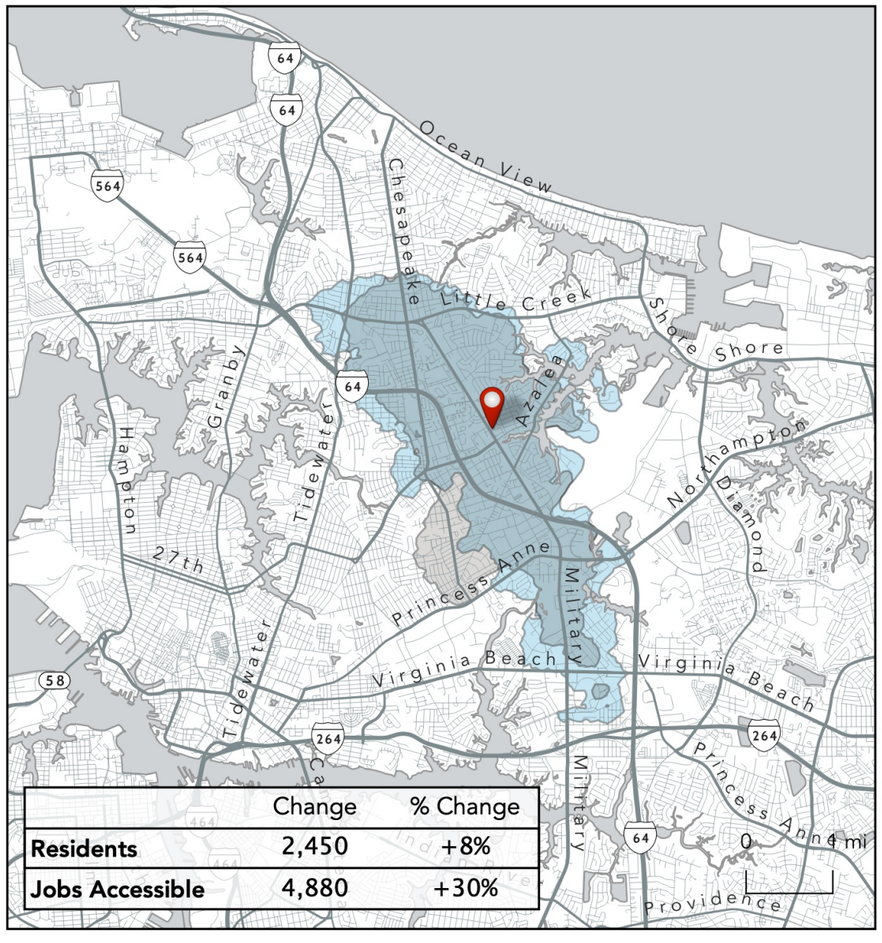
on weekdays at noon using the:

