STAFF REPORT FOR CALENDAR ITEM NO.: 10
FOR THE MEETING OF: July 14, 2016

TRANSBAY JOINT POWERS AUTHORITY

BRIEF DESCRIPTION:

Presentation of the Project Delivery Options study for Phase 2 of the Transbay Transit Center Program (Program).

REPORT:

Phase 2 of the Program will complete design and construction of the Downtown Rail Extension (DTX), including the tunnel, trackwork, rail systems, and related components; the Fourth and Townsend Street Station; fit-out of the below-grade levels of the Transit Center; the Intercity Bus Facility; and the BART/Muni Pedestrian Connector. The current Phase 2 delivery plan is based on a seven-year construction duration under a traditional design-bid-build delivery method.

In October 2013, TJPA began studying the range of project delivery methods to determine the best option for completing Phase 2. This study was to analyze traditional methods as well as examine whether an alternative method, such as design-build or a public-private partnership (P3), could be used to complete Phase 2 more effectively, efficiently and earlier than would be achievable under the anticipated design-bid-build procurement. Alternative delivery options include various types of contractual relationships and risk transfer methodologies between public sector owners and the private sector whereby the private sector may assume accountability for the cost, schedule and quality of the final project.

In January 2014, staff from URS' Alternative Finance and Procurement Advisory group introduced the TJPA Board to alternative delivery concepts and gave a brief overview of options warranting further study. Staff then began work on a high-level study, holding a series of workshops to understand the Phase 2 needs and characteristics, significant risks with potential to affect the successful delivery of the Phase 2 infrastructure, and goals and objectives. The options ultimately selected for evaluation were those that have the potential to best meet criteria established during those workshops and achieve the optimum transfer of risk to the private sector. The results of this work are summarized in this staff report and discussed in detail in the draft final Phase 2 Project Delivery Options report (attached).

Needs and Characteristics
The goal of TJPA is to execute the planning, design and construction of Phase 2 as soon as possible in accordance with established schedules, budgets, and agreements with Program funders, which include the Federal Transit Administration, Federal Railroad Administration, Metropolitan Transportation Commission (MTC), San Francisco County Transportation Authority, California High-Speed Rail Authority (CHSRA), and Caltrain. The DTX and below-grade Transit Center must be designed and constructed to meet the operational needs and standards of the rail operators Caltrain and CHSRA. Additionally, because construction cannot begin without a full funding plan in place, funding is also a principal need of Phase 2.

It is assumed that long-term maintenance of the rail infrastructure will be the responsibility of the rail operators, as the 1.3-mile DTX (1.95 miles total length) will be an extension of a much larger 50-mile track system currently being maintained by Caltrain. Likewise, the operators Caltrain and CHSRA will oversee operations of their respective systems.

Risk Profile
Workshops were conducted in 2015 with the input of TJPA staff, Parsons Transportation Group (DTX designer), and Sperry Capital (TJPA's financial consultant) to update specific high-level risks from an existing risk management study. High-level risks are risks that have the highest probability of occurrence and the potential to cause impacts to cost or schedule, or both. Ten high-level risks were identified:

- Funding commitment and availability
- Access for businesses, vehicles and pedestrians (during construction)
- Scope creep control
- Cost overrun and budget adherence
- Schedule achievement and synchronization
- Tunnel construction and geotechnical risk transfer
- Right-of-way and property acquisition
- Permitting
- Utility relocation and protection
- System integration and inter-agency coordination

Goals and Objectives
Specific goals and objectives linked to the high-level risks were developed with the expertise and experience of staff from TJPA, the Program management team, Parsons, Sperry Capital, and other stakeholders. The team identified twenty-five goals related to Community Impact and Engagement; Cost Certainty; Design and Construction Quality; Maximizing Competition; Risk Definition, Mitigation and Allocation; Schedule Certainty; and Transparency and Fairness. For example, goals related to Cost Certainty include providing certainty of construction cost, developing a comprehensive project funding and cash flow program, and reducing and controlling exposure to claims.

Cost and Value
The study looked at the recently updated cost estimate and funding plan for Phase 2 (refer to the staff report for the June 9, 2016, Phase 2 update). The current Phase 2 estimate is approximately $3,935 million. The funding plan shows that in 2019 (the anticipated start of Phase 2 construction) approximately $1,998 million of the funding needed is expected to be available to TJPA, with additional funds becoming available over a considerable length of time after substantial completion of Phase 2. This indicates that financing solutions to bridge the funding gap need to be considered in the evaluation of an appropriate delivery method for Phase 2. It is noted that project delivery options that provide financing must be carefully considered to ensure and validate that private sector financing is not greater in cost when compared to financing available through the public sector.

Project Delivery Options Considered

Six delivery options that are widely used in transit and rail procurements and can meet the needs of the Phase 2 work were selected for consideration in this study. The options were grouped according to the type of risk each option can address and effectively transfer to the private sector (Figure 1).

