Report to the Board of the Port Authority of New York and New Jersey

Findings of the Panel in the Port Authority Bus Terminal International Design + Deliverability Competition

Presented by Martin Wachs, Independent Panel Chairman

Background

The Port Authority Bus Terminal (PABT) is the most heavily used bus terminal in the world and plays a critical role in the New York and New Jersey economies. Its location is convenient to employment centers in Midtown Manhattan and the burgeoning Hudson Yards development. It benefits from direct access to the Lincoln Tunnel, linkage to the busiest express bus lane in the country, eleven subway lines, and close proximity to intercity bus and rail services.

However, the PABT is facing major challenges. Today, the existing building is overcrowded, obsolete, and deteriorating. It fails to take advantage of the commercial potential of its prime location and is poorly equipped to adapt to technological advances. It is operating at or near capacity today and therefore lacks the ability to accommodate the dramatic growth in the bus travel projected in the coming decades. The need to rebuild or reconstruct it is unquestioned.

Recognizing that it is a facility of great complexity and that its possible replacement affects many stakeholders who hold differing values, the International Design + Deliverability Competition (Competition) is intended to present to the Board of The Port Authority of New York and New Jersey (Board) and stakeholders ideas for consideration as part of a planning process that is in its early stages. The Deliverability component is intended to convey that the Competition is about contemplating the operational needs of the bus terminal and the logistics of building a new bus terminal. This is not an architecture competition to be decided solely based on aesthetic or design criteria. Accordingly, teams submitted competition concepts in response to fourteen Design + Deliverability objectives listed in Table 1.

The findings in this report are intended to stimulate stakeholders, planners and policymakers as they consider options for the future of the PABT. The submitted competition concepts are illustrative ideas and have not been subjected to required environmental impact assessment or formal technical review by numerous affected public agencies. The Board has no obligation to adopt any of the submitted competition concepts and is free to discuss elements from all the submissions as it considers the future of the PABT.

The Panel and Process

An international panel of experts, listed in Table 2, was created to evaluate, compare and analyze competition concepts submitted by entrants into the Design + Deliverability Competition.

Fifteen submissions were received in response to Phase I of the Competition, and were reviewed by the panel against the fourteen Design + Deliverability Objectives. Five of the submissions were selected by the panel to develop their competition concept in Phase II. The five finalist

teams, listed in Table 3, all submitted entries in response to detailed instructions given to them by an interdepartmental team of Port Authority (PA) staff, led by Procurement, on behalf of the Board. The finalists and the panel also received interim findings regarding interstate bus network operations and relevant emerging technologies in the form of draft technical memoranda prepared by the independent consultant team engaged by the Port Authority to conduct a Trans-Hudson Commuting Capacity Study in parallel with the Competition.

The panel was instructed to conduct a comparative analysis of the submissions based on its collective expertise and to advise the Board of its findings. The fourteen Design + Deliverability objectives were all considered and three specific considerations were found by the panel to be the most challenging: 1) the ability of the competition concept to support the most complex and numerous bus operations of any such facility in the world; 2) the capital and operating costs of a new facility and the risk of cost escalation; and 3) the impacts of the competition concept on the surrounding community including maximizing the use of Port Authority-owned properties and minimizing the acquisition of private real estate.

The panel met frequently by teleconference, webinar, and twice in person for several days. With the enthusiastic and attentive support of staff, we observed in person the PABT facility and its operations. We toured the surrounding community on foot and in vehicles; reviewed media reports about the PABT; reviewed written submissions, including addenda that responded to requests for further information or clarification; viewed video presentations and examined 3D depictions of each submitted competition concept; and formally interviewed representatives of each team. We developed the conclusions presented here following several days of discussion and review of public and stakeholder comments provided via the competition website, as well as letters from local community boards and other stakeholders received during both phases of the Competition.