Ridership Concept?*



	Change	% Change
Residents	26,800	+91%
Jobs Accessible	16,910	+103%

Coverage Concept?*



	Change	% Change
Residents	2,450	+8%
Jobs Accessible	4,880	+30%

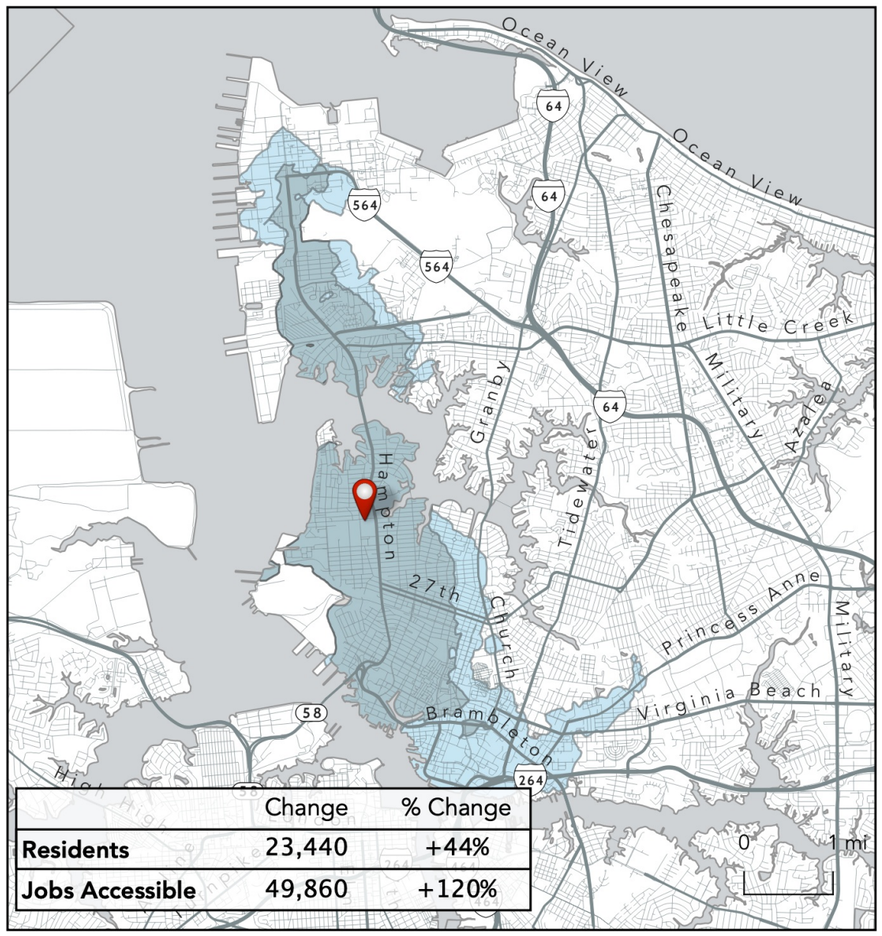
*compared with the HRT network as of February 2020.

How far can I travel in **45 minutes** from

Old Dominion University

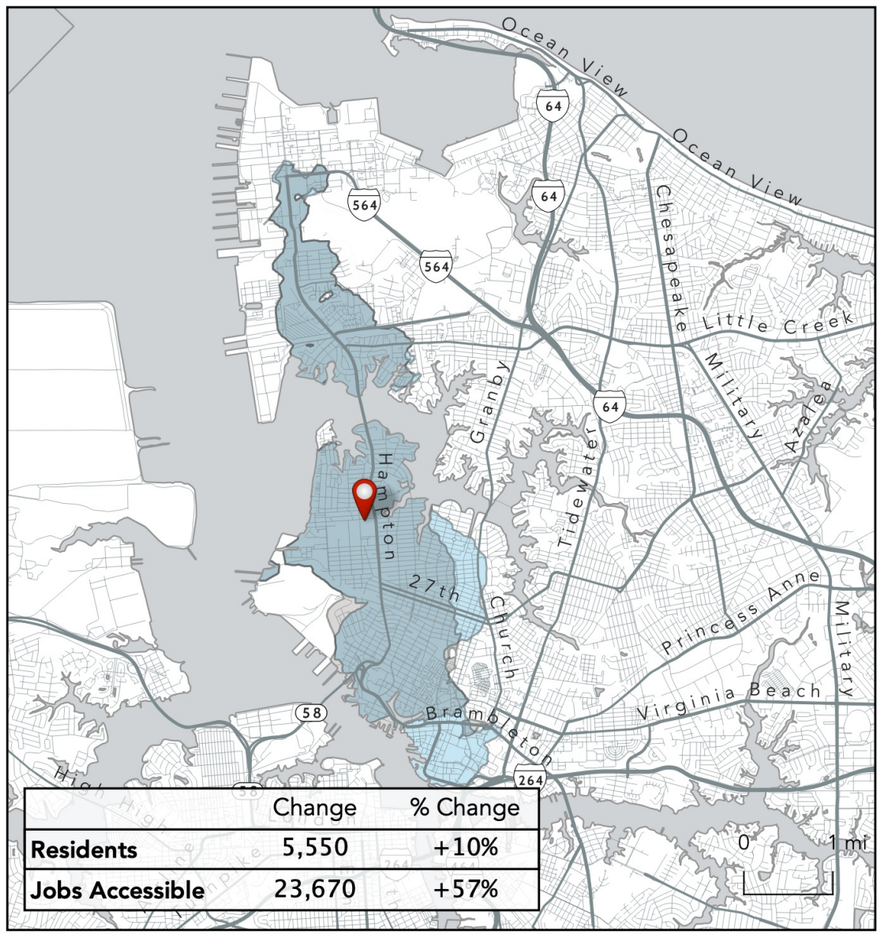
on weekdays at noon using the:

