

Planning Process

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Commission member agencies established an unprecedented collaborative and comprehensive planning process to build consensus around three strategies for this initial 15-year plan: service & capital, delivery, and financial. This chapter describes the purpose and methods for developing each strategy as well as additional areas of analysis for measuring the benefits of proposed investments.

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Service & Capital Strategy

NEC FUTURE established a corridor-wide long-term vision for future service frequency and travel times.⁹ The starting point for C35 was to gather incremental, first-phase 2035 service objectives from each of the member agencies. Agencies also identified infrastructure investments needed to achieve their service objectives and to bring the NEC to a state of good repair.

Input from each agency was used to create an integrated 2035 operating plan that addressed corridor-wide objectives to improve reliability, increase service frequency, and improve speeds. Throughout the C35 analysis, member agencies balanced individual needs with advancing projects in every state and creating corridor-wide benefits. In some cases, service and demand assumptions were aspirational, in other cases, assumptions reflect anticipated service outlined in other public documents.

Infrastructure investments were compiled into a combined project list (see Appendix) comprised of special projects to enhance capacity and speed and replace major bridges and tunnels, as well as capital renewal efforts needed to bring the existing NEC to a state of good repair.

The integrated 2035 operating plan was tested against these infrastructure investments to confirm that service levels could be delivered by 2035.

Figure 2-1: Railroad Infrastructure Components



Major Structures

Tunnels and multi-span structures such as movable bridges and viaducts. Movable bridges have center spans that lift to allow passage of marine traffic when necessary.



Structures (Roadbed, Culverts, Undergrade Bridges)

Includes components other than major structures needed to support the railroad track or right-of-way.



Track

Physically supports the movement of trains, including rail, concrete or wooden ties, a track bed of crushed stone, and sub-layers designed to ensure proper drainage and prevent shifting of the railroad.



Interlocking

Allows for the movement (switching) of a train from one track to another. Includes a control system to prevent trains from switching to occupied tracks.



Electric Power Supply

Draws power from the regional electric grid and distributes it to trains through a complex system of frequency converters, substation facilities, and overhead catenary lines.



Storage Yards and Maintenance Facilities

Secondary tracks that allow the storage and maintenance of trains and rail cars when not in service. They are strategically located to minimize the non-revenue movement of trains.

Source: C35 Analysis, 2021

Delivery Strategy

The delivery strategy assessed how the service & capital strategy could be delivered by 2035. The analysis focused on maximizing the productivity of track outages and minimizing service impacts to customers, and assumed unconstrained workforce and funding. The Commission developed an integrated project delivery and operations analysis tool that:

- Gathered and defined scope, schedules, and capital cost estimates of special projects and capital renewal efforts.
- Considered special projects together rather than individually and grouped them based on their geography, construction requirements, and operational interdependencies.
- Incorporated capital renewal efforts into special project groups where there was overlap, to increase implementation efficiency and reduce customer impact, particularly where special projects could replace or eliminate the need for underlying capital renewal.
- Estimated workforce, equipment requirements, capital cost, and track outages for special project groups and capital renewal efforts.
- Compared required peak period track outages with available track capacity to estimate service impacts. Significant service disruptions were mitigated with refinements to sequencing or by adding enabling projects to improve operating flexibility during and after construction.