Challenges, Tradeoffs, and Limitations

The challenges facing a new bus terminal inherently involve a number of critical tradeoffs. Satisfaction of one objective makes it more difficult to satisfy others. Some of the most important challenges, tradeoffs and limitations reflected in the competition submissions are summarized here:

> **1) Balancing Building Footprint and Height:** To maximize the efficiency of bus operations a large building footprint is desirable. But, to minimize community disruption a small footprint is highly desirable. Keeping the footprint small requires the building to be taller, and that in turn means longer vertical climbs for buses on ramps, circuitous bus movements, and the vertical movement of passengers traversing many floors. Restricting bus operations to two or three levels means accepting a facility that covers much more land area and results in more impact on the surrounding neighborhood, and may sacrifice some development opportunity.
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> **2) The Importance of Operational Flexibility:** The current bus terminal performs well given that it is obsolete and used beyond its intended capacity. This is in part due to the ingenuity of its staff and the flexibility to shift operations in unusual situations or in

response to disruptive events. The staff has learned how to adapt to changing conditions over many decades. Their flexibility is in part derived from the design of the terminal, which includes multiple exclusive ramps, street access and direct tunnel access. The panel appreciated the need for similar flexibility in a future terminal but had difficulty assessing the flexibility of all of the submitted Competition concepts based on the information provided. The submissions were of necessity presented at a high level of generality, which limited our ability to assess their operational flexibility in detail.

3) Achieving Proximity to Traveler Origins and Destinations: To maximize access to the origins and destinations of travelers, the facility should be located as close as possible to the site of the existing terminal. But that proximity could result in a terminal that could be disruptive to nearby residences, businesses, and institutions that already experience the intrusions of bus movements and the visual intrusion of ramp structures. While businesses in Midtown benefit greatly from the PABT's access to New Jersey's workforce, the nearby residential and local business community is clearly affected by its proximity to the terminal and bus operations.

4) Welcoming Technological Change Realistically: Technology is changing rapidly, and a new terminal will be completed in a decade or perhaps later. It is tempting to assume that new technology and new vehicle designs, from connected vehicles and automated buses to dynamic gate assignment, could in combination completely transform bus operations; yet the trajectory of technological change is uncertain and it would be irresponsible to rely too heavily on expected changes that may or may not eventuate or that might take longer to realize than their proponents predict.

5) Improving the Customer Experience: The customer experience is an essential element of a successful future bus terminal and is influenced by many factors including: 1) terminal location relative to transit connections and popular destinations north and east of the existing site; 2) terminal ramp designs and gate configurations that allow reliable and efficient travel times from the gate to the Lincoln Tunnel; and 3) in-terminal pedestrian access time from the street to the bus gate; 4) adequacy of vertical circulation paths for pedestrians; 5) ease of wayfinding and availability of real-time traveler information; 6) passenger circulation on concourses and gate areas that allow smooth and safe movements and comfortable queuing; 7) terminal amenities and a pleasant passenger environment compliant with current codes and standards. The panel attempted to view each submission through the lens of the customer, and struggled with the inherent tradeoffs regarding aspects of the customer experience with the deliverability of a new terminal. The panel was particularly concerned with the tradeoffs regarding aspects of the customer experience, such as the longer pedestrian access times due to locations further west, higher terminal designs and winding ramps on smaller footprints, and the passenger space that would be required at gates with high turns per gate per hour. As the terminal planning advances toward detailed designs and assessments of alternatives, the balance between the customer experience and other project objectives will become more apparent. A balanced solution will require ongoing stakeholder consultation and involvement.

6) Realistically Addressing Access Improvements by Other Agencies: The PABT is part of the regional transportation network and cannot function in isolation. The future efficiency of bus operations depends heavily on actions that must be taken by agencies other than the Port Authority and which are difficult to predict or assume. For example, the decision to build or not build a new #7 subway station at W. 41st Street and Tenth Avenue is central to the success of some of the submissions, but is not considered within the projected costs of the submissions, and is not under the control of the Port Authority.