Ridership Concept?*



	Change	% Change
Residents	23,440	+44%
Jobs Accessible	49,860	+120%

Coverage Concept?*



	Change	% Change
Residents	5,550	+10%
Jobs Accessible	23,670	+57%

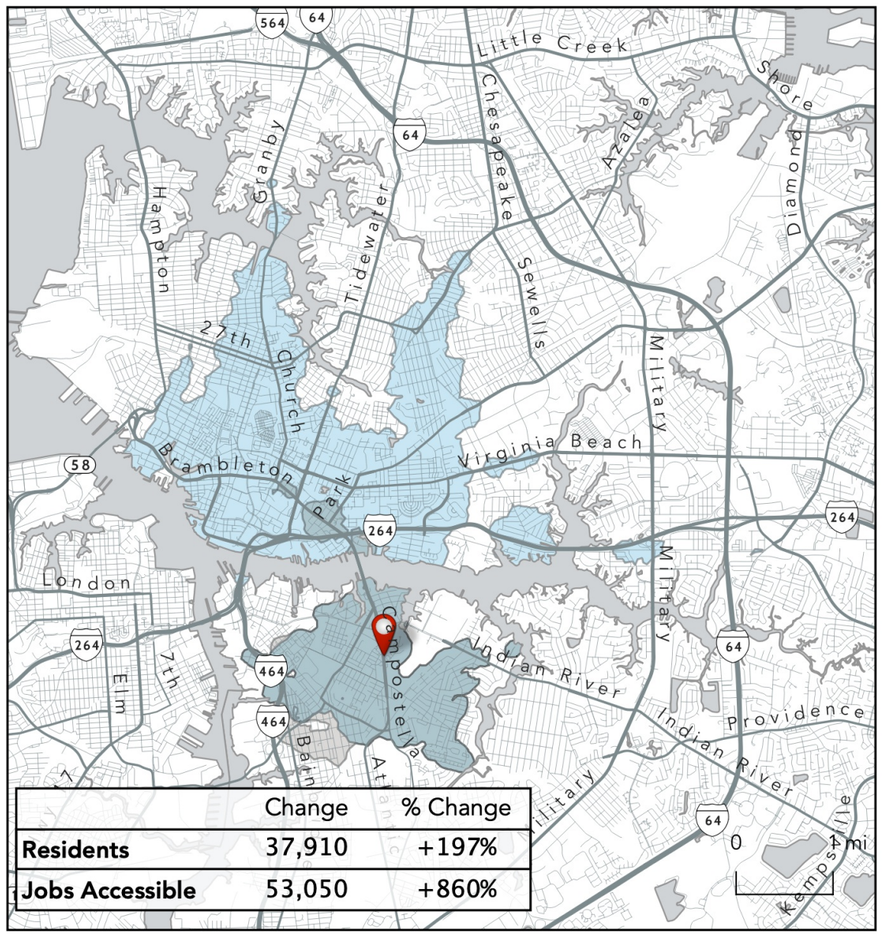
*compared with the HRT network as of February 2020.