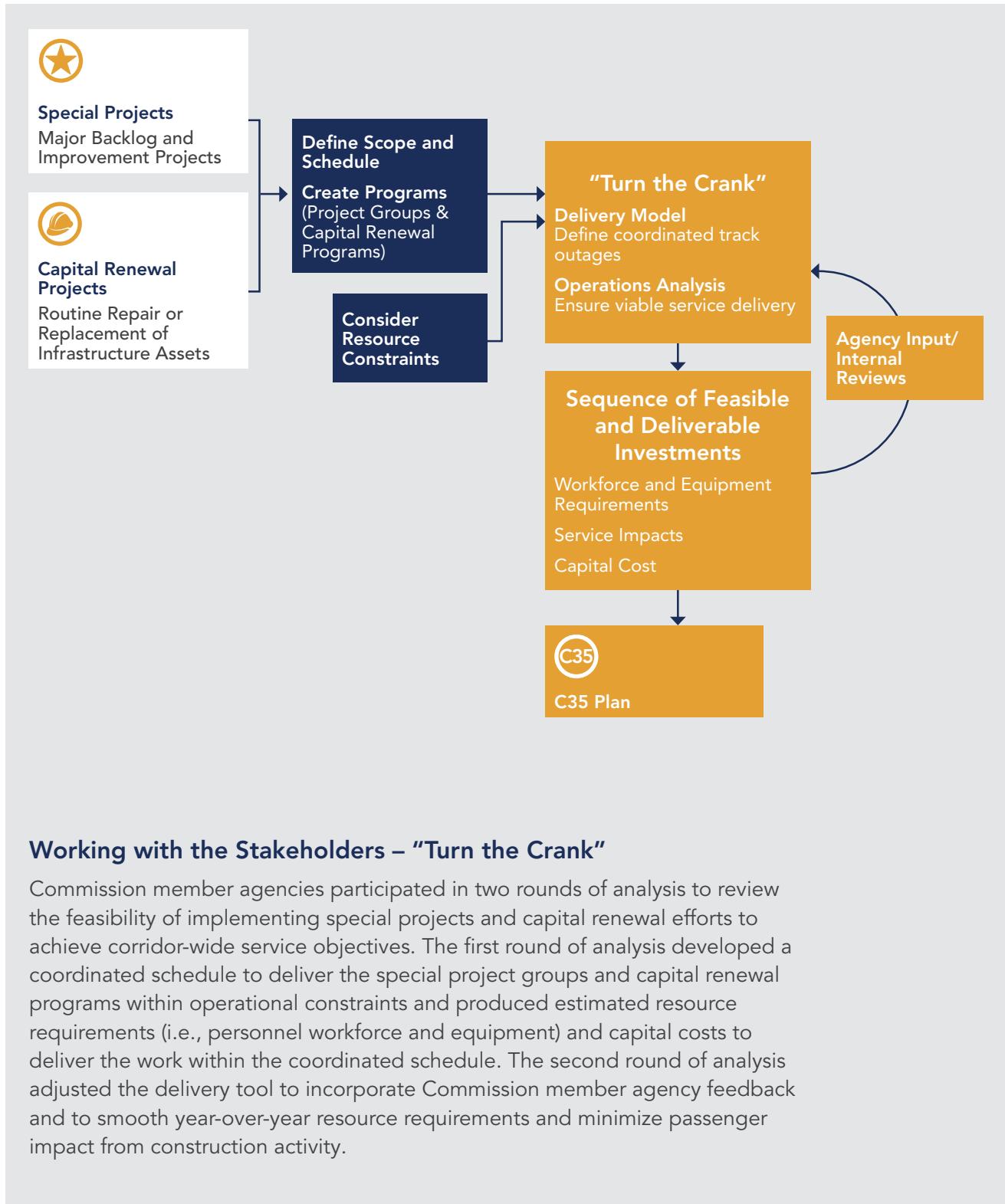
A delay analysis was performed to identify peak delay locations and how C35 projects could mitigate those delays and improve service reliability. Train delay data, calculated from Metro-North and Amtrak 2019 dispatch data for weekday revenue trains, was analyzed to estimate total annual minutes of train delay for locations along the NEC. The analysis was performed on an interlocking-to-interlocking basis by territory, consistent with the project delivery analysis, to identify capacity choke points or other major train delay locations. Relevant C35 special projects that could eliminate choke points and reduce delays were identified for each of these peak delay locations.

Estimated Workforce and Equipment Requirements

C35 railroad specific workforce and maintenance-of-way equipment requirements were estimated for special projects and capital renewal using the delivery analysis tool and a construction activities database. Equipment and workforce needs were estimated assuming activities could be scheduled and sequenced to make efficient use of equipment, workforce, and track outages. For example, if two construction activities on the same project, each requiring a crane, are planned in the same vicinity, the estimate assumes a single crane would be shared to perform both activities. Similarly, the estimate assumes that concurrent activities planned in the same section of track would share railroad workforce for protection and supervision.