7) Treating City Streets as an Asset while Respecting Communities: The City of New York and residents and businesses of the surrounding community would prefer designs that minimize bus movements on City streets. Today's terminal has historically done this effectively with a large footprint of connecting ramps, but recently has struggled to be effective as terminal capacity constraints have choked terminal ramps and internal circulation. Future terminal designs that minimize bus traffic on City streets may have to balance the prospect of a new location and smaller footprint for supporting ramp infrastructure with the potential for expensive reconfiguration of the Lincoln Tunnel ramps and, perhaps, major tunnel modernization which would be very costly. Direct access between the tunnel and the bus terminal must also preserve flexibility in terminal operations. Doing that would require the provision of some street access for buses as a design requirement.

8) Bus Parking and Staging: Bus parking and staging is critical because the PABT peak-hour operations require hundreds of buses that are not in use between the peaks. Providing for parking and staging proximate to the new terminal increases efficiency of bus operations but can increase the size of the terminal complex. Staging and storing buses elsewhere in Manhattan increases cost, increases bus movement on crowded streets and through sensitive communities, and could diminish reliability of the tunnel operation. It also may require institutional partnerships that do not currently exist. Storing buses in New Jersey increases travel time, consumes valuable Lincoln Tunnel capacity, affects traffic flow, and impinges on local communities that see no benefit for their citizens. Some mix of storage and staging strategies may be most appropriate and an optimal mix will require tradeoffs among competing objectives.

9) Intercity versus Commuter Bus Operations- Complementarities and Conflicts: The privately-operated intercity bus market is growing and curbside bus operations in Manhattan are becoming a major source of traffic congestion. A future intercity bus terminal could consolidate intercity operations presently taking place in the PABT with others that operate elsewhere. While this is proposed, it is by no means a certainty. A larger intercity bus terminal could be located away from the PABT and could efficiently accommodate intercity bus operations presently located at the PABT, allowing for growth in commuter bus operations at the new PABT by repurposing gates rather than adding gates. Separating intercity bus operations from a new commuter bus terminal would add the additional investment cost of two (or more) Manhattan bus terminals. There would also be revenue consequences because intercity carriers currently pay the lion's share of terminal fees at the PABT. Depending upon the location of an additional terminal or terminals, there could be added city street congestion as intercity buses travel to a new

separate terminal facility, while there could also be lessened congestion from a reduction in curbside loading and unloading. While there would be a reduction in community impacts of the commuter terminal by separating intercity operations, those would have to be considered alongside community impacts of another terminal. There also would be the opportunity costs if the ability to share some gates among intercity and commuter carriers were to be lost.

10) Safety, Security, and Sustainability: The panel carefully considered the safety, security, and environmental sustainability of each of the submissions but in general found these to be less decisive in its comparisons of the submitted concepts than cost, potential impacts on bus operations, and impacts on surrounding neighborhoods. These additional criteria remain central as more detailed concepts for the PABT are developed in the future.

11) Minimizing Capital Costs and Cost Escalation: The Port Authority capital budget for the coming decade is constrained and there are many competing needs. Investment in a new bus terminal is considered by the panel to be essential, yet the sources of revenue needed are uncertain and can change. Considerations to minimizing capital investment requirements and risks of cost escalation as planning and design decisions are matured.

12) Real Estate: We considered a variety of strategies that would monetize Port Authority real estate assets to enhance revenue. The present value of the real estate portfolio does not differ significantly among the various development proposals. By example, two of the most valuable sites in the portfolio are improved with the availability of the existing PABT site and the ramps immediately west of the PABT; these sites are made available for redevelopment in all five proposals. However, the real estate value will not be unlocked until the new facility is built and the existing terminal and ramps are demolished. Revenue from PILOTs and modifications to zoning, such as increased density or a Transferable Development Right (TDR) receiver district, are not exclusive to any one proposal and should be pursued regardless of which plan is ultimately selected. These strategies would be highly dependent on market conditions and government decisions beyond those of the Port Authority itself, so they remain valuable but uncertain.

13) Other Financial Opportunities: Federal grants and loans and public private partnerships are likely to help finance the new bus terminal but can incorporate a wide range of characteristics that were not developed in depth in any of the submitted concepts. Both also bring high levels of uncertainty.

