

## Summary of Proposed Project Improvements

The building and rail yard improvements comprising the proposed project recommended by the project team are summarized below.

### Building

**Table 1. Proposed Project: Building and Site Improvements**

Improvement	Proposed Project Improvements
Vertical Circulation and Access	Implement a two-elevator configuration with an enclosed stair to the second and third floors. The two-elevator approach avoids the potential historic impact of the mezzanine connector bridge on the main concourse. The stairway and elevator configuration would be the most compatible with proposed main floor and upper floor improvements in Amtrak and other leasable spaces.
Amtrak Operations and Passenger Concourse	Create a new north foyer hallway which would increase train boarding gate capacity for growth in future passenger rail service, and would minimize circulation and quieting conflicts between arriving and departing passenger flows and queues within the main concourse. The configuration of ticketing, baggage, and restrooms would meet Amtrak operational and business objectives, and the orientation of passenger services would be the most conducive for arriving and departing passengers. Consolidation of ticketing / baggage functions would increase Amtrak operational efficiency and passenger convenience and would create opportunities to implement accessibility improvements to the customer service counter. The Passenger Vestibule would be modified to facilitate passenger flow to and from the crossing, and also to comply with ADA requirements for floor slope.
Ticketing Area	Preserve the existing, historic walnut ticketing counter to incorporate it as a feature into a new retail concession such as a café. A café alternative would provide a new passenger amenity and creates a high-quality amenity in a prominent main concourse location. Preservation of the existing walnut ticket counter and other features would honor the historic use of this area and would add interest and character to the space.
South Concourse	Expand retail concessions with shared use seating. This would improve and enhance the south concourse as an amenity for rail passengers, building tenants, and visitors alike. This concept envisions flexible seating that can be used both by concession patrons and waiting rail passengers, providing flexible capacity during peak periods. Introduction of new retail concessions activates this area and is compatible with providing exhibit space as part of the final space configuration.
First Class Lounge	Retain the First Class Passenger Lounge because of its value to Amtrak's premium customer base such as sleeper car passengers and business class passengers. Should Amtrak direction change, the space could be repurposed to accommodate a tenant or amenity.
South Main Floor Leasable Spaces	Implement a core and shell only option. The decision about the highest and best use of this space will depend on future market conditions closer to the completion of construction, which is anticipated to be up to five or more years into the future. During this time, market conditions are expected to evolve significantly in the Broadway Corridor, particularly with the potential redevelopment of the nearby U.S. Post Office site and other parcels in the immediate vicinity.  The core and shell improvement would accommodate restaurant and/or retail, consistent with the historic uses of the south end of the building as a restaurant and dining hall, and the historical presence of other public services along the south hallway (e.g. barber shop). The refurbishments of this area of the building would require replacement of the floor structure, potential modifications to the ceiling structure, and seismic retrofits of the interior and exterior walls. Code and

	accessibility requirements would likely result in modification to the existing configuration of interior spaces. The re-designed south floor leasable spaces would incorporate elements of the historic corridor to the extent practical.
Upper Floor Leasable Spaces	Reconfigure leasable spaces to create larger floorplates. PDC will preserve the existing character, footprint, and materials of the existing historic corridors, while creating larger footprint leasable spaces that are more financially viable. In the near term, it is expected that leasable spaces will be rehabilitated to a core and shell level following major structural, systems, and vertical circulation improvements. This will maintain flexibility for tenant fit-out in the future. On a case-by-case basis, historic materials and features of leasable areas (e.g. casework, finishes) will be preserved and/or relocated.
Nursery	Remove the nursery building. The nursery building is in poor physical and seismic condition, is currently unused, and cannot be occupied in its current state. Damage due to water and mold has compromised the structure, which risks damaging the main structure. The trackside location behind the Amtrak security control line limits the re-use options and potential future public access to any rehabilitated or reconstructed space. In order to preserve the legacy of the WWII era nursery, an interpretive display of the history of Union Station during WWII in a more public area of Union Station could be considered.
Main Building Seismic Strengthening	Implement reinforced concrete shear walls as the most efficient option for strengthening the existing station. Reinforced concrete shear walls provide the most flexibility in layout and are the easiest to enclose in architectural features so as to avoid a significant impact on the overall appearance of the station. Reinforced concrete walls also provide the greatest amount of stiffness and would limit the amount of work to brace architectural features. There are some locations in the interior of the building near new stair/elevator cores where the recommended option between a braced frame and a concrete shear wall would be determined during the design process.
Diaphragm Alternatives	Add plywood sheathing above or below the existing floor diaphragm. A horizontal truss reduces the amount of shear walls to be added to the structure, but has a significant impact on the ceiling of the station. The horizontal truss has to be located below the existing floor diaphragm and is not an option in areas where the ceiling is to be preserved. Additionally, reducing the number of shear walls would increase the load to each shear wall and as a result could require a large amount of foundation work.
Out of Plane Strengthening Alternatives	<p>Implement reinforced concrete shear walls. Reinforced concrete shear walls would be relatively simple to attach to the existing URM brick walls. As part of the lateral system for the structure and as such, concrete shear walls can be used for both in-plane and out-of-plane strengthening.</p> <p>Where historic finishes and materials exist (such as the walls of the main concourse), the concrete shear wall reinforcement can be implemented behind the historic material by temporarily removing the marble panels, replacing existing hollow clay tile with a shotcrete shear wall, and replacing the marble panels. This process may result in minor changes to finish room dimensions due to the slight increase in wall thickness, but the restored structural reinforcement will be hidden from view behind the restored marble panels with relatively small permanent dimensional changes anticipated. In less historic locations, such as the baggage room or leasable tenant spaces, the introduction of concrete shear walls on the inside of the existing URM wall would result in an increase in the overall wall thickness. However unlike braced framing, there is no risk of steel structural members blocking existing historic windows.</p> <p>The use of concrete shear walls would also create opportunities to introduce new building insulation, acoustic window treatments, and mechanical/electrical conduit within new the wall system. These opportunities would be explored in preliminary design.</p> <p>In certain locations, the steel tube strongback system may be considered as an</p>