The order-of-magnitude estimate of railroad-specific workforce was completed and results are presented in Chapter 3. However, the C35 team determined that additional refinement is needed to complete the equipment estimate and results are not included in this report. Specific equipment needs are significantly influenced by several factors such as how the equipment is utilized, ability to share major equipment throughout the corridor, whether equipment would be purchased or leased, or whether it is provided by a third-party contractor to a railroad. A comprehensive plan for establishing reasonable assumptions for these factors, including determining realistic equipment production metrics will be completed as part of C37. Workforce availability and feasible ramp-up rates will also be incorporated in C37.

Figure 2-2: Project Delivery Tool Flow Chart



Working with the Stakeholders – “Turn the Crank”

Commission member agencies participated in two rounds of analysis to review the feasibility of implementing special projects and capital renewal efforts to achieve corridor-wide service objectives. The first round of analysis developed a coordinated schedule to deliver the special project groups and capital renewal programs within operational constraints and produced estimated resource requirements (i.e., personnel workforce and equipment) and capital costs to deliver the work within the coordinated schedule. The second round of analysis adjusted the delivery tool to incorporate Commission member agency feedback and to smooth year-over-year resource requirements and minimize passenger impact from construction activity.

C35 TERMINOLOGY



Special projects

“Major backlog projects” (overhaul or replacement of major bridges and tunnels) and “improvement projects” (infrastructure above and beyond existing assets or replacing existing structures with markedly superior ones).

Special project groups

A grouping of geographically proximate and interrelated special projects, often inclusive of some capital renewal efforts.



Capital renewal

Routine state of good repair and replacement of existing basic infrastructure, such as track/roadbed, signals, catenary, and undergraduate bridges. Some capital renewal work is accomplished within special projects.

Capital renewal programs

Capital renewal efforts delivered concurrently within capital renewal sections to optimize project delivery and minimize rider impact not associated with special projects.



C35 delivery analysis

Sequencing of special project groups and capital renewal programs to gain efficiencies in project delivery and optimize the use of available track outages or other railroad resources.



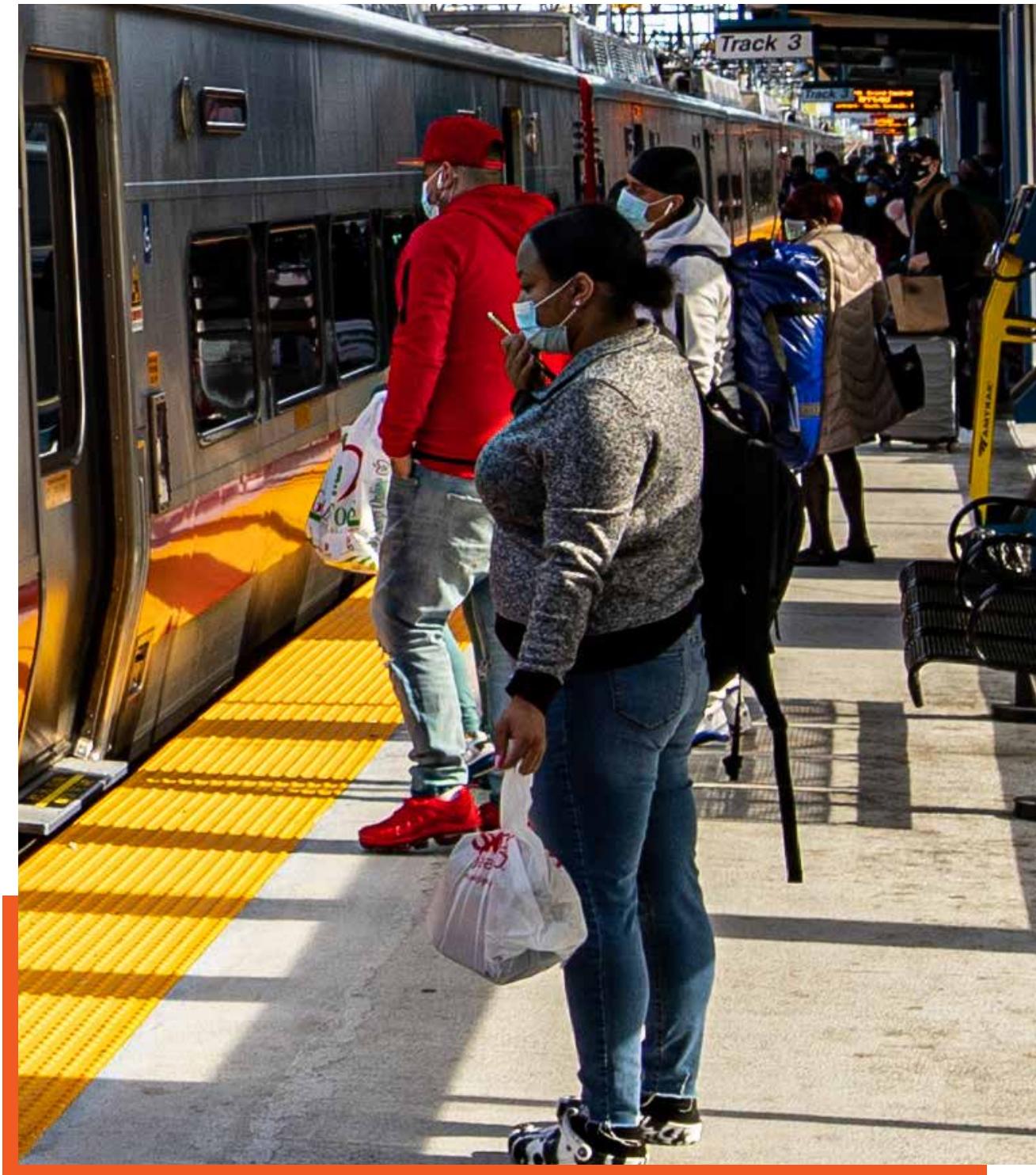
C35 is the first phase of the corridor’s long-term vision established in FRA’s NEC FUTURE plan and is focused on modernizing the NEC and bringing it to a state of good repair. NEC FUTURE service and performance objectives were considered throughout the project delivery analysis. The integrated project delivery approach was used to identify ways to make progress towards adding capacity, relieving chokepoints, and improving operating flexibility to incrementally work towards NEC FUTURE travel time and frequency targets.