Because real estate and financial such strategies apply to almost all possible designs of a new PABT, we address real estate and finance in the remainder of this document to a lesser extent than other elements of the submissions. It remains, however, a critical consideration for the Port Authority.

The submissions revealed that all the entrants had carefully considered all of the criteria but had addressed them differently and/or with different emphasis on the specific considerations. These variations can be used to help inform the scoping during the planning process.

At the same time, not surprisingly, the panel found that none of the submitted entries was ideal and that addressing some of the criteria well often involved accepting weaknesses in meeting others. As planning, design, and stakeholder discussions go forward, it is possible that some of the best features of each entry may be discussed in formal scoping discussions.

Especially important as planning goes forward is deeper analysis and more detailed planning of bus operations inside and outside of the terminal. While the submissions all addressed alternative operating regimes for buses, alternative gate arrangements, ramp designs, and circulation plans, and included bus storage and staging submissions, these were all preliminary and will need to be analyzed in greater depth and refined.

Comparative Analysis of the Phase II Submissions (in Alphabetical Order)

Given the complexity of the environment and multiplicity of objectives, the panel considered the submission by **Arcadis of New York, Inc.** to achieve a good balance among the many competition objectives and issues raised by stakeholders. Located west of 9th Avenue between 38th and 40th Streets, a moderately small footprint is achieved with no use of additional private property. This submission is in the mid-range of estimated construction costs for all of five submissions.[1] Access to nearby transit and pedestrian destinations are appropriate and the pedestrian circulation pattern within the proposed structure is suitable. This submission incorporated modest expectations for technological change in order to achieve the future projected bus traffic. Bus access and circulation in this competition concept are complex and using information provided in the submission, the panel felt bus circulation might well pose operational difficulties at projected future bus traffic volumes. Locating the intercity bus terminal on the seventh or top level was deemed problematic by the panel because it creates longer pedestrian paths for passengers carrying luggage. The panel considered the mass of the building and the proposed façade in combination to be more impactful to the surrounding community than might be desired, while recognizing the challenges presented by a structure that must be large in order to function. Repurposing the current Greyhound bus tunnel as a path for pedestrian circulation seemed to the panel to be a creative idea in concept, but we found it to have been developed in insufficient detail for us to assess its effectiveness.

The submission by **Archilier Architecture Consortium** also located the new terminal west of 9th Avenue between 38th and 41st Streets, and also meets many of the specified criteria. However, the proposed new terminal has the largest footprint of the submitted entries and the panel found that it "turns inward," in that presents a very massive façade to the community and does not integrate well with the streets, for example, by incorporating street-facing retailing on the first level. This submission is in the mid-range of estimated construction costs. By incorporating staging areas on each level of the proposed new terminal the competition concept supports operational efficiency but increases the footprint. It also would require, but did not include in its cost estimates, the completion of a #7 subway station at 41st Street and Tenth Avenue. This concept also requires the use of private property. The panel has reservations about incorporating a rooftop park that is rather high above street level and not easily accessible, and the team did not discuss who would operate, maintain or provide security for the park. There

[1] For more information about cost estimates, please see Table 4.

were favorable comments about the rooftop park submitted by members of the public via the competition website.

The panel found the competition concept submitted by the **Hudson Terminal Center Collaborative** to be uniquely creative. By proposing to locate the new bus terminal entirely underground and close to the existing facility, this submission provides many opportunities for real estate development on Port Authority property and less disruption to the superior intermodal connections of the existing terminal site. This submission has an estimated capital construction cost that is much higher than all the other submissions and the panel concluded that the cost estimates also left open the risk of potential cost escalations. The panel also was concerned that this proposal might result in high long-term operating costs because of deep vertical circulation on a relatively large footprint. This submission would benefit by but not depend upon developing a #7 subway station at W. 41st Street and Tenth Avenue. Bus storage and staging could be maximized within the terminal cavern. We are uncertain as to the accuracy of the predicted construction costs and impacts on nearby property and are concerned about the safety and security risks of the underground cavern solution. We also believe there to be potential challenges securing the required skilled labor necessary for such a project, particularly as other major projects (e.g., Gateway) are underway. The team asserted that the terminal could be financed by proceeds of real estate development on Port Authority property, but the panel thinks that assertion to be speculative and that this entry could not be so financed with greater certainty than could other entries having lower capital costs. Ironically, despite creatively locating the terminal underground, this submission would require the acquisition of the largest number of privately owned parcels among the five submissions, for ventilation shafts and construction access.

