WASHINGTON
UNION STATION
STATION EXPANSION

Draft Environmental Impact Statement for Washington Union Station Expansion Project

Appendix A8 – Action Alternatives Cost Estimates Memorandum

U.S. Department of Transportation
Federal Railroad Administration

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WASHINGTON
UNION STATION
STATION EXPANSION

Project Memorandum

DATE: April 19, 2020

REFERENCE: Washington Union Station Expansion Draft Environmental Impact Statement

SUBJECT: Action Alternatives Cost Estimates

Introduction

The Federal Railroad Administration (FRA) conducted the analysis presented in this memorandum to estimate the cost of constructing the Washington Union Station Expansion Project (Project) under each of the Action Alternatives considered in the Draft Environmental Impact Statement (DEIS) prepared for the Project.

FRA developed the Project cost estimates on the basis of detailed construction and cost studies prepared by Amtrak. In these studies, Amtrak provided rough-order-of-magnitude (ROM) estimates of the cost of constructing the Project along with overbuild decks for the private air-rights development[1] and the potential Federal air-rights development under each of the Action Alternatives (combined estimates). The detailed combined estimates are included in Attachment 1 to this memorandum, along with a brief summary of the estimating methodology. The total combined construction cost estimates are shown in Table 1.

Table 1 – Amtrak's Combined Construction Cost Estimates

Action Alternative	Combined Estimated Cost
A	$6,795,699,753
B	$8,186,925,245
C	$7,111,025,497
D	$7,171,089,312
E	$8,253,860,496
A-C	$6,783,902,637

Because the private air-rights development and the potential Federal air-rights development are separate from the Project, FRA needs to remove these costs from the combined estimates. In addition, Amtrak's combined estimates do not include the cost of column removal in the First Street Tunnel, needed to accommodate track realignment, nor the cost of railroad infrastructure construction north of K Street. FRA needs to add these costs.

Amtrak subsequently developed two additional cost estimates for Alternative A-C: one that removed the costs of the private air-rights development and the potential Federal air-rights decks from the combined

[1] A private developer (Akridge) owns the air rights above the WUS rail terminal between the historic station and K Street NE, excluding the existing bus and parking facility. Akridge intends to develop these air rights as Burnham Place (private air-rights development).

estimate (Attachment 2); and one that added the column removal costs to the combined estimate (Attachment 4). Amtrak also provided a separate estimate of the costs associated with railroad infrastructure construction north of K Street, which would be the same regardless of the Action Alternative (Attachment 5).

Therefore, to develop Project cost estimates for all Action Alternatives, FRA:

- Removed the private air-rights development deck and potential Federal air-rights development deck costs from the combined costs estimated by Amtrak for Alternatives A through E using the approach described in Section 1 below;

- Added the costs associated with the column removal work to the estimates for Alternative A through E using the approach described in Section 2 below; and

- Added the costs associated with the railroad infrastructure construction to the estimates for all Action Alternatives, as described in Section 3 below.

1. Removal of Air-Rights Development Deck Costs

1.1 Approach

As noted above, Amtrak developed and provided an adjusted construction cost estimate for Alternative A-C that removed the costs associated with construction of decks for the private air-rights development and potential Federal air-rights development. This estimate is provided in Attachment 2.

FRA used the revised Alternative A-C cost estimate to develop similar estimates for Alternatives A through E. The approach FRA used is based on the reasonable assumption that the removed costs are approximately proportional to the area of deck removed. The analysis proceeded through the following steps:

- Step 1: Determine a “Cost Unit Factor” by square foot of deck removed based on the adjustment conducted for Alternative A-C.

- Step 2: Estimate the deck area needed to support Project elements (including roadways) for Alternatives A through E and deduct it from the size of the deck used to develop the combined estimates. This yields the area of deck to be removed from the estimate.

- Step 3: Estimate the total amount to be removed from the combined cost estimate by multiplying the removed deck area by the Cost Unit Factor.

- Step 4: Deduct that amount from the combined cost estimate.

1.2 Calculations

- Step 1: For Alternative A-C, Amtrak’s analysis showed a difference of $1,674,609,375 between the combined estimate and the estimate without the private air-rights development and potential Federal air-rights development decks, with a total of 598,216 square feet of deck being removed. After rounding, this yields a Cost Unit Factor of $2,799 per square foot.

Table 2 summarizes the results of the analysis conducted by Amtrak for Alternative A-C, from which the Cost Unit Factor was calculated.[2]

Table 2 – Amtrak's Construction Cost Estimate for Alternative A-C (Air-rights Development Decks Removed)

Combined Cost Estimate	Deck Area Removed from Estimate (Square Feet)	Costs Removed	Costs Removed as a % of Combined Estimate	Project Cost Estimate[3]	Cost Unit Factor
$6,783,902,637	598,216	$1,674,609,375	24.7%	$5,109,293,262	$2,799/square foot[4]

- Step 2: The area of deck needed for the Project in Alternatives A through E was estimated using AutoCAD based on the drawings included in Attachment 3. For each alternative, this area was then deducted from the size of the deck used to develop the combined estimate, as shown in Table 3.

Table 3 – Deck Area Removal Estimates (Square Feet)

	Total Deck Area (Combined Estimate)	Project Deck	**Deck Area Removed from Estimate**
Alternative A	805,396	281,878	**523,518**
Alternative B	805,396	270,641	**534,755**
Alternative C	805,396	219,364	**586,032**
Alternative D	805,486	183,210	**622,276**
Alternative E	805,486	60,308	**745,178**

- Step 3: Table 4 shows the costs associated with the area of deck removed for each of Alternative A through E.

[2] Amtrak did not provide similar estimates for Alternatives A through E. However, the cost estimators suggested that, although the exact amount to be removed would vary with each alternative, they expected it to represent approximately a quarter of the combined estimate for all alternatives. The estimates obtained for Alternatives A through E by using the methodology defined in Section 1.1 are consistent with this statement (see Table 4).

[3] This estimate does not include the costs associated with the column removal work costs (see Section 2) or the railroad infrastructure work north of K Street (see Section 3).

[4] Amount rounded to whole dollars.

Table 4 – Costs Removed from Combined Estimates

	Deck Area Removed (Square Feet)	Cost Unit Factor	**Costs Removed**	**Costs Removed as a % of Combined Estimate**
Alternative A	523,518	$2,799/ square foot	**$1,465,326,882**	**21.6%**
Alternative B	534,755		**$1,496,779,245**	**18.3%**
Alternative C	586,032		**$1,640,303,568**	**23.1%**
Alternative D	622,276		**$1,741,750,524**	**24.3%**
Alternative E	745,178		**$2,085,753,222**	**25.3%**

- Step 4: Table 4 shows resulting cost estimates for the Project, obtained from deducting the removed costs shown in Table 4 from the total combined estimates shown in Table 1. These estimates do not include the costs associated with the column removal work costs (see Section 2) or the railroad infrastructure work north of K Street (see Section 3).

Table 4 – Estimated Project Cost Without Column Removal and Railroad Infrastructure North of K Street

	Combined Cost Estimate	Costs Removed	**Project Cost Estimate**
Alternative A	$6,795,699,753	$1,465,326,882	**$5,330,372,871**
Alternative B	$8,186,925,245	$1,496,779,245	**$6,690,146,000**
Alternative C	$7,111,025,497	$1,640,303,568	**$5,470,721,929**
Alternative D	$7,171,089,312	$1,741,750,524	**$5,429,338,788**
Alternative E	$8,253,860,496	$2,085,753,222	**$6,168,107,274**

2. Incorporation of Column Removal Costs

Amtrak provided an updated combined cost estimate for Alternative A-C that included costs associated with the column removal work. This estimate is provided in Attachment 4. Table 5 summarizes the result of this update. The column removal work would expand the construction schedule by one year between Phase 1 and Phase 2. As can be seen, the majority of additional costs due to the column removal work are due to this schedule extension, in the form of additional escalation costs.

Table 5 – Amtrak's Combined Cost Estimate for Alternative A-C with Column Removal

Combined Cost Estimate	Direct Cost of Column Removal	Indirect Costs of Column Removal	Escalation Costs	Total Additional Cost	Combined Cost Estimate with Column Removal Cost
$6,783,902,637	$30,250,560	$18,595,362	$235,066,989	$283,912,911	$7,067,815,548

To incorporate the column removal costs to the Project Cost Estimates, FRA first incorporated them to the combined cost estimates for Alternative A through E and calculated the total additional cost for each of these alternatives using the approach described in Section 2.1 below. This step was required because the

methodology used to develop the Project Estimates (see Section 1 above) does not allow for directly calculating escalation costs. FRA then applied the additional costs to the Project estimates for all Action Alternatives, as explained in Section 2.2.

2.1 Incorporation of Column Removal Costs to Combined Cost Estimates (Alternatives A through E)

2.1.1 Approach

The direct and indirect costs of the column removal work (shown in Table 5) would be the same in all Action Alternatives because this work is independent of the Project elements that vary according to the alternative. To incorporate the column removal costs to the combined estimates for Alternatives A through E, FRA:

- Added these costs to the direct and indirect costs of the alternative.
- Recalculated escalation costs with one year added to the duration of Phase 1 to account for the extension of the schedule.
- Calculated the difference to obtain the total cost of the column removal work under each alternative.

2.1.2 Calculations

Table 6 shows the resulting calculations. As previously noted for Alternative A-C, the majority of the additional costs are due to escalation.

Table 6 – Addition of Column Removal to Amtrak's Combined Cost Estimates

	Combined Cost Estimate without Column Removal	Combined Cost Estimate with Column Removal	**Increase**
Alternative A	$6,795,699,753	$7,080,711,412	**$285,011,659**
Alternative B	$8,186,925,245	$8,521,349,778	**$334,424,533**
Alternative C	$7,111,025,497	$7,407,481,034	**$296,455,537**
Alternative D	$7,171,089,312	$7,469,980,139	**$298,890,827**
Alternative E	$8,253,860,496	$8,590,582,355	**$336,721,859**

2.2 Incorporation of Column Removal Costs to Project Cost Estimates (All Action Alternatives)

2.2.1 Approach

The column removal work is a discrete part of the Project that bears no relation to the deck area. Therefore, associated direct and indirect costs do not change when the decks for the private air-rights development and for the potential Federal air-rights development are removed from the combined estimates.

Based on this, FRA incorporated them to the Project cost estimated presented in Table 4 above by adding to these estimates the increases shown in Table 6 above for Alternatives A through E, and the increase estimated by Amtrak for Alternative A-C (see Table 5 above). This approach is conservative because construction of the Project without development decks would require less time than assumed by Amtrak for the development of the combined estimates. This would reduce escalation costs.

2.2.2 Calculations

Table 7 shows the resulting calculations.

Table 7 –Project Cost Estimates with Column Removal

	Project Cost Estimate without Column Removal	Estimated Column Removal Costs (Including Additional Escalation)	**Project Cost Estimate with Column Removal[5]**
Alternative A	$5,330,372,871	$285,011,659	**$5,615,384,530**
Alternative B	$6,690,146,000	$334,424,533	**$7,024,570,533**
Alternative C	$5,470,721,929	$296,455,537	**$5,767,177,466**
Alternative D	$5,429,338,788	$298,890,827	**$5,728,229,615**
Alternative E	$6,168,107,274	$336,721,859	**$6,504,829,133**
Alternative A-C	$5,109,293,262	$283,912,911	**$5,393,206,173**

3. Incorporation of Railroad Infrastructure North of K Street Costs

Amtrak developed and provided a separate estimate of the construction costs related to the modifications to the railroad infrastructure associated with the Project north of K Street. This estimate is in Attachment 5. The cost estimate includes escalation and would be the same in all Action Alternatives. It is not influenced by the inclusion or removal of the private and potential Federal air-rights decks.

As a last step to the Project cost analysis presented in this memorandum, the cost associated with the railroad infrastructure North of K Street was added to the Project estimates shown in Table 7. Results are shown in Table 8.

Table 8 – Project Cost Estimates with Column Removal and Railroad Infrastructure North of K Street

	Project Cost Estimate with Column Removal	Estimated Cost of Railroad Infrastructure Work North of K Street	**Total Project Cost Estimate**
Alternative A	$5,615,384,530	$439,012,035	**$6,054,396,565**
Alternative B	$7,024,570,533		**$7,463,582,568**
Alternative C	$5,767,177,466		**$6,206,189,501**
Alternative D	$5,728,229,615		**$6,167,241,650**
Alternative E	$6,504,829,133		**$6,943,841,168**
Alternative A-C	$5,393,206,173		**$5,832,218,208**

[5] Construction costs of the railroad infrastructure north of K Street not included.

4. Conclusion

The Project construction cost estimates developed in this memorandum are based on combined construction cost estimates provided by Amtrak. Both Amtrak's combined estimates and the Projects developed using the simplified methodology described above are ROM estimates intended for comparison of Alternatives purposes in the DEIS.[6]

Table 9 shows the rounded Project construction cost estimate in $ billion for each Action Alternative. Project construction costs are estimated to range from approximately $5.8 billion (Alternative A-C) to approximately $7.5 billion (Alternative B).

Table 9 – Project Construction Cost Estimates (Rounded)

	Total Project Cost Estimate ($ billion)
Alternative A	**$6.1**
Alternative B	**$7.5**
Alternative C	**$6.2**
Alternative D	**$6.2**
Alternative E	**$6.9**
Alternative A-C	**$5.8**

[6] ROM estimates are appropriate for the conceptual stage of project planning and environmental review. The methodology cannot be scaled down to estimate costs by construction phase for Alternatives A through E.

Attachment 1 - Combined ROM Construction Cost Estimates.[7]

The estimates evaluated costs under eleven categories:

- Substructure (including excavation);
- Superstructure (including overbuild deck);
- Interiors;
- Conveying;
- Plumbing;
- Heating, Ventilation, and Air Conditioning (HVAC);
- Fire Protection;
- Electrical;
- Concourse/Train Hall;
- Other/Miscellaneous; and
- Transportation.

Costs were estimated for each phase of construction according the preliminary schedule developed for each Action Alternative were divided into direct costs, indirect costs, and escalation costs.

- Direct costs were estimated by
- Defining the schedule step;
- Identifying the individual elements and tasks per steps;
- Costing each element from published listings;
- Verifying costs with local suppliers or contractors; and
- and rolling up costs per tasks to the general unit pricing.

For each Action Alternatives, the following pages include a summary of the basis of estimate, estimating assumptions, exclusions, and list of individual elements per task (these are the same for Alternatives A and A-C and are not repeated; the estimate summary for Alternative A-C can found after the estimate for Alternative A).

For Alternatives A and A-C, the assumed support of excavation (SOE) is a secant-pile cut off (SOE Option #2); for Alternatives B and E, SOE is assumed to be a slurry wall (SOE Option #1); for Alternatives C and D, SOE is assumed to be a Sheet-pile cut-off wall (SOE Option #5).

[7] Source: Amtrak. November 2019. *Washington Union Station Terminal Infrastructure Project Constructability Report.*

Estimate:	**Rough Order of Magnitude**
Design Documents Dated:	**Washington Union Station Expansion Project** **Concept Screening Report** **July 31, 2017**
Estimate Dated:	**December 17, 2018**
Project:	**Washington Union Station - Station Expansion Project** **Alternate A-Support of Excavation Option #2** **Washington, DC**
Client:	**AMTRAK**

Project: **Washington Union Station - Station Expansion Project**
Alternate A-Support of Excavation Option #2
Location: **Washington, DC**
Client: **AMTRAK**
Date: **12/17/2018**
Rough Order of Magnitude

Basis of Estimate and Estimating Assumptions:

1 The purpose of this document is to establish a rough order of magnitude estimate for the Washington Union Station - Station Expansion Project.

2 Estimate is based on Beyer Blinder Belle|Grimshaw design and design/engineering basis of 2016 and recent clarifications.

3 Estimate prices are based on April 2017 prevailing wage labor rates, material market prices, and equipment and materials thru 2017 applicable for work in Washington, DC, including generally practiced project indirects (general conditions), bonds and OH&P for a project of this scale for an "all-in" cost. Estimate includes phasing, 30% design contingency and time-value-of-money escalation.

4 Estimate includes a $150,000,000 allowance for AMTRAK fit-out of Back of House areas.

5 Existing facilities impact is calculated as 5% of the Total Direct Cost.

6 All work is assumed to be performed during 20 hour days (two shifts of 10 hours), 6 days a week. Premium or Over Time Hours are included.

7 Subcontractor's Overhead and Profit is included at 21% in the Direct Cost for each trade.

8 Cost of the project is estimated in "Today's" Dollars and only includes escalation.

9 Sales tax is not included.

10 Costs for hazardous material abatement or disposal are not included.

11 Premium cost of LEED certification is not included.

12 The estimate does not include any "soft cost" items, such as designer's or consultant's fees, reviews and reports, furniture, fixtures, equipment provided by the Owner, moving or any other Owner's expenses costs, etc.

13 Statement of Probable Cost

AECOM Estimating has no control over the cost of labor and materials, the general contractors' or any subcontractors' method of determining prices, or competitive bidding and market conditions. AECOM Estimating's opinion of the probable cost of construction is made on the basis of experience, qualifications, and best judgment of a professional consultant familiar with the construction industry. AECOM Estimating cannot and does not guarantee that proposals, bids or actual construction costs will not vary from this or subsequent estimates. AECOM Estimating has no control over the quality, completeness, intricacy, constructability or coordination of design documents. AECOM Estimating also has no control over the amount of funds available for the project. AECOM Estimating will not be responsible for any design revision costs incurred by the project in the event the estimate or bids are in excess of the budget.

Project: **Washington Union Station - Station Expansion Project**
Alternate A-Support of Excavation Option #2
Location: **Washington, DC**
Client: **AMTRAK**
Date: **12/17/2018**
Rough Order of Magnitude

Hard Cost Exclusions	**Excuded from current design and current cost estimate (possibly included within 30% design contingency per subsequent decisions)**
Legacy Union Station	Estimate does not include cost related to the historic Union Station or its infrastructure
Burnham Place Upgrades	Utility upgrades (combined or stand-alone): steam, chilled water, centralized plant, sewer, water, gas, fire protection loops, power, tel-com service , stormwater retention, green roof, plaza structural upgrades, plaza finishes, plaza emergency access ramps & roadways (fire truck/ambulance), bollards, plaza lighting. Cost-sharing on structure & systems may be future decisions.
Work Calendar	Work calendar is estimated as 20 hour days (2 shifts x 10 Hrs) 6 day week. Work calendar may be limited due to public interest constraints about length of workday and noise.
Other Design Reviews	Excluded: the BuroHappold|Hensel Phelps Concept Feasibility Review of 2015 options and features not included in the BBB|Grimshaw design such as MEP in support of Burnham Place, Legacy Union Station, smoke evacuation zone separation walls and other features. The estimate design contingency is intended for follow-on design decisions.
Environmental Hazards	Estimate INCLUDES disposal fees for contaminated NON-hazardous; it excludes higher classifications in soils, ties, ballast or electrical insulation
Seismic Considerations	No special considerations for additional costs due to seismic constraints
Public Streets/Intersections	Reconstruction of public roads and traffic control beyond repairs for utility connections
Public Utilities	Upgrades to public gas/electrical/water/sewer systems beyond utility connections
Back of House for Amtrak	Up to $150 million allowance.
Retail Areas	No fit-out; "core & shell" utilities terminates at lease line walls. Kitchen exhaust undefined and not included.
Revenue Devices	Revenue machines and related controls
Police & Holding Cells	Break rooms, response ready rooms, holding cells, special MEP-telcom services
Bridges & Tunnels	K Street bridge and reconstruction of H Street tunnel
Security Features	Access control X-Ray devices, blast control construction of walls and floors (such as above standard embedded plates/rebars)
Greenway/WAMATA	Upgrades to WAMATA Greenway and access to new Union Station
Parking	Cost model for parking spaces and parking garage excludes upgrades for rental car fit-out, electric vehicle charging stations

Soft Cost Exclusions	**Excuded from Cost Estimate**
Design	Cost of completion of design processes. No Design-Build costs are included.
Owner Soft Costs	Program mgmt, CM or GC-oversight, Owner QA/QC costs, preconstruction testing, OCIP (if any), incentives, commissioning, legal, accounting and funding fees
Other Owner Indirects	Amtrak Force-Account work, temporary relocations and facilities, temporary parking, final moving costs

Project: **Washington Union Station - Station Expansion Project**
Alternate A-Support of Excavation Option #2
Location: **Washington, DC**
Client: **AMTRAK**
Date: **12/17/2018**
Rough Order of Magnitude

Substructure

1	Track Removals	Remove track, traction power and signals included above in train systems estimate
2	Platform & Canopy Removals	Remove platform and substructure, canopies and columns based on LF of existing platforms
3	Slurry Wall-210'Deep & 62'Exposed Face	From El [51] existing grade to El [-158] rock socketed, covers the full outside perimeter of the jobsite, including tie-backs, permanent
4	Slurry Wall-210'Deep & 49'Exposed Face	measuring 210' deep slurry wall by LF 49' exposed face
5	Slurry Wall-100'Deep & 62'Exposed Face	measuring 100' deep slurry wall by LF 64' exposed face
6	Slurry Wall-100'Deep & 49'Exposed Face	measuring 100' deep slurry wall by LF 49' exposed face
7	Secant Pile Walls-64'Deep & 32'Exposed Face	Drilled secant piles walls cost projected on the basis of LF of secant wall averaging 64' deep
8	Sheet Pile Walls-100'Deep & 62'Exposed Face	From El [51] to El [-49] for temporary phasing support of adjacent tracks and ground water control, including tie-backs and subsequent removals
9	Sheet Pile Walls-100'Deep & 49'Exposed Face	same as above 100' piles with 49' exposed face (fewer tiebacks)
10	Sheet Pile Walls-80'Deep & 49'Exposed Face	80' piles with 49' exposed face (fewer tiebacks)
11	Sheet Pile Walls-64'Deep & 32'Exposed Face	64' piles with 32' exposed face (fewer tiebacks)
12	Dewatering Wells/EA	From El "0" dewatering wells are drilled during each east to west phase; estimate at 100ft OC on perimeter of phased cutoff walls. Install dewatering wells 24" dia, gravel, perf pipe and pump, 100' deep
13	Dewatering O&M/Pump/Mo	Per month per well O&M dewatering wells, maintain pumps, modify discharge lines
14	Drilled Shafts - 5ft Dia	Drilled shaft modeled to Elevation [-140] deep, calculated to LF cost. With Potomac Basal Gravel at approximately [-140], these shafts are estimated as unencased (slurry type) shafts.
15	Drilled Shafts - 6ft Dia	Drilled shaft modeled to Elevation [-140] deep, calculated to LF cost
16	Drilled Shafts - 9ft Dia	Drilled shaft modeled to Elevation [-140] deep, calculated to LF cost
17	Drilled Shafts - 10ft Dia	Drilled shaft modeled to Elevation [-140] deep, calculated to LF cost

Project: **Washington Union Station - Station Expansion Project**
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18	Drilled Shafts - 12ft Dia	Drilled shaft modeled to Elevation [-192] deep including a rock socket and fully steel encased to metamorphic rock due to soil conditions at that depth, calculated to a LF cost. Metamorphic rock at approx El [-158 to -160] means the rock socket will be approximately 35 feet deep.
19	Pile Test Program	One (1) 9' dia. 140' depth test pile, located offsite prior to bid to provide contractor information. Extra costs will be offset by less risk for bidders. Ten (10) Production piles with Osterberg tests. Broken down into (4) 5' Dia., (4) 9' Dia., (2) 12' Dia. to corresponding depths and split evenly across the phases.
20	Mass Excav Open Cut	Open cut from El [51] to approx [3] subgrade. Two alternatives: remove spoils by truck or by train. Trucks loaded by clamshell; gondolas loaded by conveyors . No direct truck loading from deeper levels, extra handling required.
21	Export via Train + Truck	Gondolas loaded by conveyors and railcar loader after excavation spoils are located to one end due to limited site access using clamshell. Cost includes tipping fees for contaminated non-hazardous soil characterization
22	Slab on Grade 4-1/2ft	Mud slab, reinforced conc slab 4.5' thick. Site access limitations increases cost due to pumping concrete from the street side redi-mix trucks into the pit, then horizontally, then redistributed to the pour by a concrete conveyor (or additional pump truck at lower level)
23	SOG 3-1/2 ft	Similar but 3.5' thick
24	SOG 2-1/2 ft	Similar but 2.5' thick
25	Mud Slab only	For temporary (or buried) work surface
26	Track Support Columns	Reinforced concrete columns from drilled shaft to bottom of hammerhead, 8ft wide x 3ft thick x various lengths depending upon design. Rebar ties in to embedded rebar in the drilled shafts
27	Super Columns	Overbuild deck support steel columns bearing on drilled shaft foundations at about El [3] to [55], including anchor bolts and base plate. Steel at 503 lbs/LF, concrete encased into a 28" square column
28	Below Grade Liner Wall for Slurry/Secant Wall	Single face 12" thick wall abutting the slurry wall as a finished liner wall, including waterproofing membrane, and painted finish one side
29	Below Grade Liner Wall for Sheet Pile Wall	8" thick liner wall & flute infill abutting the 12" thick interior wall, including waterproofing membrane, and painted finish one side
30	Structural Slabs	12" reinforced structural slabs at interim levels; for simplicity, no structural concrete beams are included (possible design development)

Project: **Washington Union Station - Station Expansion Project**
Alternate A-Support of Excavation Option #2
Location: **Washington, DC**
Client: **AMTRAK**
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Rough Order of Magnitude

Superstructure

1	Hammerheads	Estimated at 34' wide 5' deep to 7.5' deep x 3' thick, heavily reinforced; for the few smaller hammerheads, cost adjustments will be made
2	Super Columns	Continue higher from El [55] to support the trusses under the overbuild deck, concrete encased
3	Track Support	Track invert slab at 28' wide x 3' thick, supported by six precast bulb tee beams longitudinally between hammerheads. Also includes a drainage gutter.
4	Platform Support	Platform slab 30' wide 2' deep with tactile warning strip each side and a slab finish (terazzo priced), supported by 2' thick support walls 10' high running between the hammerheads. Also, a wall approx 18' high between adjacent hammerheads at approx 32' OC.
5	Type A Steel Trusses	3,000 LBS/LF + 20% for Connections (Supporting Buildings and Cars). Trusses support the overhead deck. Truss weights/LF vary between. Model cost is based on tonnage furnished and erected
6	Type B Steel Trusses	2,700 LBS/LF + 20% for Connections (Supporting Buildings). Trusses support the overhead deck. Truss weights/LF vary between. Model cost is based on tonnage furnished and erected
7	Type C Steel Trusses	900 LBS/LF + 20% for Connections (Supporting Plaza Only). Trusses support the overhead deck. Truss weights/LF vary between. Model cost is based on tonnage furnished and erected
8	Overbuild Deck	Cost model includes a 6" composite (shear studs and reinforcing) on metal deck, supported on bar joists between the trusses (due to height and complexity below), fireproofed; 10 bar joists per 30x30 grid. Same problem with concrete (limited site access, double handling or pumping). Slab may be too thin.
9	Overbuild Deck Alt 1	12" reinforced structural slab; for simplicity, no structural concrete beams are included (relying on trusses). Formwork difficult due height and irregular slab elevations below. Slab may still be too thin for firetruck/ambulance lanes or possible bus lanes on plaza.
10	Overbuild Deck Alt 2	2-1/2 ft thick Structural Concrete slab stiffened to protect from overbuild progressive collapse. Formwork difficult due to weight of wet concrete and irregular slab elevations below.
11	Smaller Column	Cost model based on W18x114 concrete encased for misc small
12	Abv Grade Exterior Wall	Exterior wall (finished both sides) comprised 40% of precast architectural granite faced panels 40% glass and frame and 20% architectural precast brick faced panels, with 60% of the inside face painted
13	Abv Grade Ext Wall Alt	Exterior wall spider-pin cable truss-braced structurally glazed curtain wall

14	Interior CIP Walls	Double face finish on interior CIP walls 12" thick
15	Central Concourse	Overhead structure and roof including columns long span trusses and joist girders to frame roof, metal deck, fireproofing, 30% insulated skylights, EPDM membrane roofing, smoke vents, fascia with drains
16	Skylights	Skylight structures through Overbuild Deck; size varies on plans and sections. Estimating custom skylights at 2,400 SF each
17	Entrances & Canopies	Cantilevered or cable stayed canopies; revolving doors

Interiors

1	Platform to Overbuild Deck Stairs	62 VLF. Metal pan stairs, railings per flight
2	Platform to Overbuild Deck Stairs	33 VLF. Metal pan stairs, railings per flight
3	Concourse to Higher Platform Stairs	23 VLF. Metal pan stairs, railings per flight
4	Concourse to Lower Platform Stairs	21 VLF. Metal pan stairs, railings per flight
5	H St Conc to Lower Level Stairs	16 VLF. Metal pan stairs, railings per flight
6	Mid Level Parking to Concourse Stairs	15 VLF. Metal pan stairs, railings per flight
7	Street to H St Concourse Stairs	12 VLF. Metal pan stairs, railings per flight
8	Lower to Mid Level Parking Stairs	12 VLF. Metal pan stairs, railings per flight
9	Train Platforms	Terrazzo and Tactile Warning Strip included above with train platform structure; PIDS and safety electronics included in Electrical. Allow for undefined furnishings, column covers, soffits, artwork
10	Public Concourse	Interior finishes including walls and wall finishes, framing for large video displays, ceilings, column cover finishes, flooring, artwork based on a current large scale train station project
11	Stormwater Cisterns	Four total at corners along outside wall, designed to gravity drain to city stormwater system. Total 1.63 million gallons into four waterproofed CIP tanks approx 20'h X 30'w X 90' long set at the Concourse level, wiers to limit flow.