Financial Strategy

The financial strategy identifies the sizable gap between historically available funding levels and the capital needs of the C35 plan and suggests an approach for closing it. This process began with a survey of existing funding programs and an evaluation of their suitability for implementing a plan at the scale of C35.

Existing funding programs, though insufficient to address SOGR backlog and capacity needs, have been critical in supporting the services the region has enjoyed in the roughly 50 years of NEC public ownership. However, the patchwork of existing funding sources for NEC projects and their unpredictable nature present core challenges to ramping up to the C35 investment levels required to tackle the SOGR backlog and build a foundation for growth. C35 developed principles regarding how a preferred federal-state funding partnership could be structured to support implementation of a more aggressive and highly coordinated plan. See Chapter 9 for funding strategy recommendations.





Passengers boarding a Metro-North train at Bridgeport Station (CT)

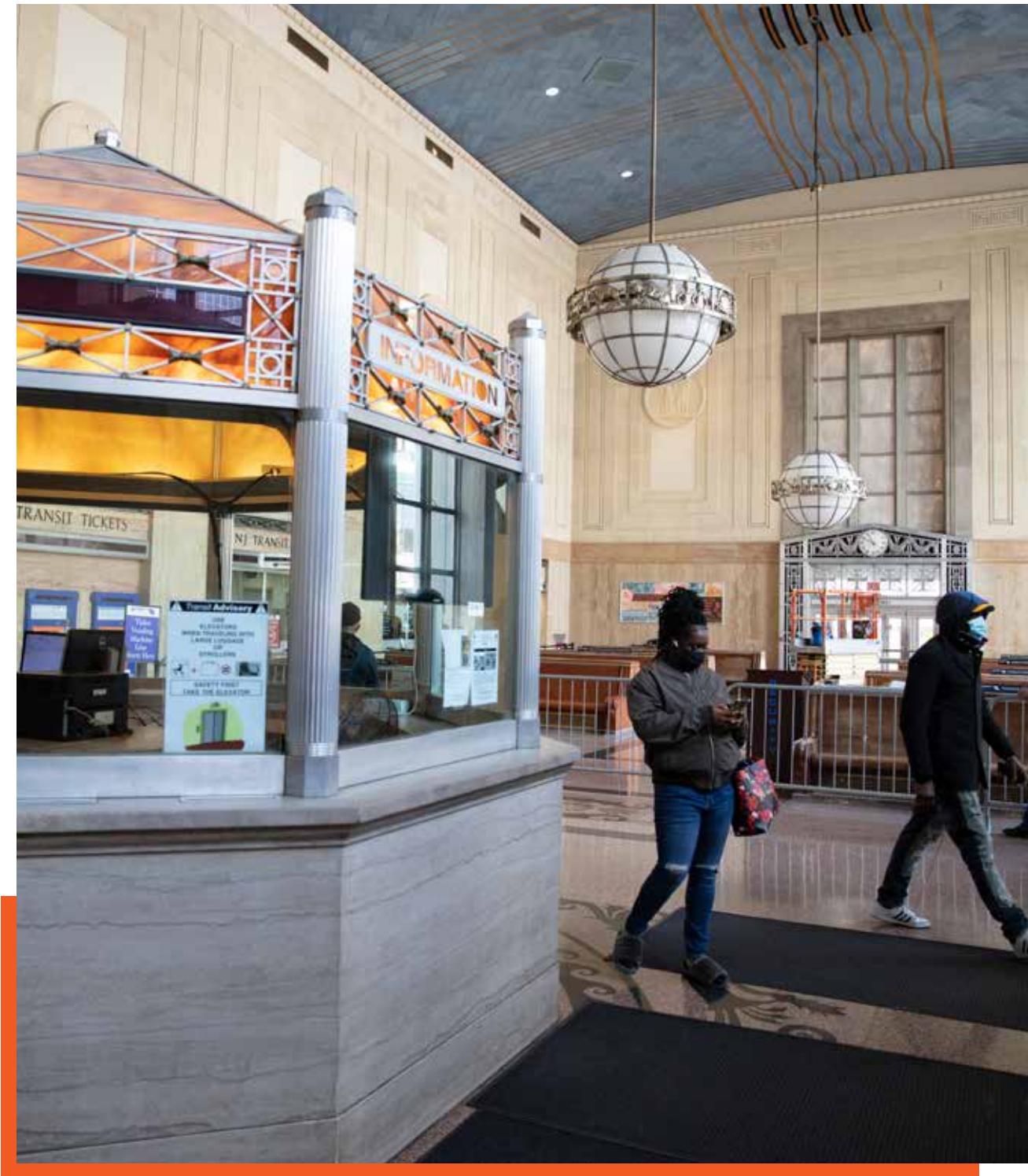
Benefits Analysis Methods

The delivery and operations analysis that shaped the plan were supplemented with additional methods and tools for forecasting ridership demand, estimating capital costs, and examining the plan's potential economic impact.

ANALYSIS	METHODS	OUTCOMES