The Pelli Clarke Pelli Architects submission creatively proposes a solution located west of 9th Avenue between 38th and 40th Streets that requires no property acquisition, minimizing the PABT footprint while keeping the location close the current terminal. Although the submission offers the lowest construction cost of all five submissions, the panel observed that it did not include the costs of technologically enhanced buses, subway improvements, and a required intercity bus terminal at another location. It also would require, but did not include in its cost estimates, the completion of a #7 train station at 41st Street and Tenth Avenue. The passenger circulation and interior design of this submission are notably creative and favorable comments about the façade were submitted by the public. This submission was responsive to feedback received from stakeholder groups, particularly community concerns about specific properties. This solution provides fewer than 50% of the number of gates that are present in the existing terminal and less accommodation for bus staging and storage than would be ideal, and proposes to relocate intercity bus operations to a location other than that of the commuter bus terminal. Further, proposed locations for bus storage would put buses on city streets and some would require new partnerships with other public agencies. The panel was open to considering an intercity terminal at another location, but agreed that this entry does not discuss, even in general terms, a strategy for accommodating intercity buses. The proposal that the center tube of the Lincoln Tunnel be used exclusively by buses in the peak hours was similarly difficult for the panel to accept as feasible without deeper analysis. This entry also relies heavily on technological changes including a new fleet of Bus Rapid Transit type vehicles and pushing the utilization of gates in "turns per hour" well beyond the current level by applications of

technology. The panel understood that a relatively small number of proposed gates in this submission reflects the expectation that changes in technology and bus design will enable higher gate productivity. The panel agreed that it is appropriate to promote technological advances but felt that this submission, by having many fewer gates, does not sufficiently "hedge" against possible failure to attain these advances. If the number of bus turns per gate per hour does not increase to the extent anticipated, there could be insufficient gates to handle 2040 operations even after another floor is added. And, the additional floor would add complexity to bus flows already required to traverse several levels even without it. The additional floor would also reduce the attractiveness of the facility in terms of compatibility with the surrounding community. The panel notes that favorable comments about the façade submitted by the public, and the panel thought the proposal for establishing a Transferable Development Rights receiver district was innovative and creative.

The entry by **Perkins Eastman** is also uniquely creative. It locates the terminal in an existing building – the Javits Convention Center – in an area of that facility that it asserts will be underutilized following a Javits expansion. The submission does not require private property acquisition and remains in the mid-range of estimated construction costs for all of five submissions. A terminal on a single bus operating level and that provides for bus storage and passenger circulation was seen by the panel to be very creative. Achieving this competition concept would, however, require extensive negotiations and agreements among public agencies and stakeholders that have different objectives. We could not be certain how this submission would be accommodated by the Convention Center given that it has already issued a Request for Proposals to expand the Center. We do not believe such agreements to be unachievable, but the submission did not develop possible arrangements in sufficient detail for us to evaluate that possibility. We found distances to be traversed by passengers to be excessive in two ways: 1) although the location near the existing #7 subway terminal at the 34th Street Hudson Yards Station is a clear benefit for some commuters, access to and from the northeast would require much longer distances than seemed desirable even if the proposed transit terrace, including moving sidewalks, was successful and which would only materialize after the bus facilities are completed *and* the related private development comes online; and 2) while the bus gates would be on a single level, we found that long horizontal distances would have to be traversed by passengers within the terminal as well. This solution would also require rebuilding Lincoln Tunnel ramps in such ways that the panel found potentially feasible but at unknown cost and impact on tunnel traffic and tunnel fire and ventilation code compliance that we could not clearly assess.