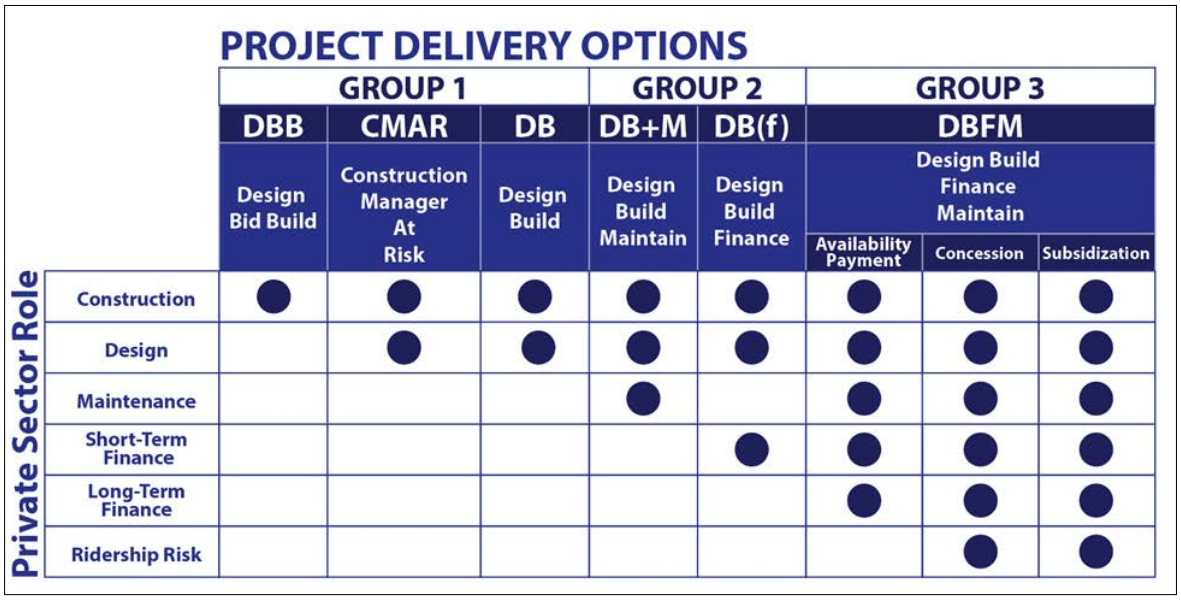

Figure 1, Risk Transfer among Project Delivery Options

Group 1 consists of design and build-only options; these will meet most of the Phase 2 needs and characteristics:

- Design-Bid-Build (DBB)
- Construction Manager at Risk (CMAR)
- Design-Build (DB)

Group 2 adds either short-term finance or short-term maintenance to the base design and build options, as the potential remains that short-term financing during construction may be required:

- Design-Build-Finance (DBf)
- Design-Build+Maintain (DB+M)

Group 3 includes P3 structures that have provisions for long-term maintenance and long-term financing. Concession P3 options, while shown in the figure, were not considered in the study because they are untested in the procurement of large transit systems. It was determined that the DBFM Availability Payment Structure would be a viable option only if long-term maintenance and long-term financing become the responsibility of TJPA.

- Design-Build-Finance-Maintain (DBFM) (Availability Payment Structure)
- Design-Build-Finance-Maintain (DBFM) (Concession Payment)
- Design-Build-Finance-Maintain (DBFM) (Concession Subsidization)

Evaluation Methodology

Both a qualitative analysis and a quantitative analysis were undertaken for each project delivery option. During the qualitative analysis, each option was evaluated against five screening factors or questions (Table 1), which were derived from the team's project delivery experience and the case studies of major transit projects with characteristics similar to the Phase 2 work. Although it has been established that maintenance is currently not a need of Phase 2, the results of the maintenance options (DB+M and DBFM) are included for comparison.

Table 1. Qualitative Analysis Results

Qualitative Screening Factor (Summarized)	Project Delivery Methodologies					
	Group 1			Group 2		Group 3
	DBB	CMAR	DB	DBf	DB+M	DBFM
If not 100% of funding commitment in place, can it be transacted?	Y*	-	Y*	Y	-	N
Market-tested in transit and tunnel type projects?	Y	-	Y	Y	-	Y
Would the industry consider the method supportive of a biddable and bankable transaction?	Y	Y	Y	Y	Y	Y
Driver to deliver a better quality project, and a better value?	N	-	Y	Y	Y	Y
Protect investment during the maintenance term?	N	N	N	N	Y	Y

* = Yes, but only if multiple bid packages are solicited
- = Neutral, or not enough comparative transactions are known

The results of the qualitative analysis indicate that of the three options that address the baseline design and construction needs of Phase 2, DB is the best solution, as it meets four out of the five screening factors, while DBB meets three of the five and CMAR meets one out of five and is neutral or inconclusive on three others. DBf would offer all the benefits of DB and provide a short-term financing element if it is later confirmed to be a principal need of the Phase 2 work.

The quantitative analysis examined how well the project delivery options achieved each goal and objective and resulted in a numerical score for each option (Table 2). Again, while it is understood that maintenance is currently not a need of Phase 2, results for the maintenance options are included for comparison.

Table 2, Quantitative Analysis Results

Goal and Objective Category	Project Delivery Methodologies					
	Group 1			Group 2		Group 3
	DBB	CMAR	DB	DBf	DB+M	DBFM
Community Impact & Engagement (9 Point Maximum)	7	8	9	9	9	9
Cost Certainty (15 Points Maximum)	7	10	11	12	12	14
Design and Construction Quality (12 Points Maximum)	5	9	9	9	9	11
Maximize Competition (9 points Maximum)	7	7	8	8	8	8
Risk Definition, Mitigation and Allocation (15 Points Maximum)	5	9	9	9	9	13
Schedule Certainty (12 Points Maximum)	9	8	8	10	8	10
Transparency and Fairness (3 Points Maximum)	3	1	3	3	3	2
Quantitative Scoring Summary & Total (75 Points Maximum)	**43**	**52**	**57**	**60**	58	67

The results of the quantitative analysis show CMAR and DB offering better solutions over DBB, particularly in the area of risk allocation where transferring geotechnical, tunneling, and schedule risks, among others, were identified as important goals and objectives. DB ranked slightly higher than CMAR, as it better addresses other goals, such as engaging stakeholders and ensuring an open, fair and transparent procurement process. Like the qualitative results, when funding needs are factored in, DBf ranks higher than the base design and build options, offering advantages in addressing both cost certainty and schedule certainty. As a point of comparison, DBFM scores the highest among all options considered because under that model a private DBFM consortium would assume the risks associated with design, construction, finance and maintenance, resulting in greater risk transfer to the private sector and consequently more aggressive management of cost certainty, design and construction quality, and schedule certainty.

Results

The combined results of the quantitative and qualitative analyses indicate whether the delivery option is achievable and accepted in the marketplace, while providing value to the TJPA, stakeholders and the public (Table 3).

Consistent with the results of the individual qualitative and quantitative analyses, the combined results indicate that DB and DBf would achieve the majority of the desired risk transfer requirements presently understood at this stage of Phase 2 development: DB if the Phase 2 needs include only design and construction and DBf if short-term financing is needed.

