

MEMORANDUM

FROM: Chief Capital Megaprojects Delivery Officer, Tom Maguire

DATE: October 6, 2025

SUBJECT: BART Silicon Valley Phase II Peer Review – Final Report

BACKGROUND:

The Federal Transit Administration (FTA) accepted VTA's BART Silicon Valley Phase II Extension (BSVII) into New Starts Engineering (NSE) in August 2024 and indicated a maximum contribution from FTA's Capital Investment Grant Program of approximately \$5.1 billion (40 percent of the \$12.745 NSE Estimate). Since that time, VTA has focused on a comprehensive project wide cost saving effort to align project costs within available funding, including the development of cost saving concepts, pursuit of additional non-local funding sources, and review of the project contracting and procurement approach.

VTA invited industry expert peers recommended by FTA, and FTA's Project Management Oversight Consultant (PMOC), to an August 20, 2025 Peer Review to review and evaluate feasibility, constructability, contract packaging, and delivery approaches, related to specific project scenarios. These scenarios incorporate the multiple cost saving ideas developed over the last year and reflect updates to contract packaging approaches, including work related to tunnel construction. The panel consisted of project delivery executives from peer public agencies, including LA Metro and Sound Transit who provided their input and feedback based on their respective experiences delivering transportation infrastructure projects. Key findings from the Peer Review will be presented at the October VTA Board BSVII Oversight Committee.

The peer review panel provided the attached report (Attachment A), which summarizes their evaluation of Scenarios 1 and 1a developed through the cost saving effort, provides independent perspective on Value Engineering (VE) ideas, provides recommendations for contract re-packaging and delivery methods, and also identifies outstanding risks for future evaluation as the project advances towards construction.

Staff is available to further discuss or respond to any follow-up questions as necessary.

**BART Silicon Valley Phase II Extension
Independent Peer Review**

Final Report

September 25, 2025

Peer Review Panel

Rick Clarke, LA Metro (Retired)
Joseph Gildner, Sound Transit
Anthony Pooley, Sound Transit
Mat Antonelli, LA Metro
Kimberly Ong, LA Metro

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EXECUTIVE SUMMARY

The Valley Transportation Authority (VTA) conducted a peer review to review and assess the BART Silicon Valley Phase II Extension (BSVII) Project (the Project). The Project is a six-mile extension (mostly underground) with an estimated overall cost of approximately \$12 billion. This Project will extend BART service into downtown San Jose and Santa Clara. In conjunction with Caltrain, the Project will allow high-level rail transit service to “ring the bay” highlighting the regional significance of the Project.

VTA, with the support of Federal Transit Administration (FTA) and their project management oversight consultant are contributing to this peer review. FTA will give due consideration to the peer panel recommendations in this report.

These sponsors are seeking independent perspectives on VTA’s current Value Engineering efforts to bring the Project’s scope and budget into alignment. VTA and FTA are inviting experienced staff from other transit agencies to provide feedback on the feasibility, constructability, contract packaging and delivery of the Project configuration. The focus is on the VTA’s cost savings work that started in 2024 and aligning it with the Project’s available funding including VTA’s ongoing work with the FTA towards receipt of a Full Funding Grant Agreement (FFGA).

The peer review was conducted on August 19 with a project tour and August 20, 2025, with an all-day presentation of project information, questions and input from VTA and FTA. The peer review team continued interactions with VTA and FTA after these meetings. The VTA team was thorough and transparent in providing information.

The members of the peer review team are:

- Joe Gildner, Sound Transit
- Anthony Pooley, Sound Transit
- Mat Antonelli, LA Metro
- Kimberly Ong, LA Metro
- Rick Clarke, LA Metro (retired)

The peer review’s scope and efforts assumed consistency with the basic Project configuration including alignment, station locations and fundamental decisions made in the past such as using a large, single bore tunnel. Re-opening any project configuration elements risks major Project delays for elements that have previously been studied in separate efforts.

The peer review panel reviewed a number of key areas including:

- Scenario 1 vs. Scenario 1A
- Independent perspective on VE efforts to bring the scope and budget into alignment
- Contract Packaging
- Risk

The Project is at a crossroads as VTA is rethinking its longstanding plan to deliver the extension. VTA and its progressive design-builder (Kiewit Shea Traylor – KST) for baseline Contract Package 2 – Tunnel and Trackwork (CP2) were unable to come to terms for construction of this package. VTA has elected to take an off-ramp and re-package the bulk of the scope of work of CP2 into different contract packages for this extension.