	alternative base. Exceptions to the use of concrete shear walls would be further explored in preliminary design based on overall architectural and structural design considerations.
Tower Unreinforced Masonry (URM) Strengthening	Implement a combination of reinforced concrete shear walls in the lower levels and steel braced frames in the upper levels. The light weight of the braces in the upper levels would provide lateral resistance without adding a significant amount of mass. Reinforced concrete shear walls would anchor the braces from above and at the same time can be used to provide lateral support to the main station structure.
Tower Overturning Resistance	Implement the addition of piles to the existing pile cap. Drilled pile foundations can be challenging to construct, but the work would be concentrated to a small area. Additionally, by adding the piles below the tower, the lateral elements of the tower can be used to support the main station. Without the addition of these piles, the loads from the tower would have to be redistributed to the rest of the station.
Main Building Chimney	Add a pipe column inside the chimneys. This would have no permanent impact on the exterior appearance of the chimney structures. The chimneys are non-functional, and therefore the primary objective for a structural/seismic retrofit is to preserve their historic appearance and character.
Platform Canopies	<p>Implement contemporary umbrella canopies with a perpendicular 'high shed' cover over the primary platform crossing. The replacement high shed will be less prominent in profile than the existing high shed. This is because of the northward shift of the replacement high shed away from the central axis of symmetry of the Main Concourse, as well as the intersection of multiple building elements (canopies, high shed, maintenance shed, and multiple rooflines) in the vicinity of the new crossing location. This concept provides the essential benefits for rail operations (increased clearances and improved weather protection) while preserving the historic form of the existing umbrella canopy/high shed system. The capital cost of this alternative would be lower than several of the other concepts considered, while still providing sufficient area for a photovoltaic system, if desired.</p> <p>In terms of constructability and maintenance of rail operations during construction, the umbrella canopy would be simpler to implement as part of a staged track reconstruction that upgrades one platform/platform canopy system at a time. It is anticipated that a contemporary platform canopy/high shed design can be developed to capture the positive benefits of a contemporary design approach while honoring the historic platform canopies and adjacent station.</p>
Rail / Building Maintenance and Operations Areas	Implement a new replacement shed and restore the attached gable. This provides the greatest functional benefit and design flexibility to provide coverage that meets the operations needs of Amtrak. It also would provide the historic benefit of the restored attached gable, which was removed from the Main Building when the current maintenance shed was constructed in the 1960s. The specific sizing requirements and organization of the maintenance area and associated shed structure would be further developed through preliminary engineering.
Annex Plaza	Replace the existing, parking, grass and landscape beds in front of the Annex with a public plaza. This transformation would be consistent with the periodic change and re-purposing of this area over the history of Union Station. It would maximize the potential of the annex while creating a community gathering spot that celebrates Union Station and provides benefits to the broader neighborhood.
Annex Floor Plan	Implementing a Single-Story Shell which would provide the most flexibility for re-use of the annex building, once the basic building upgrades have been completed and the annex is ready for leasing and fit-out based on future market and neighborhood conditions. The additional cost and space consumption of stair and elevator access to a second floor or mezzanine is not cost effective; however, the single story shell alternative could be designed in a manner to accommodate the addition of a second floor mezzanine in the future, if warranted by the tenant.
Annex Chimney	Implement the Full Height Chimney Reconstruction with Reinforced Core. The annex chimney is evocative of the building's historic use as Union Station's boiler room. The

	historic benefit of preserving the character-defining annex chimney was the key factor in selecting the chimney preservation alternative. This approach assumes technical viability of chimney restoration, including but not limited to the ability to salvage existing face brick. Technical feasibility and constructability considerations would continue to be explored in future design phases.
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## Rail Yard