Table 3, Overall Ranking of Project Delivery Options Considered

		Evaluation			
Project Delivery Option		**Qualitative Results (Table 1)**	**Quantitative Scoring (Table 2)**	**Overall Ranking**	**Comment**
Group 1	DBB	Meets 3 factors; does not meet 2	43	3	Good solution, with flexibility on schedule and segmenting construction (if required) but does not transfer the risk as much as other options
	CMAR	Meets 1 factor; does not meet 1; is neutral on 3	53	2	Largely untested in delivering horizontal and transit infrastructure
	DB	Meets 4 factors; does not meet 1	57	1	Remains highly ranked as it is a well-accepted solution that transfers the design and construction risk, is well accepted in the marketplace, and has been used in transit infrastructure projects
Group 2	DBf	Meets 4 factors; does not meet 1	60	1 (if short term F is included)	If short-term financing is deemed to be required while a greater amount of funding is collected and accrued, DBf would be optimal
	DB+M	Meets 3 factors; is neutral on 2	58	1 (if limited M is included)	If additional maintenance responsibilities are undertaken by TJPA, DB+M provides a solid solution. For this analysis, the maintenance understood to be undertaken by TJPA is limited. If life-cycle maintenance is undertaken option can shift to a DBM model
Group 3	DBFM	Meets 4; does not meet 1	67	1 (if long-term finance and maintenance are included)	Provides all benefits of DB, and addresses long-term financing and maintenance should they become requirements of the TJPA

Next Steps

The Phase 2 update presented to the Board in June 2016 listed the steps required to advance Phase 2, which include selecting a delivery method. The following next steps presented in June are directly linked to the work of selecting a project delivery option:

- Complete 30% PE drawings
- Perform risk assessment
- Update Program cost estimate (& peer review)
- Complete development of funding plan (& peer review)
- Finalize and approve the selected project delivery method
- Update budget

Additional validation efforts will be needed as funding and financing requirements are refined. These efforts include:

- Finalizing and gaining written commitments for all of the funding amounts and sources required for Phase 2.

- Undertaking a risk-based comparative cost analysis of the preferred project delivery option. A risk-based comparative cost analysis compares a traditional project delivery method to the proposed alternative delivery method and should occur when the funding plan and project financing plans near completion, a firm project cost update is in place, an updated risk assessment is available, and a project delivery option has been recommended.
- Embarking on a market sounding with the design, construction and financing industry to understand whether the bidding environment is robust and ready to engage in the project.

RECOMMENDATION:
Information only.

ATTACHMENT:
Phase 2 Project Delivery Options Report (draft final)

Transbay Transit Center Program

Phase 2 Project Delivery Options

July 2016

Transbay Transit Center

URS

DRAFT FINAL

TRANSBAY TRANSIT CENTER PROGRAM

Phase 2 Project Delivery Options

July 2016

DRAFT FINAL

Prepared for the

Transbay Joint Powers Authority

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Executive Summary

This Phase 2 Project Delivery Options Report (Report) presents the analysis and conclusions of a high-level study undertaken by URS Alternative Finance and Procurement staff (URS AFP team) as part of the Program Management/Program Controls (PMPC) consultant team at the request of the Transbay Joint Powers Authority (TJPA). The purpose of the study was to analyze traditional project delivery methods as well as examine whether an alternative method, such as design-build or a public-private partnership (P3), could be used to complete Phase 2 of the Transbay Transit Center Program more effectively, efficiently and earlier than would be achievable under the anticipated design-bid-build procurement. The URS AFP team assessed six potential viable and achievable project delivery options, both traditional and alternative, to assist the TJPA in advancing its planning for Phase 2. The following steps were undertaken during the work of this study:

1. **Review and understand project needs and characteristics**: Section 2 discusses the underlying need for and purpose of the Program, including the goals of the TJPA with regard to design and construction, financing, and maintenance of the Phase 2 facilities.
2. **Assess key high-level risks**: Section 3 explains how the high-level risks were identified, describes each risk factor and associated mitigation measure, and evaluates the impact of the risk on cost and schedule.
3. **Develop the goals and objectives for the Phase 2 work**: Section 4 describes how the Phase 2 goals and objectives were developed and presents each by goal category.
4. **Understand the project costs, funding sources, amounts and commitment status**: Section 5 discusses the history of the Phase 2 budget, the current anticipated construction cost, and the sources and commitment status of Phase 2 funding.
5. **Identify, group, and assess the most applicable project delivery options**: Section 6 presents the project delivery options and discusses their key benefits and limitations.
6. **Assess and rank each of the six options**: Section 7 presents the results of quantitative and qualitative evaluations of each option and assigns each an overall ranking for its effectiveness in addressing the Phase 2 goals and objectives and other important criteria.
7. **Provide a series of conclusions, considerations and next steps**: Section 8 summarizes the results of the assessment and ranking step, discusses key issues for the TJPA to consider as Phase 2 planning progresses, and lists the major tasks to be completed to advance Phase 2.

The six delivery options considered in this study are widely used in transit and rail procurements and can meet the needs of the Phase 2 work. For the purposes of this evaluation, each option was assigned to a group according to the type of risk it can address and effectively transfer to the private sector. Group 1 includes three well-known methods for procuring design and construction only; Groups 2 and 3 introduce options that integrate short-term and long-term finance and maintenance risk transfer to the private sector entity.

Group 1 – Design & Build Only Options:
Design-Bid-Build (DBB)
Construction Manager at Risk (CMAR)
Design-Build (DB)

Group 2 – Short-Term Finance or Maintenance Additive Options:
Design-Build-Finance (DBf)
Design-Build+Maintain (DB+M)

Group 3 – Long-Term Maintenance & Finance Additive Options:
Design-Build-Finance-Maintain (DBFM) (Availability Payment Structure)

As project needs and characteristics are the typical starting point in the identification of the project risk profile, significant time was spent understanding key aspects of the Program and the goals of the TJPA. The TJPA is responsible for executing planning, design and construction of Phase 2 in accordance with established schedules, budgets, and agreements with Program stakeholders and funders. Funding currently ranks among the most critical needs of Phase 2. Current planning indicates that Caltrain and the California High-Speed Rail Authority, the principal Phase 2 stakeholders and tenants of the Transit Center's below-grade levels, will take responsibility for most of the maintenance of the Phase 2 rail infrastructure and all of their respective operations.