One of the early, completed tasks by KST was the procurement of a large diameter tunnel boring machine (TBM). The off-ramp with KST will likely now assign the risk of TBM performance and warranty to VTA. The peer review believes that this is the most significant project risk as TBM performance is critical to the project schedule including potential delays to follow-on contractors. The TBM supplier – Herrenknecht – has an excellent reputation for producing quality equipment, however, given the large diameter bore and difficult ground conditions, production problems that affect the schedule are possible, potentially resulting in VTA needing to bear the cost and schedule impacts of performance challenges.

In addition to procuring a quality TBM, the most effective mitigation for this risk is to select a contractor with deep experience in the operation of a large diameter TBM. Such specialized experience is not widespread in the construction industry and availability of qualified contractors could be an issue. As VTA goes through the formal off-ramp process, it may be worthwhile to engage with the KST team or major components of that team (to the extent contractually allowable) who specialize in tunneling to ascertain their interest in taking on the revised tunneling contract scope at a reasonable price. The re-packaging being considered by VTA does include a tunnel-specific contract (CP5) that may be appropriate for the contractors with focused skills related to tunneling.

The Project has recently commenced a significant amount of construction developing the west portal area using a CP2 early works contract with the progressive design-builder. This construction provides the Project with very positive momentum that must be sustained. However, it is a long, complicated Project with many risks along the way.

Given the Project's large size and complexity, there is no "silver" bullet that will quickly and easily bring and maintain the Project into budget and schedule alignment. However, there are several actions and considerations that the peer review panel can offer VTA based on their individual and collective experience. The project management approaches offered by

the peer review panel or those implemented by VTA are not necessarily right or wrong. More importantly is that effective management and best practices are applied to each facet of the Project to assure success.

Scenario 1 vs. Scenario 1A

General comments on Scenario 1

The broad aim of Scenario 1 is to complete the Project with a configuration generally consistent with the current Baseline. Scenario 1 makes adjustments to the Baseline to address the off ramping of KST from the CP2 contract, affordability gaps and the risk of delay caused by the CP2 off-ramp.

Scenario 1 has the advantage of requiring relatively little redesign and reconfiguration. Any alternative scenario (including Scenario 1A) would require considerably more new design work, thereby increasing the risk of overall project delay. Attempting to mitigate potential delays in an alternative scenario by using a Progressive Design Build procurement would run the risk of repeating the experience of CP2 and is not recommended.

Comments on Specific Aspects of Scenario 1

1. *Cost Saving Measures*: the proposed Level 1 and Level 2 cost savings measures and station refinements appear reasonable, offering measurable cost reductions while preserving the overall scope, intent and configuration of the Project.
2. *Newhall Yard Scope Refinements*: the proposed Yard refinements also offer cost savings but have yet to be accepted by BART (several press articles on BART's apparent rejection of the Yard refinements were published on August 26th, 2025). Achieving concurrence between BART and VTA on this subject needs to be a priority for the project to proceed successfully. It is recommended that VTA and BART continue to collaborate and study the optimal storage and maintenance needs at Newhall.
3. *Increased TBM Advance Rate*: Scenario 1 increases the assumed daily TBM advance rate by 21% from the baseline 29 ft/day to 35 ft/day. Additionally, the TBM is assumed to mine 6 days/week rather than the baseline 5 days/week. The combined effects of the two changes result in a 44% increase in the planned weekly production.

The assumed increases are not unreasonable, and VTA has provided data from comparable projects to demonstrate this. Nevertheless, increasing the planned TBM advance rate at this early stage with no contractor buy-in optimizes the

schedule, increasing the overall schedule risk.