**Table 2. Proposed Project: Rail Yard Improvements**

Improvement	Proposed Project Improvements
Improvements to Existing Trackwork	<p>Implement track improvements to accommodate the anticipated 2035 passenger volumes. Reduced maintenance and down-time would provide a substantial return-on-investment:</p> <ul style="list-style-type: none"> <li>• Replace existing, old, or broken equipment in the yard with new equipment and develop an improved maintenance program for tie replacement</li> <li>• Replace 90# rail and Other Trackside Materials (OTM) with heavier, industry standard 115# rail.</li> <li>• Weld the existing rail joints</li> <li>• Replace existing defective ties within Tracks #1 - Tracks #4 with new wood ties and formalize an ongoing tie replacement program</li> <li>• Replace the drip pan system</li> <li>• Replace the No. 7 turnout at the south end of the yard (between Tracks 1 and 2) with a No. 9 turnout <i>if the geometry will allow this without extensive rework.</i></li> <li>• Replace existing turnouts in kind</li> <li>• Replace the existing switch machines on the south end of tracks 1-4</li> <li>• Install switch machines at the two turnouts leading to Track #1 south</li> <li>• Install correct voltage power to all switch machines</li> </ul>
Improvements north of NW 9 <sup>th</sup> Avenue to Accommodate Inspection Needs	<p>Implement track improvements north of NW 9<sup>th</sup> Avenue to accommodate train movements required for inspection needs due to 15" high platforms:</p> <ul style="list-style-type: none"> <li>• Install trackwork and signaling to allow for a 700' train movement into and out of the station without entering mainline signalized territory</li> <li>• Install approximately 900' of storage track and walkway north of NW 9th outside of mainline signalized territory</li> <li>• Install special trackwork to allow for two continuous mainlines to by-pass the storage track and station</li> <li>• Extend Track #6 (see below) across NW 9th</li> <li>• Revise the existing railroad access road to accommodate the new tracks</li> <li>• Reconstruct the existing grade crossing at NW 9th Ave. to accommodate new tracks</li> <li>• Revise the railroad signalization and communications systems to allow for new track</li> </ul>
Signalize and Remotely Control All Tracks	<p>Implement railroad signal improvements necessary for implementing the 2035 passenger train volumes and has been characterized as necessary by the FRA:</p> <ul style="list-style-type: none"> <li>• Signalize the tracks within the station and consider using Centralized Traffic Control. This would require installing communications conduit from a central control point to the north and south switches, as well as installing switch point indicators and other infrastructure needed for a fully signalized system)</li> <li>• Install signal conduit and signals</li> <li>• Install signal houses (if needed)</li> <li>• Detail wiring diagrams</li> </ul>

Improvement	Proposed Project Improvements
	<ul style="list-style-type: none"> <li>• Develop and coordinate an operating plan with all parties</li> </ul>
Fuel Delivery System	<p>Implement new fueling system to replace the existing system, which is unsustainable from an operations and maintenance standpoint:</p> <ul style="list-style-type: none"> <li>• Construct a new underground fueling system to replace the existing method of stretching hoses across the tracks. The system would be designed to be expanded to the south in the future if desired; the expansion south would mirror the north installation in terms of equipment and layout. The system would also accommodate the Diesel Emissions Fluid (DEF) additive required for newer locomotives.</li> <li>• Construction of fueling and DEF equipment under the Butler Shed</li> <li>• Underground piping with leak detection</li> <li>• Piping underneath the existing platforms to hose reel cabinets on-platform</li> </ul>
Relocate and Reduce Width of Passenger Crossing	<p>Relocate and reduce the passenger crossing. Passenger loading south of the passenger crossing must be available in order to achieve the anticipated 2035 train volumes:</p> <ul style="list-style-type: none"> <li>• Relocate and reduce the width and location of the passenger crossing in order to maximize the available space for trains south of the passenger crossing. Reducing the passenger crossing will allow for the loading of passengers on the Cascades routes south of the crossing, increasing overall station capacity.</li> <li>• Demolition of existing passenger crossing</li> <li>• Reconstruction of the existing passenger crossing in new location farther north</li> </ul>
Shorten Existing Platforms	<p>Shorten the platform to coincide with the limits of straight track (or minimally curved track in accordance with Amtrak design standards) and pave a section of track to allow for a baggage cart path to the station :</p> <ul style="list-style-type: none"> <li>• Shorten existing platforms</li> <li>• Construct baggage cart path</li> </ul>
Construct Track #6	<p>To accommodate the loss in current capacity, and to allow for the most flexible operating plan for passenger trains into and out of the station, rebuild Track #6, which was removed in the mid - 1990s, allowing for a second freight main adjacent to the station yard. If the 2035 expected passenger train volumes are realized, all four tracks within the station plus Track #5 will be required for passenger trains, no longer allowing for freight traffic on Track #4. Track #6 will also likely be needed for phasing of other track, canopy, and platform improvements. Freight trains would use Tracks #5 and #6 exclusively, and would not need to enter the yard on Track #4, allowing for the increased flexibility needed for increased passenger train volumes:</p> <ul style="list-style-type: none"> <li>• Construct new trackwork (Track #6)</li> <li>• To maximize platform widths, construct Track #6 to the east of the Broadway Bridge pier and acquire ROW ownership and/or easement as needed</li> <li>• Construct special trackwork</li> <li>• Construct bridge pier protection</li> <li>• Reconstruct NW 9th Avenue crossing</li> <li>• Signalize track work</li> </ul>
Raise Platform Heights	<p>Raise the existing two platforms to the allowable height above top of rail (TOR).</p> <ul style="list-style-type: none"> <li>• Demolish existing platforms and canopies</li> <li>• Construct platforms. If the freight railroads using Track #5 can accommodate a 15" high platform, raise all platforms to 15" high. If the freight railroads using Track #5 cannot accommodate a 15" high platform, raise the platforms serving Track #'s 2 and 3 to 15" above TOR, and raise the platforms serving Track #'s 4 and 5 to 8" above TOR pending approval from FRA</li> <li>• Construct new canopies</li> </ul>