How far can I travel in **45 minutes** from

Southside Campostella Norfolk Public Housing

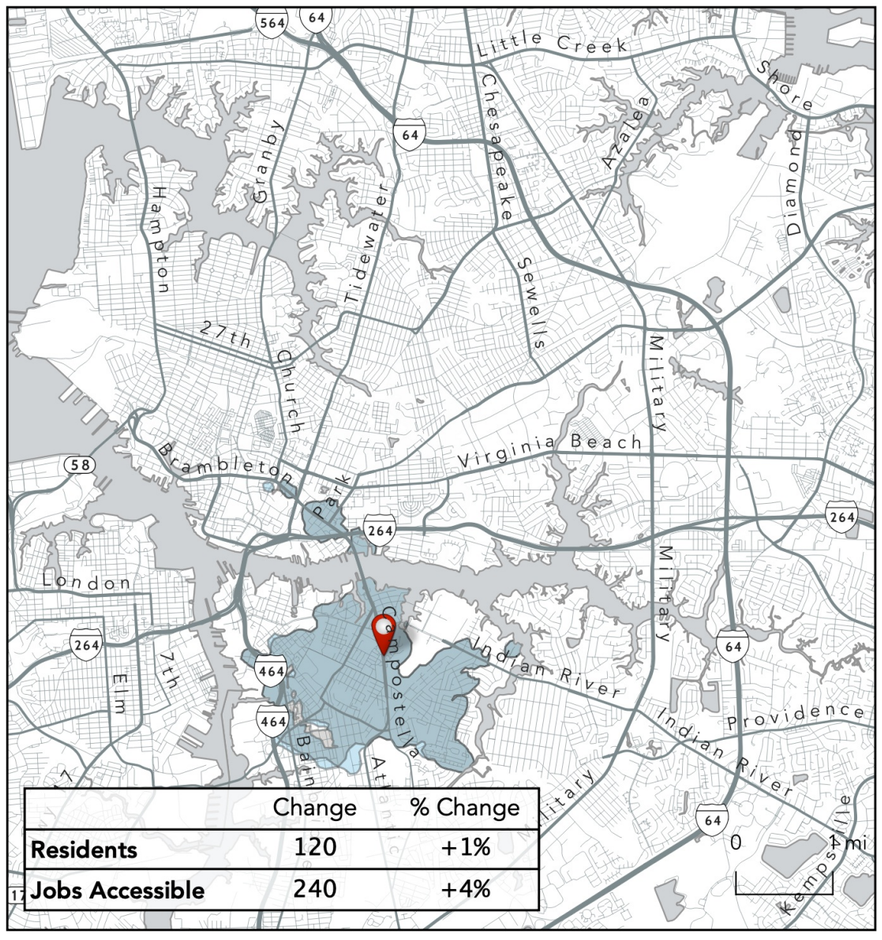
on weekdays at noon using the:

Ridership Concept?*



	Change	% Change
Residents	37,910	+197%
Jobs Accessible	53,050	+860%

Coverage Concept?*



	Change	% Change
Residents	120	+1%
Jobs Accessible	240	+4%

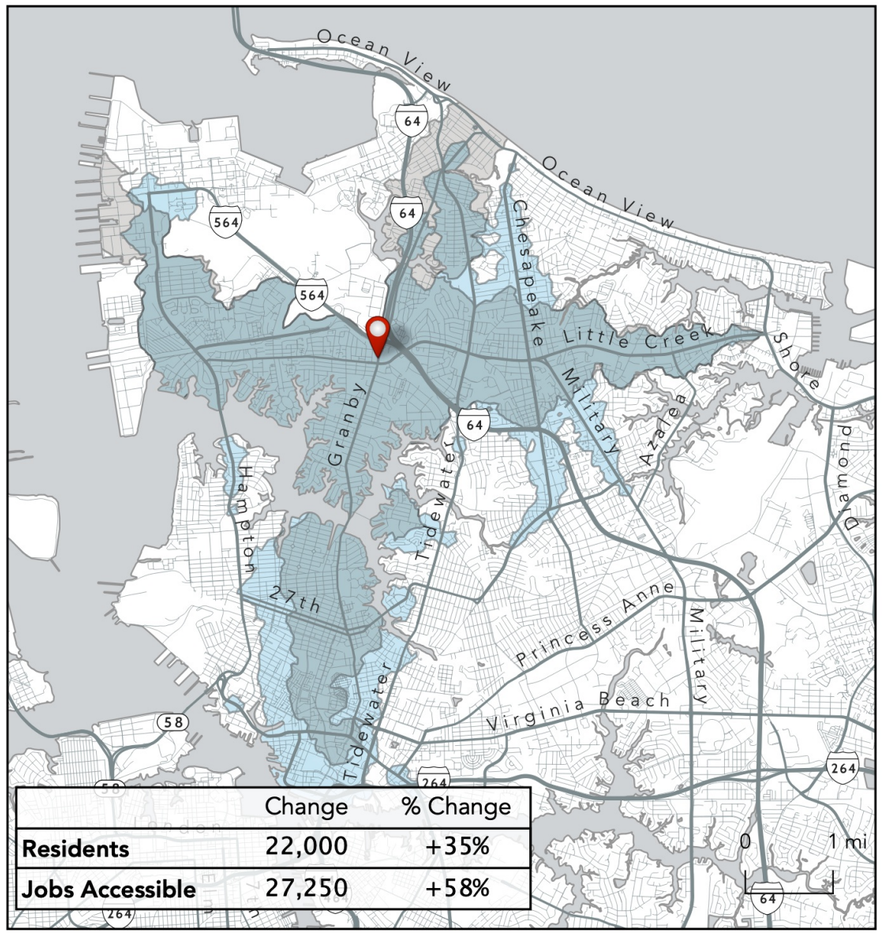
*compared with the HRT network as of February 2020.