Factors to consider:

- TBM operations in the USA typically run 2 x 10-hour shifts, 5 days per week. Internationally 3 x 8-hour shifts, 7 days per week is not uncommon, with parts of at least one shift daily being dedicated to routine maintenance and resupply.
 - Increasing to 7-day, 3-shift working would offset the schedule risk introduced by increasing the weekly production rate.
 - The peer review team recommends that VTA staff discuss with responsible Herrenknecht representatives this option of extended weekly TBM operations in conjunction with their comprehensive machine maintenance recommendations. This crosswalk should result in an optimal schedule for TBM production combined with required maintenance intervals.
 - Running a 53ft diameter TBM continuously is economically prudent, because it is an unusually expensive piece of equipment, making standing time a significant expense.
 - Availability of labor is already identified as a “Top 10” project risk (BSV-036). Increasing the proposed TBM working hours increases this risk. Nevertheless, it would be easier to increase labor on one TBM than to try and set up an entire second TBM operation, as proposed in Scenario 1A.
 - The challenging ground conditions and low overburden (1.5 diameters) will make it more difficult to achieve an optimized planned TBM advance rate. It is recommended that this aspect of TBM operations be studied and considered further. Furthermore, VTA should consider conferring with key personnel that worked on SR 99, Alaska Way Viaduct in Washington state – SR 99 Bored Tunnel Design-Build Project to identify key lessons learned to incorporate into the contract documents optimize large diameter TBM performance and minimize potential risks associated with excessive surface and near surface ground settlement.
4. CP 5 Contract Procurement: the proposed CP5 package focuses on tunneling, removing the station excavation elements. The result is a smaller, less risky contract, likely to be more appealing to tunnel contractors than the previous CP2 contract. The proposed procurement timeline is reasonable (approximately 18 months).

Factors to consider:

- VTA is proposing to procure CP5 as a CM/GC contract with a fixed price on the tunneling element. Given the circumstances in which the contract is being procured combined with the fact that the tunneling element is the largest cost component, VTA may find it difficult to obtain a fixed price commitment from a contractor. Industry outreach should be carried out to assess the viability of this approach versus proceeding with a design-bid-build delivery (it may already have been done). The use of targeted, shared risk pools may also help in this regard (see below).
 - If any contractor other than Kiewit, Shea or Traylor (or some combination of these firms) operates the TBM procured by KST, VTA is likely to carry an owner-implied warranty for the TBM's performance. This is potentially a very significant risk. VTA should consider carefully how it would structure and manage such a contract to mitigate the risk. VTA should be prepared that the contractor selected will not take any responsibility for the TBM's performance.
 - The risk presented by an owner-implied warranty on the TBM is increased by the combination of large TBM diameter, soft ground conditions and limited overburden. Potential events such as ground loss, mechanical failure or tunneling-induced settlement would likely be characterized by contractors as being the result of TBM design/performance issues.
 - To avoid the potential risk of an owner-implied warranty, VTA should consider whether it has any means of negotiating a contract with one or more of the existing KST JV members before embarking on an open procurement.
 - Given the reliance on the single TBM, VTA should consider having appropriate staff from Herrenknecht to serve on the construction management team throughout the time period of TBM operations. This staff can provide the necessary analysis/assessment of the machine and advise on proper maintenance during this timeframe.
5. *Risk/Cost Management in CP5 Contract*: one way of managing risk, reducing bid price and making the CP5 contract more appealing to potential bidders would be the targeted use of contingency sums (risk pools). Areas to consider for such an approach would be Differing Site Conditions and building damage due to tunneling. VTA might also consider the use of performance incentives.

General Comments on Scenario 1A

The broad aim of Scenario 1A is to provide an alternative configuration for the Project that would result in a more affordable outcome that could be completed within the existing schedule timeframes. Based on the information presented in the briefing document, it is not apparent that Scenario 1A would achieve these aims any more effectively than Scenario 1.

- Cost: Scenario 1A does not appear to offer cost savings compared with Scenario 1. In fact, the ROM costs provided to the peer review team show the opposite: Scenario 1A would be 7% more expensive than Scenario 1. The figures should not be regarded as authoritative, since they are based on ROM costs.
- Schedule: Scenario 1A does not appear to show any schedule benefit compared with Scenario 1. Both result in a 2039 opening date, and both show TBM tunneling as critical until 2033. Under Scenario 1A the critical path shifts to the smaller TBM once the larger one completes its drive.
- New Risks: Scenario 1A introduces new risks to the project and exacerbates others, as explained below. Taking these as a whole, Scenario 1A is a riskier configuration than Scenario 1, from a construction perspective.

For these reasons, Scenario 1A does not appear to offer a more viable chance of delivering a successful Project outcome than Scenario 1.

Disadvantages and Risks of Scenario 1A

Scenario 1A has several key disadvantages, introduces several new risks and exacerbates some existing risks already identified as “Top 10” risk items.

