"Doubling Trans-Hudson Train Capacity at New York Penn Station"

Fact Sheet on the Penn Station Capacity Expansion Feasibility Study

"Doubling Trans-Hudson Train Capacity at New York Penn Station" is an engineering feasibility study commissioned jointly by Amtrak, MTA, and NJ TRANSIT ("the Railroad Partners") that examines concepts for increasing rail capacity at the busiest train station in the Western Hemisphere – New York Penn Station ("Penn Station").

The study focuses on two alternatives with two design concepts each and evaluates their potential to accommodate the trans-Hudson capacity requirements of the Gateway Program, as well as increased service on the Empire Line, without expanding the station's physical footprint.

The study also examines international examples of capacity enhancement including the development of "cross-regional rail" and its potential application at Penn Station.

Study Conclusion: After extensive review of the technical practicality of the four design concepts (see below for a more detailed summary), the study has determined that none of the concepts meet the established criteria for future evaluation.

Next Steps: A separate, future analysis will evaluate additional alternatives for the Penn Station Capacity Expansion project that are not constrained by the current physical boundaries of the station.

The Evaluation Process:

The analysis was conducted by WSP/FXC on behalf of the Railroad Partners.

Determining Technical Feasibility

The four design concepts were evaluated with respect to their technical feasibility. The evaluation criteria were:

1. Can the **track geometry** function operationally, and can it provide connections to the existing Penn Station, the existing North River Tunnel, the future Hudson River Tunnel, and the East River Tunnel?
2. Is the concept **reasonable to construct** from a structural and geotechnical perspective, without untenable impacts to existing train service, passenger flows, station operations, structures, utilities, and systems?
3. Can the concept **comply with governing regulations** for emergency egress and ventilation?
4. Can the concept provide total **operational capacity** sufficient to enable peak trans-Hudson rail service to increase to at least 48 trains per hour (tph) in the peak direction (doubling the existing trans-Hudson capacity by enabling at least 24 tph in each direction through the new Hudson River Tunnel) while also maintaining existing levels of bi-directional suburban commuter services?
5. Is the concept compatible with the **future cross-regional rail** vision that includes creating a regional metro network, maintaining longer-distance suburban commuter service, and expanding intercity service?

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Design Concepts Analyzed

Alternative 1: Expand beneath the existing Penn Station ("Under Penn")

This alternative aims to double trans-Hudson rail capacity at the station by adding 10 new tracks and platforms below the existing tracks of Penn Station. Implementation would require construction of two additional lead tunnels branching off from the new Hudson River Tunnel near Twelfth Avenue. The concept does not provide direct train connectivity from these new tunnels to the existing Penn Station.

Two variations ("design concepts") of the Under Penn alternative were evaluated in the study. The primary difference between the two concepts ("Underpinning" and "Mined") is the method of constructing the new station infrastructure below the existing facility and the depth at which new tracks would be located relative to the existing station tracks.

- **Design Concept #1: Underpinning** This concept, built at a shallow depth below the existing station, requires underpinning, or physically supporting, over 1,000 existing columns between Eighth and Seventh Avenues, an incredibly complex and challenging technical feat that is deemed infeasible in the analysis. This plan would also require the removal of existing tracks within Penn Station to make vertical circulation possible for passengers moving between the expanded station below and the main, existing concourse, substantially lowering the net increase in total station capacity.
- **Design Concept #2: Mined** This concept avoids the above pitfall because it is built deeper below grade, obviating the need for underpinning, but still has a critical remaining fatal flaw. The required operational capacity cannot be achieved due to train movement conflicts at the new single-level interlocking west of the station expansion, which would feed the new lower-level platform tracks.

Both of these concepts fail to meet constructability, fire-life safety, and operational requirements. They are therefore eliminated from future evaluation.

Alternative 2: Convert Penn Station to Through-Running Operation

This alternative examines the feasibility of converting the existing station to all through-running as a way of at least doubling Penn Station's trans-Hudson rail capacity and increasing service along the Empire Line without physically expanding the station.