How far can I travel in **45 minutes** from

Wards Corner

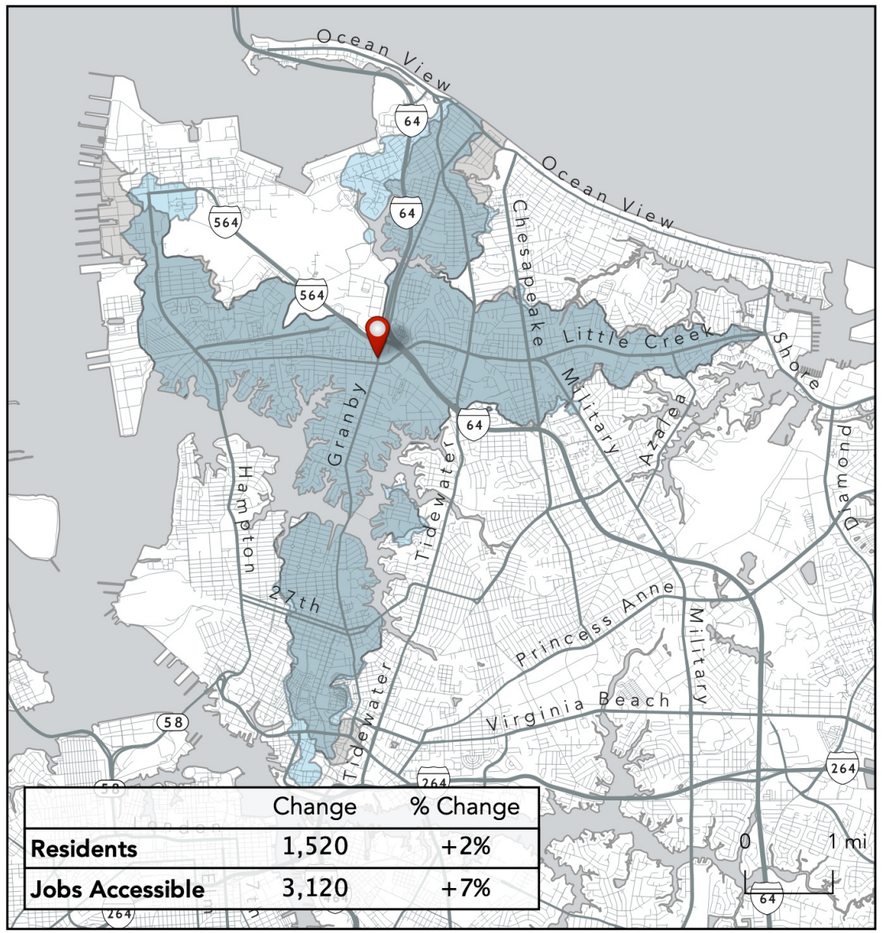
on weekdays at noon using the:

Ridership Concept?*



	Change	% Change
Residents	22,000	+35%
Jobs Accessible	27,250	+58%

Coverage Concept?*



	Change	% Change
Residents	1,520	+2%
Jobs Accessible	3,120	+7%

*compared with the HRT network as of February 2020.