1. Cut & Cover in Downtown Area: the proposed meeting point of the two TBMs is a cut & cover box east of the Downtown Station. Such an excavation explicitly defeats a key intent of utilizing a large diameter single bore, namely avoiding cut & cover excavations in the Downtown area. Proposing this approach is likely to meet with 3rd party stakeholders and public resistance, increasing the risk of delay to the Project schedule.
2. Procurement of a 2nd Large Diameter TBM: procurement of a second large diameter TBM in a buoyant global tunneling market adds a new schedule risk to the project, because there is a reasonable chance that delivery of the 2nd TBM could be delayed,

resulting in an overall project delay (the latter stage of the smaller TBM drive is on the critical path). This risk could be mitigated by moving swiftly to procure the 2nd TBM (new or used). The Peer Review team recommends that the VTA staff and its consultants document their industry outreach efforts to review and assess the key risks associated with this scenario of utilizing a 2nd large diameter TBM.

3. Availability of Specialist Skilled TBM Personnel: availability of general labor is already identified as a “Top 10” project risk (risk register item BSV-036). Operation and management of TBM mining operations require specialized, skilled, experienced labor and engineers. The Project requires operation of a very large diameter TBM in difficult and variable hydro-geologic conditions with less than two diameters of overburden. Successful completion of such a drive will require the industry’s most skilled and experienced TBM operators and tunnel frontline supervisors, with documented successful experience overseeing the operations of similar-sized machines. In the judgement of this peer review team the worldwide availability of these highly skilled personnel are very limited.

The addition of a second large diameter TBM to the Project increases the existing risk that an insufficient number of skilled TBM personnel will be available for the Project. If the skill pool of the TBM operation is diluted in this way, the risk of operational errors also increases. This in turn leads to an increased risk of unanticipated tunneling-induced settlement on both drives, which is already a Top 10 risk (BSV-005).

4. Availability of trucks for muck disposal: the availability of sufficient trucks to support spoil disposal for the currently proposed large single bore is a “Top 10” risk (BSV-152). Addition of a second concurrent TBM drive would require an increase in the number of available trucks, sufficient to support both TBM drives plus simultaneous excavations at four station sites.
5. Optimistic TBM Advance Rate: the assumed daily advance rate for the smaller 40-ft diameter TBM has been assumed to be 37ft/day, greater than the 35ft/day assumed for the 53-ft diameter TBM. While this is not unreasonable, it is edging into optimistic territory. Without this assumption the Scenario 1A schedule would be longer than Scenario 1. This adds an element of risk to the Scenario 1A schedule.

Possible Advantages of Scenario 1A

1. The smaller diameter TBM would reduce the risk of ground settlement along the eastern portion of the alignment, because of the anticipated smaller volume loss and the greater depth of overburden to the tunnel crown.

2. In the event of one TBM breaking down, the other would still be mining, enabling some progress to be maintained. However, this is not a real advantage, since both TBMs have to complete their drives for the project to be completed. If the smaller TBM broke down, the larger could continue to mine eastward. The same is not true for the smaller TBM.

Follow-Up Actions for Scenario 1A

1. Review ROM cost data and assess its reliability.
2. If Scenario 1A is considered further, consider eliminating the cut & cover meet-up point for the two TBMs. Instead, complete the large drive (CP-5), dismantle the TBM within the tunnel, treat the tunnel face and drive the smaller TBM into the completed larger tunnel. This has the advantage of eliminating an open excavation in the Downtown area. However, it would have the disadvantage of making completion of the smaller drive dependent on prior successful completion of the larger, adding a critical risk to the overall schedule.

Further Considerations for Scenario 1A

1. If Scenario 1A is not viable, another, less expensive way of reducing schedule risk, saving time and ensuring the required 35 ft/day TBM advance rate is met would be to utilize a 24/7 TBM operating schedule. Such schedules are common outside the USA. While a 20-hrs, 5 days per week schedule may be appropriate for smaller TBMs, it seems wasteful to have a 53ft TBM operating for only 60% of the available hours per week. The peer review team recommends that VTA staff discuss with responsible Herrenknecht representatives this option of extended weekly TBM operations in conjunction with their comprehensive machine maintenance recommendations. This crosswalk should result in an optimal schedule for TBM production combined with required maintenance intervals.