Project: **Washington Union Station - Station Expansion Project**
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Conveying

1	Platform to Overbuild Deck Escalator	SS skirt, 120 fpm, 62 VLF. Cost includes fab/install/temporary service/extended warranty, structural pit, mechanical in the pit, electrical power, BMS/FA detectors and interface
2	Overbuild Deck to Bus Terminal Escalator	Glass, 100 fpm, 35 VLF. Cost includes fab/install/temporary service/extended warranty, structural pit, mechanical in the pit, electrical power, BMS/FA detectors and interface
3	Concourse to High Track Platform Escalator	Glass, 100 fpm, 33 VLF. Cost includes fab/install/temporary service/extended warranty, structural pit, mechanical in the pit, electrical power, BMS/FA detectors and interface
4	Concourse to Low Track Platform Escalator	Glass, 100 fpm, 21 VLF. Cost includes fab/install/temporary service/extended warranty, structural pit, mechanical in the pit, electrical power, BMS/FA detectors and interface
5	Concourse to Mid-Upper Level Escalator	Glass, 100 fpm, 21 VLF. Cost includes fab/install/temporary service/extended warranty, structural pit, mechanical in the pit, electrical power, BMS/FA detectors and interface
6	LL Garage to Overbuild Deck Elevator	5-Stop, 350 fpm, 92 VLF Elevator. Based on current cost for transit quality, based on vertical lineal foot (rise), speed and per each: high level transportaton system quality. Addtionally includes elevator shaft wall or masonry wall, elevator pit, MEP services and BMS/FA interface
7	LL Garage to Track High Platform Elevator	4-Stop, 100 fpm, 60 VLF Elevator. Based on current cost for transit quality, based on vertical lineal foot (rise), speed and per each: high level transportaton system quality. Addtionally includes elevator shaft wall or masonry wall, elevator pit, MEP services and BMS/FA interface
8	LL Garage to Low Track Plaform Elevator	4-Stop, 100 fpm, 48 VLF Elevator. Based on current cost for transit quality, based on vertical lineal foot (rise), speed and per each: high level transportaton system quality. Addtionally includes elevator shaft wall or masonry wall, elevator pit, MEP services and BMS/FA interface
9	LL Garage to Concourse 3-Stop Elevator	3-Stop, 100 fpm, 28 VLF Elevator. Based on current cost for transit quality, based on vertical lineal foot (rise), speed and per each: high level transportaton system quality. Addtionally includes elevator shaft wall or masonry wall, elevator pit, MEP services and BMS/FA interface
10	Middle Lvl Garage to Concourse 2-Stop Elevator	2-Stop, 100 fpm, 15 VLF Elevator. Based on current cost for transit quality, based on vertical lineal foot (rise), speed and per each: high level transportaton system quality. Addtionally includes elevator shaft wall or masonry wall, elevator pit, MEP services and BMS/FA interface

11	LL Gar to Street 3-Stop 6 ton freight Elevator	3-Stop 6 ton freight, 50 fpm, 28 VLF Elevator. Based on current cost for transit quality, based on vertical lineal foot (rise), speed and per each: high level transportaton system quality. Addtionally includes elevator shaft wall or masonry wall, elevator pit, MEP services and BMS/FA interface
12	LL Gar to Street 2-Stop 10 ton freight Elevator	2-Stop 10 ton freight, 50 fpm, 28 VLF Elevator. Based on current cost for transit quality, based on vertical lineal foot (rise), speed and per each: high level transportaton system quality. Addtionally includes elevator shaft wall or masonry wall, elevator pit, MEP services and BMS/FA interface
13	LL Gar to Street 2-Stop 20T Compactor Lift	2-Stop 20T compactor lift, 30 fpm, 28 VLF Elevator. Based on current cost for transit quality, based on vertical lineal foot (rise), speed and per each: high level transportaton system quality. Addtionally includes elevator shaft wall or masonry wall, elevator pit, MEP services and BMS/FA interface

Plumbing

1	BOH & Retail White Box	Sewer and water to space perimeter, no fit-out
2	Platforms & Corridors	Escalator/elevator and floor drains, water for passenger services
3	Train Service Utilities	Drains, water, pneumatic air and stations for train services
4	Stormwater Detention	Overbuild plaza drains and piping to cisterns (priced above), total area of the plaza excluding the H-Street bridge. Cost includes heat tracing at the drains and partial pipe insulation.

Project: **Washington Union Station - Station Expansion Project**
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HVAC

1	Ventilation Smoke Evac	Emergency smoke evacuation of train shed estimated as 25 ea 250,000 CFM 250 hp fans, silencers, hangers, testing & balancing
2	Vent Diesel Platforms	Conventional ventilation at 12 ACH of unconditioned spaces in train shed; train shed exterior is open to the East, West and North
3	Ventilation Concourses & Platforms	Outside air ventilation and background radiant heating of semi-conditioned concourses and platforms (not cooled).
4	Ventilation Parking	Conventional ventilation of underground car parking and taxi areas at 0.75 CFM/SF plus CO2 & NO monitoring
5	BOH White Box Service	Hydronic piping to BOH & undeveloped Amtrak spaces including temporary HW fan coil units to prevent freezing
6	HVAC Energy System	Heating & cooling plant: heat and cooling for conditioned spaces. Air handlers, hydronic piping and air distribution included in "HVAC for tempered areas"
7	HVAC in Tempered Areas	Design incomplete in regard to tempered areas, includes Amtrak waiting areas; cost model for heating / cooling / hydronic piping / ductwork / BMS

Fire Protection

1	FP Service	Main fire pumps assembly 2 diesel 2 electric redundant systems
2	FP Fire Standpipe	Standpipe (wet & dry) and hose assembly serves all Gross Square Feet.
3	FP Dry System	Dry system fire for possible freezing areas garage/platform and covered trainways; possible mist heads some areas
4	FP Wet System	Wet system for temperature modified areas, BOH, retail, Amtrak waiting area
5	FP Clean Agent System	Inert gas FP system for electrical switchgear & xfer switch rooms
6	FP Pre-Action AFFF	Aqueous Film-Forming Foam system for emergency genset rooms

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Electrical

1	HV & Main Panels	Service and Power Distribution (Medium & Low Voltage)
2	Emergency Power	Assume 6 ea - 2.5 MVA Medium Voltage Em. Generators - 2.5 MVA x 6 = 15 MVA, tanks, Tier 4F Emmision (per Generator), MV ATS switches
3	Wayside Power	Wayside 480 V panelboards for train use, 16 ea
4	Grounding	Grounding system
5	Tenants	Power to future tenants, Amtrak BOH and Retail areas
6	Smoke Evac Power	Power to 25 ea, 250 hp smoke evacuation fans
7	Temporary Light & Power	Temporary lighting and power during construction phases
8	Security	Security Access Control/Intercom/CCTV
9	Fire Alarm	Main FA panels and balance of service
10	Overcurrent Protection	OP engineering required of electrical contractor, coordination studies
11	Commissioning	Commissioning and testing of electrical system

Concourse / Train Hall

1	Electrical Service	Main service, power distribution and local panels
2	Electrical Low Voltage	Under 5 kV power distribution panels, power feeds to mech systms
3	Electrical Lighting	Lighting and lighting control systems
4	Electrical Fire Alarm	Fire Alarm system
5	Electrical Communications	Communications, emergency call stations, CCTV, security & access control, wireless modems
6	Electrical Video/PIDS	Passenger Information Displays (PIDS), large video displays

Parking Areas / Buses

1	Underground Parking	Striping, signs, parking bumpers, taxi finishes, entrance and control systems
2	Plumbing - Underground Parking	Floor & ramp drains, sump pits, sewage ejectors, service water for garage and taxi areas
3	Electrical - Underground Parking	Electrical for parking and taxi areas, all inclusive
4	Overbuild Deck Parking Garage	Based on comparable: full facility cost per car for bus garage
5	Bus Waiting Area	Based on comparable and scaled larger: full cost per bus + waiting area
6	Parking Garage Demo	Phased demolition of Union Station Parking Garage per cubic foot

Project: **Washington Union Station - Station Expansion Project**
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Other

1	Site Access Support	Clear site, pave access road, erect and operate a lufting tower crane (Favco 760), dismantle crane, demo crane support pad and restore site (fixed costs pro-rated over a 5 year life cycle)
2	General Conditions	Staff including administration, project engineering, schedule and cost controls, field supervision including a second night sift supervisory crew, QA/QC, safety, maintenance and protection of traffic, environmental monitoring, temporary facilities. Staff ranges from 50 to 60. Allowance for rental and operation of 12,000 SF off-site field office.
3	Fit-Out Amtrak BOH	Allowance for Amtrak's Back of House spaces.
4	Temporary Support of H Street Bridge	Temporary support for phased demolition of track-supporting H St. bridge/tunnel is undesigned and not estimated. This would be a component of the phasing costs "below-the-line" in the estimate.
5	Remove and Replace Water Main	Support, remove & replace 12" water main E/W under H Street
6	Remove and Replace Sewer Main	Remove and replace 42" sewer main between H Street & Union Sta

Transportation

1	Track Installation	New track, ties drilled into track slab
2	Catenary Installation	Catenary (system replaced)
3	Signals and Communication System	Signals and Communication System
4	Control Tower	New control tower
5	Pepco Feeder	Pepco feeder relocation and Substation 25A

Project: Washington Union Station - Station Expansion Project
Alternate A-Support of Excavation Option #2
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Alternate A-Support of Excavation Option #2 Estimated Cost - Open Excavation

		Phase 1	Phase 2	Phase 3	Phase 4	Total
Substructure		$ 136,233,806	$ 216,305,924	$ 123,585,481	$ 310,099,153	**$ 786,224,364**
Superstructure		$ 151,379,519	$ 185,634,027	$ 145,692,728	$ 383,258,243	**$ 865,964,517**
Interiors		$ 40,830,713	$ 58,579,959	$ 35,394,105	$ 83,946,212	**$ 218,750,989**
Conveying		$ 13,143,227	$ 13,910,018	$ 11,678,967	$ 15,450,768	**$ 54,182,980**
Plumbing		$ 1,974,441	$ 2,424,908	$ 1,950,951	$ 4,159,132	**$ 10,509,431**
HVAC		$ 6,768,186	$ 9,558,816	$ 15,101,092	$ 12,296,827	**$ 43,724,921**
Fire Protection		$ 5,002,860	$ 8,136,348	$ 9,999,524	$ 12,576,892	**$ 35,715,625**
Electrical		$ 9,138,572	$ 14,279,019	$ 10,852,054	$ 22,846,430	**$ 57,116,076**
Concourse / Train Hall		$ 22,886,153	$ 34,704,661	$ 24,258,849	$ 51,159,756	**$ 133,009,419**
Parking / Bus		$ -	$ -	$ 53,398,591	$ 73,412,701	**$ 126,811,293**
Other		$ 95,397,434	$ 98,576,830	$ 89,604,336	$ 126,406,739	**$ 409,985,339**
Transportation		$ 14,268,000	$ 12,727,000	$ 9,409,080	$ 26,917,160	**$ 63,321,240**
Total Direct Cost		**$ 497,022,911**	**$ 654,837,511**	**$ 530,925,758**	**$ 1,122,530,014**	**$ 2,805,316,193**
Existing Facility Impact	5%	$ 24,851,146	$ 32,741,876	$ 26,546,288	$ 56,126,501	$ 140,265,810
Sub-Total		$ 521,874,057	$ 687,579,386	$ 557,472,046	$ 1,178,656,515	$ 2,945,582,003
Contingency	30%	$ 156,562,217	$ 206,273,816	$ 167,241,614	$ 353,596,954	$ 883,674,601
Sub-Total		$ 678,436,274	$ 893,853,202	$ 724,713,659	$ 1,532,253,469	$ 3,829,256,604
Contractor Overhead	10%	$ 67,843,627	$ 89,385,320	$ 72,471,366	$ 153,225,347	$ 382,925,660
Sub-Total		$ 746,279,901	$ 983,238,523	$ 797,185,025	$ 1,685,478,816	$ 4,212,182,264
Contractor Profit	5%	$ 37,313,995	$ 49,161,926	$ 39,859,251	$ 84,273,941	$ 210,609,113
Sub-Total		$ 783,593,896	$ 1,032,400,449	$ 837,044,277	$ 1,769,752,757	$ 4,422,791,378
Bonds & Insurances	2%	$ 15,671,878	$ 20,648,009	$ 16,740,886	$ 35,395,055	$ 88,455,828
Sub-Total		$ 799,265,774	$ 1,053,048,458	$ 853,785,162	$ 1,805,147,812	$ 4,511,247,205
Escalation - Phase 1	28.1%	$ 224,937,683				$ 224,937,683
Escalation - Phase 2	39.3%		$ 413,340,640			$ 413,340,640
Escalation - Phase 3	51.5%			$ 440,046,663		$ 440,046,663
Escalation - Phase 4	66.8%				$ 1,206,127,561	$ 1,206,127,561
Total Probable Bid Sum		**$ 1,024,203,457**	**$ 1,466,389,098**	**$ 1,293,831,825**	**$ 3,011,275,373**	**$ 6,795,699,753**

Note:
1. Escalation 3.5% Per Year
2. Assume Construction Starts in 6 Years
3. Construction Durations
   - A. Phase 1 2.42 Years
   - B. Phase 2 2.42 Years
   - C. Phase 3 2.50 Years
   - D. Phase 4 3.08 Years
4. Mid-Point of Construction
   - A. Phase 1 7.21 Years
   - B. Phase 2 9.63 Years
   - C. Phase 3 12.08 Years
   - D. Phase 4 14.88 Years

Project: Washington Union Station - Station Expansion Project
Alternate A-C-Support of Excavation Option #2
Location: Washington, DC
Rough Order of Magnitude

Alternate A-C-Support of Excavation Option #2 Estimated Cost - Open Excavation

		Phase 1	Phase 2	Phase 3	Phase 4	Total
Substructure		$ 136,233,806	$ 216,305,924	$ 123,585,481	$ 310,099,153	**$ 786,224,364**
Superstructure		$ 150,758,087	$ 186,365,079	$ 137,872,160	$ 383,005,235	**$ 858,000,561**
Interiors		$ 40,830,713	$ 58,579,959	$ 35,394,105	$ 83,946,212	**$ 218,750,989**
Conveying		$ 13,143,227	$ 13,910,018	$ 11,678,967	$ 15,450,768	**$ 54,182,980**
Plumbing		$ 1,974,441	$ 2,424,908	$ 1,950,951	$ 4,159,132	**$ 10,509,431**
HVAC		$ 6,768,186	$ 9,558,816	$ 15,101,092	$ 12,296,827	**$ 43,724,921**
Fire Protection		$ 5,002,860	$ 8,136,348	$ 9,999,524	$ 12,576,892	**$ 35,715,625**
Electrical		$ 9,138,572	$ 14,279,019	$ 10,852,054	$ 22,846,430	**$ 57,116,076**
Concourse / Train Hall		$ 22,886,153	$ 34,704,661	$ 24,258,849	$ 51,159,756	**$ 133,009,419**
Parking / Bus		$ -	$ -	$ 54,033,291	$ 75,663,001	**$ 129,696,293**
Other		$ 95,397,434	$ 98,576,830	$ 89,604,336	$ 126,406,739	**$ 409,985,339**
Transportation		$ 14,268,000	$ 12,727,000	$ 9,409,080	$ 26,917,160	**$ 63,321,240**
Total Direct Cost		**$ 496,401,479**	**$ 655,568,563**	**$ 523,739,890**	**$ 1,124,527,306**	**$ 2,800,237,237**
Existing Facility Impact	5%	$ 24,820,074	$ 32,778,428	$ 26,186,994	$ 56,226,365	$ 140,011,862
Sub-Total		$ 521,221,553	$ 688,346,991	$ 549,926,884	$ 1,180,753,671	$ 2,940,249,099
Contingency	30%	$ 156,366,466	$ 206,504,097	$ 164,978,065	$ 354,226,101	$ 882,074,730
Sub-Total		$ 677,588,019	$ 894,851,088	$ 714,904,950	$ 1,534,979,772	$ 3,822,323,829
Contractor Overhead	10%	$ 67,758,802	$ 89,485,109	$ 71,490,495	$ 153,497,977	$ 382,232,383
Sub-Total		$ 745,346,821	$ 984,336,197	$ 786,395,444	$ 1,688,477,750	$ 4,204,556,212
Contractor Profit	5%	$ 37,267,341	$ 49,216,810	$ 39,319,772	$ 84,423,887	$ 210,227,811
Sub-Total		$ 782,614,162	$ 1,033,553,007	$ 825,715,217	$ 1,772,901,637	$ 4,414,784,023
Bonds & Insurances	2%	$ 15,652,283	$ 20,671,060	$ 16,514,304	$ 35,458,033	$ 88,295,680
Sub-Total		$ 798,266,445	$ 1,054,224,067	$ 842,229,521	$ 1,808,359,670	$ 4,503,079,703
Escalation - Phase 1	28.1%	$ 224,656,442				$ 224,656,442
Escalation - Phase 2	39.3%		$ 413,802,088			$ 413,802,088
Escalation - Phase 3	51.5%			$ 434,090,807		$ 434,090,807
Escalation - Phase 4	66.8%				$ 1,208,273,597	$ 1,208,273,597
Total Probable Bid Sum		**$ 1,022,922,887**	**$ 1,468,026,155**	**$ 1,276,320,329**	**$ 3,016,633,266**	**$ 6,783,902,637**

Note:
1. Escalation 3.5% Per Year
2. Assume Construction Starts in 6 Years
3. Construction Durations
   - A. Phase 1 2.42 Years
   - B. Phase 2 2.42 Years
   - C. Phase 3 2.50 Years
   - D. Phase 4 3.08 Years
4. Mid-Point of Construction
   - A. Phase 1 7.21 Years
   - B. Phase 2 9.63 Years
   - C. Phase 3 12.08 Years
   - D. Phase 4 14.88 Years

Estimate:	**Rough Order of Magnitude**
Design Documents Dated:	**Washington Union Station Expansion Project** **Concept Screening Report** **July 31, 2017**
Estimate Dated:	**December 17, 2018**
Project:	**Washington Union Station - Station Expansion Project** **Alternate B-Support of Excavation Option #1** **Washington, DC**
Client:	**AMTRAK**

Project: **Washington Union Station - Station Expansion Project**
Alternate B-Support of Excavation Option #1
Location: **Washington, DC**
Client: **AMTRAK**
Date: **12/17/2018**
Rough Order of Magnitude

Basis of Estimate and Estimating Assumptions:

1 The purpose of this document is to establish a rough order of magnitude estimate for the Washington Union Station - Station Expansion Project.

2 Estimate is based on Beyer Blinder Belle|Grimshaw design and design/engineering basis of 2016 and recent clarifications.

3 Estimate prices are based on April 2017 prevailing wage labor rates, material market prices, and equipment and materials thru 2017 applicable for work in Washington, DC, including generally practiced project indirects (general conditions), bonds and OH&P for a project of this scale for an "all-in" cost. Estimate includes phasing, 30% design contingency and time-value-of-money escalation.

4 Estimate includes a $150,000,000 allowance for AMTRAK fit-out of Back of House areas.

5 Existing facilities impact is calculated as 5% of the Total Direct Cost.

6 All work is assumed to be performed during 20 hour days (two shifts of 10 hours), 6 days a week. Premium or Over Time Hours are included.

7 Subcontractor's Overhead and Profit is included at 21% in the Direct Cost for each trade.

8 Cost of the project is estimated in "Today's" Dollars and only includes escalation.

9 Sales tax is not included.

10 Costs for hazardous material abatement or disposal are not included.

11 Premium cost of LEED certification is not included.

12 The estimate does not include any "soft cost" items, such as designer's or consultant's fees, reviews and reports, furniture, fixtures, equipment provided by the Owner, moving or any other Owner's expenses costs, etc.

13 Statement of Probable Cost

AECOM Estimating has no control over the cost of labor and materials, the general contractors' or any subcontractors' method of determining prices, or competitive bidding and market conditions. AECOM Estimating's opinion of the probable cost of construction is made on the basis of experience, qualifications, and best judgment of a professional consultant familiar with the construction industry. AECOM Estimating cannot and does not guarantee that proposals, bids or actual construction costs will not vary from this or subsequent estimates. AECOM Estimating has no control over the quality, completeness, intricacy, constructability or coordination of design documents. AECOM Estimating also has no control over the amount of funds available for the project. AECOM Estimating will not be responsible for any design revision costs incurred by the project in the event the estimate or bids are in excess of the budget.

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Hard Cost Exclusions	**Excluded from current design and current cost estimate (possibly included within 30% design contingency per subsequent decisions)**
Legacy Union Station	Estimate does not include cost related to the historic Union Station or its infrastructure
Burnham Place Upgrades	Utility upgrades (combined or stand-alone): steam, chilled water, centralized plant, sewer, water, gas, fire protection loops, power, tel-com service , stormwater retention, green roof, plaza structural upgrades, plaza finishes, plaza emergency access ramps & roadways (fire truck/ambulance), bollards, plaza lighting. Cost-sharing on structure & systems may be future decisions.
Work Calendar	Work calendar is estimated as 20 hour days (2 shifts x 10 Hrs) 6 day week. Work calendar may be limited due to public interest constraints about length of workday and noise.
Other Design Reviews	Excluded: the BuroHappold|Hensel Phelps Concept Feasibility Review of 2015 options and features not included in the BBB|Grimshaw design such as MEP in support of Burnham Place, Legacy Union Station, smoke evacuation zone separation walls and other features. The estimate design contingency is intended for follow-on design decisions.
Environmental Hazards	Estimate INCLUDES disposal fees for contaminated NON-hazardous; it excludes higher classifications in soils, ties, ballast or electrical insulation
Seismic Considerations	No special considerations for additional costs due to seismic constraints
Public Streets/Intersections	Reconstruction of public roads and traffic control beyond repairs for utility connections
Public Utilities	Upgrades to public gas/electrical/water/sewer systems beyond utility connections
Back of House for Amtrak	Up to $150 million allowance.
Retail Areas	No fit-out; "core & shell" utilities terminates at lease line walls. Kitchen exhaust undefined and not included.
Revenue Devices	Revenue machines and related controls
Police & Holding Cells	Break rooms, response ready rooms, holding cells, special MEP-telcom services
Bridges & Tunnels	K Street bridge and reconstruction of H Street tunnel
Security Features	Access control X-Ray devices, blast control construction of walls and floors (such as above standard embedded plates/rebars)
Greenway/WAMATA	Upgrades to WAMATA Greenway and access to new Union Station
Parking	Cost model for parking spaces and parking garage excludes upgrades for rental car fit-out, electric vehicle charging stations

Soft Cost Exclusions	**Excluded from Cost Estimate**
Design	Cost of completion of design processes. No Design-Build costs are included.
Owner Soft Costs	Program mgmt, CM or GC-oversight, Owner QA/QC costs, preconstruction testing, OCIP (if any), incentives, commissioning, legal, accounting and funding fees
Other Owner Indirects	Amtrak Force-Account work, temporary relocations and facilities, temporary parking, final moving costs

Project: **Washington Union Station - Station Expansion Project**
Alternate B-Support of Excavation Option #1
Location: **Washington, DC**
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Substructure

1	Track Removals	Remove track, traction power and signals included above in train systems estimate
2	Platform & Canopy Removals	Remove platform and substructure, canopies and columns based on LF of existing platforms
3	Slurry Wall-210'Deep & 62'Exposed Face	From El [51] existing grade to El [-158] rock socketed, covers the full outside perimeter of the jobsite, including tie-backs, permanent
4	Slurry Wall-210'Deep & 49'Exposed Face	measuring 210' deep slurry wall by LF 49' exposed face
5	Slurry Wall-100'Deep & 62'Exposed Face	measuring 100' deep slurry wall by LF 64' exposed face
6	Slurry Wall-100'Deep & 49'Exposed Face	measuring 100' deep slurry wall by LF 49' exposed face
7	Secant Pile Walls-64'Deep & 32'Exposed Face	Drilled secant piles walls cost projected on the basis of LF of secant wall averaging 64' deep
8	Sheet Pile Walls-100'Deep & 62'Exposed Face	From El [51] to El [-49] for temporary phasing support of adjacent tracks and ground water control, including tie-backs and subsequent removals
9	Sheet Pile Walls-100'Deep & 49'Exposed Face	same as above 100' piles with 49' exposed face (fewer tiebacks)
10	Sheet Pile Walls-80'Deep & 49'Exposed Face	80' piles with 49' exposed face (fewer tiebacks)
11	Sheet Pile Walls-64'Deep & 32'Exposed Face	64' piles with 32' exposed face (fewer tiebacks)
12	Dewatering Wells/EA	From El "0" dewatering wells are drilled during each east to west phase; estimate at 100ft OC on perimeter of phased cutoff walls. Install dewatering wells 24" dia, gravel, perf pipe and pump, 100' deep
13	Dewatering O&M/Pump/Mo	Per month per well O&M dewatering wells, maintain pumps, modify discharge lines
14	Drilled Shafts - 5ft Dia	Drilled shaft modeled to Elevation [-140] deep, calculated to LF cost. With Potomac Basal Gravel at approximately [-140], these shafts are estimated as unencased (slurry type) shafts.
15	Drilled Shafts - 6ft Dia	Drilled shaft modeled to Elevation [-140] deep, calculated to LF cost
16	Drilled Shafts - 9ft Dia	Drilled shaft modeled to Elevation [-140] deep, calculated to LF cost
17	Drilled Shafts - 10ft Dia	Drilled shaft modeled to Elevation [-140] deep, calculated to LF cost

Project: **Washington Union Station - Station Expansion Project**
Alternate B-Support of Excavation Option #1
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18	Drilled Shafts - 12ft Dia	Drilled shaft modeled to Elevation [-192] deep including a rock socket and fully steel encased to metamorphic rock due to soil conditions at that depth, calculated to a LF cost. Metamorphic rock at approx El [-158 to -160] means the rock socket will be approximately 35 feet deep.
19	Pile Test Program	One (1) 9' dia. 140' depth test pile, located offsite prior to bid to provide contractor information. Extra costs will be offset by less risk for bidders. Ten (10) Production piles with Osterberg tests. Broken down into (4) 5' Dia., (4) 9' Dia., (2) 12' Dia. to corresponding depths and split evenly across the phases.
20	Mass Excav Open Cut	Open cut from El [51] to approx [-10] subgrade. Two alternatives: remove spoils by truck or by train. Trucks loaded by clamshell; gondolas loaded by conveyors . No direct truck loading from deeper levels, extra handling required.
21	Export via Train + Truck	Gondolas loaded by conveyors and railcar loader after excavation spoils are located to one end due to limited site access using clamshell. Cost includes tipping fees for contaminated non-hazardous soil characterization
22	Slab on Grade 4-1/2ft	Mud slab, reinforced conc slab 4.5' thick. Site access limitations increases cost due to pumping concrete from the street side redi-mix trucks into the pit, then horizontally, then redistributed to the pour by a concrete conveyor (or additional pump truck at lower level)
23	SOG 3-1/2 ft	Similar but 3.5' thick
24	SOG 2-1/2 ft	Similar but 2.5' thick
25	Mud Slab only	For temporary (or buried) work surface
26	Track Support Columns	Reinforced concrete columns from drilled shaft to bottom of hammerhead, 8ft wide x 3ft thick x various lengths depending upon design. Rebar ties in to embedded rebar in the drilled shafts
27	Super Columns	Overbuild deck support steel columns bearing on drilled shaft foundations at about El [-10] to [55], including anchor bolts and base plate. Steel at 503 lbs/LF, concrete encased into a 28" square column
28	Below Grade Liner Wall for Slurry/Secant Wall	Single face 12" thick wall abutting the slurry wall as a finished liner wall, including waterproofing membrane, and painted finish one side
29	Below Grade Liner Wall for Sheet Pile Wall	8" thick liner wall & flute infill abutting the 12" thick interior wall, including waterproofing membrane, and painted finish one side
30	Structural Slabs	12" reinforced structural slabs at interim levels; for simplicity, no structural concrete beams are included (possible design development)

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Superstructure

1	Hammerheads	Estimated at 34' wide 5' deep to 7.5' deep x 3' thick, heavily reinforced; for the few smaller hammerheads, cost adjustments will be made
2	Super Columns	Continue higher from El [55] to support the trusses under the overbuild deck, concrete encased
3	Track Support	Track invert slab at 28' wide x 3' thick, supported by six precast bulb tee beams longitudinally between hammerheads. Also includes a drainage gutter.
4	Platform Support	Platform slab 30' wide 2' deep with tactile warning strip each side and a slab finish (terazzo priced), supported by 2' thick support walls 10' high running between the hammerheads. Also, a wall approx 18' high between adjacent hammerheads at approx 32' OC.
5	Type A Steel Trusses	3,000 LBS/LF + 20% for Connections (Supporting Buildings and Cars). Trusses support the overhead deck. Truss weights/LF vary between. Model cost is based on tonnage furnished and erected
6	Type B Steel Trusses	2,700 LBS/LF + 20% for Connections (Supporting Buildings). Trusses support the overhead deck. Truss weights/LF vary between. Model cost is based on tonnage furnished and erected
7	Type C Steel Trusses	900 LBS/LF + 20% for Connections (Supporting Plaza Only). Trusses support the overhead deck. Truss weights/LF vary between. Model cost is based on tonnage furnished and erected
8	Overbuild Deck	Cost model includes a 6" composite (shear studs and reinforcing) on metal deck, supported on bar joists between the trusses (due to height and complexity below), fireproofed; 10 bar joists per 30x30 grid. Same problem with concrete (limited site access, double handling or pumping). Slab may be too thin.
9	Overbuild Deck Alt 1	12" reinforced structural slab; for simplicity, no structural concrete beams are included (relying on trusses). Formwork difficult due height and irregular slab elevations below. Slab may still be too thin for firetruck/ambulance lanes or possible bus lanes on plaza.
10	Overbuild Deck Alt 2	2-1/2 ft thick Structural Concrete slab stiffened to protect from overbuild progressive collapse. Formwork difficult due to weight of wet concrete and irregular slab elevations below.
11	Smaller Column	Cost model based on W18x114 concrete encased for misc small
12	Abv Grade Exterior Wall	Exterior wall (finished both sides) comprised 40% of precast architectural granite faced panels 40% glass and frame and 20% architectural precast brick faced panels, with 60% of the inside face painted
13	Abv Grade Ext Wall Alt	Exterior wall spider-pin cable truss-braced structurally glazed curtain wall

14	Interior CIP Walls	Double face finish on interior CIP walls 12" thick
15	Central Concourse	Overhead structure and roof including columns long span trusses and joist girders to frame roof, metal deck, fireproofing, 30% insulated skylights, EPDM membrane roofing, smoke vents, fascia with drains
16	Skylights	Skylight structures through Overbuild Deck; size varies on plans and sections. Estimating custom skylights at 2,400 SF each
17	Entrances & Canopies	Cantilevered or cable stayed canopies; revolving doors

Interiors

1	Platform to Overbuild Deck Stairs	62 VLF. Metal pan stairs, railings per flight
2	Platform to Overbuild Deck Stairs	33 VLF. Metal pan stairs, railings per flight
3	Concourse to Higher Platform Stairs	23 VLF. Metal pan stairs, railings per flight
4	Concourse to Lower Platform Stairs	21 VLF. Metal pan stairs, railings per flight
5	H St Conc to Lower Level Stairs	16 VLF. Metal pan stairs, railings per flight
6	Mid Level Parking to Concourse Stairs	15 VLF. Metal pan stairs, railings per flight
7	Street to H St Concourse Stairs	12 VLF. Metal pan stairs, railings per flight
8	Lower to Mid Level Parking Stairs	12 VLF. Metal pan stairs, railings per flight
9	Train Platforms	Terrazzo and Tactile Warning Strip included above with train platform structure; PIDS and safety electronics included in Electrical. Allow for undefined furnishings, column covers, soffits, artwork
10	Public Concourse	Interior finishes including walls and wall finishes, framing for large video displays, ceilings, column cover finishes, flooring, artwork based on a current large scale train station project
11	Stormwater Cisterns	Four total at corners along outside wall, designed to gravity drain to city stormwater system. Total 1.63 million gallons into four waterproofed CIP tanks approx 20'h X 30'w X 90' long set at the Concourse level, wiers to limit flow.