In collaboration with staff from the TJPA, PMPC, Parsons Transportation Group (the Downtown Rail Extension designer), Sperry Capital (TJPA's financial consultant), and other experts, the URS AFP team evaluated a 2008 risk assessment and a high-level risk review conducted in 2013, and conducted workshops to assess the mitigation strategies for the key high-level risks identified. This work helped to define the goals and objectives during workshops held in 2015.

Both a quantitative analysis and a qualitative analysis were undertaken for each project delivery option. The quantitative analysis examined how well the project delivery options achieved each goal and objective and resulted in a numerical score for each option. The qualitative analysis sought to reveal any flaws that could create a critical obstacle to the successful outcome in procuring the Phase 2 work by evaluating each option against five critical screening factors, as shown in the Table ES1:

Table ES1 – Assessment of Project Delivery to Qualitative Screening Criteria

Qualitative Screening Factor (Summarized)	Project Delivery Methodologies					
	Group 1			Group 2		Group 3
	DBB	CMAR	DB	DBf	DB+M	DBFM
If not 100% of funding commitment in place, can it be transacted?	Y*	-	Y*	Y	-	N
Market-tested in transit and tunnel type projects?	Y	-	Y	Y	-	Y
Would the industry consider the method supportive of a biddable and bankable transaction?	Y	Y	Y	Y	Y	Y
Driver to deliver a better value?	N	-	Y	Y	Y	Y
Protect investment during the maintenance term?	N	N	N	N	Y	Y

Y = Yes, the project delivery option fulfills the screening factor
N = No, the project delivery option does not fulfill the screening factor
Y* = Yes, but only if multiple bid packages are solicited
- = Neutral, or not enough comparative transactions are known

The results of the quantitative and qualitative analyses indicate whether the delivery option is achievable and accepted in the marketplace, while providing value to the TJPA, stakeholders and the public. The following table shows the quantitative scoring and the qualitative results and the overall ranking for each option. Group 1 options were evaluated first to determine the optimal method for procuring the base services of design and construction, which are the foundation of the TJPA's core purpose. The Group 2 and 3 options were then evaluated to determine whether the additional private sector services each model uniquely offers would benefit the TJPA.

Table ES2 – Group 1, Group 2 and Group 3 Combined Ranking

Project Delivery Option		Evaluations			Comment
		Quantitative Scoring	Qualitative Results (Table ES1)	Overall Ranking	
Group 1	DBB	43	Meets 3 factors; does not meet 2	3	Good solution, with flexibility on schedule and segmenting construction (if required), but it does not transfer the risk as much as other options. It also discourages innovation and value engineering.
	CMAR	52	Meets 1 factor; does not meet 1; is neutral on 3	2	Largely untested in delivering horizontal and transit infrastructure.
	DB	57	Meets 4 factors; does not meet 1	1	Remains highly ranked, as it is a well-accepted solution that transfers the design and construction risk, is well accepted in the marketplace, and has been successfully used in transit infrastructure projects.
Group 2	DBf	60	Meets 4 factors; does not meet 1	1 if short term F is included	If short-term financing is deemed to be required while a greater amount of funding is collected and accrued, DBf would be optimal.
	DB+M	58	Meets 3 factors; is neutral on 2	1 if limited M is included	If additional maintenance responsibilities are undertaken by TJPA, DB+M provides a solid solution. For this analysis, the maintenance understood to be undertaken by TJPA is limited. If life-cycle maintenance is undertaken, the option can shift to a DBM model.
Group 3	DBFM	67	Meets 4 factors; does not meet 1	1 if long-term finance and maintenance are included	Provides all the benefits of DB, and addresses long-term financing and maintenance should they become requirements of the TJPA.

The results indicate that DB is the best option for the transfer of design and construction risk to the private sector (Group 1). However, the current level of commitment of funds introduces significant business and commercial issues with respect to engaging the private sector, as the private sector generally requires the public sector to have all funding commitments documented in written agreements prior to the execution of an agreement to which such funding applies. Thus, options that include short-term finance (Group 2) or long-term finance (Group 3) may provide a greater benefit to the TJPA than those in Group 1, should short-term or long-term finance be needed. Maintenance is not a consideration at this point, as this report assumes that Caltrain and High-Speed Rail will maintain and operate their infrastructure as part of their overall systems.

Additional validation efforts will be needed as funding and financing requirements are refined. These efforts include:

- Finalizing and gaining written commitments for all of the funding amounts and sources required for Phase 2.
- Undertaking a risk-based comparative cost analysis of the preferred project delivery option. A risk-based comparative cost analysis compares a traditional project delivery method to the proposed alternative delivery method and should occur when the funding plan and project financing plans near completion, a firm project cost update is in place, an updated risk assessment is available, or a project delivery option has been recommended.
- Embarking on a market sounding with the design, construction and financing industry to understand whether the bidding environment is robust and ready to engage in the project.

1. Introduction, Purpose & Background

The Transbay Transit Center Program (Program) will provide the Bay Area with a new regional multimodal transit station in downtown San Francisco that will serve local, regional, and intercity bus and rail passengers. The Program is being built in two phases: Phase 1 principally consists of the above-grade portion of the Transit Center building and the core and shell of the two below-grade train levels. The Phase 1 Transit Center is scheduled to open for bus operations at the end of 2017. Phase 2 proposes to bring commuter and high-speed trains into the Transit Center via a 1.3-mile tunnel, and complete the build-out of the below-grade train station at the Transit Center, in addition to other improvements. The Program location and components are shown in Figure 1.0 and are discussed in detail in Sections 1.3 and 1.4 of this Project Delivery Options Report (Report).