RIDERSHIP	Commuter and intercity ridership estimated using a customized elasticity-based ridership tool derived from behaviors embedded in existing ridership models, incorporating demand sensitivities to travel time, service frequency, and fare	<ul style="list-style-type: none">Mode shifts to rail from auto, air, and bus with proposed 2035 operating plan for individual territories and corridor-wideTravel time savingsChange in both vehicle and passenger miles traveled
COST	Capital needs estimated using ground-up, asset-by-asset cost model in 2020 dollars	<ul style="list-style-type: none">Estimated capital costs in five-year time framesIncludes labor and materials
ECONOMIC	Economic benefits derived from the capital investment and service improvements, captured at territory, corridor-wide, and national scales	<ul style="list-style-type: none">Value of capital investmentAnnual jobs and estimated earningsEconomic benefit of travel time savings and improved reliability to individual riders and to the regional economy

How the pandemic may influence future rail ridership

The pandemic and worldwide shut down of businesses resulted in an abrupt halt to travel everywhere. Public transportation was hit hard as social distancing was enforced and people with options chose not to travel or shifted away from metro, rail, air, and bus travel to auto. As a result, rail ridership throughout the Northeast dropped dramatically. We are now starting to see ridership rebound as people return to their offices and business and leisure travel resumes. The C35 ridership analysis was adjusted to allow time for ridership to recover to pre-pandemic levels by assuming that growth forecast to occur by 2030 would now not be realized until 2035.



People at the Newark Penn Station Information Kiosk (NJ)