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Conveying

1	Platform to Overbuild Deck Escalator	SS skirt, 120 fpm, 62 VLF. Cost includes fab/install/temporary service/extended warranty, structural pit, mechanical in the pit, electrical power, BMS/FA detectors and interface
2	Overbuild Deck to Bus Terminal Escalator	Glass, 100 fpm, 35 VLF. Cost includes fab/install/temporary service/extended warranty, structural pit, mechanical in the pit, electrical power, BMS/FA detectors and interface
3	Concourse to High Track Platform Escalator	Glass, 100 fpm, 33 VLF. Cost includes fab/install/temporary service/extended warranty, structural pit, mechanical in the pit, electrical power, BMS/FA detectors and interface
4	Concourse to Low Track Platform Escalator	Glass, 100 fpm, 21 VLF. Cost includes fab/install/temporary service/extended warranty, structural pit, mechanical in the pit, electrical power, BMS/FA detectors and interface
5	Concourse to Mid-Upper Level Escalator	Glass, 100 fpm, 21 VLF. Cost includes fab/install/temporary service/extended warranty, structural pit, mechanical in the pit, electrical power, BMS/FA detectors and interface
6	LL Garage to Overbuild Deck Elevator	5-Stop, 350 fpm, 92 VLF Elevator. Based on current cost for transit quality, based on vertical lineal foot (rise), speed and per each: high level transportaton system quality. Addtionally includes elevator shaft wall or masonry wall, elevator pit, MEP services and BMS/FA interface
7	LL Garage to Track High Platform Elevator	4-Stop, 100 fpm, 60 VLF Elevator. Based on current cost for transit quality, based on vertical lineal foot (rise), speed and per each: high level transportaton system quality. Addtionally includes elevator shaft wall or masonry wall, elevator pit, MEP services and BMS/FA interface
8	LL Garage to Low Track Plaform Elevator	4-Stop, 100 fpm, 48 VLF Elevator. Based on current cost for transit quality, based on vertical lineal foot (rise), speed and per each: high level transportaton system quality. Addtionally includes elevator shaft wall or masonry wall, elevator pit, MEP services and BMS/FA interface
9	LL Garage to Concourse 3-Stop Elevator	3-Stop, 100 fpm, 28 VLF Elevator. Based on current cost for transit quality, based on vertical lineal foot (rise), speed and per each: high level transportaton system quality. Addtionally includes elevator shaft wall or masonry wall, elevator pit, MEP services and BMS/FA interface
10	Middle Lvl Garage to Concourse 2-Stop Elevator	2-Stop, 100 fpm, 15 VLF Elevator. Based on current cost for transit quality, based on vertical lineal foot (rise), speed and per each: high level transportaton system quality. Addtionally includes elevator shaft wall or masonry wall, elevator pit, MEP services and BMS/FA interface

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11	LL Gar to Street 3-Stop 6 ton freight Elevator	3-Stop 6 ton freight, 50 fpm, 28 VLF Elevator. Based on current cost for transit quality, based on vertical lineal foot (rise), speed and per each: high level transportaton system quality. Addtionally includes elevator shaft wall or masonry wall, elevator pit, MEP services and BMS/FA interface
12	LL Gar to Street 2-Stop 10 ton freight Elevator	2-Stop 10 ton freight, 50 fpm, 28 VLF Elevator. Based on current cost for transit quality, based on vertical lineal foot (rise), speed and per each: high level transportaton system quality. Addtionally includes elevator shaft wall or masonry wall, elevator pit, MEP services and BMS/FA interface
13	LL Gar to Street 2-Stop 20T Compactor Lift	2-Stop 20T compactor lift, 30 fpm, 28 VLF Elevator. Based on current cost for transit quality, based on vertical lineal foot (rise), speed and per each: high level transportaton system quality. Addtionally includes elevator shaft wall or masonry wall, elevator pit, MEP services and BMS/FA interface

Plumbing

1	BOH & Retail White Box	Sewer and water to space perimeter, no fit-out
2	Platforms & Corridors	Escalator/elevator and floor drains, water for passenger services
3	Train Service Utilities	Drains, water, pneumatic air and stations for train services
4	Stormwater Detention	Overbuild plaza drains and piping to cisterns (priced above), total area of the plaza excluding the H-Street bridge. Cost includes heat tracing at the drains and partial pipe insulation.

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HVAC

1	Ventilation Smoke Evac	Emergency smoke evacuation of train shed estimated as 25 ea 250,000 CFM 250 hp fans, silencers, hangers, testing & balancing
2	Vent Diesel Platforms	Conventional ventilation at 12 ACH of unconditioned spaces in train shed; train shed exterior is open to the East, West and North
3	Ventilation Concourses & Platforms	Outside air ventilation and background radiant heating of semi-conditioned concourses and platforms (not cooled).
4	Ventilation Parking	Conventional ventilation of underground car parking and taxi areas at 0.75 CFM/SF plus CO2 & NO monitoring
5	BOH White Box Service	Hydronic piping to BOH & undeveloped Amtrak spaces including temporary HW fan coil units to prevent freezing
6	HVAC Energy System	Heating & cooling plant: heat and cooling for conditioned spaces. Air handlers, hydronic piping and air distribution included in "HVAC for tempered areas"
7	HVAC in Tempered Areas	Design incomplete in regard to tempered areas, includes Amtrak waiting areas; cost model for heating / cooling / hydronic piping / ductwork / BMS

Fire Protection

1	FP Service	Main fire pumps assembly 2 diesel 2 electric redundant systems
2	FP Fire Standpipe	Standpipe (wet & dry) and hose assembly serves all Gross Square Feet.
3	FP Dry System	Dry system fire for possible freezing areas garage/platform and covered trainways; possible mist heads some areas
4	FP Wet System	Wet system for temperature modified areas, BOH, retail, Amtrak waiting area
5	FP Clean Agent System	Inert gas FP system for electrical switchgear & xfer switch rooms
6	FP Pre-Action AFFF	Aqueous Film-Forming Foam system for emergency genset rooms

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Electrical

1	HV & Main Panels	Service and Power Distribution (Medium & Low Voltage)
2	Emergency Power	Assume 6 ea - 2.5 MVA Medium Voltage Em. Generators - 2.5 MVA x 6 = 15 MVA, tanks, Tier 4F Emmision (per Generator), MV ATS switches
3	Wayside Power	Wayside 480 V panelboards for train use, 16 ea
4	Grounding	Grounding system
5	Tenants	Power to future tenants, Amtrak BOH and Retail areas
6	Smoke Evac Power	Power to 25 ea, 250 hp smoke evacuation fans
7	Temporary Light & Power	Temporary lighting and power during construction phases
8	Security	Security Access Control/Intercom/CCTV
9	Fire Alarm	Main FA panels and balance of service
10	Overcurrent Protection	OP engineering required of electrical contractor, coordination studies
11	Commissioning	Commissioning and testing of electrical system

Concourse / Train Hall

1	Electrical Service	Main service, power distribution and local panels
2	Electrical Low Voltage	Under 5 kV power distribution panels, power feeds to mech systms
3	Electrical Lighting	Lighting and lighting control systems
4	Electrical Fire Alarm	Fire Alarm system
5	Electrical Communications	Communications, emergency call stations, CCTV, security & access control, wireless modems
6	Electrical Video/PIDS	Passenger Information Displays (PIDS), large video displays

Parking Areas / Buses

1	Underground Parking	Striping, signs, parking bumpers, taxi finishes, entrance and control systems
2	Plumbing - Underground Parking	Floor & ramp drains, sump pits, sewage ejectors, service water for garage and taxi areas
3	Electrical - Underground Parking	Electrical for parking and taxi areas, all incusive
4	Overbuild Deck Parking	Based on comparables: full facility cost per car for bus garage
5	Bus Waiting Area	Based on comparables and scaled larger: full cost per bus + waiting area
6	Parking Garage Demo	Phased demolition of Union Staton Parking Garage per cubic foot

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Other

1	Site Access Support	Clear site, pave access road, erect and operate a lufting tower crane (Favco 760), dismantle crane, demo crane support pad and restore site (fixed costs pro-rated over a 5 year life cycle)
2	General Conditions	Staff including administration, project engineering, schedule and cost controls, field supervision including a second night sift supervisory crew, QA/QC, safety, maintenance and protection of traffic, environmental monitoring, temporary facilities. Staff ranges from 50 to 60. Allowance for rental and operation of 12,000 SF off-site field office.
3	Fit-Out Amtrak BOH	Allowance for Amtrak's Back of House spaces.
4	Temporary Support of H Street Bridge	Temporary support for phased demoliton of track-supporting H St. bridge/tunnel is undesigned and not estimated. This would be a component of the phasing costs "below-the-line" in the estimate.
5	Remove and Replace Water Main	Support, remove & replace 12" water main E/W under H Street
6	Remove and Replace Sewer Main	Remove and replace 42" sewer main between H Street & Union Sta

Transportation

1	Track Installation	New track, ties drilled into track slab
2	Catenary Installation	Catenary (system replaced)
3	Signals and Communication System	Signals and Communication System
4	Control Tower	New control tower
5	Pepco Feeder	Pepco feeder relocation and Substation 25A

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Alternate B-Support of Excavation Option #1 Estimated Cost - Open Excavation

		Phase 1	Phase 2	Phase 3	Phase 4	Total
Substructure		$ 142,381,934	$ 309,033,226	$ 194,481,335	$ 521,768,905	**$ 1,167,665,401**
Superstructure		$ 151,379,474	$ 185,857,355	$ 147,354,360	$ 384,435,699	**$ 869,026,888**
Interiors		$ 40,735,893	$ 58,499,149	$ 35,492,568	$ 84,096,979	**$ 218,824,589**
Conveying		$ 6,693,154	$ 13,910,018	$ 30,931,046	$ 43,243,728	**$ 94,777,947**
Plumbing		$ 1,974,441	$ 2,424,908	$ 1,955,199	$ 4,295,434	**$ 10,649,982**
HVAC		$ 6,768,186	$ 9,558,816	$ 15,331,562	$ 13,133,891	**$ 44,792,454**
Fire Protection		$ 5,002,860	$ 8,136,348	$ 12,613,369	$ 21,097,280	**$ 46,849,858**
Electrical		$ 5,140,447	$ 8,567,411	$ 11,994,376	$ 31,413,842	**$ 57,116,076**
Concourse / Train Hall		$ 22,886,153	$ 34,704,661	$ 24,258,849	$ 51,159,756	**$ 133,009,419**
Parking / Bus		$ -	$ -	$ 14,945,597	$ 48,873,518	**$ 63,819,115**
Other		$ 95,397,434	$ 107,417,893	$ 97,182,390	$ 154,192,937	**$ 454,190,654**
Transportation		$ 14,268,000	$ 12,727,000	$ 9,409,080	$ 26,917,160	**$ 63,321,240**
Add Alternate: Top Down		$ -	$ -	$ -	$ -	**$ -**
Top Down General Conditions		$ -	$ -	$ -	$ -	**$ -**
Total Direct Cost		**$ 492,627,976**	**$ 750,836,786**	**$ 595,949,731**	**$ 1,384,629,130**	**$ 3,224,043,623**
Existing Facility Impact	5%	$ 24,631,399	$ 37,541,839	$ 29,797,487	$ 69,231,457	$ 161,202,181
Sub-Total		$ 517,259,375	$ 788,378,626	$ 625,747,217	$ 1,453,860,587	$ 3,385,245,805
Contingency	30%	$ 155,177,813	$ 236,513,588	$ 187,724,165	$ 436,158,176	$ 1,015,573,741
Sub-Total		$ 672,437,188	$ 1,024,892,213	$ 813,471,383	$ 1,890,018,762	$ 4,400,819,546
Contractor Overhead	10%	$ 67,243,719	$ 102,489,221	$ 81,347,138	$ 189,001,876	$ 440,081,955
Sub-Total		$ 739,680,906	$ 1,127,381,435	$ 894,818,521	$ 2,079,020,639	$ 4,840,901,501
Contractor Profit	5%	$ 36,984,045	$ 56,369,072	$ 44,740,926	$ 103,951,032	$ 242,045,075
Sub-Total		$ 776,664,952	$ 1,183,750,506	$ 939,559,447	$ 2,182,971,671	$ 5,082,946,576
Bonds & Insurances	2%	$ 15,533,299	$ 23,675,010	$ 18,791,189	$ 43,659,433	$ 101,658,932
Sub-Total		$ 792,198,251	$ 1,207,425,516	$ 958,350,636	$ 2,226,631,104	$ 5,184,605,507
Escalation - Phase 1	28.1%	$ 222,948,667				$ 222,948,667
Escalation - Phase 2	40.7%		$ 490,891,724			$ 490,891,724
Escalation - Phase 3	55.9%			$ 536,177,011		$ 536,177,011
Escalation - Phase 4	78.7%				$ 1,752,302,336	$ 1,752,302,336
Total Probable Bid Sum		**$ 1,015,146,918**	**$ 1,698,317,240**	**$ 1,494,527,647**	**$ 3,978,933,440**	**$ 8,186,925,245**

Note: 1. Escalation 3.5% Per Year
2. Assume Construction Starts in 6 Years
3. Construction Durations
A. Phase 1 2.42 Years
B. Phase 2 3.00 Years
C. Phase 3 3.00 Years
D. Phase 4 4.92 Years
4. Mid-Point of Construction
A. Phase 1 7.21 Years
B. Phase 2 9.92 Years
C. Phase 3 12.92 Years
D. Phase 4 16.88 Years

Estimate:	**Rough Order of Magnitude**
Design Documents Dated:	**Washington Union Station Expansion Project** **Concept Screening Report** **July 31, 2017**
Estimate Dated:	**December 17, 2018**
Project:	**Washington Union Station - Station Expansion Project** **Alternate C-Support of Excavation Option #5** **Washington, DC**
Client:	**AMTRAK**

Project: **Washington Union Station - Station Expansion Project**
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Location: **Washington, DC**
Client: **AMTRAK**
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Basis of Estimate and Estimating Assumptions:

1 The purpose of this document is to establish a rough order of magnitude estimate for the Washington Union Station - Station Expansion Project.

2 Estimate is based on Beyer Blinder Belle|Grimshaw design and design/engineering basis of 2016 and recent clarifications.

3 Estimate prices are based on April 2017 prevailing wage labor rates, material market prices, and equipment and materials thru 2017 applicable for work in Washington, DC, including generally practiced project indirects (general conditions), bonds and OH&P for a project of this scale for an "all-in" cost. Estimate includes phasing, 30% design contingency and time-value-of-money escalation.

4 Estimate includes a $150,000,000 allowance for AMTRAK fit-out of Back of House areas.

5 Existing facilities impact is calculated as 5% of the Total Direct Cost.

6 All work is assumed to be performed during 20 hour days (two shifts of 10 hours), 6 days a week. Premium or Over Time Hours are included.

7 Subcontractor's Overhead and Profit is included at 21% in the Direct Cost for each trade.

8 Cost of the project is estimated in "Today's" Dollars and only includes escalation.

9 Sales tax is not included.

10 Costs for hazardous material abatement or disposal are not included.

11 Premium cost of LEED certification is not included.

12 The estimate does not include any "soft cost" items, such as designer's or consultant's fees, reviews and reports, furniture, fixtures, equipment provided by the Owner, moving or any other Owner's expenses costs, etc.

13 Statement of Probable Cost

AECOM Estimating has no control over the cost of labor and materials, the general contractors' or any subcontractors' method of determining prices, or competitive bidding and market conditions. AECOM Estimating's opinion of the probable cost of construction is made on the basis of experience, qualifications, and best judgment of a professional consultant familiar with the construction industry. AECOM Estimating cannot and does not guarantee that proposals, bids or actual construction costs will not vary from this or subsequent estimates. AECOM Estimating has no control over the quality, completeness, intricacy, constructability or coordination of design documents. AECOM Estimating also has no control over the amount of funds available for the project. AECOM Estimating will not be responsible for any design revision costs incurred by the project in the event the estimate or bids are in excess of the budget.

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Hard Cost Exclusions	**Excluded from current design and current cost estimate (possibly included within 30% design contingency per subsequent decisions)**
Legacy Union Station	Estimate does not include cost related to the historic Union Station or its infrastructure
Burnham Place Upgrades	Utility upgrades (combined or stand-alone): steam, chilled water, centralized plant, sewer, water, gas, fire protection loops, power, tel-com service , stormwater retention, green roof, plaza structural upgrades, plaza finishes, plaza emergency access ramps & roadways (fire truck/ambulance), bollards, plaza lighting. Cost-sharing on structure & systems may be future decisions.
Work Calendar	Work calendar is estimated as 20 hour days (2 shifts x 10 Hrs) 6 day week. Work calendar may be limited due to public interest constraints about length of workday and noise.
Other Design Reviews	Excluded: the BuroHappold|Hensel Phelps Concept Feasibility Review of 2015 options and features not included in the BBB|Grimshaw design such as MEP in support of Burnham Place, Legacy Union Station, smoke evacuation zone separation walls and other features. The estimate design contingency is intended for follow-on design decisions.
Environmental Hazards	Estimate INCLUDES disposal fees for contaminated NON-hazardous; it excludes higher classifications in soils, ties, ballast or electrical insulation
Seismic Considerations	No special considerations for additional costs due to seismic constraints
Public Streets/Intersections	Reconstruction of public roads and traffic control beyond repairs for utility connections
Public Utilities	Upgrades to public gas/electrical/water/sewer systems beyond utility connections
Back of House for Amtrak	Up to $150 million allowance.
Retail Areas	No fit-out; "core & shell" utilities terminates at lease line walls. Kitchen exhaust undefined and not included.
Revenue Devices	Revenue machines and related controls
Police & Holding Cells	Break rooms, response ready rooms, holding cells, special MEP-telcom services
Bridges & Tunnels	K Street bridge and reconstruction of H Street tunnel
Security Features	Access control X-Ray devices, blast control construction of walls and floors (such as above standard embedded plates/rebars)
Greenway/WAMATA	Upgrades to WAMATA Greenway and access to new Union Station
Parking	Cost model for parking spaces and parking garage excludes upgrades for rental car fit-out, electric vehicle charging stations

Soft Cost Exclusions	**Excluded from Cost Estimate**
Design	Cost of completion of design processes. No Design-Build costs are included.
Owner Soft Costs	Program mgmt, CM or GC-oversight, Owner QA/QC costs, preconstruction testing, OCIP (if any), incentives, commissioning, legal, accounting and funding fees
Other Owner Indirects	Amtrak Force-Account work, temporary relocations and facilities, temporary parking, final moving costs

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Substructure

1	Track Removals	Remove track, traction power and signals included above in train systems estimate
2	Platform & Canopy Removals	Remove platform and substructure, canopies and columns based on LF of existing platforms
3	Slurry Wall-210'Deep & 62'Exposed Face	From El [51] existing grade to El [-158] rock socketed, covers the full outside perimeter of the jobsite, including tie-backs, permanent
4	Slurry Wall-210'Deep & 49'Exposed Face	measuring 210' deep slurry wall by LF 49' exposed face
5	Slurry Wall-100'Deep & 62'Exposed Face	measuring 100' deep slurry wall by LF 64' exposed face
6	Slurry Wall-100'Deep & 49'Exposed Face	measuring 100' deep slurry wall by LF 49' exposed face
7	Secant Pile Walls-64'Deep & 32'Exposed Face	Drilled secant piles walls cost projected on the basis of LF of secant wall averaging 64' deep
8	Sheet Pile Walls-100'Deep & 62'Exposed Face	From El [51] to El [-49] for temporary phasing support of adjacent tracks and ground water control, including tie-backs and subsequent removals
9	Sheet Pile Walls-100'Deep & 49'Exposed Face	same as above 100' piles with 49' exposed face (fewer tiebacks)
10	Sheet Pile Walls-80'Deep & 49'Exposed Face	80' piles with 49' exposed face (fewer tiebacks)
11	Sheet Pile Walls-64'Deep & 32'Exposed Face	64' piles with 32' exposed face (fewer tiebacks)
12	Dewatering Wells/EA	From El "0" dewatering wells are drilled during each east to west phase; estimate at 100ft OC on perimeter of phased cutoff walls. Install dewatering wells 24" dia, gravel, perf pipe and pump, 100' deep
13	Dewatering O&M/Pump/Mo	Per month per well O&M dewatering wells, maintain pumps, modify discharge lines
14	Drilled Shafts - 5ft Dia	Drilled shaft modeled to Elevation [-140] deep, calculated to LF cost. With Potomac Basal Gravel at approximately [-140], these shafts are estimated as unencased (slurry type) shafts.
15	Drilled Shafts - 6ft Dia	Drilled shaft modeled to Elevation [-140] deep, calculated to LF cost
16	Drilled Shafts - 9ft Dia	Drilled shaft modeled to Elevation [-140] deep, calculated to LF cost
17	Drilled Shafts - 10ft Dia	Drilled shaft modeled to Elevation [-140] deep, calculated to LF cost

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18	Drilled Shafts - 12ft Dia	Drilled shaft modeled to Elevation [-192] deep including a rock socket and fully steel encased to metamorphic rock due to soil conditions at that depth, calculated to a LF cost. Metamorphic rock at approx El [-158 to -160] means the rock socket will be approximately 35 feet deep.
19	Pile Test Program	One (1) 9' dia. 140' depth test pile, located offsite prior to bid to provide contractor information. Extra costs will be offset by less risk for bidders. Ten (10) Production piles with Osterberg tests. Broken down into (4) 5' Dia., (4) 9' Dia., (2) 12' Dia. to corresponding depths and split evenly across the phases.
20	Mass Excav Open Cut	Open cut from El [51] to approx [-10] subgrade. Two alternatives: remove spoils by truck or by train. Trucks loaded by clamshell; gondolas loaded by conveyors . No direct truck loading from deeper levels, extra handling required.
21	Export via Train + Truck	Gondolas loaded by conveyors and railcar loader after excavation spoils are located to one end due to limited site access using clamshell. Cost includes tipping fees for contaminated non-hazardous soil characterization
22	Slab on Grade 4-1/2ft	Mud slab, reinforced conc slab 4.5' thick. Site access limitations increases cost due to pumping concrete from the street side redi-mix trucks into the pit, then horizontally, then redistributed to the pour by a concrete conveyor (or additional pump truck at lower level)
23	SOG 3-1/2 ft	Similar but 3.5' thick
24	SOG 2-1/2 ft	Similar but 2.5' thick
25	Mud Slab only	For temporary (or buried) work surface
26	Track Support Columns	Reinforced concrete columns from drilled shaft to bottom of hammerhead, 8ft wide x 3ft thick x various lengths depending upon design. Rebar ties in to embedded rebar in the drilled shafts
27	Super Columns	Overbuild deck support steel columns bearing on drilled shaft foundations at about El [-10] to [55], including anchor bolts and base plate. Steel at 503 lbs/LF, concrete encased into a 28" square column
28	Below Grade Liner Wall for Slurry/Secant Wall	Single face 12" thick wall abutting the slurry wall as a finished liner wall, including waterproofing membrane, and painted finish one side
29	Below Grade Liner Wall for Sheet Pile Wall	8" thick liner wall & flute infill abutting the 12" thick interior wall, including waterproofing membrane, and painted finish one side
30	Structural Slabs	12" reinforced structural slabs at interim levels; for simplicity, no structural concrete beams are included (possible design development)

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Superstructure

1	Hammerheads	Estimated at 34' wide 5' deep to 7.5' deep x 3' thick, heavily reinforced; for the few smaller hammerheads, cost adjustments will be made
2	Super Columns	Continue higher from El [55] to support the trusses under the overbuild deck, concrete encased
3	Track Support	Track invert slab at 28' wide x 3' thick, supported by six precast bulb tee beams longitudinally between hammerheads. Also includes a drainage gutter.
4	Platform Support	Platform slab 30' wide 2' deep with tactile warning strip each side and a slab finish (terazzo priced), supported by 2' thick support walls 10' high running between the hammerheads. Also, a wall approx 18' high between adjacent hammerheads at approx 32' OC.
5	Type A Steel Trusses	3,000 LBS/LF + 20% for Connections (Supporting Buildings and Cars). Trusses support the overhead deck. Truss weights/LF vary between. Model cost is based on tonnage furnished and erected
6	Type B Steel Trusses	2,700 LBS/LF + 20% for Connections (Supporting Buildings). Trusses support the overhead deck. Truss weights/LF vary between. Model cost is based on tonnage furnished and erected
7	Type C Steel Trusses	900 LBS/LF + 20% for Connections (Supporting Plaza Only). Trusses support the overhead deck. Truss weights/LF vary between. Model cost is based on tonnage furnished and erected
8	Overbuild Deck	Cost model includes a 6" composite (shear studs and reinforcing) on metal deck, supported on bar joists between the trusses (due to height and complexity below), fireproofed; 10 bar joists per 30x30 grid. Same problem with concrete (limited site access, double handling or pumping). Slab may be too thin.
9	Overbuild Deck Alt 1	12" reinforced structural slab; for simplicity, no structural concrete beams are included (relying on trusses). Formwork difficult due height and irregular slab elevations below. Slab may still be too thin for firetruck/ambulance lanes or possible bus lanes on plaza.
10	Overbuild Deck Alt 2	2-1/2 ft thick Structural Concrete slab stiffened to protect from overbuild progressive collapse. Formwork difficult due to weight of wet concrete and irregular slab elevations below.
11	Smaller Column	Cost model based on W18x114 concrete encased for misc small
12	Abv Grade Exterior Wall	Exterior wall (finished both sides) comprised 40% of precast architectural granite faced panels 40% glass and frame and 20% architectural precast brick faced panels, with 60% of the inside face painted
13	Abv Grade Ext Wall Alt	Exterior wall spider-pin cable truss-braced structurally glazed curtain wall

14	Interior CIP Walls	Double face finish on interior CIP walls 12" thick
15	Central Concourse	Overhead structure and roof including columns long span trusses and joist girders to frame roof, metal deck, fireproofing, 30% insulated skylights, EPDM membrane roofing, smoke vents, fascia with drains
16	Skylights	Skylight structures through Overbuild Deck; size varies on plans and sections. Estimating custom skylights at 2,400 SF each
17	Entrances & Canopies	Cantilevered or cable stayed canopies; revolving doors

Interiors

1	Platform to Overbuild Deck Stairs	62 VLF. Metal pan stairs, railings per flight
2	Platform to Overbuild Deck Stairs	33 VLF. Metal pan stairs, railings per flight
3	Concourse to Higher Platform Stairs	23 VLF. Metal pan stairs, railings per flight
4	Concourse to Lower Platform Stairs	21 VLF. Metal pan stairs, railings per flight
5	H St Conc to Lower Level Stairs	16 VLF. Metal pan stairs, railings per flight
6	Mid Level Parking to Concourse Stairs	15 VLF. Metal pan stairs, railings per flight
7	Street to H St Concourse Stairs	12 VLF. Metal pan stairs, railings per flight
8	Lower to Mid Level Parking Stairs	12 VLF. Metal pan stairs, railings per flight
9	Train Platforms	Terrazzo and Tactile Warning Strip included above with train platform structure; PIDS and safety electronics included in Electrical. Allow for undefined furnishings, column covers, soffits, artwork
10	Public Concourse	Interior finishes including walls and wall finishes, framing for large video displays, ceilings, column cover finishes, flooring, artwork based on a current large scale train station project
11	Stormwater Cisterns	Four total at corners along outside wall, designed to gravity drain to city stormwater system. Total 1.63 million gallons into four waterproofed CIP tanks approx 20'h X 30'w X 90' long set at the Concourse level, wiers to limit flow.