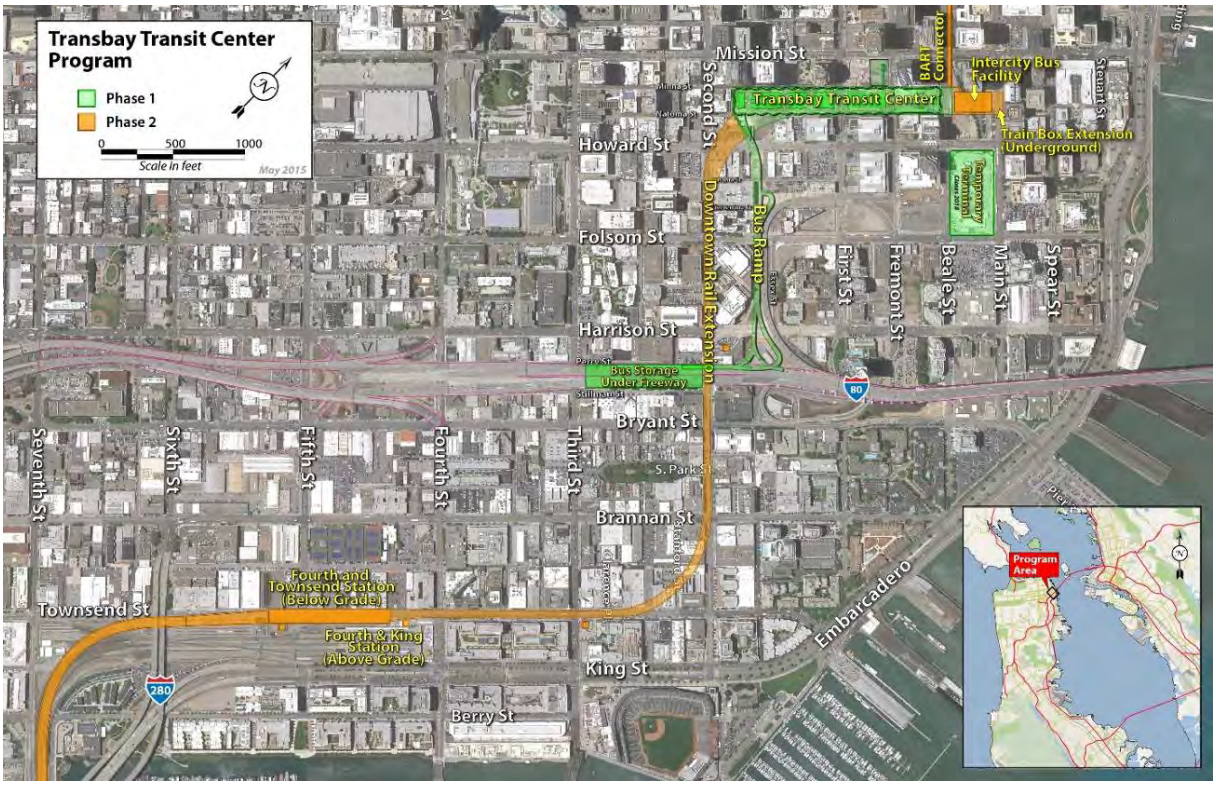

Figure 1.0 - Program Area and Components

As Phase 2 is not fully designed or funded as of the date of this Report, the Transbay Joint Powers Authority (TJPA) is evaluating traditional procurement methods as well as alternative delivery options to examine whether an alternative method, such as design-build or a public-private partnership (P3), could be used to complete Phase 2 more effectively, efficiently and earlier than would be achievable under the anticipated design-bid-build procurement. To advance progress in preparation for Phase 2, the TJPA has engaged URS Alternative Finance and Procurement Advisory staff (URS AFP team), working closely with the TJPA's Program Management/ Program Controls (PMPC) consultant, financial consultant Sperry Capital, and DTX designer Parsons Transportation Group (Parsons), to evaluate the available delivery options, both traditional and alternative.

The main purpose of this analysis is to undertake an early and high-level evaluation and assessment of the methods to procure and deliver Phase 2 of the Program. The evaluation and assessment work

described seeks to measure the TJPA's goals and objectives against a set of evaluation criteria to identify the critical issues and next steps that the TJPA should take to procure and deliver Phase 2 at the best value to the TJPA and its stakeholders. During the analysis, strong emphasis was placed on understanding the risk profile of the Phase 2 work and allocating each risk to the party that can manage the risk at the best overall value.

1.1. Transbay Joint Powers Authority

The TJPA was formed in 2001 through a Joint Exercise of Powers Agreement between the City and County of San Francisco (City), the Alameda-Contra Costa Transit District (AC Transit), and the Peninsula Corridor Joint Powers Board (PCJPB). The mission of the TJPA is to design, build, develop, operate, and maintain a new multimodal transportation station and associated facilities in downtown San Francisco.

A six-member Board of Directors governs the TJPA. Each of the following government and transportation entities participating in the Program appoints one member to the TJPA Board: the PCJPB, AC Transit, the Mayor of San Francisco, the San Francisco Municipal Transportation Agency Board of Directors, the San Francisco Board of Supervisors, and the California Department of Transportation (Caltrans) (ex officio, non-voting). The member agencies have granted the TJPA most of their jointly held powers, including the authority to buy and sell property, enter into contracts, and accept and expend grants of cash and property.

A twelve-person staff led by the TJPA Executive Director oversees the day-to-day management of the Program with assistance from the PMPC team.

1.2. Key Phase 2 Stakeholders & Partners

An undertaking as large and complex as the Program cannot be accomplished without the cooperation of key partners and stakeholders.

The PCJPB, which operates Caltrain, and the California High-Speed Rail Authority (CHSRA) are the primary stakeholders for Phase 2 and will be the primary tenants of the below-grade rail levels of the Transit Center. Other key government stakeholders and partners for the Downtown Rail Extension (DTX) and related Phase 2 components are the Federal Railroad Administration (FRA), Federal Transit Administration (FTA), Caltrans, Metropolitan Transportation Commission (MTC), San Francisco County Transportation Authority (SFCTA), the City, and the California Public Utilities Commission.