Suggestions for Board Consideration

The panel was asked to share with the Board its suggestions regarding potential steps in planning for a new bus terminal. The following suggestions represent a consensus of the panelists and emerge from comparative analysis of all the submissions and general discussion of points that arose in our evaluative discussions.

1) Building New Bus Parking and Staging Facilities Can Precede a New Bus Terminal: Some of the most pressing problems facing operation of the existing PABT deal with bus parking and staging. The submitted entries all address staging and parking,

some within the new terminal, some on sites near their proposed terminals, some using existing buildings, some on proposed decks over Dyer and Galvin Plazas, and some on sites in New Jersey. In all likelihood a combination of bus storage and staging locations will be needed to accommodate future demand, and the development of new parking and staging facilities could increase the efficiency of operations at the current bus terminal long before a new terminal is completed. Bus parking and staging capacity has been cited in the Port Authority's ***Trans-Hudson Commuting Capacity Study*** as a potentially valuable early action item for the Authority and its partners to consider in managing corridor travel demand while a new terminal is planned, designed and constructed. Such a strategy contributes to the achievement of modularity recommended in one of the objectives and may help maintain reliable operations and on-time performance during the years that the current terminal must continue to operate, and also holds the potential to be advanced in a manner that may be part of the permanent terminal replacement solution. We recommend careful consideration of alternative bus parking and staging facilities while a new terminal is being planned and built.

2) Give Serious Consideration to Separate Terminals for Commuting and Intercity Travel: The submissions clearly indicate that a combined terminal to meet future bus traffic forecasts could be massive. Achieving a small footprint requires a building having many levels that compromises bus operations; while limiting the number of levels requires a large footprint that may be considered intrusive by the surrounding community. One entrant proposes separating the intercity bus terminal from the commuter bus terminal but does not develop a proposal for the intercity bus terminal. Given the massive structure that results from accommodating future growth in intercity traffic and commuting traffic, the separation of these functions seems to the panel to have merit. The Port Authority should consider two, or perhaps more, separate facilities with appropriate attention to a careful transition over time. The opening of a new commuter bus terminal could allow, for example, the existing PABT to be used only for intercity operations while a second new terminal is completed.

The optimal solution might be to include a portion of the intercity bus operations in the new terminal and to provide one or more separate terminals for intercity buses at other locations in Manhattan or in New Jersey. Including a portion of the intercity bus operations in the terminal offers the potential to maximize the utility of the terminal that would otherwise be underutilized for all but afternoon/evening rush (15 hours a week.) The inclusion of intercity bus operations would also help increase revenues derived from these operations.

3) Consider Future Terminal Designs that Include Underground Levels:
The panel found that many of the options included structures that were too tall for efficient operations and noted that tall structures also were likely to be opposed by community stakeholders. While we identified above some limitations in the submission that recommends the future terminal be located entirely underground, we suggest consideration of a terminal design that includes a combination of above and below ground levels. This might lower the cost in comparison with one entirely underground

and might simplify bus operations in comparison with a design that requires buses to climb ramps to as many as six or seven levels above grade.

4) Considerations for Site of New Bus Terminal: Review of five creative submissions for a new PABT revealed how complex and challenging the project is. While the panel found great merit in each submission, there were also drawbacks to each, resulting from the inherent complexity of trying to achieve a program in which bus terminal traffic will grow substantially while minimizing the terminal footprint, using little or no private property, limiting community impacts and enhancing operational efficiency. Each entry was a compromise among those goals.