Independent perspective on Value Engineering (VE) efforts to bring the scope and budget into alignment

The VTA staff and their consultants have identified and implemented a series of VE changes that have significantly reduced costs. Although it is not a direct comparison, the estimated cost for Scenario 1, which includes the VE savings, is \$12.123 billion (Source: Table 7) compared to the baseline cost of \$12.746 billion (Source: Table 2).

Some of the significant savings' categories include:

- Re-arrangement of various station access and egress shafts to optimize underground structures in stations.
- Minimize basement and underground support structures.
- Moving many Station Infrastructure Facilities (SIF) structures to surface.
- Converting two parking garages to surface parking.
- Reducing size of the Newhall storage yard and eliminating the maintenance facility
- Tunnel interior reconfiguration
- Various modifications to systems elements.

This report previously noted that BART has taken exception to proposed reductions in the Newhall maintenance facility and storage yard. It is important to resolve this issue quickly as it is a major scope and cost item. A joint review of the BART's operations and maintenance needs at Newhall is recommended.

Additional Potential Savings

As the VE elements listed above are implemented, it will become increasingly difficult to identify any additional savings without violating the basic project definition. The team should continue to search for these savings, however, but as the project advances, it will soon reach a point of diminishing returns.

Opportunities for cost savings are more likely to be in risk reduction during both the bidding stage and thereafter. The Project will soon be moving into a period of contractor bidding for several major contracts. These savings are difficult to quantify but offer the potential for significant cost savings if contractors reduce the amount of costs in their bids that they have set aside for risks.

Some of these opportunities are:

- Assure that any identified VE items are formally approved by BART prior to bidding. If bidders are not confident that BART supports the Project configuration, they will add contingency in their bid. A jointly signed correspondence between VTA and BART listing the agreed upon VE elements should address any concerns from bidders.
- A strong working relationship between VTA and BART appears to be a priority of both organizations. This is critical to the success of the project. The peer review

encourages VTA and BART to continue efforts to maintain this relationship given the challenges of such a long and complex project.

- Build bidders confidence that VTA is a strong organization that will work fairly with contractors and work proactively to resolve disputes in an equitable manner. VTA's inclusion of a Disputes Review Board on its tunnel contract and possibly other contracts is a strong signal to the industry of its desire to work to avoid disputes before they become claims.
- One-on-One meetings to hear contractor input and build trust. This includes continued discussions with heavy civil underground contractors and systems contractors and starting discussions with vertical contractors for station finishes, and rail works contractors.
- Consider the identification of "owner-controlled" float in the Project's baseline master schedule. This float should include a minimum of six months of owner-controlled float at the back end of the master schedule ahead of the planned Revenue Service Date. And, for all critical interface milestone dates between lead- and follow-on-contractors, instruct the lead contractor to include an appropriate amount of owner-controlled float (at least 30 calendar days) ahead of the date.
- Consider incentives – since the Project schedule is so dependent of the performance of the tunnel boring, an incentive tied to TBM performance can motivate a contractor to meet or exceed this milestone.
- Consider shared incentive pool or shared contingency as Caltrain successfully implemented on their electrification project. A shared contingency arrangement could persuade a contractor not to mark up or escalate their costs for additional profit for any changes with merit.
- Consider risk sharing for certain items such as inflation and adjustment clauses for specific commodities/material pricing. For example, if the contractor has all the inflation risk, they will add a significant premium in their bid and VTA will be paying for this regardless of whether it occurs or not. Another area that could be considered is a shared risk pool for unforeseen ground conditions – a frequent area for risk and disputes. There may be other opportunities for risk sharing. One-on-one meetings with contractors may identify these areas.
- Consider requiring certain contracts to include "cost of delay" in their price bid as LA Metro does. With so many contracts, the potential for delays on certain contracts is high. This would give VTA more certainty about the cost of a delay,

provide bidders with some level of confidence that their cost would be covered and would be a mitigation for potential future complex legal disputes regarding the legitimate cost of delays.

- The estimated professional services cost of approximately \$3 billion seems high. This number may be correct, especially as professional services costs have been incurred as far back as 2016. Also, the pool of owner-controlled insurance reserves of approximately \$250 million is included in this amount. However, given the high number, there may be opportunities for savings. Suggest VTA periodically reviews the bottoms up cost estimate and burn rate to see if any reductions are possible. VTA could use Phase 1 of the Berryessa extension project as a comparison baseline.
- The criteria for maximum one-half inch maximum settlement is very stringent. This criteria is used on other projects. However, these projects are using smaller diameter tunnel boring machines. VTA may consider performing an engineering analysis that evaluates a less stringent criterion.