In this alternative, all trains, except those arriving via the Empire Connection tunnel, would run through the station. Development of this alternative included a review of international practices to determine how to configure the alternative in Penn Station.

Two variations ("design concepts") of the Through-Running alternative were evaluated:

- **Design Concept #1: Full Reconstruction**
  - This concept completely reconfigures the track and platform level of Penn Station, providing 17 tracks and nine 30-foot-wide platforms, all in new locations.

- It would require the complete reconstruction of the track and platform level at both Penn Station and Moynihan Train Hall, including the removal, relocation or strengthening of approximately 1,045 structural columns supporting Madison Square Garden, the PENN 2 office building, Eighth Avenue, and the Eighth Avenue A/C/E subway lines.
- Construction staging within Penn Station and Moynihan Train Hall would reduce train service at Penn Station by approximately 30% during peak periods for approximately 12 years, an unacceptable level of disruption.
- The concept fails to meet the constructability, operational performance, and future regional rail criteria and is therefore eliminated from further study.

- **Design Concept #2: Limited Track and Platform Reconfiguration**
  - This concept addresses the extreme constructability impacts of Design Concept 1 by proposing to widen the existing platforms to a width of 30-feet by decking over or eliminating the existing track on one side of each island platform.
  - In this concept, 12 of the existing 21 station tracks would be retained in their current locations. This would reduce but not eliminate the need for structural modifications and track re-alignment under both Penn Station and Moynihan Train Hall.
  - This concept fails to meet the operational performance requirements as it does not have enough tracks to reliably deliver the additional 24 tph through each Hudson River and East River Tunnel tube (48 tph total in each direction of travel). It also fails the future regional rail criterion. It is therefore deemed technically infeasible and not recommended for further study.

Additional Notes on Through-Running Concepts

Both through-running concepts require significant reconstruction at Penn Station and would also require major investment in turnback station facilities — one in New Jersey and another in Queens or the Bronx.

In addition to turnback stations, new train storage yards would be required both west and east of the station, each requiring significant property acquisition and subject to lengthy environmental review and permitting processes, further delaying needed improvements to the core facility at Penn Station. The 100% through-running concepts would also render Long Island Rail Road's West Side Storage Yard — a 35-year-old facility that provides storage for 30 trainsets — unusable. Extensive capital investment would also be required to address issues of fleet interoperability and other technical considerations among the Railroad Partners.

No combination of through-running tracks and platforms within the footprint of the existing station meet the operational performance needs and can be constructed without massive and unacceptable disruption to service, including significant capital investments throughout the region.

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Summary of Study Findings & Conclusions

As shown in the graphic below, none of the concepts evaluated meet the operational performance goals set forth by the Gateway Program, CONNECT NEC 2037 (the Northeast Corridor Commission’s 15-year service plan for the Northeast Corridor), or the Federal Railroad Administration (FRA)’s long-term vision outlined in the NEC FUTURE Program.

It is therefore necessary to evaluate the construction of an expansion of Penn Station beyond its existing footprint and provide additional tracks and platforms to meet the operational performance needs.

A separate, future analysis will evaluate additional alternatives for the Penn Station Capacity Expansion project that are not constrained by the current physical boundaries of the station.

		Step 1 (Pass / Fail)					**Step 2***	
		Track Geometry	Constructability	Fire-Life Safety	Operational Performance	Future Regional Rail Vision	Construction Cost	Construction Schedule
Alternative 1: **Under Penn Station**	Design Concept 1: **Underpinning — Single Level**	Pass	Fail	Fail	Fail	Pass	-	-
	Design Concept 2: **Mined — Single Level**	Pass	Fail	Fail	Fail	Pass	-	-
Alternative 2: **Through-Running**	Design Concept 1: **Full Reconstruction**	Pass	Fail	Pass	Fail	Fail	-	-
	Design Concept 2: **Limited Track and Platform Reconfiguration**	Pass	Pass	Pass	Fail	Fail	-	-

* None of the design concepts evaluated in this report passed the Step 1 technical feasibility screening.