Stakeholder coordination on both technical and financial matters is integral to the development of Phase 2. Program staff participates in monthly technical coordination and working groups with Caltrain and CHSRA to ensure that the Phase 2 facilities are coordinated with the requirements of both rail operators; the CHSRA has approved the configuration of the tracks entering the Transit Center as well as other aspects of the below-grade station and has designated the Transit Center as the San Francisco terminus for California's new high-speed rail system. Representatives from funding partners, including the SFCTA, FTA and FRA, are actively engaged in the Program and provided with periodic status reports. The DTX has been designated in MTC's regional transportation plan, Plan Bay Area, as a regional priority for the federal New Starts program, and the TJPA is working with the U.S. Department of Transportation (U.S. DOT) on a request for the DTX project to enter the New Starts Project Development Phase, the first step toward securing New Starts funding for Phase 2.

1.3. Program Summary Overview

The roughly $6 billion Program will replace the former Transbay Terminal at First and Mission streets in San Francisco with a modern regional transit station that will connect eight Bay Area counties and the State of California through eleven transit systems: AC Transit, BART (Bay Area Rapid Transit), Caltrain, Golden Gate Transit, Greyhound, Muni (San Francisco municipal bus lines), SamTrans (San Mateo County Transit), WestCAT (Western Contra Costa Transit) Lynx, Amtrak, Paratransit, and California High-Speed Rail.

Phase 1 includes design and construction of the above-grade portion of the Transit Center, including a ground-level bus plaza, an elevated bus deck, a 5.4-acre rooftop park, and over 100,000 square feet of retail space; the core and shell of the two below-grade levels of the train station; a new bus ramp; and an off-site bus storage facility. Phase 2 will complete the design and construction of the DTX tunnel and the build-out of the below-grade train station facilities at the Transit Center as well as a new underground station along the DTX alignment, an intercity bus facility, and a pedestrian tunnel between the Transit Center and the Embarcadero BART/Muni Metro station. Each of these components is discussed in detail in Section 1.4.

The Program's Final Environmental Impact Statement/Environmental Impact Report (EIS/EIR) was certified in April 2004 by the San Francisco Redevelopment Agency, the San Francisco Planning Commission, the San Francisco Board of Supervisors, and the PCJPB. The DTX design is now being refined to accommodate current design criteria from the CHSRA (which was not available in 2004), and other improvements. A draft Supplemental EIS/EIR evaluating these refinements was issued for public comment in December 2015; final certification is expected in 2016.

All right-of-way acquisition for Phase 1 is complete. One parcel has been acquired to preserve right-of-way for Phase 2, and additional parcels will be needed for construction of the DTX tunnel and the Intercity Bus Facility. Current planning calls for the full acquisition of twenty-one parcels, including a parcel to be transferred from the City; partial acquisition of one parcel; and multiple permanent underground easements at the throat structure of the tunnel and along the mined tunnel segment.

1.4. Detailed Phase 2 Work Elements & Scope

Phase 2 will complete the design and construction of the DTX and other related infrastructure. Each Phase 2 component is described in the following sections, and illustrated in Figure 1.4.

Downtown Rail Extension. The DTX will extend Caltrain commuter rail from its current terminus at Fourth and King streets, as well as provide the tracks to deliver CHSRA's future high-speed service to the new Transit Center. The 1.3-mile rail extension (1.95 miles total length) will be constructed principally below grade using cut-and-cover and mined tunneling methods underneath Townsend and Second streets. The DTX includes six structures for emergency exit and ventilation along the alignment, utility relocations, and rail systems work.