Improvement	Proposed Project Improvements
	<ul style="list-style-type: none"> <li>• Construct utilities within platform</li> </ul>
Reconfigure Drip Pans	<p>Replace the existing drip pan system to accommodate the future 2035 train berthing locations, install a new oil water separator for the improved lines, and replace the existing piping as needed to account for the removal of the stormwater feeds from the existing platform canopies into the drip pan system .</p> <ul style="list-style-type: none"> <li>• Replace existing piping</li> <li>• Install new oil water separator</li> </ul>
Provide 480V Locomotive Power	<p>To accommodate the anticipated 2035 passenger volumes replace the existing 480V power supply feeds for idling locomotives with new feeds in underground ducts, leading to power stanchions within the yard . Stanchions would be located at berthing locations coordinated with anticipated 2035 passenger train volumes, consists, and lengths. The conceptual design considers placement of electrical ducts beneath new, 15-inch high platforms.</p> <ul style="list-style-type: none"> <li>• Construct new electrical ductbank under platform</li> <li>• Install new power stanchions within yard</li> </ul>
Stormwater and Sewer System Improvements	<p>Rehabilitate and/or replace certain elements of the stormwater and sewer system identified as deficient in the Site Utilities Report:</p> <ul style="list-style-type: none"> <li>• Abandon certain existing pipes</li> <li>• Replace certain existing pipes</li> <li>• Install pipe liners in certain pipes</li> <li>• Inspect and clean canopy downspouts and connect to a new pipe</li> <li>• Upgrades to sewer dump station, grinder pump and discharge line</li> </ul>
Water System Improvements	<p>Replace, rehabilitate, and upgrade the existing potable water delivery system within the yard and station area, as well as new sprinkler supply lines to the annex and main terminal buildings:</p> <ul style="list-style-type: none"> <li>• Install new water cabinets on platforms</li> <li>• Install supply piping and valve fixtures for new water cabinets</li> <li>• Removal and replacement of some existing water lines</li> <li>• Concrete encasement for some water lines</li> </ul>
Electrical System Improvements	<p>Replace the existing electrical ductbank on the north end of the terminal with a new line to a new electrical vault located north of the terminal. The existing line would be abandoned in place.</p> <ul style="list-style-type: none"> <li>• Construct new electrical feed and new vault</li> <li>• Abandon existing electrical feed</li> </ul>
Telephone and Voice System Improvements	<p>Install a new data and telecommunications line into the main terminal building from the existing vault on NW Irving Street to support modern business needs within the main terminal and annex building, as well as to support the installation of on-site yard control:</p> <ul style="list-style-type: none"> <li>• Install telecommunications ductbank</li> </ul>
Compressed Air System Improvements	<p>Reconfigure the compressed air system within the yard to accommodate the 2035 passenger train schedule, and resulting berthing locations for the trains. The new compressed air piping is assumed to run within a utility ductbank in the new, 15" high platforms; however, replacement of the platforms is not required for the installation of the new air system; the piping could be run within the yard.</p> <ul style="list-style-type: none"> <li>• Install new air piping system</li> <li>• Install new air stanchions on the platform</li> </ul>