Proposed Re-Packaged Contract Packaging

Systems – CP1-A Through CP1-E

The consideration to break out the Systems contract into separate packages appears to be driven by the lack of bidders when Contract CP1 was presented to the industry as a Design-Build contract and it appears in part due to the forecasted cost of CP1 exceeding \$1billion. In response to this, the single large Systems contract is proposed to be split into five systems contracts, with Contract CP1A as the main systems contract and is now envisioned to be a Design Bid Build contract. It is understood that the CP1A Systems Installation and Testing contract also includes systems integration and would be required to coordinate the other four specialty Systems contracts, CP1B through CP1E, which includes Emergency Ventilation System, Train Control/CBTC, Traction Power, and Communications/Fare Collection.

Having the systems work separately from the major civil/structural contracts is a good approach. VTA and BART will overall be likely to receive better products and installation from a contractor experienced in this specialized work. However, experience has shown that having all systems work in one single contract package is especially beneficial for systems integration and interfaces. Since it appears that the industry was presented with and not receptive to a Design-Build (DB) contract approach, the industry may be receptive to other procurement methods with a single systems contract such CM/GC. Experience has shown that having the systems contractor early to help with specialist procurements,

such as with a CM/GC contract, can reduce integration risk. Should the approach to have the Contract CP1A proceed along with four separate specialty systems contracts, then contract requirements should be clear on the integration requirements and contract interfaces to reduce risk to VTA.

Recommendations:

- Since VTA is now approaching the Systems contract as DBB instead of DB, consider presenting the Systems contract as one DBB contract to the industry and receptiveness to potential bidders
- Consideration for one Systems CM/GC contract, which would reduce integration risk and difficulties administering all the required warranty provisions. If VTA pursues a CM/GC contract, then VTA should establish a preconstruction contract with a start date that overlaps with the CM/GC station finishes preconstruction contract. It is crucially important to have all CM/GC contractors collaborating with VTA staff and their consultants as the designs progress in conjunction with estimating/negotiating full contract pricing.
- Should VTA pursue separate systems contracts, then the following considerations:
 - Systems integration appears to be a risk with this approach, so having a well experienced integrator over all systems contracts will be essential. The Systems integrator be brought on early to help with specialist procurements.
 - VTA should consider bringing in a high-level Systems Manager early to provide overall management and coordination of the significant systems integration efforts that VTA will be responsible. This Systems Manager should be given the opportunity to adjust the final systems contract packaging approach.
 - Specialty systems contractors' availability early on to coordinate with the CP1A systems integrator.
 - Provide sufficient float in the project schedule when considering system contractor access dates.
 - Consideration that systems specialty contracts warranty requirements are clearly defined to the satisfaction of VTA and BART and align with all the specific requirements for the Project's Pre- Revenue phase and the Revenue Service Date.

Tunnels – Contract CP2 (West Portal) and CP5 (Tunnel and TIBO)

The Project is experiencing positive momentum with the significant amount of work being performed at the west portal. This work is being performed as part of an early works package as part of the KST early works. In order to keep up this momentum and advance critical path work in the Project schedule, it is important to continue advancing the procurement of the revised tunnel package (CP5) in an expeditious manner.

With VTA separating Contract CP5 from Contract CP2, VTA is now retaining the risk of performance for the owner-furnished Herrenknecht TBM. VTA has identified that the design engineer under the KST contract is being transferred to VTA. To reduce risk VTA may want to explore transferring tunneling contractors under the KST contract to be transferred to VTA.

It is inherent to the schedules of large diameter bored tunnel projects that the TBM drive is the critical schedule and performance risk for the project. It is particularly so in this case where the depth is relatively shallow and the ground conditions are poor. Obtaining a top-tier world class TBM operation & management team is absolutely critical to success of this project. VTA should focus on how to achieve that most effectively.

Since CP5 is now becoming more of a tunnel-only contract it is suggested that VTA have discussions with the tunnel-specialty contractors on the KST team to determine the feasibility, cost and willingness for them to engage in negotiations to perform this work including assuming the risk of tunneling.