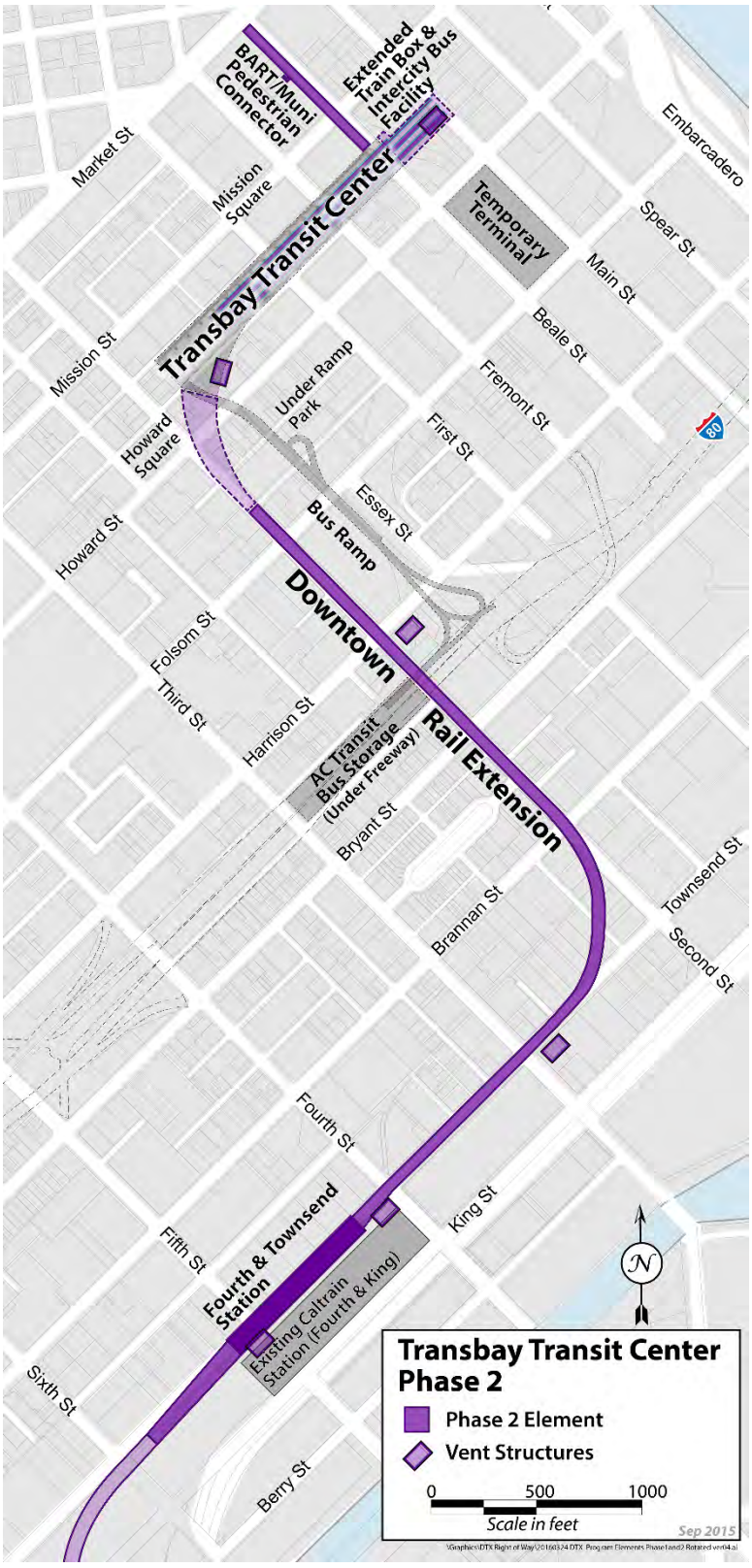

Figure 1.4 – Phase 2 Components

Fourth and Townsend Street Station. The new underground station at Fourth and Townsend streets will serve Caltrain commuters. The street level station entrances and exits along the north and south sides of Townsend Street will lead to two levels below grade: a concourse mezzanine and a train platform. The concourse level will accommodate passenger amenities such as ticketing machines, a staffed station agent booth, maps and schedule information, restrooms, and a bicycle shop and storage. This level will also house mechanical and electrical rooms and Caltrain staff areas. The train platform level will feature a center platform with one passing track on the south side.

Phase 2 Transit Center. The core and shell of the Transit Center's two below-grade levels will be built out during Phase 2. The Lower Concourse will house rail ticketing, passenger waiting areas, and support spaces for Caltrain and CHSRA, the primary tenants, as well as leasable retail space. One level down, the Train Platform will contain six tracks and three platforms for commuter and high-speed rail service. Back-of-house support spaces will also be built on this level to support rail service.

Intercity Bus Facility. The Intercity Bus Facility, across the street from the east end of the Transit Center between Beale and Main streets, will be dedicated to intercity bus services such as Greyhound and Amtrak. The main public entrances will be located along Beale and Natoma streets, and the building will include a bus canopy on its north side where a bus parking and passenger-loading zone

are planned. The facility will house a passenger waiting area, ticketing counters, retail space, transit agency operations space, and mechanical space. An escalator and elevator located in the lobby will lead to the Lower Concourse of the Transit Center, giving passengers direct access to rail ticketing and waiting areas. An exterior escalator and elevator on Beale Street will descend directly to the Transit Center's Lower Concourse.

BART/Muni Pedestrian Connector. The BART/Muni Pedestrian Connector will connect the east end of the Transit Center's Lower Concourse with the Embarcadero BART/Muni Metro station, providing passengers with a direct connection between the two stations. The block-long pedestrian tunnel will run down the center of the Beale Street right-of-way, entering the Embarcadero Station at the mezzanine level outside the paid fare zones.

1.5. Project Delivery Preliminary Work

In order to gain a full and in-depth understanding of possible and practical project delivery options and tools available, the TJPA has taken a series of progressive and strategic steps and activities leading up to the work articulated within this Report. The key activities are summarized as follows:

October 2013	Initiation of discussions on the strategies and possibilities that may be employed in the procurement of Phase 2
January 2014	Presentation to the TJPA Board of Directors outlining the most practicable and achievable project delivery options for Phase 2, and the importance of establishing an overall governance structure with all stakeholders and partners
February 2014	Initial and follow-up meetings with Caltrain representatives to discuss and develop a draft Phase 2 governance structure
April 2014	Initial meetings with internal and external parties for the purpose of developing a draft Phase 2 responsibility matrix to outline and define initially how partners and stakeholders will interface on a variety of cost, maintenance and operational parameters
April 2015	Initial kick-off and organizational meetings with the TJPA and PMPC teams to establish parameters, workshop schedule, and go-forward strategy for the Report
May 2015	Workshops with the TJPA, PMPC, Parsons, and Sperry Capital to determine and establish the goals and objectives
October 2015	Risk profile workshops with the TJPA, PMPC, Parsons, and Sperry Capital to review applicability and impact of key risk factors for Phase 2
April 2016	Submission of Phase 2 Project Delivery Options Report to the MTC for review and comment
June 2016	Presentation of a Phase 2 update to the TJPA Board of Directors
July 2016	Presentation of the Phase 2 Project Delivery Options Report to the TJPA Board of Directors

1.6. Key Understandings & Assumptions

To advance the evaluation of the project delivery options, the URS AFP team established key understandings and assumptions regarding Phase 2, which guided the analysis described in this Report. While it is understood that updated or new information, when available, may need to be incorporated into the analysis, the underlying approach used and the conclusions reached should not change significantly.