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Conveying

1	Platform to Overbuild Deck Escalator	SS skirt, 120 fpm, 62 VLF. Cost includes fab/install/temporary service/extended warranty, structural pit, mechanical in the pit, electrical power, BMS/FA detectors and interface
2	Overbuild Deck to Bus Terminal Escalator	Glass, 100 fpm, 35 VLF. Cost includes fab/install/temporary service/extended warranty, structural pit, mechanical in the pit, electrical power, BMS/FA detectors and interface
3	Concourse to High Track Platform Escalator	Glass, 100 fpm, 33 VLF. Cost includes fab/install/temporary service/extended warranty, structural pit, mechanical in the pit, electrical power, BMS/FA detectors and interface
4	Concourse to Low Track Platform Escalator	Glass, 100 fpm, 21 VLF. Cost includes fab/install/temporary service/extended warranty, structural pit, mechanical in the pit, electrical power, BMS/FA detectors and interface
5	Concourse to Mid-Upper Level Escalator	Glass, 100 fpm, 21 VLF. Cost includes fab/install/temporary service/extended warranty, structural pit, mechanical in the pit, electrical power, BMS/FA detectors and interface
6	LL Garage to Overbuild Deck Elevator	5-Stop, 350 fpm, 92 VLF Elevator. Based on current cost for transit quality, based on vertical lineal foot (rise), speed and per each: high level transportaton system quality. Addtionally includes elevator shaft wall or masonry wall, elevator pit, MEP services and BMS/FA interface
7	LL Garage to Track High Platform Elevator	4-Stop, 100 fpm, 60 VLF Elevator. Based on current cost for transit quality, based on vertical lineal foot (rise), speed and per each: high level transportaton system quality. Addtionally includes elevator shaft wall or masonry wall, elevator pit, MEP services and BMS/FA interface
8	LL Garage to Low Track Plaform Elevator	4-Stop, 100 fpm, 48 VLF Elevator. Based on current cost for transit quality, based on vertical lineal foot (rise), speed and per each: high level transportaton system quality. Addtionally includes elevator shaft wall or masonry wall, elevator pit, MEP services and BMS/FA interface
9	LL Garage to Concourse 3-Stop Elevator	3-Stop, 100 fpm, 28 VLF Elevator. Based on current cost for transit quality, based on vertical lineal foot (rise), speed and per each: high level transportaton system quality. Addtionally includes elevator shaft wall or masonry wall, elevator pit, MEP services and BMS/FA interface
10	Middle Lvl Garage to Concourse 2-Stop Elevator	2-Stop, 100 fpm, 15 VLF Elevator. Based on current cost for transit quality, based on vertical lineal foot (rise), speed and per each: high level transportaton system quality. Addtionally includes elevator shaft wall or masonry wall, elevator pit, MEP services and BMS/FA interface

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11	LL Gar to Street 3-Stop 6 ton freight Elevator	3-Stop 6 ton freight, 50 fpm, 28 VLF Elevator. Based on current cost for transit quality, based on vertical lineal foot (rise), speed and per each: high level transportaton system quality. Addtionally includes elevator shaft wall or masonry wall, elevator pit, MEP services and BMS/FA interface
12	LL Gar to Street 2-Stop 10 ton freight Elevator	2-Stop 10 ton freight, 50 fpm, 28 VLF Elevator. Based on current cost for transit quality, based on vertical lineal foot (rise), speed and per each: high level transportaton system quality. Addtionally includes elevator shaft wall or masonry wall, elevator pit, MEP services and BMS/FA interface
13	LL Gar to Street 2-Stop 20T Compactor Lift	2-Stop 20T compactor lift, 30 fpm, 28 VLF Elevator. Based on current cost for transit quality, based on vertical lineal foot (rise), speed and per each: high level transportaton system quality. Addtionally includes elevator shaft wall or masonry wall, elevator pit, MEP services and BMS/FA interface

Plumbing

1	BOH & Retail White Box	Sewer and water to space perimeter, no fit-out
2	Platforms & Corridors	Escalator/elevator and floor drains, water for passenger services
3	Train Service Utilities	Drains, water, pneumatic air and stations for train services
4	Stormwater Detention	Overbuild plaza drains and piping to cisterns (priced above), total area of the plaza excluding the H-Street bridge. Cost includes heat tracing at the drains and partial pipe insulation.

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HVAC

1	Ventilation Smoke Evac	Emergency smoke evacuation of train shed estimated as 25 ea 250,000 CFM 250 hp fans, silencers, hangers, testing & balancing
2	Vent Diesel Platforms	Conventional ventilation at 12 ACH of unconditioned spaces in train shed; train shed exterior is open to the East, West and North
3	Ventilation Concourses & Platforms	Outside air ventilation and background radiant heating of semi-conditioned concourses and platforms (not cooled).
4	Ventilation Parking	Conventional ventilation of underground car parking and taxi areas at 0.75 CFM/SF plus CO2 & NO monitoring
5	BOH White Box Service	Hydronic piping to BOH & undeveloped Amtrak spaces including temporary HW fan coil units to prevent freezing
6	HVAC Energy System	Heating & cooling plant: heat and cooling for conditioned spaces. Air handlers, hydronic piping and air distribution included in "HVAC for tempered areas"
7	HVAC in Tempered Areas	Design incomplete in regard to tempered areas, includes Amtrak waiting areas; cost model for heating / cooling / hydronic piping / ductwork / BMS

Fire Protection

1	FP Service	Main fire pumps assembly 2 diesel 2 electric redundant systems
2	FP Fire Standpipe	Standpipe (wet & dry) and hose assembly serves all Gross Square Feet.
3	FP Dry System	Dry system fire for possible freezing areas garage/platform and covered trainways; possible mist heads some areas
4	FP Wet System	Wet system for temperature modified areas, BOH, retail, Amtrak waiting area
5	FP Clean Agent System	Inert gas FP system for electrical switchgear & xfer switch rooms
6	FP Pre-Action AFFF	Aqueous Film-Forming Foam system for emergency genset rooms

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Electrical

1	HV & Main Panels	Service and Power Distribution (Medium & Low Voltage)
2	Emergency Power	Assume 6 ea - 2.5 MVA Medium Voltage Em. Generators - 2.5 MVA x 6 = 15 MVA, tanks, Tier 4F Emmision (per Generator), MV ATS switches
3	Wayside Power	Wayside 480 V panelboards for train use, 16 ea
4	Grounding	Grounding system
5	Tenants	Power to future tenants, Amtrak BOH and Retail areas
6	Smoke Evac Power	Power to 25 ea, 250 hp smoke evacuation fans
7	Temporary Light & Power	Temporary lighting and power during construction phases
8	Security	Security Access Control/Intercom/CCTV
9	Fire Alarm	Main FA panels and balance of service
10	Overcurrent Protection	OP engineering required of electrical contractor, coordination studies
11	Commissioning	Commissioning and testing of electrical system

Concourse / Train Hall

1	Electrical Service	Main service, power distribution and local panels
2	Electrical Low Voltage	Under 5 kV power distribution panels, power feeds to mech systms
3	Electrical Lighting	Lighting and lighting control systems
4	Electrical Fire Alarm	Fire Alarm system
5	Electrical Communications	Communications, emergency call stations, CCTV, security & access control, wireless modems
6	Electrical Video/PIDS	Passenger Information Displays (PIDS), large video displays

Parking Areas / Buses

1	Underground Parking	Striping, signs, parking bumpers, taxi finishes, entrance and control systems
2	Plumbing - Underground Parking	Floor & ramp drains, sump pits, sewage ejectors, service water for garage and taxi areas
3	Electrical - Underground Parking	Electrical for parking and taxi areas, all incusive
4	Overbuild Deck Parking	Based on comparables: full facility cost per car for bus garage
5	Bus Waiting Area	Based on comparables and scaled larger: full cost per bus + waiting area
6	Parking Garage Demo	Phased demolition of Union Staton Parking Garage per cubic foot

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Other

1	Site Access Support	Clear site, pave access road, erect and operate a lufting tower crane (Favco 760), dismantle crane, demo crane support pad and restore site (fixed costs pro-rated over a 5 year life cycle)
2	General Conditions	Staff including administration, project engineering, schedule and cost controls, field supervision including a second night sift supervisory crew, QA/QC, safety, maintenance and protection of traffic, environmental monitoring, temporary facilities. Staff ranges from 50 to 60. Allowance for rental and operation of 12,000 SF off-site field office.
3	Fit-Out Amtrak BOH	Allowance for Amtrak's Back of House spaces.
4	Temporary Support of H Street Bridge	Temporary support for phased demoliton of track-supporting H St. bridge/tunnel is undesigned and not estimated. This would be a component of the phasing costs "below-the-line" in the estimate.
5	Remove and Replace Water Main	Support, remove & replace 12" water main E/W under H Street
6	Remove and Replace Sewer Main	Remove and replace 42" sewer main between H Street & Union Sta

Transportation

1	Track Installation	New track, ties drilled into track slab
2	Catenary Installation	Catenary (system replaced)
3	Signals and Communication System	Signals and Communication System
4	Control Tower	New control tower
5	Pepco Feeder	Pepco feeder relocation and Substation 25A

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Alternate C-Support of Excavation Option #5 Estimated Cost - Open Excavation

		Phase 1	Phase 2	Phase 3	Phase 4	Total
Substructure		$ 130,700,817	$ 206,911,014	$ 157,382,821	$ 356,536,638	**$ 851,531,290**
Superstructure		$ 149,581,178	$ 205,688,999	$ 154,322,057	$ 382,927,822	**$ 892,520,056**
Interiors		$ 40,735,893	$ 58,499,339	$ 35,377,498	$ 83,981,910	**$ 218,594,640**
Conveying		$ 6,693,154	$ 13,910,018	$ 17,081,958	$ 30,596,350	**$ 68,281,480**
Plumbing		$ 1,974,441	$ 2,424,914	$ 1,955,199	$ 4,295,434	**$ 10,649,988**
HVAC		$ 6,768,186	$ 9,558,825	$ 15,208,618	$ 12,765,060	**$ 44,300,690**
Fire Protection		$ 5,002,860	$ 8,136,360	$ 11,200,774	$ 16,859,495	**$ 41,199,489**
Electrical		$ 6,853,929	$ 10,852,054	$ 11,423,215	$ 27,986,877	**$ 57,116,076**
Concourse / Train Hall		$ 22,886,153	$ 34,704,844	$ 24,258,849	$ 51,159,756	**$ 133,009,603**
Parking / Bus		$ 16,731,477	$ 20,307,353	$ 22,775,950	$ 34,744,178	**$ 94,558,958**
Other		$ 60,563,311	$ 60,346,996	$ 59,035,616	$ 242,669,506	**$ 422,615,429**
Transportation		$ 14,268,000	$ 12,727,000	$ 9,409,080	$ 26,917,160	**$ 63,321,240**
Add Alternate: Top Down		$ -	$ -	$ -	$ -	**$ -**
Top Down General Conditions		$ -	$ -	$ -	$ -	**$ -**
Total Direct Cost		**$ 462,759,398**	**$ 644,067,717**	**$ 519,431,636**	**$ 1,271,440,187**	**$ 2,897,698,938**
Existing Facility Impact	5%	$ 23,137,970	$ 32,203,386	$ 25,971,582	$ 63,572,009	$ 144,884,947
Sub-Total		$ 485,897,368	$ 676,271,103	$ 545,403,218	$ 1,335,012,196	$ 3,042,583,885
Contingency	30%	$ 145,769,211	$ 202,881,331	$ 163,620,965	$ 400,503,659	$ 912,775,165
Sub-Total		$ 631,666,579	$ 879,152,434	$ 709,024,183	$ 1,735,515,855	$ 3,955,359,050
Contractor Overhead	10%	$ 63,166,658	$ 87,915,243	$ 70,902,418	$ 173,551,585	$ 395,535,905
Sub-Total		$ 694,833,237	$ 967,067,677	$ 779,926,601	$ 1,909,067,440	$ 4,350,894,955
Contractor Profit	5%	$ 34,741,662	$ 48,353,384	$ 38,996,330	$ 95,453,372	$ 217,544,748
Sub-Total		$ 729,574,899	$ 1,015,421,061	$ 818,922,931	$ 2,004,520,812	$ 4,568,439,703
Bonds & Insurances	2%	$ 14,591,498	$ 20,308,421	$ 16,378,459	$ 40,090,416	$ 91,368,794
Sub-Total		$ 744,166,397	$ 1,035,729,482	$ 835,301,390	$ 2,044,611,228	$ 4,659,808,497
Escalation - Phase 1	28.1%	$ 209,431,044				$ 209,431,044
Escalation - Phase 2	39.1%		$ 404,476,766			$ 404,476,766
Escalation - Phase 3	51.1%			$ 426,896,360		$ 426,896,360
Escalation - Phase 4	69.0%				$ 1,410,412,830	$ 1,410,412,830
Total Probable Bid Sum		**$ 953,597,440**	**$ 1,440,206,249**	**$ 1,262,197,750**	**$ 3,455,024,058**	**$ 7,111,025,497**

Note: 1. Escalation 3.5% Per Year
2. Assume Construction Starts in 6 Years
3. Construction Durations
A. Phase 1 2.42 Years
B. Phase 2 2.33 Years
C. Phase 3 2.50 Years
D. Phase 4 4.00 Years
4. Mid-Point of Construction
A. Phase 1 7.21 Years
B. Phase 2 9.58 Years
C. Phase 3 12.00 Years
D. Phase 4 15.25 Years

Estimate:	**Rough Order of Magnitude**
Design Documents Dated:	**Washington Union Station Expansion Project** **Concept Screening Report** **July 31, 2017**
Estimate Dated:	**December 17, 2018**
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Basis of Estimate and Estimating Assumptions:

1 The purpose of this document is to establish a rough order of magnitude estimate for the Washington Union Station - Station Expansion Project.

2 Estimate is based on Beyer Blinder Belle|Grimshaw design and design/engineering basis of 2016 and recent clarifications.

3 Estimate prices are based on April 2017 prevailing wage labor rates, material market prices, and equipment and materials thru 2017 applicable for work in Washington, DC, including generally practiced project indirects (general conditions), bonds and OH&P for a project of this scale for an "all-in" cost. Estimate includes phasing, 30% design contingency and time-value-of-money escalation.

4 Estimate includes a $150,000,000 allowance for AMTRAK fit-out of Back of House areas.

5 Existing facilities impact is calculated as 5% of the Total Direct Cost.

6 All work is assumed to be performed during 20 hour days (two shifts of 10 hours), 6 days a week. Premium or Over Time Hours are included.

7 Subcontractor's Overhead and Profit is included at 21% in the Direct Cost for each trade.

8 Cost of the project is estimated in "Today's" Dollars and only includes escalation.

9 Sales tax is not included.

10 Costs for hazardous material abatement or disposal are not included.

11 Premium cost of LEED certification is not included.

12 The estimate does not include any "soft cost" items, such as designer's or consultant's fees, reviews and reports, furniture, fixtures, equipment provided by the Owner, moving or any other Owner's expenses costs, etc.

13 Statement of Probable Cost

AECOM Estimating has no control over the cost of labor and materials, the general contractors' or any subcontractors' method of determining prices, or competitive bidding and market conditions. AECOM Estimating's opinion of the probable cost of construction is made on the basis of experience, qualifications, and best judgment of a professional consultant familiar with the construction industry. AECOM Estimating cannot and does not guarantee that proposals, bids or actual construction costs will not vary from this or subsequent estimates. AECOM Estimating has no control over the quality, completeness, intricacy, constructability or coordination of design documents. AECOM Estimating also has no control over the amount of funds available for the project. AECOM Estimating will not be responsible for any design revision costs incurred by the project in the event the estimate or bids are in excess of the budget.

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Hard Cost Exclusions	**Excluded from current design and current cost estimate (possibly included within 30% design contingency per subsequent decisions)**
Legacy Union Station	Estimate does not include cost related to the historic Union Station or its infrastructure
Burnham Place Upgrades	Utility upgrades (combined or stand-alone): steam, chilled water, centralized plant, sewer, water, gas, fire protection loops, power, tel-com service , stormwater retention, green roof, plaza structural upgrades, plaza finishes, plaza emergency access ramps & roadways (fire truck/ambulance), bollards, plaza lighting. Cost-sharing on structure & systems may be future decisions.
Work Calendar	Work calendar is estimated as 20 hour days (2 shifts x 10 Hrs) 6 day week. Work calendar may be limited due to public interest constraints about length of workday and noise.
Other Design Reviews	Excluded: the BuroHappold|Hensel Phelps Concept Feasibility Review of 2015 options and features not included in the BBB|Grimshaw design such as MEP in support of Burnham Place, Legacy Union Station, smoke evacuation zone separation walls and other features. The estimate design contingency is intended for follow-on design decisions.
Environmental Hazards	Estimate INCLUDES disposal fees for contaminated NON-hazardous; it excludes higher classifications in soils, ties, ballast or electrical insulation
Seismic Considerations	No special considerations for additional costs due to seismic constraints
Public Streets/Intersections	Reconstruction of public roads and traffic control beyond repairs for utility connections
Public Utilities	Upgrades to public gas/electrical/water/sewer systems beyond utility connections
Back of House for Amtrak	Up to $150 million allowance.
Retail Areas	No fit-out; "core & shell" utilities terminates at lease line walls. Kitchen exhaust undefined and not included.
Revenue Devices	Revenue machines and related controls
Police & Holding Cells	Break rooms, response ready rooms, holding cells, special MEP-telcom services
Bridges & Tunnels	K Street bridge and reconstruction of H Street tunnel
Security Features	Access control X-Ray devices, blast control construction of walls and floors (such as above standard embedded plates/rebars)
Greenway/WAMATA	Upgrades to WAMATA Greenway and access to new Union Station
Parking	Cost model for parking spaces and parking garage excludes upgrades for rental car fit-out, electric vehicle charging stations

Soft Cost Exclusions	**Excluded from Cost Estimate**
Design	Cost of completion of design processes. No Design-Build costs are included.
Owner Soft Costs	Program mgmt, CM or GC-oversight, Owner QA/QC costs, preconstruction testing, OCIP (if any), incentives, commissioning, legal, accounting and funding fees
Other Owner Indirects	Amtrak Force-Account work, temporary relocations and facilities, temporary parking, final moving costs

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Substructure

1	Track Removals	Remove track, traction power and signals included above in train systems estimate
2	Platform & Canopy Removals	Remove platform and substructure, canopies and columns based on LF of existing platforms
3	Slurry Wall-210'Deep & 62'Exposed Face	From El [51] existing grade to El [-158] rock socketed, covers the full outside perimeter of the jobsite, including tie-backs, permanent
4	Slurry Wall-210'Deep & 49'Exposed Face	measuring 210' deep slurry wall by LF 49' exposed face
5	Slurry Wall-100'Deep & 62'Exposed Face	measuring 100' deep slurry wall by LF 64' exposed face
6	Slurry Wall-100'Deep & 49'Exposed Face	measuring 100' deep slurry wall by LF 49' exposed face
7	Secant Pile Walls-64'Deep & 32'Exposed Face	Drilled secant piles walls cost projected on the basis of LF of secant wall averaging 64' deep
8	Sheet Pile Walls-100'Deep & 62'Exposed Face	From El [51] to El [-49] for temporary phasing support of adjacent tracks and ground water control, including tie-backs and subsequent removals
9	Sheet Pile Walls-100'Deep & 49'Exposed Face	same as above 100' piles with 49' exposed face (fewer tiebacks)
10	Sheet Pile Walls-80'Deep & 49'Exposed Face	80' piles with 49' exposed face (fewer tiebacks)
11	Sheet Pile Walls-64'Deep & 32'Exposed Face	64' piles with 32' exposed face (fewer tiebacks)
12	Dewatering Wells/EA	From El "0" dewatering wells are drilled during each east to west phase; estimate at 100ft OC on perimeter of phased cutoff walls. Install dewatering wells 24" dia, gravel, perf pipe and pump, 100' deep
13	Dewatering O&M/Pump/Mo	Per month per well O&M dewatering wells, maintain pumps, modify discharge lines
14	Drilled Shafts - 5ft Dia	Drilled shaft modeled to Elevation [-140] deep, calculated to LF cost. With Potomac Basal Gravel at approximately [-140], these shafts are estimated as unencased (slurry type) shafts.
15	Drilled Shafts - 6ft Dia	Drilled shaft modeled to Elevation [-140] deep, calculated to LF cost
16	Drilled Shafts - 9ft Dia	Drilled shaft modeled to Elevation [-140] deep, calculated to LF cost
17	Drilled Shafts - 10ft Dia	Drilled shaft modeled to Elevation [-140] deep, calculated to LF cost

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18	Drilled Shafts - 12ft Dia	Drilled shaft modeled to Elevation [-192] deep including a rock socket and fully steel encased to metamorphic rock due to soil conditions at that depth, calculated to a LF cost. Metamorphic rock at approx El [-158 to -160] means the rock socket will be approximately 35 feet deep.
19	Pile Test Program	One (1) 9' dia. 140' depth test pile, located offsite prior to bid to provide contractor information. Extra costs will be offset by less risk for bidders. Ten (10) Production piles with Osterberg tests. Broken down into (4) 5' Dia., (4) 9' Dia., (2) 12' Dia. to corresponding depths and split evenly across the phases.
20	Mass Excav Open Cut	Open cut from El [51] to approx [-10] subgrade. Two alternatives: remove spoils by truck or by train. Trucks loaded by clamshell; gondolas loaded by conveyors . No direct truck loading from deeper levels, extra handling required.
21	Export via Train + Truck	Gondolas loaded by conveyors and railcar loader after excavation spoils are located to one end due to limited site access using clamshell. Cost includes tipping fees for contaminated non-hazardous soil characterization
22	Slab on Grade 4-1/2ft	Mud slab, reinforced conc slab 4.5' thick. Site access limitations increases cost due to pumping concrete from the street side redi-mix trucks into the pit, then horizontally, then redistributed to the pour by a concrete conveyor (or additional pump truck at lower level)
23	SOG 3-1/2 ft	Similar but 3.5' thick
24	SOG 2-1/2 ft	Similar but 2.5' thick
25	Mud Slab only	For temporary (or buried) work surface
26	Track Support Columns	Reinforced concrete columns from drilled shaft to bottom of hammerhead, 8ft wide x 3ft thick x various lengths depending upon design. Rebar ties in to embedded rebar in the drilled shafts
27	Super Columns	Overbuild deck support steel columns bearing on drilled shaft foundations at about El [-10] to [55], including anchor bolts and base plate. Steel at 503 lbs/LF, concrete encased into a 28" square column
28	Below Grade Liner Wall for Slurry/Secant Wall	Single face 12" thick wall abutting the slurry wall as a finished liner wall, including waterproofing membrane, and painted finish one side
29	Below Grade Liner Wall for Sheet Pile Wall	8" thick liner wall & flute infill abutting the 12" thick interior wall, including waterproofing membrane, and painted finish one side
30	Structural Slabs	12" reinforced structural slabs at interim levels; for simplicity, no structural concrete beams are included (possible design development)

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Superstructure

1	Hammerheads	Estimated at 34' wide 5' deep to 7.5' deep x 3' thick, heavily reinforced; for the few smaller hammerheads, cost adjustments will be made
2	Super Columns	Continue higher from El [55] to support the trusses under the overbuild deck, concrete encased
3	Track Support	Track invert slab at 28' wide x 3' thick, supported by six precast bulb tee beams longitudinally between hammerheads. Also includes a drainage gutter.
4	Platform Support	Platform slab 30' wide 2' deep with tactile warning strip each side and a slab finish (terazzo priced), supported by 2' thick support walls 10' high running between the hammerheads. Also, a wall approx 18' high between adjacent hammerheads at approx 32' OC.
5	Type A Steel Trusses	3,000 LBS/LF + 20% for Connections (Supporting Buildings and Cars). Trusses support the overhead deck. Truss weights/LF vary between. Model cost is based on tonnage furnished and erected
6	Type B Steel Trusses	2,700 LBS/LF + 20% for Connections (Supporting Buildings). Trusses support the overhead deck. Truss weights/LF vary between. Model cost is based on tonnage furnished and erected
7	Type C Steel Trusses	900 LBS/LF + 20% for Connections (Supporting Plaza Only). Trusses support the overhead deck. Truss weights/LF vary between. Model cost is based on tonnage furnished and erected
8	Overbuild Deck	Cost model includes a 6" composite (shear studs and reinforcing) on metal deck, supported on bar joists between the trusses (due to height and complexity below), fireproofed; 10 bar joists per 30x30 grid. Same problem with concrete (limited site access, double handling or pumping). Slab may be too thin.
9	Overbuild Deck Alt 1	12" reinforced structural slab; for simplicity, no structural concrete beams are included (relying on trusses). Formwork difficult due height and irregular slab elevations below. Slab may still be too thin for firetruck/ambulance lanes or possible bus lanes on plaza.
10	Overbuild Deck Alt 2	2-1/2 ft thick Structural Concrete slab stiffened to protect from overbuild progressive collapse. Formwork difficult due to weight of wet concrete and irregular slab elevations below.
11	Smaller Column	Cost model based on W18x114 concrete encased for misc small
12	Abv Grade Exterior Wall	Exterior wall (finished both sides) comprised 40% of precast architectural granite faced panels 40% glass and frame and 20% architectural precast brick faced panels, with 60% of the inside face painted
13	Abv Grade Ext Wall Alt	Exterior wall spider-pin cable truss-braced structurally glazed curtain wall

14	Interior CIP Walls	Double face finish on interior CIP walls 12" thick
15	Central Concourse	Overhead structure and roof including columns long span trusses and joist girders to frame roof, metal deck, fireproofing, 30% insulated skylights, EPDM membrane roofing, smoke vents, fascia with drains
16	Skylights	Skylight structures through Overbuild Deck; size varies on plans and sections. Estimating custom skylights at 2,400 SF each
17	Entrances & Canopies	Cantilevered or cable stayed canopies; revolving doors

Interiors

1	Platform to Overbuild Deck Stairs	62 VLF. Metal pan stairs, railings per flight
2	Platform to Overbuild Deck Stairs	33 VLF. Metal pan stairs, railings per flight
3	Concourse to Higher Platform Stairs	23 VLF. Metal pan stairs, railings per flight
4	Concourse to Lower Platform Stairs	21 VLF. Metal pan stairs, railings per flight
5	H St Conc to Lower Level Stairs	16 VLF. Metal pan stairs, railings per flight
6	Mid Level Parking to Concourse Stairs	15 VLF. Metal pan stairs, railings per flight
7	Street to H St Concourse Stairs	12 VLF. Metal pan stairs, railings per flight
8	Lower to Mid Level Parking Stairs	12 VLF. Metal pan stairs, railings per flight
9	Train Platforms	Terrazzo and Tactile Warning Strip included above with train platform structure; PIDS and safety electronics included in Electrical. Allow for undefined furnishings, column covers, soffits, artwork
10	Public Concourse	Interior finishes including walls and wall finishes, framing for large video displays, ceilings, column cover finishes, flooring, artwork based on a current large scale train station project
11	Stormwater Cisterns	Four total at corners along outside wall, designed to gravity drain to city stormwater system. Total 1.63 million gallons into four waterproofed CIP tanks approx 20'h X 30'w X 90' long set at the Concourse level, wiers to limit flow.

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Conveying

1	Platform to Overbuild Deck Escalator	SS skirt, 120 fpm, 62 VLF. Cost includes fab/install/temporary service/extended warranty, structural pit, mechanical in the pit, electrical power, BMS/FA detectors and interface
2	Overbuild Deck to Bus Terminal Escalator	Glass, 100 fpm, 35 VLF. Cost includes fab/install/temporary service/extended warranty, structural pit, mechanical in the pit, electrical power, BMS/FA detectors and interface
3	Concourse to High Track Platform Escalator	Glass, 100 fpm, 33 VLF. Cost includes fab/install/temporary service/extended warranty, structural pit, mechanical in the pit, electrical power, BMS/FA detectors and interface
4	Concourse to Low Track Platform Escalator	Glass, 100 fpm, 21 VLF. Cost includes fab/install/temporary service/extended warranty, structural pit, mechanical in the pit, electrical power, BMS/FA detectors and interface
5	Concourse to Mid-Upper Level Escalator	Glass, 100 fpm, 21 VLF. Cost includes fab/install/temporary service/extended warranty, structural pit, mechanical in the pit, electrical power, BMS/FA detectors and interface
6	LL Garage to Overbuild Deck Elevator	5-Stop, 350 fpm, 92 VLF Elevator. Based on current cost for transit quality, based on vertical lineal foot (rise), speed and per each: high level transportaton system quality. Addtionally includes elevator shaft wall or masonry wall, elevator pit, MEP services and BMS/FA interface
7	LL Garage to Track High Platform Elevator	4-Stop, 100 fpm, 60 VLF Elevator. Based on current cost for transit quality, based on vertical lineal foot (rise), speed and per each: high level transportaton system quality. Addtionally includes elevator shaft wall or masonry wall, elevator pit, MEP services and BMS/FA interface
8	LL Garage to Low Track Plaform Elevator	4-Stop, 100 fpm, 48 VLF Elevator. Based on current cost for transit quality, based on vertical lineal foot (rise), speed and per each: high level transportaton system quality. Addtionally includes elevator shaft wall or masonry wall, elevator pit, MEP services and BMS/FA interface
9	LL Garage to Concourse 3-Stop Elevator	3-Stop, 100 fpm, 28 VLF Elevator. Based on current cost for transit quality, based on vertical lineal foot (rise), speed and per each: high level transportaton system quality. Addtionally includes elevator shaft wall or masonry wall, elevator pit, MEP services and BMS/FA interface
10	Middle Lvl Garage to Concourse 2-Stop Elevator	2-Stop, 100 fpm, 15 VLF Elevator. Based on current cost for transit quality, based on vertical lineal foot (rise), speed and per each: high level transportaton system quality. Addtionally includes elevator shaft wall or masonry wall, elevator pit, MEP services and BMS/FA interface

11	LL Gar to Street 3-Stop 6 ton freight Elevator	3-Stop 6 ton freight, 50 fpm, 28 VLF Elevator. Based on current cost for transit quality, based on vertical lineal foot (rise), speed and per each: high level transportaton system quality. Addtionally includes elevator shaft wall or masonry wall, elevator pit, MEP services and BMS/FA interface
12	LL Gar to Street 2-Stop 10 ton freight Elevator	2-Stop 10 ton freight, 50 fpm, 28 VLF Elevator. Based on current cost for transit quality, based on vertical lineal foot (rise), speed and per each: high level transportaton system quality. Addtionally includes elevator shaft wall or masonry wall, elevator pit, MEP services and BMS/FA interface
13	LL Gar to Street 2-Stop 20T Compactor Lift	2-Stop 20T compactor lift, 30 fpm, 28 VLF Elevator. Based on current cost for transit quality, based on vertical lineal foot (rise), speed and per each: high level transportaton system quality. Addtionally includes elevator shaft wall or masonry wall, elevator pit, MEP services and BMS/FA interface

Plumbing

1	BOH & Retail White Box	Sewer and water to space perimeter, no fit-out
2	Platforms & Corridors	Escalator/elevator and floor drains, water for passenger services
3	Train Service Utilities	Drains, water, pneumatic air and stations for train services
4	Stormwater Detention	Overbuild plaza drains and piping to cisterns (priced above), total area of the plaza excluding the H-Street bridge. Cost includes heat tracing at the drains and partial pipe insulation.