The panel concluded that another compromise among the objectives that is worthy of consideration might include building a new terminal on the site of the current terminal, while the terminal remains in operation. We note that a very preliminary exploration has been conducted by Port Authority staff, following the Midtown Bus Master Planning effort's peer review, into an option to build in place. This option involves removing the automobile parking at the top of the terminal, bridging over the current terminal with a new structure, adding two bus operating levels above the current terminal and successively, replacing lower floors and requisite bus ramps "from the top down" as levels above are completed. This would be complex and it is unclear how expensive this would be to accomplish. We do not know whether it would be acceptable or unacceptable in comparison with other ideas that also are compromises among competing objectives.

5) Acquisition of Private Property: While the panel and the competition entrants emphasized the minimization of private property acquisition, another possibility would be to consider private property in the vicinity of the current terminal which may be or available for purchase.

6) Rooftop Treatments: Incorporation of a "green" roof into some of the submissions was appreciated by the panel. The new terminal should be designed to be sustainable with respect to heating, cooling, the use of energy for transportation purposes, and the capture and recycling of water. Achieving these functions does not require inclusion into the terminal of a park for public use. A park on the roof of the structure was considered by the panel to raise complex questions in that it was accessible by elevators and escalators, raised questions about security and safety, and left open questions about operating and policing and maintaining a park as part of a terminal. Planners of a future terminal should prioritize sustainability over the provision of recreational opportunities.

Conclusion

The members of the panel welcomed the opportunity to contribute to the process of developing concepts for a new PABT. We thank the Board for providing us with the opportunity to serve. Throughout the process of deliberations, the Port Authority staff was always responsive and supportive of the panel. We thank them for their diligence and were repeatedly reminded of their competence and commitment. The teams that submitted entries into the competition were all

thoughtful and responsive and we thank them as well. Their effort will make an important contribution to the development of a new terminal.

Table 1: The Design + Deliverability Objectives

1. Meets current and projected bus passenger traffic demand with an appropriate level of service, recognizing the role of a new Bus Terminal in the interstate transportation network, addressing both the commuter and long-distance markets and compatibility with other trans-Hudson transportation operations and investments;
2. Advances a functional and practical transportation solution, reflecting an effective operation for the passengers and bus carriers that rely on the terminal and its services, including appropriate pedestrian connections to mass transit in the vicinity of the new terminal;
3. Minimizes traffic impacts to the surrounding local streets;
4. Provides functionality for bus parking and staging;
5. Considers the potential for other bus storage facilities in alternative locations;
6. Provides a cost effective solution that takes into account both the capital and future operating costs as an element of "deliverability," given limited financial resources and the history of significant operating losses at the existing facility;
7. Permits scalable and modular solutions that may be phased as needs and standards for the Bus Terminal evolve;
8. Takes future constructability into account;
9. Sustains the Port Authority's interest in safety and security in terms of design, operations, and site location;
10. Utilizes currently-owned Port Authority real estate where possible, minimizing the acquisition of private real estate;
11. Encourages attention of private capital as an element of project's "deliverability," including leveraging the Port Authority's real estate development rights associated with the Bus Terminal and surrounding area, and potential public-private partnership options as a means of delivering the future project;
12. Takes into account the concerns of the local community including construction impacts, requirements for non-Port Authority property, bus operation impacts, and a conceptual design that considers the fabric of the surrounding neighborhood;
13. Utilizes sustainable design principles; and
14. Embodies the excitement and dynamism of the New York and New Jersey Metropolitan area.

Table 2: International Design + Deliverability Panel of Experts:

Martin Wachs serves as panel chairman. Wachs is a Distinguished Professor Emeritus of Civil and Environmental Engineering and of City and Regional Planning at the University of California, Berkeley. He previously served for 25 years at the University of California-Los Angeles, including 11 years as chairman of the Department of Urban Planning.

Gail Benjamin, retired former New York City Council Land Use Director. Benjamin served on the New York City Council for 24 years, and has extensive experience navigating complex New York City land-use matters.

Tilly Chang, Executive Director of the San Francisco County Transportation Authority. Chang's professional experience includes planning, development and delivery of multi-modal transportation projects, as well as transportation policy and urban planning. She also has worked at the World Bank and the San Francisco Bay Area's Metropolitan Transportation Commission.