Other considerations for the owner-furnished TBM include specifying ways of sharing risk between VTA and the tunneling contractor. Potential areas could include bi-lateral agreement between VTA and the contractor on pre-agreed measures for potential risks with TBM mining, such as TBM blocked construction.

The schedule provided for tunneling is based on two ten-hour shifts/six days a week. Although many of the local tunneling projects have used two ten-hour shifts, international practice has used 24-hour/7 days a week for tunneling work. Since the Contract CP5 contract is dependent on one TBM, this makes the skills of the tunneling personnel very important for both the tunnel management team and the mining team.

Contract CP5 also includes tunnel internal concrete and tunnel MEP. If not already taken into consideration, design provisions in the tunnel internal concrete for installation of follow-on systems elements as appropriate.

Recommendations

- Consider a 24-hour operation to determine potential schedule savings.
- Consider ways for the CP5 contract to require qualified and experienced tunnel management team and the mining team.
- Any Systems component that is embedded in the tunnel internal concrete will need to be clearly defined in the CP5 and CP1 contracts.

Underground Stations – Contracts CP4A (Diridon Station Contract), CP4B (Downtown San Jose Station), CP6 (28th St Station)

The peer review understands that VTA is evaluating separating the CP4 package into smaller contract packages and also evaluating contract delivery methods. By separating the stations contract, this could encourage the vertical contractors to compete, and experience has shown that vertical contractors generally perform vertical works better. The recommendations below include considerations for CM/GC contract delivery should VTA pursue a CM/GC delivery method for the CP4A and 4B packages.

Recommendations:

- For CM/GC contract delivery, VTA needs to confirm that their integrated team of staff and consultants have the necessary prerequisite experience to appropriately manage and administer this delivery method.
- For CM/GC delivery, VTA must procure the services of the most qualified contractors on a timely basis allowing for the optimal duration of the preconstruction phase to jointly develop the optimal design aligning scope and budget along with high-quality Issue for Bid (IFB) documents.
- For the CM/GC contract delivery, VTA needs to work with the Contractor to identify the appropriate/necessary bid packages that clearly frame the work to be self-performed versus work to be packaged in IFB documents.
- VTA must score the most qualified contractor based on the staff being proposed (as defined by VTA) for both the pre-construction and construction phases and not strictly on the firms themselves.
- For the CM/GC contract delivery, VTA/BART must objectively consider CM/GC recommendations as part of the design development during pre-construction and assure that the design team implements accepted CM/GC recommendations. Communications and partnership between the parties is key – ignoring recommendations/suggestions during this stage will impact the partnership and minimize one of the major advantages of CM/GC – early input from

a contractor.

- For CM/GC contracts, VTA must provide the contractor with full access to the design documents during the pre-construction phase allowing the contractor the optimal opportunity to identify any errors and omissions and/or conflicts before achieving 90% completion of the contract documents.
- For CM/GC contract delivery, VTA needs to work with the contractor to identify the appropriate bid packages that clearly frame the work to be negotiated as self-performed versus work to be packaged in IFB documents.
- For CM/GC contracts, the VTA and its contractors must jointly embrace the open book configuration at the outset and establish/align estimates for negotiations that identify/frame all costs (e.g., direct, indirect, negotiated support services, and risk contingency).
- For negotiated accounts within the CM/GC contract, VTA must ensure there is alignment in advance on what is included and what is not in each category and that the parties are aligned in scope before costs are exchanged.
- For CM/GC contracts, VTA must decide how risk contingency will be allocated and administered in the contract and within the guaranteed maximum price.
- For CM/GC contracts, VTA must establish timely off-ramp options the Project schedule to allow sufficient time to repackage and bid out all, or portions of this Work, as necessary.
- During pre-construction, VTA must be clear about the level of detail the schedule needs to be reported to and be prepared for the CM/GC contractor to refine the schedule as subcontractors come on board and more information becomes available.
- VTA must review subcontract work package scopes carefully to ensure that the work is optimally allocated to firms best able to handle specific work.

At-Grade Station and East Portal – Contract CP7A (Santa Clara Station and East Portal)

No specific recommendations. Assure that there is sufficient float in the schedule to assure that the East Portal is complete prior to the arrival of the TBM. If VTA decides to use the CM/GC delivery method, then the peer review has the same recommendations as provided for the delivery method for Contract CP4A and 4B packages.