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HVAC

1	Ventilation Smoke Evac	Emergency smoke evacuation of train shed estimated as 25 ea 250,000 CFM 250 hp fans, silencers, hangers, testing & balancing
2	Vent Diesel Platforms	Conventional ventilation at 12 ACH of unconditioned spaces in train shed; train shed exterior is open to the East, West and North
3	Ventilation Concourses & Platforms	Outside air ventilation and background radiant heating of semi-conditioned concourses and platforms (not cooled).
4	Ventilation Parking	Conventional ventilation of underground car parking and taxi areas at 0.75 CFM/SF plus CO2 & NO monitoring
5	BOH White Box Service	Hydronic piping to BOH & undeveloped Amtrak spaces including temporary HW fan coil units to prevent freezing
6	HVAC Energy System	Heating & cooling plant: heat and cooling for conditioned spaces. Air handlers, hydronic piping and air distribution included in "HVAC for tempered areas"
7	HVAC in Tempered Areas	Design incomplete in regard to tempered areas, includes Amtrak waiting areas; cost model for heating / cooling / hydronic piping / ductwork / BMS

Fire Protection

1	FP Service	Main fire pumps assembly 2 diesel 2 electric redundant systems
2	FP Fire Standpipe	Standpipe (wet & dry) and hose assembly serves all Gross Square Feet.
3	FP Dry System	Dry system fire for possible freezing areas garage/platform and covered trainways; possible mist heads some areas
4	FP Wet System	Wet system for temperature modified areas, BOH, retail, Amtrak waiting area
5	FP Clean Agent System	Inert gas FP system for electrical switchgear & xfer switch rooms
6	FP Pre-Action AFFF	Aqueous Film-Forming Foam system for emergency genset rooms

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Electrical

1	HV & Main Panels	Service and Power Distribution (Medium & Low Voltage)
2	Emergency Power	Assume 6 ea - 2.5 MVA Medium Voltage Em. Generators - 2.5 MVA x 6 = 15 MVA, tanks, Tier 4F Emmision (per Generator), MV ATS switches
3	Wayside Power	Wayside 480 V panelboards for train use, 16 ea
4	Grounding	Grounding system
5	Tenants	Power to future tenants, Amtrak BOH and Retail areas
6	Smoke Evac Power	Power to 25 ea, 250 hp smoke evacuation fans
7	Temporary Light & Power	Temporary lighting and power during construction phases
8	Security	Security Access Control/Intercom/CCTV
9	Fire Alarm	Main FA panels and balance of service
10	Overcurrent Protection	OP engineering required of electrical contractor, coordination studies
11	Commissioning	Commissioning and testing of electrical system

Concourse / Train Hall

1	Electrical Service	Main service, power distribution and local panels
2	Electrical Low Voltage	Under 5 kV power distribution panels, power feeds to mech systms
3	Electrical Lighting	Lighting and lighting control systems
4	Electrical Fire Alarm	Fire Alarm system
5	Electrical Communications	Communications, emergency call stations, CCTV, security & access control, wireless modems
6	Electrical Video/PIDS	Passenger Information Displays (PIDS), large video displays

Parking Areas / Buses

1	Underground Parking	Striping, signs, parking bumpers, taxi finishes, entrance and control systems
2	Plumbing - Underground Parking	Floor & ramp drains, sump pits, sewage ejectors, service water for garage and taxi areas
3	Electrical - Underground	Electrical for parking and taxi areas, all incusive
4	Overbuild Deck Parking	Based on comparables: full facility cost per car for bus garage
5	Bus Waiting Area	Based on comparables and scaled larger: full cost per bus + waiting area
6	Parking Garage Demo	Phased demolition of Union Staton Parking Garage per cubic foot

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Other

1	Site Access Support	Clear site, pave access road, erect and operate a lufting tower crane (Favco 760), dismantle crane, demo crane support pad and restore site (fixed costs pro-rated over a 5 year life cycle)
2	General Conditions	Staff including administration, project engineering, schedule and cost controls, field supervision including a second night sift supervisory crew, QA/QC, safety, maintenance and protection of traffic, environmental monitoring, temporary facilities. Staff ranges from 50 to 60. Allowance for rental and operation of 12,000 SF off-site field office.
3	Fit-Out Amtrak BOH	Allowance for Amtrak's Back of House spaces.
4	Temporary Support of H Street Bridge	Temporary support for phased demoliton of track-supporting H St. bridge/tunnel is undesigned and not estimated. This would be a component of the phasing costs "below-the-line" in the estimate.
5	Remove and Replace Water Main	Support, remove & replace 12" water main E/W under H Street
6	Remove and Replace Sewer Main	Remove and replace 42" sewer main between H Street & Union Sta

Transportation

1	Track Installation	New track, ties drilled into track slab
2	Catenary Installation	Catenary (system replaced)
3	Signals and Communication System	Signals and Communication System
4	Control Tower	New control tower
5	Pepco Feeder	Pepco feeder relocation and Substation 25A

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Alternate D-Support of Excavation Option #5 Estimated Cost - Open Excavation

		Phase 1	Phase 2	Phase 3	Phase 4	Total
Substructure		$ 130,700,817	$ 206,911,014	$ 157,382,821	$ 371,537,368	**$ 866,532,019**
Superstructure		$ 152,254,982	$ 206,735,213	$ 154,839,920	$ 386,362,641	**$ 900,192,756**
Interiors		$ 40,735,893	$ 58,499,149	$ 35,377,498	$ 83,981,910	**$ 218,594,450**
Conveying		$ 6,693,154	$ 13,910,018	$ 17,081,958	$ 30,596,350	**$ 68,281,480**
Plumbing		$ 1,974,441	$ 2,424,908	$ 1,950,951	$ 4,159,132	**$ 10,509,431**
HVAC		$ 6,768,186	$ 9,558,816	$ 15,203,610	$ 12,604,381	**$ 44,134,992**
Fire Protection		$ 5,002,860	$ 8,136,348	$ 11,177,432	$ 16,110,618	**$ 40,427,259**
Electrical		$ 6,853,929	$ 10,852,054	$ 11,423,215	$ 27,415,716	**$ 56,544,915**
Concourse / Train Hall		$ 22,886,153	$ 34,704,661	$ 24,258,849	$ 51,159,756	**$ 133,009,419**
Parking / Bus		$ 4,939,120	$ 9,878,240	$ 24,668,510	$ 52,538,858	**$ 92,024,728**
Other		$ 60,563,311	$ 60,346,996	$ 59,035,616	$ 242,669,506	**$ 422,615,429**
Transportation		$ 14,268,000	$ 12,727,000	$ 9,409,080	$ 26,917,160	**$ 63,321,240**
Add Alternate: Top Down		$ -	$ -	$ -	$ -	**$ -**
Top Down General Conditions		$ -	$ -	$ -	$ -	**$ -**
Total Direct Cost		**$ 453,640,846**	**$ 634,684,418**	**$ 521,809,461**	**$ 1,306,053,395**	**$ 2,916,188,120**
Existing Facility Impact	5%	$ 22,682,042	$ 31,734,221	$ 26,090,473	$ 65,302,670	$ 145,809,406
Sub-Total		$ 476,322,888	$ 666,418,639	$ 547,899,934	$ 1,371,356,065	$ 3,061,997,526
Contingency	30%	$ 142,896,866	$ 199,925,592	$ 164,369,980	$ 411,406,820	$ 918,599,258
Sub-Total		$ 619,219,754	$ 866,344,231	$ 712,269,914	$ 1,782,762,885	$ 3,980,596,783
Contractor Overhead	10%	$ 61,921,975	$ 86,634,423	$ 71,226,991	$ 178,276,288	$ 398,059,678
Sub-Total		$ 681,141,730	$ 952,978,654	$ 783,496,905	$ 1,961,039,173	$ 4,378,656,462
Contractor Profit	5%	$ 34,057,086	$ 47,648,933	$ 39,174,845	$ 98,051,959	$ 218,932,823
Sub-Total		$ 715,198,816	$ 1,000,627,586	$ 822,671,750	$ 2,059,091,132	$ 4,597,589,285
Bonds & Insurances	2%	$ 14,303,976	$ 20,012,552	$ 16,453,435	$ 41,181,823	$ 91,951,786
Sub-Total		$ 729,502,793	$ 1,020,640,138	$ 839,125,185	$ 2,100,272,954	$ 4,689,541,071
Escalation - Phase 1	28.1%	$ 205,304,260				$ 205,304,260
Escalation - Phase 2	39.1%		$ 398,584,022			$ 398,584,022
Escalation - Phase 3	51.1%			$ 428,850,582		$ 428,850,582
Escalation - Phase 4	69.0%				$ 1,448,809,377	$ 1,448,809,377
Total Probable Bid Sum		**$ 934,807,053**	**$ 1,419,224,160**	**$ 1,267,975,767**	**$ 3,549,082,332**	**$ 7,171,089,312**

Note: 1. Escalation 3.5% Per Year
2. Assume Construction Starts in 6 Years
3. Construction Durations
A. Phase 1 2.42 Years
B. Phase 2 2.33 Years
C. Phase 3 2.50 Years
D. Phase 4 4.00 Years
4. Mid-Point of Construction
A. Phase 1 7.21 Years
B. Phase 2 9.58 Years
C. Phase 3 12.00 Years
D. Phase 4 15.25 Years

Estimate:	**Rough Order of Magnitude**
Design Documents Dated:	**Washington Union Station Expansion Project** **Concept Screening Report** **July 31, 2017**
Estimate Dated:	**December 17, 2018**
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Basis of Estimate and Estimating Assumptions:

1 The purpose of this document is to establish a rough order of magnitude estimate for the Washington Union Station - Station Expansion Project.

2 Estimate is based on Beyer Blinder Belle|Grimshaw design and design/engineering basis of 2016 and recent clarifications.

3 Estimate prices are based on April 2017 prevailing wage labor rates, material market prices, and equipment and materials thru 2017 applicable for work in Washington, DC, including generally practiced project indirects (general conditions), bonds and OH&P for a project of this scale for an "all-in" cost. Estimate includes phasing, 30% design contingency and time-value-of-money escalation.

4 Estimate includes a $150,000,000 allowance for AMTRAK fit-out of Back of House areas.

5 Existing facilities impact is calculated as 5% of the Total Direct Cost.

6 All work is assumed to be performed during 20 hour days (two shifts of 10 hours), 6 days a week. Premium or Over Time Hours are included.

7 Subcontractor's Overhead and Profit is included at 21% in the Direct Cost for each trade.

8 Cost of the project is estimated in "Today's" Dollars and only includes escalation.

9 Sales tax is not included.

10 Costs for hazardous material abatement or disposal are not included.

11 Premium cost of LEED certification is not included.

12 The estimate does not include any "soft cost" items, such as designer's or consultant's fees, reviews and reports, furniture, fixtures, equipment provided by the Owner, moving or any other Owner's expenses costs, etc.

13 Statement of Probable Cost

AECOM Estimating has no control over the cost of labor and materials, the general contractors' or any subcontractors' method of determining prices, or competitive bidding and market conditions. AECOM Estimating's opinion of the probable cost of construction is made on the basis of experience, qualifications, and best judgment of a professional consultant familiar with the construction industry. AECOM Estimating cannot and does not guarantee that proposals, bids or actual construction costs will not vary from this or subsequent estimates. AECOM Estimating has no control over the quality, completeness, intricacy, constructability or coordination of design documents. AECOM Estimating also has no control over the amount of funds available for the project. AECOM Estimating will not be responsible for any design revision costs incurred by the project in the event the estimate or bids are in excess of the budget.

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Hard Cost Exclusions	**Excluded from current design and current cost estimate (possibly included within 30% design contingency per subsequent decisions)**
Legacy Union Station	Estimate does not include cost related to the historic Union Station or its infrastructure
Burnham Place Upgrades	Utility upgrades (combined or stand-alone): steam, chilled water, centralized plant, sewer, water, gas, fire protection loops, power, tel-com service , stormwater retention, green roof, plaza structural upgrades, plaza finishes, plaza emergency access ramps & roadways (fire truck/ambulance), bollards, plaza lighting. Cost-sharing on structure & systems may be future decisions.
Work Calendar	Work calendar is estimated as 20 hour days (2 shifts x 10 Hrs) 6 day week. Work calendar may be limited due to public interest constraints about length of workday and noise.
Other Design Reviews	Excluded: the BuroHappold|Hensel Phelps Concept Feasibility Review of 2015 options and features not included in the BBB|Grimshaw design such as MEP in support of Burnham Place, Legacy Union Station, smoke evacuation zone separation walls and other features. The estimate design contingency is intended for follow-on design decisions.
Environmental Hazards	Estimate INCLUDES disposal fees for contaminated NON-hazardous; it excludes higher classifications in soils, ties, ballast or electrical insulation
Seismic Considerations	No special considerations for additional costs due to seismic constraints
Public Streets/Intersections	Reconstruction of public roads and traffic control beyond repairs for utility connections
Public Utilities	Upgrades to public gas/electrical/water/sewer systems beyond utility connections
Back of House for Amtrak	Up to $150 million allowance.
Retail Areas	No fit-out; "core & shell" utilities terminates at lease line walls. Kitchen exhaust undefined and not included.
Revenue Devices	Revenue machines and related controls
Police & Holding Cells	Break rooms, response ready rooms, holding cells, special MEP-telcom services
Bridges & Tunnels	K Street bridge and reconstruction of H Street tunnel
Security Features	Access control X-Ray devices, blast control construction of walls and floors (such as above standard embedded plates/rebars)
Greenway/WAMATA	Upgrades to WAMATA Greenway and access to new Union Station
Parking	Cost model for parking spaces and parking garage excludes upgrades for rental car fit-out, electric vehicle charging stations

Soft Cost Exclusions	**Excluded from Cost Estimate**
Design	Cost of completion of design processes. No Design-Build costs are included.
Owner Soft Costs	Program mgmt, CM or GC-oversight, Owner QA/QC costs, preconstruction testing, OCIP (if any), incentives, commissioning, legal, accounting and funding fees
Other Owner Indirects	Amtrak Force-Account work, temporary relocations and facilities, temporary parking, final moving costs

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Substructure

1	Track Removals	Remove track, traction power and signals included above in train systems estimate
2	Platform & Canopy Removals	Remove platform and substructure, canopies and columns based on LF of existing platforms
3	Slurry Wall-210'Deep & 62'Exposed Face	From El [51] existing grade to El [-158] rock socketed, covers the full outside perimeter of the jobsite, including tie-backs, permanent
4	Slurry Wall-210'Deep & 49'Exposed Face	measuring 210' deep slurry wall by LF 49' exposed face
5	Slurry Wall-100'Deep & 62'Exposed Face	measuring 100' deep slurry wall by LF 64' exposed face
6	Slurry Wall-100'Deep & 49'Exposed Face	measuring 100' deep slurry wall by LF 49' exposed face
7	Secant Pile Walls-64'Deep & 32'Exposed Face	Drilled secant piles walls cost projected on the basis of LF of secant wall averaging 64' deep
8	Sheet Pile Walls-100'Deep & 62'Exposed Face	From El [51] to El [-49] for temporary phasing support of adjacent tracks and ground water control, including tie-backs and subsequent removals
9	Sheet Pile Walls-100'Deep & 49'Exposed Face	same as above 100' piles with 49' exposed face (fewer tiebacks)
10	Sheet Pile Walls-80'Deep & 49'Exposed Face	80' piles with 49' exposed face (fewer tiebacks)
11	Sheet Pile Walls-64'Deep & 32'Exposed Face	64' piles with 32' exposed face (fewer tiebacks)
12	Dewatering Wells/EA	From El "0" dewatering wells are drilled during each east to west phase; estimate at 100ft OC on perimeter of phased cutoff walls. Install dewatering wells 24" dia, gravel, perf pipe and pump, 100' deep
13	Dewatering O&M/Pump/Mo	Per month per well O&M dewatering wells, maintain pumps, modify discharge lines
14	Drilled Shafts - 5ft Dia	Drilled shaft modeled to Elevation [-140] deep, calculated to LF cost. With Potomac Basal Gravel at approximately [-140], these shafts are estimated as unencased (slurry type) shafts.
15	Drilled Shafts - 6ft Dia	Drilled shaft modeled to Elevation [-140] deep, calculated to LF cost
16	Drilled Shafts - 9ft Dia	Drilled shaft modeled to Elevation [-140] deep, calculated to LF cost
17	Drilled Shafts - 10ft Dia	Drilled shaft modeled to Elevation [-140] deep, calculated to LF cost

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18	Drilled Shafts - 12ft Dia	Drilled shaft modeled to Elevation [-192] deep including a rock socket and fully steel encased to metamorphic rock due to soil conditions at that depth, calculated to a LF cost. Metamorphic rock at approx El [-158 to -160] means the rock socket will be approximately 35 feet deep.
19	Pile Test Program	One (1) 9' dia. 140' depth test pile, located offsite prior to bid to provide contractor information. Extra costs will be offset by less risk for bidders. Ten (10) Production piles with Osterberg tests. Broken down into (4) 5' Dia., (4) 9' Dia., (2) 12' Dia. to corresponding depths and split evenly across the phases.
20	Mass Excav Open Cut	Open cut from El [51] to approx [-10] subgrade. Two alternatives: remove spoils by truck or by train. Trucks loaded by clamshell; gondolas loaded by conveyors . No direct truck loading from deeper levels, extra handling required.
21	Export via Train + Truck	Gondolas loaded by conveyors and railcar loader after excavation spoils are located to one end due to limited site access using clamshell. Cost includes tipping fees for contaminated non-hazardous soil characterization
22	Slab on Grade 4-1/2ft	Mud slab, reinforced conc slab 4.5' thick. Site access limitations increases cost due to pumping concrete from the street side redi-mix trucks into the pit, then horizontally, then redistributed to the pour by a concrete conveyor (or additional pump truck at lower level)
23	SOG 3-1/2 ft	Similar but 3.5' thick
24	SOG 2-1/2 ft	Similar but 2.5' thick
25	Mud Slab only	For temporary (or buried) work surface
26	Track Support Columns	Reinforced concrete columns from drilled shaft to bottom of hammerhead, 8ft wide x 3ft thick x various lengths depending upon design. Rebar ties in to embedded rebar in the drilled shafts
27	Super Columns	Overbuild deck support steel columns bearing on drilled shaft foundations at about El [-10] to [55], including anchor bolts and base plate. Steel at 503 lbs/LF, concrete encased into a 28" square column
28	Below Grade Liner Wall for Slurry/Secant Wall	Single face 12" thick wall abutting the slurry wall as a finished liner wall, including waterproofing membrane, and painted finish one side
29	Below Grade Liner Wall for Sheet Pile Wall	8" thick liner wall & flute infill abutting the 12" thick interior wall, including waterproofing membrane, and painted finish one side
30	Structural Slabs	12" reinforced structural slabs at interim levels; for simplicity, no structural concrete beams are included (possible design development)

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Superstructure

1	Hammerheads	Estimated at 34' wide 5' deep to 7.5' deep x 3' thick, heavily reinforced; for the few smaller hammerheads, cost adjustments will be made
2	Super Columns	Continue higher from El [55] to support the trusses under the overbuild deck, concrete encased
3	Track Support	Track invert slab at 28' wide x 3' thick, supported by six precast bulb tee beams longitudinally between hammerheads. Also includes a drainage gutter.
4	Platform Support	Platform slab 30' wide 2' deep with tactile warning strip each side and a slab finish (terazzo priced), supported by 2' thick support walls 10' high running between the hammerheads. Also, a wall approx 18' high between adjacent hammerheads at approx 32' OC.
5	Type A Steel Trusses	3,000 LBS/LF + 20% for Connections (Supporting Buildings and Cars). Trusses support the overhead deck. Truss weights/LF vary between. Model cost is based on tonnage furnished and erected
6	Type B Steel Trusses	2,700 LBS/LF + 20% for Connections (Supporting Buildings). Trusses support the overhead deck. Truss weights/LF vary between. Model cost is based on tonnage furnished and erected
7	Type C Steel Trusses	900 LBS/LF + 20% for Connections (Supporting Plaza Only). Trusses support the overhead deck. Truss weights/LF vary between. Model cost is based on tonnage furnished and erected
8	Overbuild Deck	Cost model includes a 6" composite (shear studs and reinforcing) on metal deck, supported on bar joists between the trusses (due to height and complexity below), fireproofed; 10 bar joists per 30x30 grid. Same problem with concrete (limited site access, double handling or pumping). Slab may be too thin.
9	Overbuild Deck Alt 1	12" reinforced structural slab; for simplicity, no structural concrete beams are included (relying on trusses). Formwork difficult due height and irregular slab elevations below. Slab may still be too thin for firetruck/ambulance lanes or possible bus lanes on plaza.
10	Overbuild Deck Alt 2	2-1/2 ft thick Structural Concrete slab stiffened to protect from overbuild progressive collapse. Formwork difficult due to weight of wet concrete and irregular slab elevations below.
11	Smaller Column	Cost model based on W18x114 concrete encased for misc small
12	Abv Grade Exterior Wall	Exterior wall (finished both sides) comprised 40% of precast architectural granite faced panels 40% glass and frame and 20% architectural precast brick faced panels, with 60% of the inside face painted
13	Abv Grade Ext Wall Alt	Exterior wall spider-pin cable truss-braced structurally glazed curtain wall

14	Interior CIP Walls	Double face finish on interior CIP walls 12" thick
15	Central Concourse	Overhead structure and roof including columns long span trusses and joist girders to frame roof, metal deck, fireproofing, 30% insulated skylights, EPDM membrane roofing, smoke vents, fascia with drains
16	Skylights	Skylight structures through Overbuild Deck; size varies on plans and sections. Estimating custom skylights at 2,400 SF each
17	Entrances & Canopies	Cantilevered or cable stayed canopies; revolving doors

Interiors

1	Platform to Overbuild Deck Stairs	62 VLF. Metal pan stairs, railings per flight
2	Platform to Overbuild Deck Stairs	33 VLF. Metal pan stairs, railings per flight
3	Concourse to Higher Platform Stairs	23 VLF. Metal pan stairs, railings per flight
4	Concourse to Lower Platform Stairs	21 VLF. Metal pan stairs, railings per flight
5	H St Conc to Lower Level Stairs	16 VLF. Metal pan stairs, railings per flight
6	Mid Level Parking to Concourse Stairs	15 VLF. Metal pan stairs, railings per flight
7	Street to H St Concourse Stairs	12 VLF. Metal pan stairs, railings per flight
8	Lower to Mid Level Parking Stairs	12 VLF. Metal pan stairs, railings per flight
9	Train Platforms	Terrazzo and Tactile Warning Strip included above with train platform structure; PIDS and safety electronics included in Electrical. Allow for undefined furnishings, column covers, soffits, artwork
10	Public Concourse	Interior finishes including walls and wall finishes, framing for large video displays, ceilings, column cover finishes, flooring, artwork based on a current large scale train station project
11	Stormwater Cisterns	Four total at corners along outside wall, designed to gravity drain to city stormwater system. Total 1.63 million gallons into four waterproofed CIP tanks approx 20'h X 30'w X 90' long set at the Concourse level, wiers to limit flow.

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Conveying

1	Platform to Overbuild Deck Escalator	SS skirt, 120 fpm, 62 VLF. Cost includes fab/install/temporary service/extended warranty, structural pit, mechanical in the pit, electrical power, BMS/FA detectors and interface
2	Overbuild Deck to Bus Terminal Escalator	Glass, 100 fpm, 35 VLF. Cost includes fab/install/temporary service/extended warranty, structural pit, mechanical in the pit, electrical power, BMS/FA detectors and interface
3	Concourse to High Track Platform Escalator	Glass, 100 fpm, 33 VLF. Cost includes fab/install/temporary service/extended warranty, structural pit, mechanical in the pit, electrical power, BMS/FA detectors and interface
4	Concourse to Low Track Platform Escalator	Glass, 100 fpm, 21 VLF. Cost includes fab/install/temporary service/extended warranty, structural pit, mechanical in the pit, electrical power, BMS/FA detectors and interface
5	Concourse to Mid-Upper Level Escalator	Glass, 100 fpm, 21 VLF. Cost includes fab/install/temporary service/extended warranty, structural pit, mechanical in the pit, electrical power, BMS/FA detectors and interface
6	LL Garage to Overbuild Deck Elevator	5-Stop, 350 fpm, 92 VLF Elevator. Based on current cost for transit quality, based on vertical lineal foot (rise), speed and per each: high level transportaton system quality. Addtionally includes elevator shaft wall or masonry wall, elevator pit, MEP services and BMS/FA interface
7	LL Garage to Track High Platform Elevator	4-Stop, 100 fpm, 60 VLF Elevator. Based on current cost for transit quality, based on vertical lineal foot (rise), speed and per each: high level transportaton system quality. Addtionally includes elevator shaft wall or masonry wall, elevator pit, MEP services and BMS/FA interface
8	LL Garage to Low Track Plaform Elevator	4-Stop, 100 fpm, 48 VLF Elevator. Based on current cost for transit quality, based on vertical lineal foot (rise), speed and per each: high level transportaton system quality. Addtionally includes elevator shaft wall or masonry wall, elevator pit, MEP services and BMS/FA interface
9	LL Garage to Concourse 3-Stop Elevator	3-Stop, 100 fpm, 28 VLF Elevator. Based on current cost for transit quality, based on vertical lineal foot (rise), speed and per each: high level transportaton system quality. Addtionally includes elevator shaft wall or masonry wall, elevator pit, MEP services and BMS/FA interface
10	Middle Lvl Garage to Concourse 2-Stop Elevator	2-Stop, 100 fpm, 15 VLF Elevator. Based on current cost for transit quality, based on vertical lineal foot (rise), speed and per each: high level transportaton system quality. Addtionally includes elevator shaft wall or masonry wall, elevator pit, MEP services and BMS/FA interface

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11	LL Gar to Street 3-Stop 6 ton freight Elevator	3-Stop 6 ton freight, 50 fpm, 28 VLF Elevator. Based on current cost for transit quality, based on vertical lineal foot (rise), speed and per each: high level transportaton system quality. Addtionally includes elevator shaft wall or masonry wall, elevator pit, MEP services and BMS/FA interface
12	LL Gar to Street 2-Stop 10 ton freight Elevator	2-Stop 10 ton freight, 50 fpm, 28 VLF Elevator. Based on current cost for transit quality, based on vertical lineal foot (rise), speed and per each: high level transportaton system quality. Addtionally includes elevator shaft wall or masonry wall, elevator pit, MEP services and BMS/FA interface
13	LL Gar to Street 2-Stop 20T Compactor Lift	2-Stop 20T compactor lift, 30 fpm, 28 VLF Elevator. Based on current cost for transit quality, based on vertical lineal foot (rise), speed and per each: high level transportaton system quality. Addtionally includes elevator shaft wall or masonry wall, elevator pit, MEP services and BMS/FA interface

Plumbing

1	BOH & Retail White Box	Sewer and water to space perimeter, no fit-out
2	Platforms & Corridors	Escalator/elevator and floor drains, water for passenger services
3	Train Service Utilities	Drains, water, pneumatic air and stations for train services
4	Stormwater Detention	Overbuild plaza drains and piping to cisterns (priced above), total area of the plaza excluding the H-Street bridge. Cost includes heat tracing at the drains and partial pipe insulation.