Robert Paaswell, Distinguished Professor at the Grove School of Engineering, The City College of New York. Paaswell previously served as executive director of the Chicago Transit Authority.

Robert Puentes, President and CEO of the Eno Center for Transportation. Puentes previously served at the Brookings Institution. He led projects relating to sustainable transportation, infrastructure finance, access to opportunity and urban planning.

Dana Skelley, Director of Asset Management, Transport for London, Surface Transport. Skelley is one of Britain's most senior and respected women in engineering. She leads 500 engineers and asset managers and is responsible for more than £15 billion of infrastructure, including maintenance of London's arterial roads, 6,200 traffic lights, 1,800 bridges, 12 tunnels and more than 1,000 miles of walkways. She has been awarded the Order of the British Empire

Phillip Washington, CEO of Los Angeles Metro. Washington oversees a fleet of 2,000 buses and six rail lines. He is a former CEO of Denver, Colorado's Regional Transportation District and a former Chair of American Public Transportation Association (APTA).

Table 3: Finalist Teams

Arcadis of New York, Inc.

- Arcadis
- CallisonRTKL
- Benthem Crouwel Architects
- Sam Schwartz Trans. Consultants
- PMA Consultants
- IMG Rebel
- Real Estate Solutions Group
- A.G. Consulting Engineering
- AI Engineers
- Clearcell Power
- DHC
- LERA
- Redland Strategies
- Siemens Industry, Building Technology
- Stellar Services
- Timothy Haahs & Associates
- Techno
- Tully Construction Company

Archilier Architecture Consortium:

- Archilier Architecture
- Langan
- CTA Consultants/DH Group
- LERA
- AFK
- W Architecture & Landscape Architecture
- Jones Lang LaSalle
- Suffolk Construction Company
- Lerch Bates

Hudson Terminal Center Collaborative:

- STV Incorporated
- AECOM USA, Inc.
- Skidmore, Owings, & Merill LLP
- McMillen Jacobs Associates, Inc
- Mueser Rutledge Consulting Engineers
- CBRE, Inc.
- CIBC World Markets Corp.
- James Lima Planning and Development
- Duke Geological Laboratory

Pelli Clarke Pelli Architects:

- Pelli Clarke Pelli Architects
- BuroHappold
- Nelson/Nygaard
- Stantec
- Turner Construction Company
- AREP Ville
- eDesign Dynamics
- Mueser Rutledge
- BJH Advisors
- DVS Security Consulting
- WXY
- OasesRE
- Shen Milsom & Wilke
- Hinman
- Cline Bettridge Bernstein Lighting Design
- Bureau Mijksenaar USA

Perkins Eastman:

- Perkins Eastman
- ARUP
- Mikyoung Kim Design
- Washington Square Partners
- VJ Associates
- Conventional Wisdom

Table 4: A Note on Rough Order of Magnitude Cost Estimates

In Phase Two, the Finalists were asked to perform and submit a Rough Order of Magnitude Cost Estimate for their design concepts.

The Rough Order of Magnitude Cost Estimates do not reflect total project costs and do not include soft costs, such as insurance, legal fees, regulatory approvals, administrative fees, finance costs, land acquisition, comprehensive architecture and engineering costs, or professional fees. They also do not include optional or alternate components of the competition concept.

The Rough Order of Magnitude Cost Estimate total for construction provided by each Finalist is as follows:

Team	Rough Order of Magnitude Cost Estimate
Arcadis	$4.2B
Archilier Architecture Consortium	$7B
HTC	$15.3B
Pelli Clarke Pelli	$3.7B
Perkins Eastman	$5.4B

These Rough Order of Magnitude Cost Estimate materials were submitted by the Finalists as part of their Phase Two Submissions and are provided herein for information only. The Port Authority makes no representation as to, and shall not be responsible for their accuracy, completeness or pertinence, and shall not be responsible for the conclusions to be drawn there from. They are being provided merely for the purpose of providing such information as is in the possession of the Port Authority, whether or not such information may be accurate, complete or pertinent.