Trackwork – Contract CP7B (Trackwork)

The Preliminary Re-Packaging approach presented Trackwork as part of Contract CP7 (Santa Clara, Newhall Yard & Track). Trackwork is specialty work and can also be marked up when combined with a larger contract. There can be cost savings by separating Trackwork into its own contract package.

Recommendation:

- Consider separating Trackwork into its own contract package.
- The mainline track work in the underground infrastructure follows Acceptance of the Contract CP-5 Work. The provisions of both Contract CP-5 and Contract C-7B should include specific language requiring joint assessment and concurrence of the tunnel invert geometry (including all survey data) ahead of the installation of the final track.

Large Contract Package vs Smaller Contract Packages with Interfaces Between Contract Packages

The Preliminary Re-Packaging approach proposed for the SVBX Phase 2 project proposes to separate large contract packages into smaller contract packages. There are also potential cost savings in separating out specialty work that has distinct interfaces. Although increasing the number of contract interfaces in a project increases cost and schedule risk to a project, a modest number of contract interfaces where works are geographically distinct and the handover schedule logic is simple can be manageable and potentially result in cost savings due to reduced markups. For any contract interfaces, it is advisable for sufficient and well experienced management resources to be accounted for in the cost, and that these added management resources are brought on early in the project.

The benefit of a single large contract package assigns multi-disciplinary coordination with the contractor, and inter-disciplinary handover risks remain with the contractor. By splitting up a single large contract into smaller contracts, the risk of contract interfaces would be shifted to VTA. This can be mitigated by judicious definition of the contract handover interfaces and can build in some protection against knock-on effects from one contract to a follow-on contract. Nevertheless, risk of increasing the contract interfaces should still be taken into account for the cost and schedule risks.

Outstanding Risks Identified for further evaluation prior to release of further construction contracts

While VTA has done an extensive risk assessment at different phases of the life of the project, there are new risks associated with the recent off ramping of a contractor that must be evaluated to better understand the state of the project. With a better understanding of the current market conditions, the agency can mitigate risks and plan the construction packaging to not only get more competition, but to hopefully drive down overall cost. Based on the recent review the peer review has identified these additional risks for further discussion:

- Reliability/Validity of existing cost estimates
- Contractor Availability
- NFPA 130 Evacuation Requirements

Reliability/Validity of existing cost estimates

VTA performed standard bottoms up estimate prior to issuing the Kiewit Shea Traylor (KST) contract and updated the estimate during the phase 1 contract negotiations. Cost negotiations led to a reduction of scope and eventual off ramping due to the parties being too far apart on their respective estimates. It is imperative that VTA knows the expected project cost as contract packaging and delivery methods are being determined. While it appears that indirect cost and associated risks were the driving force in costdisagreements, it is not clear that lessons learned have been applied to the new construction estimates and project contract valuations.

It is recommended that VTA review the project estimates and apply theoretical lessons learned from the KST negotiations. If the project team decides to continue with the same estimates, they run the risk of continuing to be under the market value and running into the same negotiation hurdles as before. It is recommended that VTA document the areas of major cost differences with the KST estimate and perform a risk mitigation for each item to either document the mitigation to lower cost or change their estimate assumptions to better align with the contractor's expected negotiations strategy.

With such a substantial difference in cost, it is critical for VTA to understand the drivers and evaluate their estimate for weaknesses. Being able to provide documented cost mitigations or assumptions will provide better trust with FTA/PMOC and allow VTA to communicate expectations with the contracting community

Contractor Availability

Size of contracts, delivery methods, and contract packaging will influence the industry's interest in the program and availability of teams competing for contracts. It is obvious in today's market that contractors are more selective in choosing procurements and are more risk adverse when negotiating contracts. With the size of this program, contractors will need to assess their ability to bid each package as items like insurance bonding requirements, joint venture decisions all playing a role in their availability.

As VTA looks to break the program out in smaller contracts, it will be critical to meet with the industry and gauge interest by meetings, industry reviews, or project public meetings. As discussed during the peer review, bringing in new contractors like vertical building contractors for stations will bring in more competition and expertise to push construction and reduce costs.

NFPA 130 Evacuation Requirements

VTA provided the peer review with the station exiting calculations. These calculations were also approved by the Fire Life Safety Committee, which includes representatives from BART and the fire departments having jurisdiction. While we did not identify any specific omissions or inaccuracies, we suggest that given the importance of safety, that VTA verify the station calculations.