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HVAC

1	Ventilation Smoke Evac	Emergency smoke evacuation of train shed estimated as 25 ea 250,000 CFM 250 hp fans, silencers, hangers, testing & balancing
2	Vent Diesel Platforms	Conventional ventilation at 12 ACH of unconditioned spaces in train shed; train shed exterior is open to the East, West and North
3	Ventilation Concourses & Platforms	Outside air ventilation and background radiant heating of semi-conditioned concourses and platforms (not cooled).
4	Ventilation Parking	Conventional ventilation of underground car parking and taxi areas at 0.75 CFM/SF plus CO2 & NO monitoring
5	BOH White Box Service	Hydronic piping to BOH & undeveloped Amtrak spaces including temporary HW fan coil units to prevent freezing
6	HVAC Energy System	Heating & cooling plant: heat and cooling for conditioned spaces. Air handlers, hydronic piping and air distribution included in "HVAC for tempered areas"
7	HVAC in Tempered Areas	Design incomplete in regard to tempered areas, includes Amtrak waiting areas; cost model for heating / cooling / hydronic piping / ductwork / BMS

Fire Protection

1	FP Service	Main fire pumps assembly 2 diesel 2 electric redundant systems
2	FP Fire Standpipe	Standpipe (wet & dry) and hose assembly serves all Gross Square Feet.
3	FP Dry System	Dry system fire for possible freezing areas garage/platform and covered trainways; possible mist heads some areas
4	FP Wet System	Wet system for temperature modified areas, BOH, retail, Amtrak waiting area
5	FP Clean Agent System	Inert gas FP system for electrical switchgear & xfer switch rooms
6	FP Pre-Action AFFF	Aqueous Film-Forming Foam system for emergency genset rooms

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Electrical

1	HV & Main Panels	Service and Power Distribution (Medium & Low Voltage)
2	Emergency Power	Assume 6 ea - 2.5 MVA Medium Voltage Em. Generators - 2.5 MVA x 6 = 15 MVA, tanks, Tier 4F Emmision (per Generator), MV ATS switches
3	Wayside Power	Wayside 480 V panelboards for train use, 16 ea
4	Grounding	Grounding system
5	Tenants	Power to future tenants, Amtrak BOH and Retail areas
6	Smoke Evac Power	Power to 25 ea, 250 hp smoke evacuation fans
7	Temporary Light & Power	Temporary lighting and power during construction phases
8	Security	Security Access Control/Intercom/CCTV
9	Fire Alarm	Main FA panels and balance of service
10	Overcurrent Protection	OP engineering required of electrical contractor, coordination studies
11	Commissioning	Commissioning and testing of electrical system

Concourse / Train Hall

1	Electrical Service	Main service, power distribution and local panels
2	Electrical Low Voltage	Under 5 kV power distribution panels, power feeds to mech systms
3	Electrical Lighting	Lighting and lighting control systems
4	Electrical Fire Alarm	Fire Alarm system
5	Electrical Communications	Communications, emergency call stations, CCTV, security & access control, wireless modems
6	Electrical Video/PIDS	Passenger Information Displays (PIDS), large video displays

Parking Areas / Buses

1	Underground Parking	Striping, signs, parking bumpers, taxi finishes, entrance and control systems
2	Plumbing - Underground Parking	Floor & ramp drains, sump pits, sewage ejectors, service water for garage and taxi areas
3	Electrical - Underground Parking	Electrical for parking and taxi areas, all incusive
4	Overbuild Deck Parking	Based on comparables: full facility cost per car for bus garage
5	Bus Waiting Area	Based on comparables and scaled larger: full cost per bus + waiting area
6	Parking Garage Demo	Phased demolition of Union Staton Parking Garage per cubic foot

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Other

1	Site Access Support	Clear site, pave access road, erect and operate a lufting tower crane (Favco 760), dismantle crane, demo crane support pad and restore site (fixed costs pro-rated over a 5 year life cycle)
2	General Conditions	Staff including administration, project engineering, schedule and cost controls, field supervision including a second night sift supervisory crew, QA/QC, safety, maintenance and protection of traffic, environmental monitoring, temporary facilities. Staff ranges from 50 to 60. Allowance for rental and operation of 12,000 SF off-site field office.
3	Fit-Out Amtrak BOH	Allowance for Amtrak's Back of House spaces.
4	Temporary Support of H Street Bridge	Temporary support for phased demoliton of track-supporting H St. bridge/tunnel is undesigned and not estimated. This would be a component of the phasing costs "below-the-line" in the estimate.
5	Remove and Replace Water Main	Support, remove & replace 12" water main E/W under H Street
6	Remove and Replace Sewer Main	Remove and replace 42" sewer main between H Street & Union Sta

Transportation

1	Track Installation	New track, ties drilled into track slab
2	Catenary Installation	Catenary (system replaced)
3	Signals and Communication System	Signals and Communication System
4	Control Tower	New control tower
5	Pepco Feeder	Pepco feeder relocation and Substation 25A

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Alternate E-Support of Excavation Option #1 Estimated Cost - Open Excavation

		Phase 1	Phase 2	Phase 3	Phase 4	Total
Substructure		$ 142,381,934	$ 309,033,226	$ 194,481,335	$ 521,768,905	**$ 1,167,665,401**
Superstructure		$ 152,254,982	$ 206,735,618	$ 154,839,920	$ 386,362,641	**$ 900,193,161**
Interiors		$ 40,735,893	$ 58,499,339	$ 35,492,568	$ 84,096,979	**$ 218,824,779**
Conveying		$ 6,693,154	$ 13,910,018	$ 30,931,046	$ 43,243,728	**$ 94,777,947**
Plumbing		$ 1,974,441	$ 2,424,914	$ 1,950,951	$ 4,159,132	**$ 10,509,437**
HVAC		$ 6,768,186	$ 9,558,825	$ 15,326,553	$ 12,973,211	**$ 44,626,776**
Fire Protection		$ 5,002,860	$ 8,136,360	$ 12,590,027	$ 20,348,404	**$ 46,077,651**
Electrical		$ 5,140,447	$ 8,567,411	$ 11,994,376	$ 30,842,681	**$ 56,544,915**
Concourse / Train Hall		$ 22,886,153	$ 34,704,844	$ 24,258,849	$ 51,159,756	**$ 133,009,603**
Parking / Bus		$ 577,000	$ 1,154,000	$ 15,407,197	$ 46,565,518	**$ 63,703,715**
Other		$ 95,397,434	$ 107,417,893	$ 97,182,390	$ 154,192,937	**$ 454,190,654**
Transportation		$ 14,268,000	$ 12,727,000	$ 9,409,080	$ 26,917,160	**$ 63,321,240**
Add Alternate: Top Down		$ -	$ -	$ -	$ -	**$ -**
Top Down General Conditions		$ -	$ -	$ -	$ -	**$ -**
Total Direct Cost		**$ 494,080,484**	**$ 772,869,449**	**$ 603,864,293**	**$ 1,382,631,052**	**$ 3,253,445,278**
Existing Facility Impact	5%	$ 24,704,024	$ 38,643,472	$ 30,193,215	$ 69,131,553	$ 162,672,264
Sub-Total		$ 518,784,509	$ 811,512,921	$ 634,057,507	$ 1,451,762,605	$ 3,416,117,542
Contingency	30%	$ 155,635,353	$ 243,453,876	$ 190,217,252	$ 435,528,782	$ 1,024,835,263
Sub-Total		$ 674,419,861	$ 1,054,966,797	$ 824,274,760	$ 1,887,291,387	$ 4,440,952,805
Contractor Overhead	10%	$ 67,441,986	$ 105,496,680	$ 82,427,476	$ 188,729,139	$ 444,095,280
Sub-Total		$ 741,861,847	$ 1,160,463,477	$ 906,702,236	$ 2,076,020,525	$ 4,885,048,085
Contractor Profit	5%	$ 37,093,092	$ 58,023,174	$ 45,335,112	$ 103,801,026	$ 244,252,404
Sub-Total		$ 778,954,940	$ 1,218,486,651	$ 952,037,347	$ 2,179,821,552	$ 5,129,300,489
Bonds & Insurances	2%	$ 15,579,099	$ 24,369,733	$ 19,040,747	$ 43,596,431	$ 102,586,010
Sub-Total		$ 794,534,038	$ 1,242,856,384	$ 971,078,094	$ 2,223,417,983	$ 5,231,886,499
Escalation - Phase 1	28.1%	$ 223,606,029				$ 223,606,029
Escalation - Phase 2	40.7%		$ 505,296,521			$ 505,296,521
Escalation - Phase 3	55.9%			$ 543,297,757		$ 543,297,757
Escalation - Phase 4	78.7%				$ 1,749,773,690	$ 1,749,773,690
Total Probable Bid Sum		**$ 1,018,140,067**	**$ 1,748,152,905**	**$ 1,514,375,851**	**$ 3,973,191,673**	**$ 8,253,860,496**

Note:
1. Escalation 3.5% Per Year
2. Assume Construction Starts in 6 Years
3. Construction Durations
   - A. Phase 1 2.42 Years
   - B. Phase 2 3.00 Years
   - C. Phase 3 3.00 Years
   - D. Phase 4 4.92 Years
4. Mid-Point of Construction
   - A. Phase 1 7.21 Years
   - B. Phase 2 9.92 Years
   - C. Phase 3 12.92 Years
   - D. Phase 4 16.88 Years

Attachment 2 – ROM Cost Estimate for Alternative A-C with Private Air-rights Deck removed.[8]

To develop this ROM estimate, Amtrak determined that the best approach was to modify the existing combined estimate by removing cost associated with the private air-rights deck.

This attachment consists of excerpts from the source document. Materials not included include front matter (Cover and Table of Contents) and several Gantt charts detailing the schedule.[9]

[8] Source: Amtrak. January 2020. *Washington Union Station Terminal Infrastructure Project. Air-Rights Analysis.*

[9] In-text references to the charts were removed, for clarity. These small, non-substantive edits are marked by ellipses in brackets.

1. Introduction

AECOM previously performed a Constructability & Cost Analysis of five Alternatives for the Station Expansion Program (SEP), Alternatives A through E, followed by a sixth alternative, Alternative A-C, which is a combination of Alternatives A and C. This is now the potentially preferred alternative and as such has been selected for the Air-rights cost evaluation. The work involved with all these Alternatives includes major construction or upgrade components of the Terminal and the Station such as complete reconfiguration of the track alignment, new platforms, new train hall, construction of new parking facilities and a below grade, i.e. track level, concourse along with upgrades to many different facilities within the Terminal. These Alternatives all include the construction of an overbuild deck to support the private Air-rights developer of Burnham Place. The work to support the SEP/TI and the Air-rights Overbuild includes the construction of large diameter drilled shafts, heavy columns, large depth long span steel trusses, the overbuild deck, mechanical/HVAC, electrical and plumbing systems. After the initial analysis of the alternatives AECOM was asked to develop a rough order of magnitude (ROM) estimate for the portion of the costs associated with the construction of the overbuild deck to support the Private Air Rights Developer.

2. Air Rights Breakdown

In order to develop the ROM estimate for the portion of the overbuild deck/Private Air Rights Developer it was determined that the best approach was to modify an existing SEP alternative to remove the Air Rights scope of work. The overbuild deck areas that will still be included in the estimate would be South of H Street for the parking garage and ramp areas. Once the scope items were identified a new SEP estimate and schedule was developed. The scope items identified are in four major categories of this project; which are Superstructure, Substructure, Interiors/Conveying/MEP, and General Conditions.

The preferred Alternative to perform this study on is Alternative A-C, SOE Option #2; which has the parking garage in the South West corner of the project and no below grade parking, as shown in figure 2.1 and 2.2 below. This alternative includes an overbuild deck of approximately 805,000 SF which includes 118,600 SF foot print for the parking garage & bus facility. The modified alternative would remove all work above the platform level except for the parking garage / bus facility and ramp areas. The highlighted blue area in figure 2.1 demonstrates the assumed areas of the Air Rights Deck that will be removed or exposed to the sky and figure 2.3 illustrates the new section view.

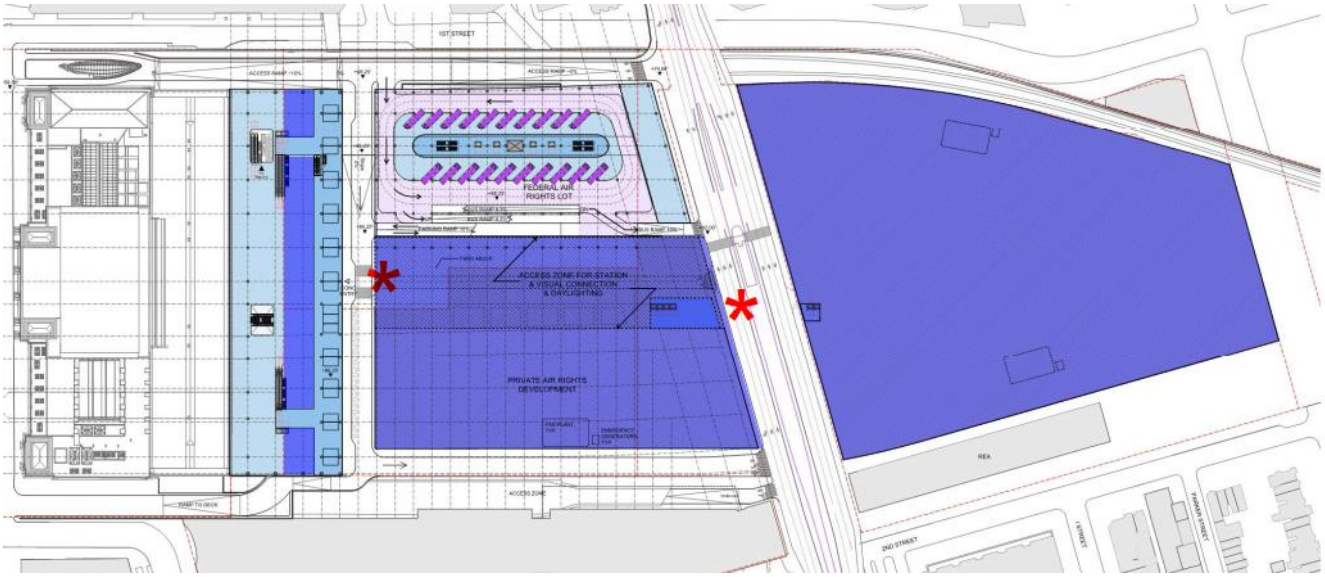


Figure 2.1 – ALT A-C Deck Level Plan

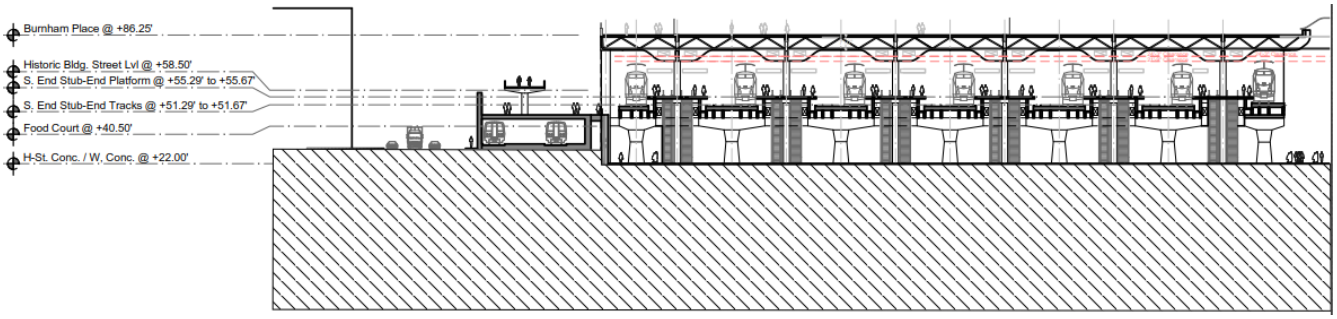


Figure 2.2 – ALT A-C Original Design Section View

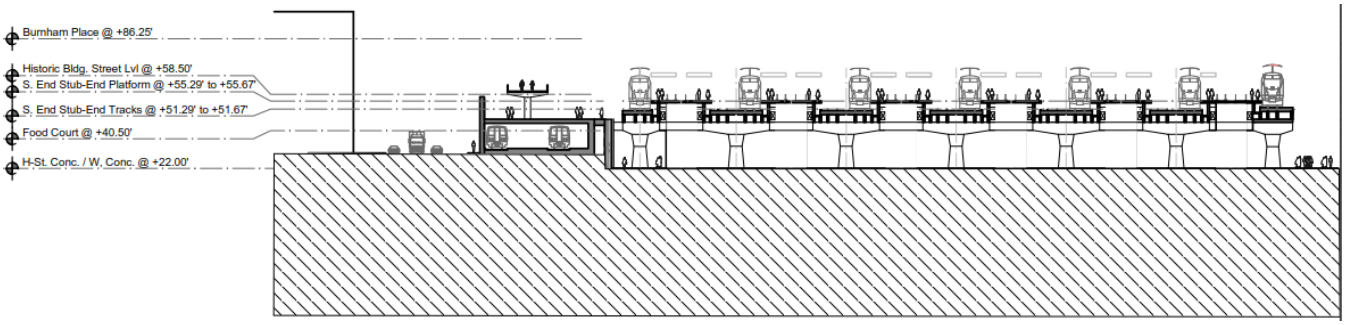


Figure 2.3 – ALT A-C No Overbuild Deck Design Section View

a. Substructure

The largest impact to cost for the modified alternative is in the Substructure. The modified alternative that affects the Substructure items would be all the Drilled Shafts, which included 5 ft, 6 ft, 9 ft, 10 ft and 12 ft diameters, and the Super Columns. Theses shafts were designed to support the super columns, overbuild deck, and portions of the concourse level and the platforms. With the decrease of the of overbuild deck the load that these shafts will have to support has been greatly reduced, which in return reduces the number of shafts needed throughout the station. Since the parking garage / bus facility and ramp areas are all South of H Street, there is no Overbuild Deck construction North of H street. Therefore, North of H street only consists of 5 ft Diameter Shafts to support the track. South of H street includes all shafts needed to support the track and Overbuild deck where needed for the parking garage / bus facility and ramp areas. Table 2b.1 below shows all the Substructure elements that have been modified due to the elimination of the Private Air Rights Developer. As shown here, 43 additional 5 ft Diameter shafts were added to support the track, due to the removal of 12 ft diameter shafts that were outside of the parking garage / bus facility and ramp areas. Figure 2.a.1 is a visual imagine of the assumed drill shafts with the removal of the Air Rights deck other than the parking garage / bus facility and ramp areas. The parking garage / bus facility and ramp areas area shown in the hatched area, while the drilled shafts are demonstrated throughout; X's shows the drilled shafts that will not be constructed.

Construction Element	Initial A-C Design	A-C Design with NO Air Rights	Delta	Units
Drilled Shafts – 5 ft. diameter	324	367	43	EA
Drilled Shafts – 6 ft. diameter	410	115	-295	EA
Drilled Shafts – 9 ft. diameter	26	26	0	EA
Drilled Shafts – 10 ft. diameter	50	0	-50	EA
Drilled Shafts – 12 ft. diameter	73	49	-24	EA
Super Columns	16,176	5,116	-11,060	VLF

Table 2a.1 – Substructure Element Comparisons

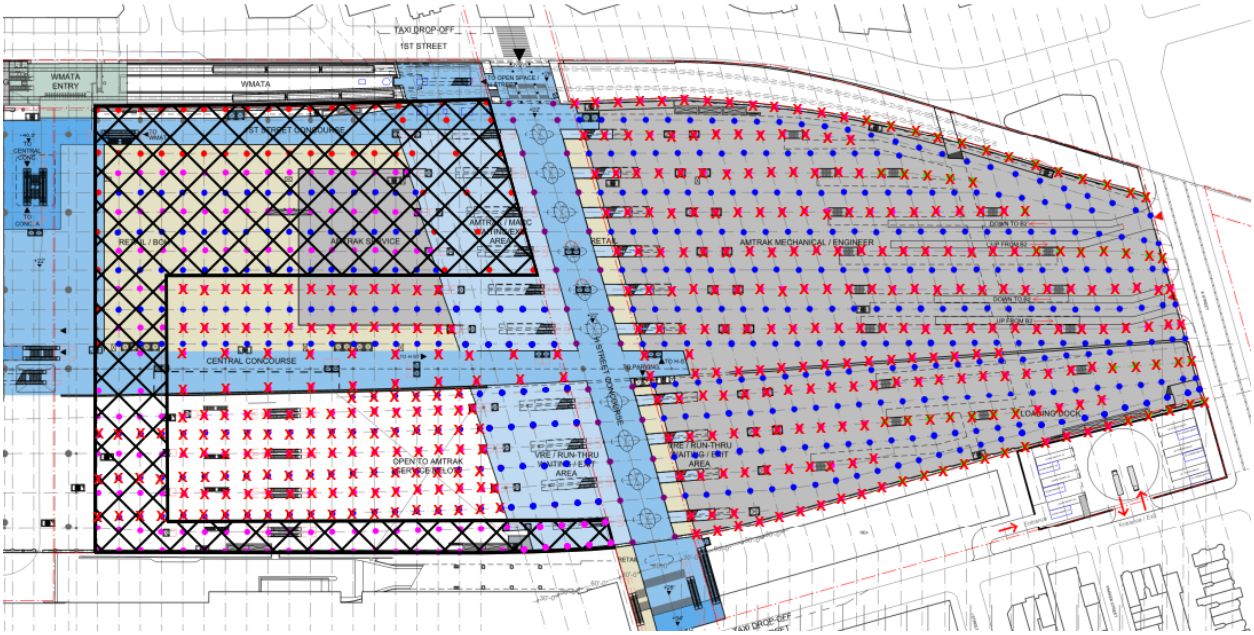


Figure 2a.1 – ALT A-C Air Rights Removed Column Layout

b. Superstructure

Superstructure has a major impact in cost for the modified Air Rights Alternative. The items that are affected by these modifications are the overbuild deck, steel trusses, super columns and above grade exterior wall. It was assumed that the only part of the overbuild deck that will be constructed will be the area for the parking garage / bus facility and ramp areas. As a result of this assumption, the majority of the steel trusses, super columns and above grade exterior wall were removed from the project. Table 2a.1 below shows all the Superstructure elements that have been modified due to the elimination of the Private Air Rights Developer.

Construction Element	Initial Design	Design with NO Air Rights	Delta	Units
Super Columns	533	164	-369	EA
Steel Trusses	77,313	8,404	-68,909	Tons
Overbuild Deck	805,396	207,180	-598,216	SF
Above Grade Exterior Wall	116,074	57,564	-58,510	SF

Table 2b.1 – Superstructure Element Comparisons

c. Interiors, Conveying & MEP Items

In addition to the major categories of Superstructure and Substructure, there are also some elimination or reductions in the Interiors, Conveying and MEP work areas. In the initial design there were a total of four (4) interior stairs that went from the platform to the overbuild deck, which is assumed not needed due to the removal of the major overbuild deck. Additionally, for conveying services, there were twenty-five (25) escalators from the platform to the overbuild deck, which are assumed not needed, other than the four (4) in Phase 4, when removing the Air Rights work. The HVAC work involved with the platform areas are also assumed to be removed, which consists of ventilation smoke evacuation of the train shed. There is also a reduction in fire protection work involved. The dry system fire for possible freezing areas of the garage/platform and covered trainways are reduced to the area of the parking garage, while this directly reduces the standpipe. Table 2c.1 below shows all the

Interiors, Conveying and MEP Construction elements that have been modified due to the elimination of the Private Air Rights Developer.

Construction Element	Initial Design	Design with NO Air Rights	Delta	Units
Interior: Platform to Overbuild Deck Stairs – 62 VLF	2	0	-2	EA
Interior: Platform to Overbuild Deck Stairs – 33 VLF	2	0	-2	EA
Conveying: Platform to Overbuild Deck Escalator	25	12	-13	EA
HVAC: Ventilation Smoke Evac	1	0.45	-0.55	LS
Fire Protection: Fire Standpipe	1,313,150	1,169,882	-143,268	SF
Fire Protection: Dry System	350,448	207,180	-143,268	SF

Table 2c.1 – Substructure Element Comparisons

3. Construction Comparison

a. Alternative A-C – Air Rights included in the work

For the original schedule with the construction of the full Overbuild Deck, excavation and drilled shafts were the longest durations and driving factors. The excavation of each phase must be done at least 1 month prior to the completion of the drilled shafts, although for Phases 2 and 3 the drilled shafts end a bit further out since the quantity and durations are much longer. The successors to these items roughly followed the logic that the drilled shafts must be completed before the following items. For example, all the drilled shafts must be completed before the construction of the bottom pressure slab can be completed. Therefore, the bottom pressure slab ends 1 month behind the drilled shafts. Most of the bottom pressure slab operations are longer than that, so the construction of this item does not outpace the drilled shafts. The hammer heads and steel columns follow a similar logic, which results in a somewhat parallel schedule with multiple operations happening at once.

Phase 1 is slightly different from the other three phases since it occurs in the non-excavated area. The construction of the non-excavated is performed first. The drilled shafts are completed in this area, while the other construction begins for the rest of the phase; such as secant and sheet pile walls. Once the drilled shafts are completed in the non-excavated area, the columns, platforms, and overbuild deck can get constructed; while the rest of the phase is completing the foundation.

The schedule for that approach [...] generates a duration of 3798 days, or 10 years, 5 months.

b. Alternative A-C – Air Rights removed from the work

The removal of the Air Rights from the work, and assuming that the Overbuild Deck will only include the construction of the parking garage / bus facility and ramp areas, decreases the overall schedule duration by roughly 1 year. Since the drilled shafts are reduced, the driving factor is mainly the excavation of each phase. Although the correlation between the excavation and drilled shafts remain the same, with the excavation must ending 1 month prior to the drilled shafts. Similarly, the bottom pressure slab ends 1 month behind the drilled shafts, although the bottom pressure slab operations were increased due to the duration of this items being longer than the reduced drilled shafts.

A driving factor in this schedule is the construction of the hammer heads & track support columns. These hammer heads & track support columns did not get reduced with the removal of the air rights. In fact, we assumed that 43 of these items had to be added due to the reduction of the other shafts, since there still must be support for the tracks. This construction item cannot start until after the bottom pressure slabs have started, and the platforms cannot start until the hammer heads & track support columns have started. The Overbuild Deck is, therefore, removed from the critical path of the schedule since it is only being constructed where needed on the south side of H street.

Phase 1 in this schedule follows a similar logic to the other phases. This is because most of the drilled shafts needed for the Overbuild Deck are removed. Since there was less construction in this area it would not make sense to push this out in front of the rest of the phase. [,,,] that work would generate a duration of 3414 days, or approximately 9 years, 4 months.

c. General Conditions & Escalation

Due to the removal of the private Air Rights and the work associated with the Overbuild Deck construction, the overall schedule will decrease. Initially. The schedule of the Alternative A-C SOE Option #2 where the air-rights work was included had a duration of 10.42 years. Assuming the reductions as stated above, the schedule with a significantly smaller Overbuild Deck work would be approximately 9.42 years, which is a reduction of approximately 1 year. due to the reduction of drilled shafts and reduction in the Overbuild Deck construction.

That decrease in project duration costs of the General Conditions and escalation costs assumed in the project. The General Conditions cost includes the staff that could range from 50 to 60 people, which consists of administration, project engineering, schedule and cost controls, field supervision including a second night sift supervisory crew, QA/QC, safety, maintenance and protection of traffic, environmental monitoring, temporary facilities.

Figure 2d.3 below gives a summary breakdown of each major cost categories and escalation costs for this project.

AECOM

Project: Washington Union Station - Station Expansion Project
Alternate A-C-Support of Excavation Option #2 - Air Rights Removal
Location: Washington, DC
Client: AMTRAK
Date: 1/17/2020
Rough Order of Magnitude

Alternate A-C-Support of Excavation Option #2 - Air Rights Removal Estimated Cost - Open Excavation

		Phase 1	Phase 2	Phase 3	Phase 4	Total
Substructure		$ 100,503,120	$ 168,206,582	$ 91,780,426	$ 265,094,439	**$ 625,584,567**
Superstructure		$ 83,682,396	$ 63,955,451	$ 71,746,446	$ 191,617,428	**$ 411,001,721**
Interiors		$ 40,830,713	$ 58,456,969	$ 35,394,105	$ 83,823,222	**$ 218,505,009**
Conveying		$ 9,457,471	$ 9,302,823	$ 7,993,211	$ 15,450,768	**$ 42,204,273**
Plumbing		$ 1,974,441	$ 2,424,908	$ 1,950,951	$ 4,159,132	**$ 10,509,431**
HVAC		$ 4,800,616	$ 5,265,936	$ 12,239,172	$ 11,581,347	**$ 33,887,071**
Fire Protection		$ 4,833,465	$ 7,473,292	$ 9,271,069	$ 12,524,601	**$ 34,102,427**
Electrical		$ 9,138,572	$ 13,136,697	$ 9,138,572	$ 25,131,073	**$ 56,544,915**
Concourse / Train Hall		$ 22,886,153	$ 34,704,661	$ 24,258,849	$ 51,159,756	**$ 133,009,419**
Parking / Bus		$ -	$ -	$ 54,033,291	$ 75,663,001	**$ 129,696,293**
Other		$ 89,082,389	$ 97,313,821	$ 84,552,300	$ 123,880,721	**$ 394,829,231**
Transportation		$ 14,268,000	$ 12,727,000	$ 9,409,080	$ 26,917,160	**$ 63,321,240**
Total Direct Cost		**$ 381,457,336**	**$ 472,968,140**	**$ 411,767,473**	**$ 887,002,648**	**$ 2,153,195,597**
Existing Facility Impact	5%	$ 19,072,867	$ 23,648,407	$ 20,588,374	$ 44,350,132	$ 107,659,780
Sub-Total		$ 400,530,203	$ 496,616,547	$ 432,355,846	$ 931,352,781	$ 2,260,855,377
Contingency	30%	$ 120,159,061	$ 148,984,964	$ 129,706,754	$ 279,405,834	$ 678,256,613
Sub-Total		$ 520,689,264	$ 645,601,512	$ 562,062,600	$ 1,210,758,615	$ 2,939,111,990
Contractor Overhead	10%	$ 52,068,926	$ 64,560,151	$ 56,206,260	$ 121,075,861	$ 293,911,199
Sub-Total		$ 572,758,190	$ 710,161,663	$ 618,268,860	$ 1,331,834,476	$ 3,233,023,189
Contractor Profit	5%	$ 28,637,910	$ 35,508,083	$ 30,913,443	$ 66,591,724	$ 161,651,159
Sub-Total		$ 601,396,100	$ 745,669,746	$ 649,182,303	$ 1,398,426,200	$ 3,394,674,349
Bonds & Insurances	2%	$ 12,027,922	$ 14,913,395	$ 12,983,646	$ 27,968,524	$ 67,893,487
Sub-Total		$ 613,424,022	$ 760,583,141	$ 662,165,949	$ 1,426,394,724	$ 3,462,567,836
Escalation - Phase 1	27.2%	$ 167,022,640				$ 167,022,640
Escalation - Phase 2	37.1%		$ 281,974,081			$ 281,974,081
Escalation - Phase 3	48.1%			$ 318,533,288		$ 318,533,288
Escalation - Phase 4	61.6%				$ 879,195,417	$ 879,195,417
Total Probable Bid Sum		**$ 780,446,662**	**$ 1,042,557,222**	**$ 980,699,238**	**$ 2,305,590,141**	**$ 5,109,293,262**

Note: 1. Escalation 3.5% Per Year
2. Assume Construction Starts in 6 Years
3. Construction Durations
A. Phase 1 2.00 Years
B. Phase 2 2.33 Years
C. Phase 3 2.17 Years
D. Phase 4 2.92 Years
4. Mid-Point of Construction
A. Phase 1 7.00 Years
B. Phase 2 9.17 Years
C. Phase 3 11.42 Years
D. Phase 4 13.96 Years

Figure 2d.3– Alternative A-C SOE #2 Estimate Summary

4. Conclusion

Ultimately the order of the construction between the work with and without reductions in the size of the Overbuild Deck stays the same, but the factors driving the project schedule change. Due to the decrease in the drilled shafts and other operations, such as bottom pressure slab as explained above, the durations of several elements of work were increased to keep pace, but the schedules' parallel logic and the relationships between predecessors and successors stays the same.

The original "full" Alternative A-C schedule is 3,798 days, or approximately 10 years 5 months. With the removal of portions of the air rights deck to reflect just the construction of the parking garage / bus facility and ramp areas of the deck, the project schedule decreases to 3,414 days, or approximately 9 years 4 months; saving roughly 1 year and 1 month.

Figure 4.1 below provides the Rough Order of Magnitude Estimate comparison of the Alternative A-C SOE Option #2 construction with and without the full Overbuild Deck. The reduction of the size of the Overbuild Deck is estimated to decrease the cost of the project by approximately 25% (24.69%). Note that this estimated reduction is specific to changes in Alternative A-C SOE Option #2 and the variation in cost reduction will vary based on the alternatives compared and/or chosen.

As part of the evaluation and consideration of the cost contribution from the private air-rights development for the Overbuild Deck, the following conditions utilized in the preparation of the estimate costs must be acknowledged and recognized. These issues have not yet been evaluated beyond basic assumptions utilizing best engineering judgment at this point in time. A cursory comparison among the existing structures in the Station and Terminal area include:

1. The design is currently at a concept level and no specification development has occurred.
2. The design loads have not been refined beyond concept level using typical building loads per square foot.
3. Geotechnical exploration has been extremely limited and mainly focused on identification of groundwater phreatic surface and drawdown.
4. Foundation depth reduction has not been evaluated and could provide potential cost savings should the overbuild deck be eliminated.
5. Some portion of a deck will be constructed, for vehicular access and circulation of pedestrians and passengers.
6. What level of the terminal will be daylighted which will have impacts on ventilation and HVAC construction?

Based on those conceptual-level judgements, the estimated costs provided herein are approximate and are based on assumptions using Alternative A-C as the baseline alternative.

AECOM

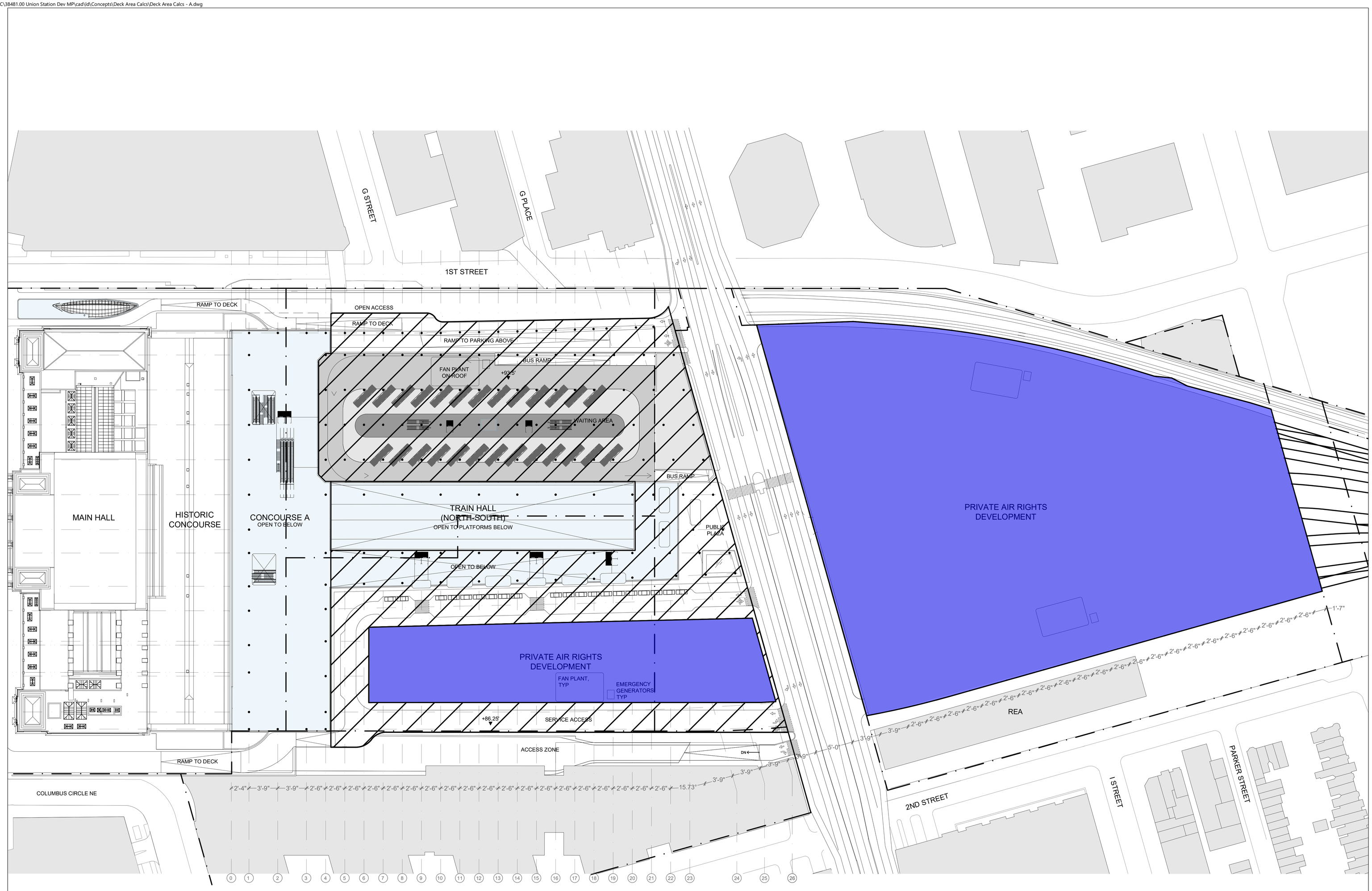
Project: Washington Union Station - Station Expansion Project
Alternate A-C-Support of Excavation Option #2
Location: Washington, DC
Client: AMTRAK
Date: 1/17/2020
Rough Order of Magnitude

SUMMARY - Method of Construction

		Open Cut with Full Overbuild Deck	Open Cut with Air Rights Removed	Cost Delta	Cost Delta %
Substructure		$ 786,224,364	$ 625,584,567	$ 160,639,797	20.43%
Superstructure		$ 858,000,561	$ 411,001,721	$ 446,998,841	52.10%
Interiors		$ 218,750,989	$ 218,505,009	$ 245,979	0.11%
Conveying		$ 54,182,980	$ 42,204,273	$ 11,978,707	22.11%
Plumbing		$ 10,509,431	$ 10,509,431	$ -	0.00%
HVAC		$ 43,724,921	$ 33,887,071	$ 9,837,850	22.50%
Fire Protection		$ 35,715,625	$ 34,102,427	$ 1,613,198	4.52%
Electrical		$ 57,116,076	$ 56,544,915	$ 571,161	1.00%
Concourse / Train Hall		$ 133,009,419	$ 133,009,419	$ -	0.00%
Parking / Bus		$ 129,696,293	$ 129,696,293	$ -	0.00%
Other		$ 409,985,339	$ 394,829,231	$ 15,156,108	3.70%
Transportation		$ 63,321,240	$ 63,321,240	$ -	0.00%
Total Direct Cost		**$ 2,800,237,237**	**$ 2,153,195,597**	**$ 647,041,640**	23.11%
Existing Facility Impact	5%	$ 140,011,862	$ 107,659,780	$ 32,352,082	23.11%
Sub-Total		$ 2,940,249,099	$ 2,260,855,377	$ 679,393,722	23.11%
Contingency	30%	$ 882,074,730	$ 678,256,613	$ 203,818,117	23.11%
Sub-Total		$ 3,822,323,829	$ 2,939,111,990	$ 883,211,839	23.11%
Contractor Overhead	10%	$ 382,232,383	$ 293,911,199	$ 88,321,184	23.11%
Sub-Total		$ 4,204,556,212	$ 3,233,023,189	$ 971,533,023	23.11%
Contractor Profit	5%	$ 210,227,811	$ 161,651,159	$ 48,576,651	23.11%
Sub-Total		$ 4,414,784,023	$ 3,394,674,349	$ 1,020,109,674	23.11%
Bonds & Insurances	2%	$ 88,295,680	$ 67,893,487	$ 20,402,193	23.11%
Sub-Total		$ 4,503,079,703	$ 3,462,567,836	$ 1,040,511,867	23.11%
Escalation - Phase 1		$ 224,656,442	$ 167,022,640	$ 57,633,801	25.65%
Escalation - Phase 2		$ 413,802,088	$ 281,974,081	$ 131,828,007	31.86%
Escalation - Phase 3		$ 434,090,807	$ 318,533,288	$ 115,557,519	26.62%
Escalation - Phase 4		$ 1,208,273,597	$ 879,195,417	$ 329,078,180	27.24%
Total Probable Bid Sum		**$ 6,783,902,637**	**$ 5,109,293,262**	**$ 1,674,609,375**	24.69%

Figure 4.1 – Alternative A-C SOE #2 Comparison Estimates

Attachment 3 – Deck Areas Diagrams.



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Legend

- PRIVATE AIR RIGHTS DEVELOPMENT
- UNION STATION EXPANSION

0 30 60 120Feet

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50 Massachusetts Avenue
Washington, DC 20002

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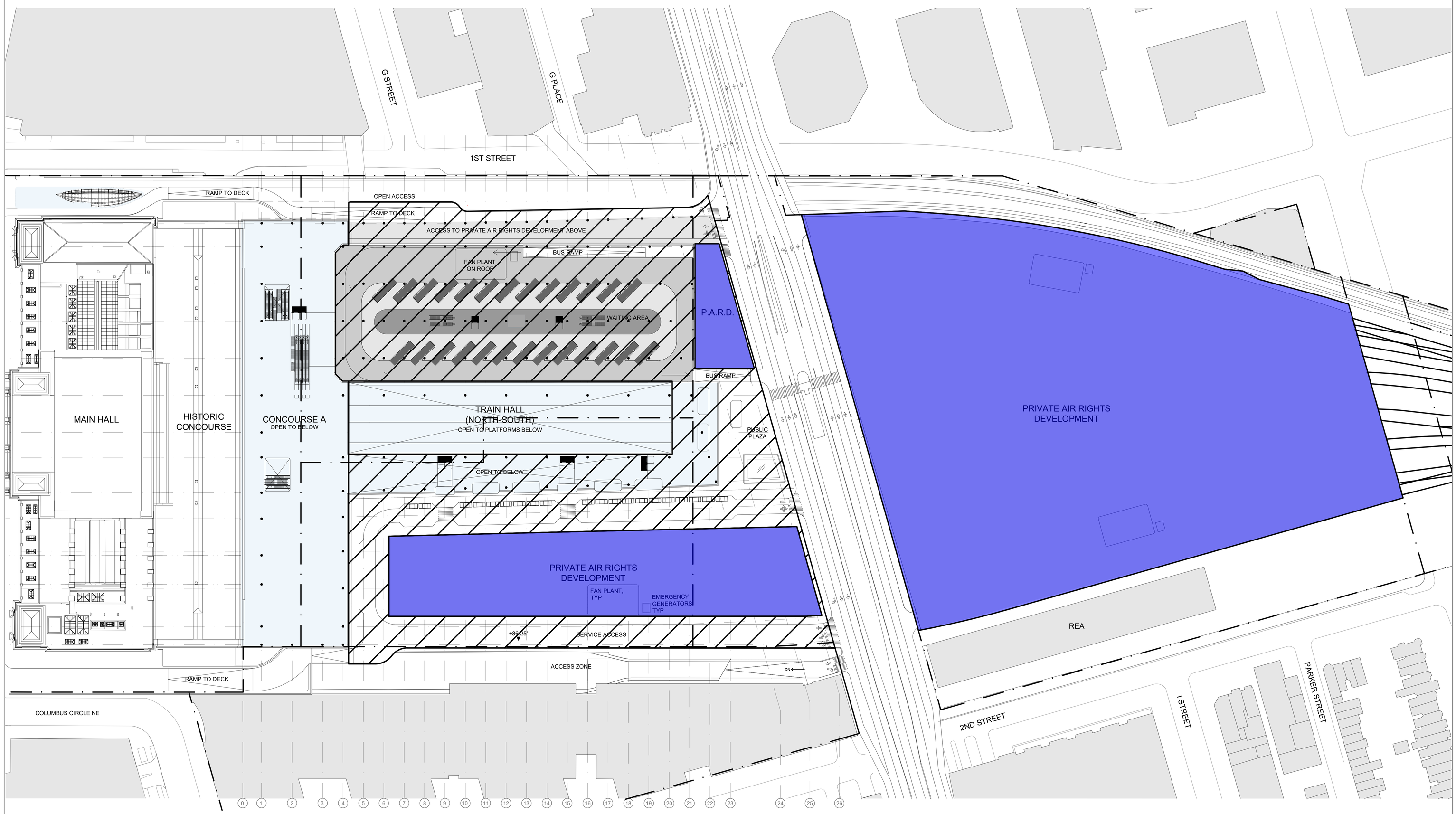
Drawing Title
ALTERNATIVE A

Drawing Number
C-1

Sheet 1 of 7

Project Number
38481.00



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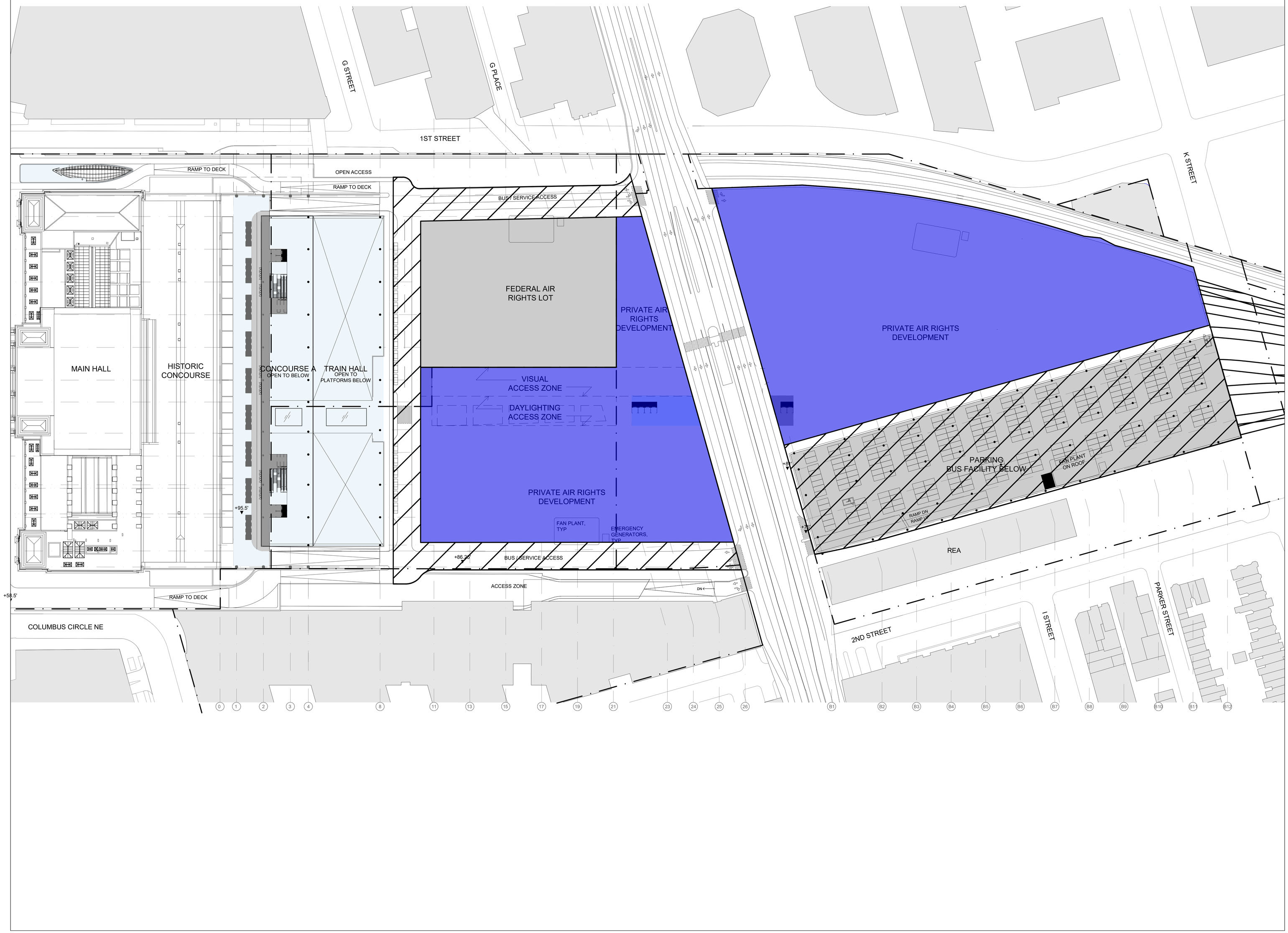

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C-3

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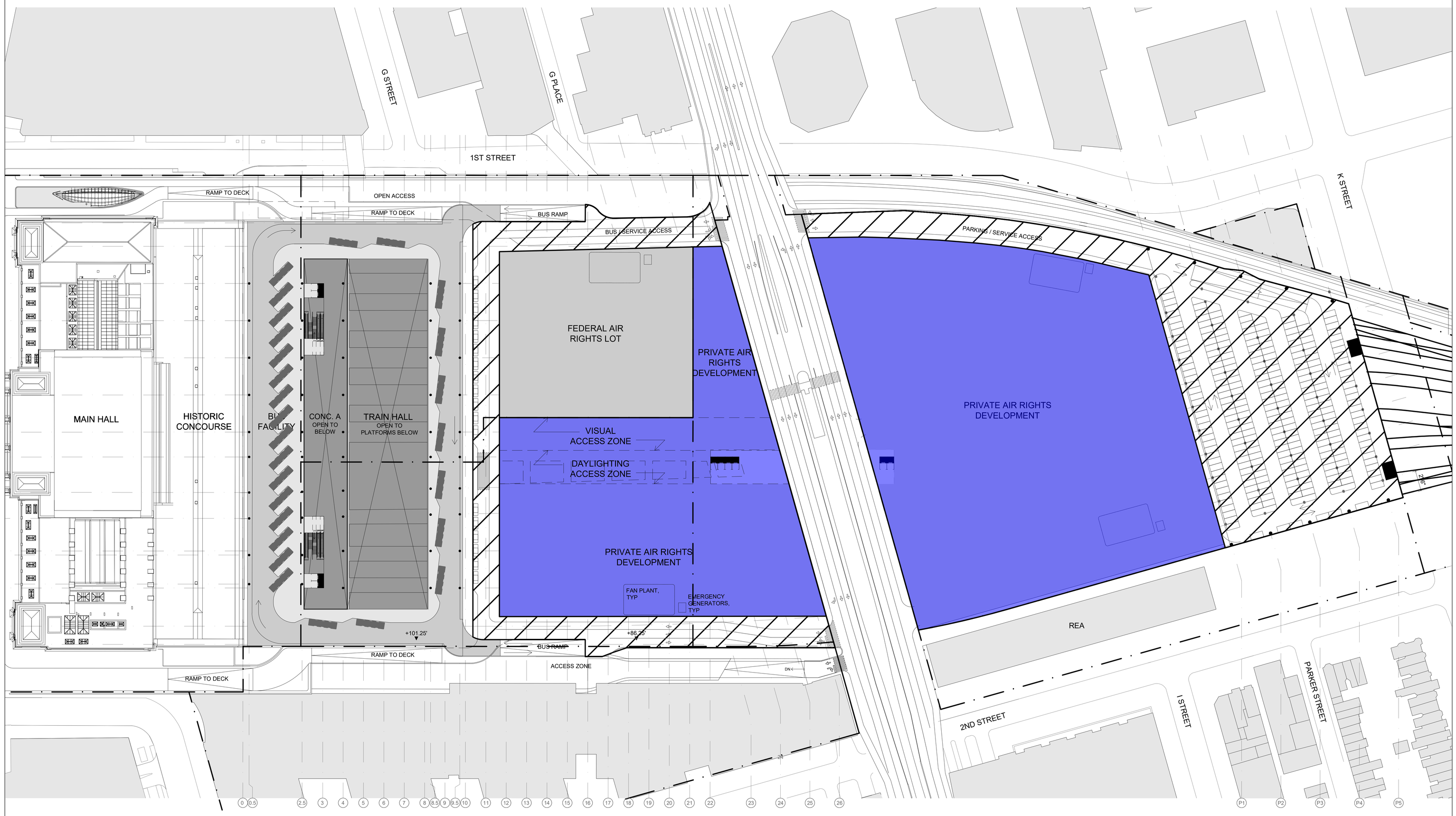

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C-6

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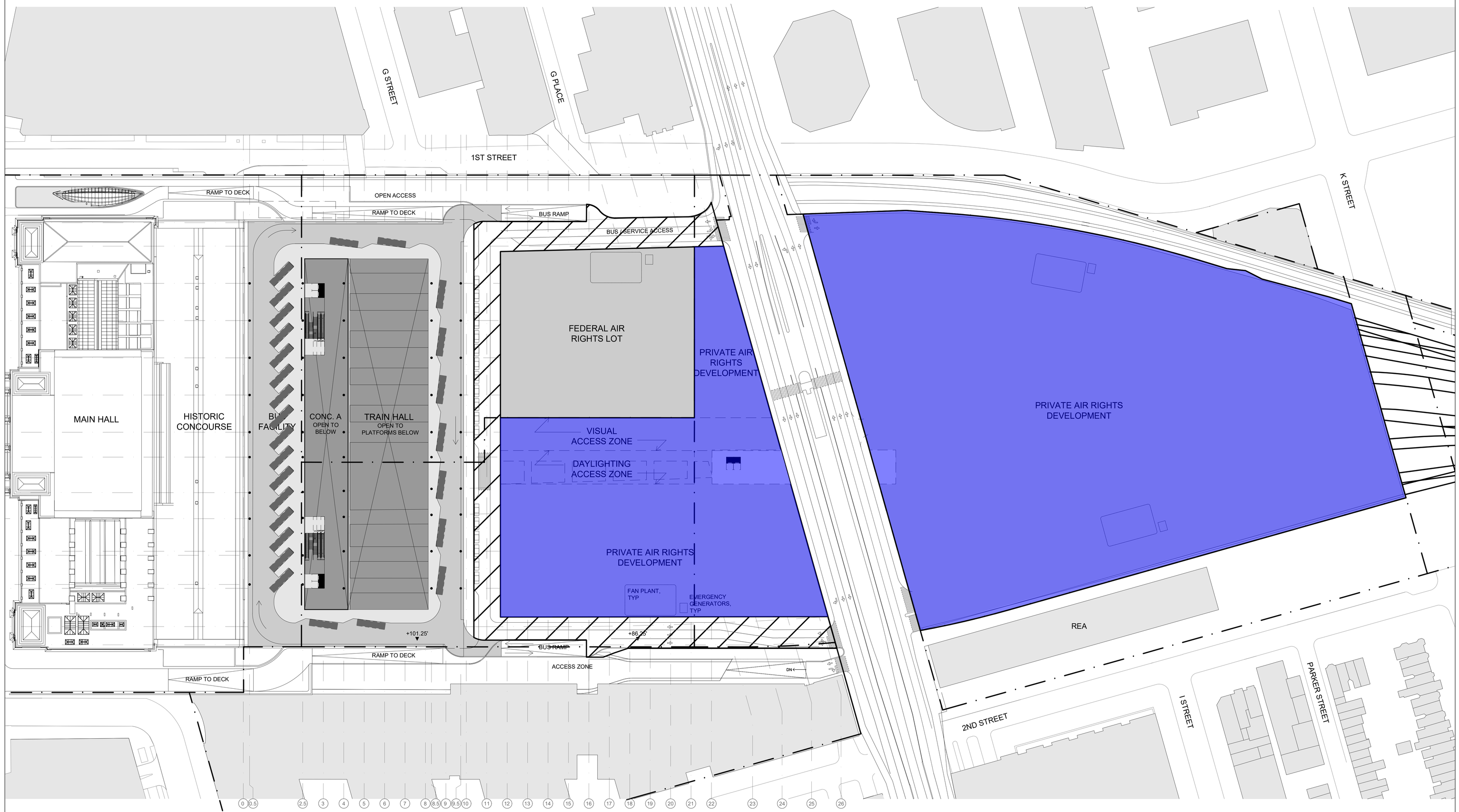

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Drawing Number
C-7

Sheet 7 of 7

Project Number
38481.00

Attachment 4 – ROM Combined Cost Estimate for Alternative A-C with Column Removal[10]

This estimate incorporates the cost of the column removal work to the combined estimate for Alternative A-C. Direct costs were estimated based on an estimate developed separately by Amtrak.[11]

The first table below (page 4 of 5) shows the ROM estimate for Alternative A-C with the column removal work.

The second table below (page 5 of 5) shows the difference between the combined cost estimate for Alternative A-C and the estimate with the column removal work.

The additional costs are due mainly to the overall 12-month delay, which impacts the duration of Phases 3 and 4, generating greater escalation costs due to the longer overall duration.

[10] Source: Amtrak. March 2020. *Washington Union Station Terminal Infrastructure Project. East-to-West Column Removal Phasing Analysis.*

[11] Amtrak. May 10, 2019. *Project Definition Report. Washington Union Station Subbasement Structural Replacement Project*.

Estimate:	**Rough Order of Magnitude**
Design Documents Dated:	**Washington Union Station Expansion Project** **Concept Screening Report** **July 31, 2017**
Estimate Dated:	**March 19, 2020**
Project:	**Washington Union Station - Station Expansion Project** **Alternate A-C-Support of Excavation Option #2 & Column moval** **Removal, Washington, DC**
Client:	**AMTRAK**

Project: **Washington Union Station - Station Expansion Project**
Alternate A-C-Support of Excavation Option #2 & Column Removal
Location: **Washington, DC**
Client: **AMTRAK**
Date: **3/19/2020**
Rough Order of Magnitude

Basis of Estimate and Estimating Assumptions:

1 The purpose of this document is to establish a rough order of magnitude estimate for the Washington Union Station - Station Expansion Project.

2 Estimate is based on Beyer Blinder Belle|Grimshaw design and design/engineering basis of 2016 and recent clarifications.

3 Estimate prices are based on April 2017 prevailing wage labor rates, material market prices, and equipment and materials thru 2017 applicable for work in Washington, DC, including generally practiced project indirects (general conditions), bonds and OH&P for a project of this scale for an "all-in" cost. Estimate includes phasing, 30% design contingency and time-value-of-money escalation.

4 Estimate includes a $150,000,000 allowance for AMTRAK fit-out of Back of House areas.

5 Existing facilities impact is calculated as 5% of the Total Direct Cost.

6 All work is assumed to be performed during 20 hour days (two shifts of 10 hours), 6 days a week. Premium or Over Time Hours are included.

7 Subcontractor's Overhead and Profit is included at 21% in the Direct Cost for each trade.

8 Cost of the project is estimated in "Today's" Dollars and only includes escalation.

9 Sales tax is not included.

10 Costs for hazardous material abatement or disposal are not included.

11 Premium cost of LEED certification is not included.

12 The estimate does not include any "soft cost" items, such as designer's or consultant's fees, reviews and reports, furniture, fixtures, equipment provided by the Owner, moving or any other Owner's expenses costs, etc.

13 Statement of Probable Cost

AECOM Estimating has no control over the cost of labor and materials, the general contractors' or any subcontractors' method of determining prices, or competitive bidding and market conditions. AECOM Estimating's opinion of the probable cost of construction is made on the basis of experience, qualifications, and best judgment of a professional consultant familiar with the construction industry. AECOM Estimating cannot and does not guarantee that proposals, bids or actual construction costs will not vary from this or subsequent estimates. AECOM Estimating has no control over the quality, completeness, intricacy, constructability or coordination of design documents. AECOM Estimating also has no control over the amount of funds available for the project. AECOM Estimating will not be responsible for any design revision costs incurred by the project in the event the estimate or bids are in excess of the budget.

Project: **Washington Union Station - Station Expansion Project**
Alternate A-C-Support of Excavation Option #2 & Column Removal
Location: **Washington, DC**
Client: **AMTRAK**
Date: **3/19/2020**
Rough Order of Magnitude

Hard Cost Exclusions	**Excuded from current design and current cost estimate (possibly included within 30% design contingency per subsequent decisions)**
Legacy Union Station	Estimate does not include cost related to the historic Union Station or its infrastructure
Burnham Place Upgrades	Utility upgrades (combined or stand-alone): steam, chilled water, centralized plant, sewer, water, gas, fire protection loops, power, tel-com service , stormwater retention, green roof, plaza structural upgrades, plaza finishes, plaza emergency access ramps & roadways (fire truck/ambulance), bollards, plaza lighting. Cost-sharing on structure & systems may be future decisions.
Work Calendar	Work calendar is estimated as 20 hour days (2 shifts x 10 Hrs) 6 day week. Work calendar may be limited due to public interest constraints about length of workday and noise.
Other Design Reviews	Excluded: the BuroHappold|Hensel Phelps Concept Feasibility Review of 2015 options and features not included in the BBB|Grimshaw design such as MEP in support of Burnham Place, Legacy Union Station, smoke evacuation zone separation walls and other features. The estimate design contingency is intended for follow-on design decisions.
Environmental Hazards	Estimate INCLUDES disposal fees for contaminated NON-hazardous; it excludes higher classifications in soils, ties, ballast or electrical insulation
Seismic Considerations	No special considerations for additional costs due to seismic constraints
Public Streets/Intersections	Reconstruction of public roads and traffic control beyond repairs for utility connections
Public Utilities	Upgrades to public gas/electrical/water/sewer systems beyond utility connections
Back of House for Amtrak	Up to $150 million allowance.
Retail Areas	No fit-out; "core & shell" utilities terminates at lease line walls. Kitchen exhaust undefined and not included.
Revenue Devices	Revenue machines and related controls
Police & Holding Cells	Break rooms, response ready rooms, holding cells, special MEP-telcom services
Bridges & Tunnels	K Street bridge and reconstruction of H Street tunnel
Security Features	Access control X-Ray devices, blast control construction of walls and floors (such as above standard embedded plates/rebars)
Greenway/WAMATA	Upgrades to WAMATA Greenway and access to new Union Station
Parking	Cost model for parking spaces and parking garage excludes upgrades for rental car fit-out, electric vehicle charging stations

Soft Cost Exclusions	**Excuded from Cost Estimate**
Design	Cost of completion of design processes. No Design-Build costs are included.
Owner Soft Costs	Program mgmt, CM or GC-oversight, Owner QA/QC costs, preconstruction testing, OCIP (if any), incentives, commissioning, legal, accounting and funding fees
Other Owner Indirects	Amtrak Force-Account work, temporary relocations and facilities, temporary parking, final moving costs

Project: **Washington Union Station - Station Expansion Project**
Alternate A-C-Support of Excavation Option #2 & Column Removal
Location: **Washington, DC**
Client: **AMTRAK**
Date: **3/19/2020**
Rough Order of Magnitude

Alternate A-C-Support of Excavation Option #2 & Column Removal Estimated Cost - Open Excavation

		Phase 1	Phase 2	Phase 3	Phase 4	Total
Substructure		$ 136,233,806	$ 216,305,924	$ 123,585,481	$ 310,099,153	**$ 786,224,364**
Superstructure		$ 150,758,087	$ 186,365,079	$ 137,872,160	$ 383,005,235	**$ 858,000,561**
Interiors		$ 40,830,713	$ 58,579,959	$ 35,394,105	$ 83,946,212	**$ 218,750,989**
Conveying		$ 13,143,227	$ 13,910,018	$ 11,678,967	$ 15,450,768	**$ 54,182,980**
Plumbing		$ 1,974,441	$ 2,424,908	$ 1,950,951	$ 4,159,132	**$ 10,509,431**
HVAC		$ 6,768,186	$ 9,558,816	$ 15,101,092	$ 12,296,827	**$ 43,724,921**
Fire Protection		$ 5,002,860	$ 8,136,348	$ 9,999,524	$ 12,576,892	**$ 35,715,625**
Electrical		$ 9,138,572	$ 14,279,019	$ 10,852,054	$ 22,846,430	**$ 57,116,076**
Concourse / Train Hall		$ 22,886,153	$ 34,704,661	$ 24,258,849	$ 51,159,756	**$ 133,009,419**
Parking / Bus		$ -	$ -	$ 54,033,291	$ 75,663,001	**$ 129,696,293**
Other		$ 110,553,542	$ 98,576,830	$ 89,604,336	$ 126,406,739	**$ 425,141,447**
Transportation		$ 14,268,000	$ 12,727,000	$ 9,409,080	$ 26,917,160	**$ 63,321,240**
Column Removal Costs		$ 10,062,968	$ 5,031,484			**$ 15,094,452**
Total Direct Cost		**$ 521,620,555**	**$ 660,600,047**	**$ 523,739,890**	**$ 1,124,527,306**	**$ 2,830,487,797**
Existing Facility Impact	5%	$ 26,081,028	$ 33,030,002	$ 26,186,994	$ 56,226,365	$ 141,524,390
Sub-Total		$ 547,701,583	$ 693,630,049	$ 549,926,884	$ 1,180,753,671	$ 2,972,012,187
Contingency	30%	$ 164,310,475	$ 208,089,015	$ 164,978,065	$ 354,226,101	$ 891,603,656
Sub-Total		$ 712,012,058	$ 901,719,064	$ 714,904,950	$ 1,534,979,772	$ 3,863,615,844
Contractor Overhead	10%	$ 71,201,206	$ 90,171,906	$ 71,490,495	$ 153,497,977	$ 386,361,584
Sub-Total		$ 783,213,263	$ 991,890,970	$ 786,395,444	$ 1,688,477,750	$ 4,249,977,428
Contractor Profit	5%	$ 39,160,663	$ 49,594,549	$ 39,319,772	$ 84,423,887	$ 212,498,871
Sub-Total		$ 822,373,927	$ 1,041,485,519	$ 825,715,217	$ 1,772,901,637	$ 4,462,476,299
Bonds & Insurances	2%	$ 16,447,479	$ 20,829,710	$ 16,514,304	$ 35,458,033	$ 89,249,526
Sub-Total		$ 838,821,405	$ 1,062,315,229	$ 842,229,521	$ 1,808,359,670	$ 4,551,725,825
Escalation - Phase 1	30.4%	$ 254,718,663				$ 254,718,663
Escalation - Phase 2	44.1%		$ 468,753,280			$ 468,753,280
Escalation - Phase 3	56.8%			$ 478,762,019		$ 478,762,019
Escalation - Phase 4	72.7%				$ 1,313,855,761	$ 1,313,855,761
Total Probable Bid Sum		**$ 1,093,540,068**	**$ 1,531,068,509**	**$ 1,320,991,540**	**$ 3,122,215,431**	**$ 7,067,815,548**

Note: 1. Escalation 3.5% Per Year
2. Assume Construction Starts in 6 Years
3. Construction Durations
4. Mid-Point of Construction

A. Phase 1	3.42	Years	A. Phase 1	7.71	Years
B. Phase 2	2.42	Years	B. Phase 2	10.63	Years
C. Phase 3	2.50	Years	C. Phase 3	13.08	Years
D. Phase 4	3.08	Years	D. Phase 4	15.88	Years

Project: **Washington Union Station - Station Expansion Project**
Alternate A-C-Support of Excavation Option #2 & Column Removal
Location: **Washington, DC**
Client: **AMTRAK**
Date: **3/19/2020**
Rough Order of Magnitude

SUMMARY - Method of Construction

		Alternate A-C	Alternate A-C with Column Removal	Cost Delta	Cost Delta %
Substructure		$ 786,224,364	$ 786,224,364	$ -	0.00%
Superstructure		$ 858,000,561	$ 858,000,561	$ -	0.00%
Interiors		$ 218,750,989	$ 218,750,989	$ -	0.00%
Conveying		$ 54,182,980	$ 54,182,980	$ -	0.00%
Plumbing		$ 10,509,431	$ 10,509,431	$ -	0.00%
HVAC		$ 43,724,921	$ 43,724,921	$ -	0.00%
Fire Protection		$ 35,715,625	$ 35,715,625	$ -	0.00%
Electrical		$ 57,116,076	$ 57,116,076	$ -	0.00%
Concourse / Train Hall		$ 133,009,419	$ 133,009,419	$ -	0.00%
Parking / Bus		$ 129,696,293	$ 129,696,293	$ -	0.00%
Other		$ 409,985,339	$ 425,141,447	$ 15,156,108	3.56%
Transportation		$ 63,321,240	$ 63,321,240	$ -	0.00%
Column Removal Costs		$ -	$ 15,094,452	$ 15,094,452	100.00%
Total Direct Cost		**$ 2,800,237,237**	**$ 2,830,487,797**	**$ 30,250,560**	**1.07%**
Existing Facility Impact	5%	$ 140,011,862	$ 141,524,390	$ 1,512,528	1.07%
Sub-Total		$ 2,940,249,099	$ 2,972,012,187	$ 31,763,088	1.07%
Contingency	30%	$ 882,074,730	$ 891,603,656	$ 9,528,926	1.07%
Sub-Total		$ 3,822,323,829	$ 3,863,615,844	$ 41,292,014	1.07%
Contractor Overhead	10%	$ 382,232,383	$ 386,361,584	$ 4,129,201	1.07%
Sub-Total		$ 4,204,556,212	$ 4,249,977,428	$ 45,421,216	1.07%
Contractor Profit	5%	$ 210,227,811	$ 212,498,871	$ 2,271,061	1.07%
Sub-Total		$ 4,414,784,023	$ 4,462,476,299	$ 47,692,277	1.07%
Bonds & Insurances	2%	$ 88,295,680	$ 89,249,526	$ 953,846	1.07%
Sub-Total		$ 4,503,079,703	$ 4,551,725,825	$ 48,646,122	1.07%
Escalation - Phase 1		$ 224,656,442	$ 254,718,663	$ 30,062,221	11.80%
Escalation - Phase 2		$ 413,802,088	$ 468,753,280	$ 54,951,192	11.72%
Escalation - Phase 3		$ 434,090,807	$ 478,762,019	$ 44,671,211	9.33%
Escalation - Phase 4		$ 1,208,273,597	$ 1,313,855,761	$ 105,582,164	8.04%
Total Probable Bid Sum		**$ 6,783,902,637**	**$ 7,067,815,548**	**$ 283,912,911**	**4.02%**

Attachment 5 – Railroad Infrastructure North of K Street Cost Estimate

Amtrak

Washington Union Station - Terminal Infrastructure

Washington, DC

Track & Systems Cost Estimate

January 22, 2019

Track			
	Phase 0	$	4,351,600
	Phase 1	$	16,679,400
	Phase 2	$	9,687,900
	Phase 3	$	12,073,400
	Phase 4	$	13,104,300
	35% Contingency	$	19,563,810
	Subtotal	**$**	**75,460,410**
Systems			
	Overhead Catenary Systems (OCS)	$	35,761,000
	Electrical Traction Power (ET)	$	20,000,000
	Communications and Signals (C&S)	$	45,000,000
	60% Contingency	$	60,456,600
	Subtotal	**$**	**161,217,600**
	Track & Systems Construction Costs	**$**	**236,678,010**
Professional Services			
	Existing Facility Impact (5%)	$	11,833,901
	Subtotal	$	248,511,911
	Contractor Overhead (10%)	$	24,851,191
	Subtotal	$	273,363,102
	Contractor Profit (10%)	$	27,336,310
	Subtotal	$	300,699,412
	Escalation (3.5% / yr thru 2030)	$	138,312,623
Amtrak Force Account			
	Flagging Support (4 flaggers, 2 shifts/day)	$	33,696,000
	Total Track & Systems Project Costs	**$**	**439,012,035**

WUS Track Cost Estimate by Stage

1/22/2019

Stage 00

	P-00a	P-00b	P-00c	P-00a Weighted	P-00b Weighted	P-00c Weighted	Total	Weighted Total	Unit	Unit Cost	Cost
Remove Track	0	437	1,556	0	831	2,957	1,994	3,788	TF	$ 40	$ 151,506
Construct New Track - Ballasted	1,296	0	1,102	1,944	0	2,093	2,398	4,037	TF	$ 250	$ 1,009,355
Construct New Track - Direct Fixation	0	0	0	0	0	0	0	0	TF	$ 350	$ -
Shift Track	0	2,321	1,157	0	4,409	2,199	3,478	6,608	TF	$ 30	$ 198,233
Place Temporary Track	0	0	0	0	0	0	0	0	TF	$ 200	$ -
Relocate Track	0	0	0	0	0	0	0	0	TF	$ 75	$ -
Remove Special Trackwork - TOs + XOs	0	0	2	0.0	0.0	4.5	2	4.5	EA	$ 40,000	$ 180,000
Remove Special Trackwork - DSS	0	0	0	0.0	0.0	0.0	0	0.0	EA	$ 80,000	$ -
Install New Special Trackwork - TO No. 8	0	0	0	0.0	0.0	0.0	0	0.0	EA	$ 140,000	$ -
Install New Special Trackwork - TO No. 9	0	0	0	0.0	0.0	0.0	0	0.0	EA	$ 150,000	$ -
Install New Special Trackwork - TO No. 10	0	0	0	0.0	0.0	0.0	0	0.0	EA	$ 160,000	$ -
Install New Special Trackwork - TO No. 15	0	0	0	0.0	0.0	0.0	0	0.0	EA	$ 190,000	$ -
Install New Special Trackwork - TO No. 20	0	2	3	0.0	4.5	6.8	5	11.3	EA	$ 250,000	$ 2,812,500
Install New Special Trackwork - DSS No. 9	0	0	0	0.0	0.0	0.0	0	0.0	EA	$ 500,000	$ -
Install New Special Trackwork - DSS No. 10	0	0	0	0.0	0.0	0.0	0	0.0	EA	$ 500,000	$ -
Install Temporary Special Trackwork - TO No. 8	0	0	0	0.0	0.0	0.0	0	0.0	EA	$ 140,000	$ -
Install Temporary Special Trackwork - TO No. 10	0	0	0	0.0	0.0	0.0	0	0.0	EA	$ 160,000	$ -
Subtotal				$ 486,000	$ 1,290,517	$ 2,575,078				Subtotal	$ 4,351,600
Contingencies 35%				$ 170,100	$ 451,681	$ 901,277				Contingencies (35%)	$ 1,523,060
Total				$ 656,100	$ 1,742,197	$ 3,476,355				Stage 00 Total	$ 5,874,660

Stage 01

	P-01a	P-01b	P-01c	P-01d	P-01a Weighted	P-01b Weighted	P-01c Weighted	P-01d Weighted	Total	Weighted Total	Unit	Unit Cost	Cost
Remove Track	12,770	1,762	2,027	0	15,097	2,643	3,040	0	16,559	20,780	TF	$ 40	$ 831,210
Construct New Track - Ballasted	1,383	1,375	692	1,812	1,383	2,063	1,038	1,856	5,262	6,339	TF	$ 250	$ 1,584,775
Construct New Track - Direct Fixation	0	0	0	2,994	0	0	0	2,994	2,994	2,994	TF	$ 350	$ 1,047,900
Shift Track	0	0	0	0	0	0	0	0	0	0	TF	$ 30	$ -
Place Temporary Track	1,273	114	937	382	1,965	171	1,528	726	2,706	4,389	TF	$ 200	$ 877,798
Relocate Track	150	75	150	75	225	113	225	113	450	675	TF	$ 75	$ 50,625
Remove Special Trackwork - TOs + XOs	15	2	4	2	22.1	3.2	6.4	4.5	23	36.2	EA	$ 40,000	$ 1,448,000
Remove Special Trackwork - DSS	1	0	3	1	1.6	0.0	6.8	2.3	5	10.6	EA	$ 80,000	$ 848,000
Install New Special Trackwork - TO No. 8	0	0	0	2	0.0	0.0	0.0	2.4	2	2.4	EA	$ 140,000	$ 336,000
Install New Special Trackwork - TO No. 9	1	1	0	6	1.2	1.6	0.0	8.0	8	10.8	EA	$ 150,000	$ 1,620,000
Install New Special Trackwork - TO No. 10	2	2	1	0	2.8	3.2	1.6	0.0	5	7.6	EA	$ 160,000	$ 1,216,000
Install New Special Trackwork - TO No. 15	2	0	0	0	2.8	0.0	0.0	0.0	2	2.8	EA	$ 190,000	$ 532,000
Install New Special Trackwork - TO No. 20	0	0	0	0	0.0	0.0	0.0	0.0	0	0.0	EA	$ 250,000	$ -
Install New Special Trackwork - DSS No. 9	0	1	0	5	0.0	1.6	0.0	6.8	6	8.4	EA	$ 500,000	$ 4,200,000
Install New Special Trackwork - DSS No. 10	0	0	0	0	0.0	0.0	0.0	0.0	0	0.0	EA	$ 500,000	$ -
Install Temporary Special Trackwork - TO No. 8	1	0	1	3	2.3	0.0	2.3	6.8	5	11.3	EA	$ 140,000	$ 1,575,000
Install Temporary Special Trackwork - TO No. 10	0	0	2	0	0.0	0.0	3.2	0.0	2	3.2	EA	$ 160,000	$ 512,000
Subtotal					$ 3,846,617	$ 2,343,911	$ 2,582,371	$ 7,906,410				Subtotal	$ 16,679,400
Contingencies 35%					$ 1,346,316	$ 820,369	$ 903,830	$ 2,767,244				Contingencies (35%)	$ 5,837,790
Total					$ 5,192,933	$ 3,164,279	$ 3,486,200	$ 10,673,654				Stage 01 Total	$ 22,517,190

Stage 02

	P-02a	P-02b	P-02c	P-02d	P-02a Weighted	P-02b Weighted	P-02c Weighted	P-02d Weighted	Total	Weighted Total	Unit	Unit Cost	Cost
Remove Track	9,746	1,193	0	388	9,746	1,790	0	583	11,327	12,118	TF	$ 40	$ 484,730
Construct New Track - Ballasted	0	901	114	1,725	0	1,352	171	1,785	2,740	3,307	TF	$ 250	$ 826,825
Construct New Track - Direct Fixation	0	0	0	5,062	0	0	0	5,062	5,062	5,062	TF	$ 350	$ 1,771,700
Shift Track	933	0	3,000	0	1,772	0	5,420	0	3,933	7,192	TF	$ 30	$ 215,770
Place Temporary Track	0	0	0	307	0	0	0	461	307	461	TF	$ 200	$ 92,100
Relocate Track	0	0	0	175	0	0	0	263	175	263	TF	$ 75	$ 19,688
Remove Special Trackwork - TOs + XOs	10	1	1	6	13.1	1.6	1.6	9.6	18	26	EA	$ 40,000	$ 1,034,000
Remove Special Trackwork - DSS	0	0	0	0	0.0	0.0	0.0	0.0	0	0	EA	$ 80,000	$ -
Install New Special Trackwork - TO No. 8	0	0	0	1	0.0	0.0	0.0	1.2	1	1	EA	$ 140,000	$ 168,000
Install New Special Trackwork - TO No. 9	0	0	0	7	0.0	0.0	0.0	9.2	7	9	EA	$ 150,000	$ 1,380,000
Install New Special Trackwork - TO No. 10	2	2	0	0	4.5	3.2	0.0	0.0	4	8	EA	$ 160,000	$ 1,232,000
Install New Special Trackwork - TO No. 15	0	0	0	0	0.0	0.0	0.0	0.0	0	0	EA	$ 190,000	$ -
Install New Special Trackwork - TO No. 20	0	0	0	0	0.0	0.0	0.0	0.0	0	0	EA	$ 250,000	$ -
Install New Special Trackwork - DSS No. 9	0	0	0	0	0.0	0.0	0.0	0.0	0	0	EA	$ 500,000	$ -
Install New Special Trackwork - DSS No. 10	0	1	0	0	0.0	1.6	0.0	0.0	1	2	EA	$ 500,000	$ 800,000
Install New Special Trackwork - Diamond Crossing	0	0	0	1	0.0	0.0	0.0	1.2	1	1	EA	$ 150,000	$ 180,000
Install Temporary Special Trackwork - TO No. 8	1	0	0	2	2.3	0.0	0.0	3.2	3	5	EA	$ 140,000	$ 763,000
Install Temporary Special Trackwork - TO No. 10	0	0	0	2	0.0	0.0	0.0	4.5	2	5	EA	$ 160,000	$ 720,000
Subtotal					$ 1,999,992	$ 1,785,623	$ 269,244	$ 5,632,954				Subtotal	$ 9,687,900
Contingencies 35%					$ 699,997	$ 624,968	$ 94,235	$ 1,971,534				Contingencies (35%)	$ 3,390,765
Total					$ 2,699,989	$ 2,410,591	$ 363,479	$ 7,604,488				Stage 02 Total	$ 13,078,665

Stage 03

	P-03a	P-03b	P-03c	P-03d	P-03e	P-03a Weighted	P-03b Weighted	P-03c Weighted	P-03d Weighted	P-03e Weighted	Total	Weighted Total	Unit	Unit Cost	Cost
Remove Track	7,268	2,733	826	664	1,419	8,732	4,190	1,094	997	2,128	10,826	14,016	TF	$ 40	$ 560,622
Construct New Track - Ballasted	2,271	4,137	697	5,725	634	2,271	6,206	1,046	6,111	951	7,105	9,522	TF	$ 250	$ 2,380,538
Construct New Track - Direct Fixation	0	0	0	0	0	0	0	0	0	0	0	0	TF	$ 350	$ -
Shift Track	0	0	660	0	200	0	0	990	0	300	680	990	TF	$ 30	$ 29,700
Place Temporary Track	396	904	151	0	0	518	1,668	227	0	0	1,451	2,412	TF	$ 200	$ 482,480
Relocate Track	0	0	0	0	135	0	0	0	0	203	0	0	TF	$ 75	$ -
Remove Special Trackwork - TOs + XOs	4	12	2	2	2	6.4	21.8	4.5	3.2	3.2	18	33	EA	$ 40,000	$ 1,308,000
Remove Special Trackwork - DSS	1	3	0	0	0	1.2	6.1	0.0	0.0	0.0	4	7	EA	$ 80,000	$ 584,000
Install New Special Trackwork - TO No. 8	0	0	1	0	1	0.0	0.0	2.3	0.0	1.6	1	2	EA	$ 140,000	$ 315,000
Install New Special Trackwork - TO No. 9	0	1	0	4	1	0.0	1.6	0.0	6.0	1.6	1	2	EA	$ 150,000	$ 240,000
Install New Special Trackwork - TO No. 10	0	2	1	0	3	0.0	3.2	1.6	0.0	4.8	3	5	EA	$ 160,000	$ 768,000
Install New Special Trackwork - TO No. 15	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0	0	EA	$ 190,000	$ -
Install New Special Trackwork - TO No. 20	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0	0	EA	$ 250,000	$ -
Install New Special Trackwork - DSS No. 9	1	2	2	4	1	1.2	3.2	3.2	6.4	1.6	5	8	EA	$ 500,000	$ 3,800,000
Install New Special Trackwork - DSS No. 10	0	0	1	0	0	0.0	0.0	2.3	0.0	0.0	1	2	EA	$ 500,000	$ 1,125,000
Install Temporary Special Trackwork - TO No. 8	0	0	1	0	0	0.0	0.0	1.6	0.0	0.0	1	2	EA	$ 140,000	$ 224,000
Install Temporary Special Trackwork - TO No. 10	1	0	0	0	0	1.6	0.0	0.0	0.0	0.0	1	2	EA	$ 160,000	$ 256,000
Subtotal						$ 2,228,617	$ 5,764,515	$ 4,080,208	$ 5,795,694	$ 2,507,166				Subtotal	$ 12,073,400
Contingencies 35%						$ 780,016	$ 2,017,580	$ 1,428,073	$ 2,028,493	$ 877,508				Contingencies (35%)	$ 4,225,690
Total						$ 3,008,633	$ 7,782,095	$ 5,508,281	$ 7,824,187	$ 3,384,674				Stage 03 Total	$ 16,299,090

Stage 04

	P-04a	P-04b	P-04a Weighted	P-04b Weighted	Total	Weighted Total	Unit	Unit Cost	Cost
Remove Track	8,783	0	9,721	0	8,783	9,721	TF	$ 40	$ 388,820
Construct New Track - Ballasted	2,650	3,596	3,773	3,596	6,246	7,368	TF	$ 250	$ 1,842,068
Construct New Track - Direct Fixation	0	10,146	0	10,146	10,146	10,146	TF	$ 350	$ 3,551,100
Shift Track	0	0	0	0	0	0	TF	$ 30	$ -
Place Temporary Track	0	0	0	0	0	0	TF	$ 200	$ -
Relocate Track	650	0	938	0	650	938	TF	$ 75	$ 70,313
Remove Special Trackwork - TOs + XOs	13	0	16	0	13	16	EA	$ 40,000	$ 624,000
Remove Special Trackwork - DSS	3	0	4	0	3	4	EA	$ 80,000	$ 288,000
Install New Special Trackwork - TO No. 9	0	0	0	0	0	0	EA	$ 140,000	$ -
Install New Special Trackwork - TO No. 9	2	10	3	12	12	16	EA	$ 150,000	$ 2,340,000
Install New Special Trackwork - TO No. 10	0	0	0	0	0	0	EA	$ 160,000	$ -
Install New Special Trackwork - TO No. 15	0	0	0	0	0	0	EA	$ 190,000	$ -
Install New Special Trackwork - TO No. 20	0	0	0	0	0	0	EA	$ 250,000	$ -
Install New Special Trackwork - DSS No. 9	0	6	0	8	6	8	EA	$ 500,000	$ 4,000,000
Install New Special Trackwork - DSS No. 10	0	0	0	0	0	0	EA	$ 500,000	$ -
Install Temporary Special Trackwork - TO No. 8	0	0	0	0	0	0	EA	$ 140,000	$ -
Install Temporary Special Trackwork - TO No. 10	0	0	0	0	0	0	EA	$ 160,000	$ -
Subtotal			$ 2,794,283	$ 10,310,018				Subtotal	$ 13,104,300
Contingencies 35%			$ 977,999	$ 3,608,506				Contingencies (35%)	$ 4,586,505
Total			$ 3,772,281	$ 13,918,524				Stage 04 Total	$ 17,690,805

Total

	Unit	Unit Cost
Remove Track	TF	$ 40
Construct New Track - Ballasted	TF	$ 250
Construct New Track - Direct Fixation	TF	$ 350
Shift Track	TF	$ 30
Place Temporary Track	TF	$ 200
Relocate Track	TF	$ 75
Remove Special Trackwork - TOs + XOs	EA	$ 40,000
Remove Special Trackwork - DSS	EA	$ 80,000
Install New Special Trackwork - TO No. 8	EA	$ 140,000
Install New Special Trackwork - TO No. 9	EA	$ 150,000
Install New Special Trackwork - TO No. 10	EA	$ 160,000
Install New Special Trackwork - TO No. 15	EA	$ 190,000
Install New Special Trackwork - TO No. 20	EA	$ 250,000
Install New Special Trackwork - DSS No. 9	EA	$ 500,000
Install New Special Trackwork - DSS No. 10	EA	$ 500,000
Install New Special Trackwork - Diamond Crossing	EA	$ 150,000
Install Temporary Special Trackwork - TO No. 8	EA	$ 140,000
Install Temporary Special Trackwork - TO No. 10	EA	$ 160,000
Contingencies	35%	

WUS Systems Cost Estimate

1/22/2019

ITEM	Quantity	Unit	Cost	Total
Overhead Catenary Systems (OCS)				**$35,761,000**
New Portal Structures	22	EA	$284,000	$6,248,000
New Cantilever Structures	25	EA	$131,000	$3,275,000
New Termination / Pull off Structures	11	EA	$117,000	$1,287,000
New Down Guys	60	EA	$55,000	$3,300,000
New Sectionalizing Switches	60	EA	$63,000	$3,780,000
Miscellaneous Catenary Assembly Installation	1	LS	$690,000	$690,000
New Catenary Installation	83,000	LF	$90	$7,470,000
Reprofile Existing Catenary	32,000	LF	$72	$2,304,000
Remove Existing Catenary	75,000	LF	$43	$3,225,000
New Feeder Installation	22,000	LF	$37	$814,000
New Signal Power Installation	11,000	LF	$37	$407,000
Static Wire Installation	27,000	LF	$33	$891,000
Existing Structure Demo	90	EA	$23,000	$2,070,000
Electrical Traction Power (ET)	**1**	**LS**		**$20,000,000**
Communications and Signals (C&S)	**1**	**LS**		**$45,000,000**

Subtotal		$ 100,761,000
Contingencies (60%)		$ 60,457,000
Subtotal		$ 161,218,000
Existing Facilities Impact (5%)		$ 8,061,000
Subtotal		$ 169,279,000
Contractor Overhead (10%)		$ 16,928,000
Subtotal		$ 186,207,000
Contactor Profit (10%)		$ 18,621,000
Subtotal		$ 204,828,000
	Escalation 3.5% / yr thru 2030	**$ 299,043,000**

Amtrak Force Account Assumptions

Flagger/day	(2019)	$ 1,200
Escalated	(2030)	$ 1,800.00
Years	10	
Months/yr	9	
Days/mo	26	
Shifts/d	2	
Flaggers/Shift	4	
Total	**$ 33,696,000.00**	