The key understandings and assumptions supporting the work of this Report are as follows:

- The core mission of the TJPA is to plan, develop and deliver the Phase 2 work, which includes oversight and management of the construction and the securing of project funding;
- The TJPA's responsibility related to maintenance will be routine cleaning and maintenance of the Transit Center's public spaces;
- Operation and life-cycle maintenance and rehabilitation of rolling stock (trains), tunnel, command centers, among other Phase 2 rail components, will be the responsibility of Caltrain and CHSRA;
- The construction costing within this Report, and in particular the information in Section 5, has been updated through mid-year 2016 and represents the Phase 2 base-costs as well as a high level cost review conducted by MTC in late 2015 (based on a 2013 cost estimate (see Table 5.2.b);
- The final schedule related to the arrival date of CHSRA remains in-progress;
- The risk model and Phase 2 Risk Assessment and Risk Management Report are from 2008, and have not been completely updated;
- To better assess the Phase 2 risk profile from 2008, the URS AFP team held a series of working sessions with the staffs of the TJPA, PMPC, Parsons, and Sperry Capital to segregate the more significant risks for their effects on the goals and objectives, as well as to validate their impact to Phase 2;
- Case studies of major transit projects with similar characteristics to the Phase 2 work, both across North America and globally, informed the analysis and considerations of the key-benefits and key-limitations for each delivery option analyzed in this Report. A summary of each of these projects has been included in Appendix C, Case Studies; and
- Critical commitments related to a draft Phase 2 responsibility matrix and governance structure remain in-progress.

Additional assumptions related to the anticipated contribution of funding for Phase 2 are included in Appendix D, Current Anticipated Funding Sources and Flow.

1.7. TJPA Authorities & Jurisdiction

The TJPA likely has the authority under its existing governing documents and enabling legislation to use a variety of alternative delivery methods, including a public-private partnership (P3). Although these documents and legislation do not explicitly authorize a specific alternative delivery method, they do not prevent the TJPA from engaging in any particular methodology of procurement or project delivery.

Principal to this discussion, California Assembly Bill 812 (July 2003) amended Section 5027.1 of the California Public Resources Code to allow for the "demolition of the Transbay Terminal building at First and Mission Streets in the City and County of San Francisco, including its associated vehicle ramps, for construction of a new terminal at the same location, designed to serve Caltrain in addition to local, regional, and intercity bus lines, and designed to accommodate high-speed passenger rail service." [1]

Section 5027.1 further states, "The Transbay Joint Powers Authority shall have primary jurisdiction with respect to all matters concerning the financing, design, development, construction, and operation of the new terminal."[2]

Alternatively, the TJPA may apply for express authority to engage in various alternative delivery methods, including P3 agreements, under the provisions of Senate Bill (SB) 4,[3] which allows joint powers authorities to apply for express authority to execute "comprehensive development lease agreement[s]" with a private entity to carry out qualifying "transportation project[s]."[4] The TJPA may also be able to engage in a P3 under existing legislation that allows such procurement for "transit service" projects.[5] Although it is not certain, there is a good argument that the Program qualifies. The TJPA could also pursue special legislation that would expressly permit it to engage in a P3 or other specific alternative project delivery method. This approach would provide the least risk of legal challenge and may provide fewer procedural requirements than applying for express authority under SB 4.

1 California Public Resources Code Section 5027.1
2 California Public Resources Code Section 5027.1
3 SB4 will expire on January 1, 2017
4 California Streets and Highways Code Sections 143(a)(2), (a)(6), (c)(1)
5 California Public Contract Code Sections 20209.5-20209.14

2. Project Needs & Characteristics

The Program, approved by the FTA in 2005, was created to modernize the former Transbay Terminal, revitalize the surrounding area, and extend Caltrain service from its current terminus outside the downtown area into the San Francisco employment core, the destination of most daily Caltrain riders. Providing a multimodal transit facility that meets future transit needs, enhancing connectivity between Caltrain and other major transit systems, and enabling direct access to downtown San Francisco for future intercity and high-speed rail service are key objectives identified in the Program's approved environmental document.

Previously, in a 1987 study, the MTC highlighted the need for an underground Caltrain extension to the Transbay site as the single most important improvement that could be made to the commuter line. San Francisco voters concurred in November 1999 by passing Proposition H—Downtown Caltrain Station and again in November 2003, approving Proposition K, which required inclusion of the DTX as a condition of funding for the Program. In 2008, voters statewide passed Proposition 1A—The Safe, Reliable High-Speed Passenger Train Bond Act for the 21st Century, which allocated funds for construction of a high-speed train system linking Southern California to the San Francisco Bay Area. Proposition 1A designated the Transit Center as the northern terminus of the state's future high-speed rail system.

Along with the DTX, an intercity bus facility and a pedestrian connector to BART are Phase 2 transportation improvements that are being planned to enhance connectivity and services in the area (refer to Section 1.4).

2.1. TJPA Phase 2 Mission

The TJPA is responsible for executing planning, design and construction of Phase 2 in accordance with established schedules, budgets, and agreements with the U.S. DOT's operating administrations, the MTC, SFCTA, and other funders. Program stakeholders are engaged in many aspects of development, including the environmental approval process, development of design criteria, ensuring compliance with governing code, and securing funding to deliver the Phase 2 facilities.

The TJPA oversees the transit-related aspects of the Program. The key project needs and characteristics of Phase 2 include, but are not limited to, the following:

- Extend Caltrain commuter rail approximately 1.3 miles from its current terminus at Fourth and King streets and deliver the CHSRA's future high-speed service into the new Transit Center;
- Build a rail station in the below-grade levels of the new Transit Center to accommodate commuter and high-speed train service;
- Build a new underground station at Fourth and Townsend streets that will serve Caltrain; and
- Integrate the Phase 2 work with the Phase 1 work, which includes replacing the former Transbay Terminal with the new Transit Center building.

2.2. Current Anticipated Phase 2 Schedule

Currently, the TJPA anticipates a Phase 2 construction start date of 2019. It projects that a seven-year construction timeframe will be required to construct Phase 2 and to integrate Caltrain's and CHSRA's operational needs and control centers. A Phase 2 anticipated completion and revenue commencement date of late 2025 is assumed.

The TJPA continues to progress critical work elements. The current DTX configuration is environmentally cleared, and preliminary engineering has been completed to the 30% level. The TJPA is managing a supplemental environmental process for refinements to the DTX and other Phase 2 elements, which is expected to conclude with federal approval at the end of 2016. Following approval of the Supplemental EIS/EIR, additional preliminary engineering will be undertaken to bring all Phase 2 elements to the 30% level of completion. Figure 2.2 shows the anticipated duration of the major Phase 2 work.

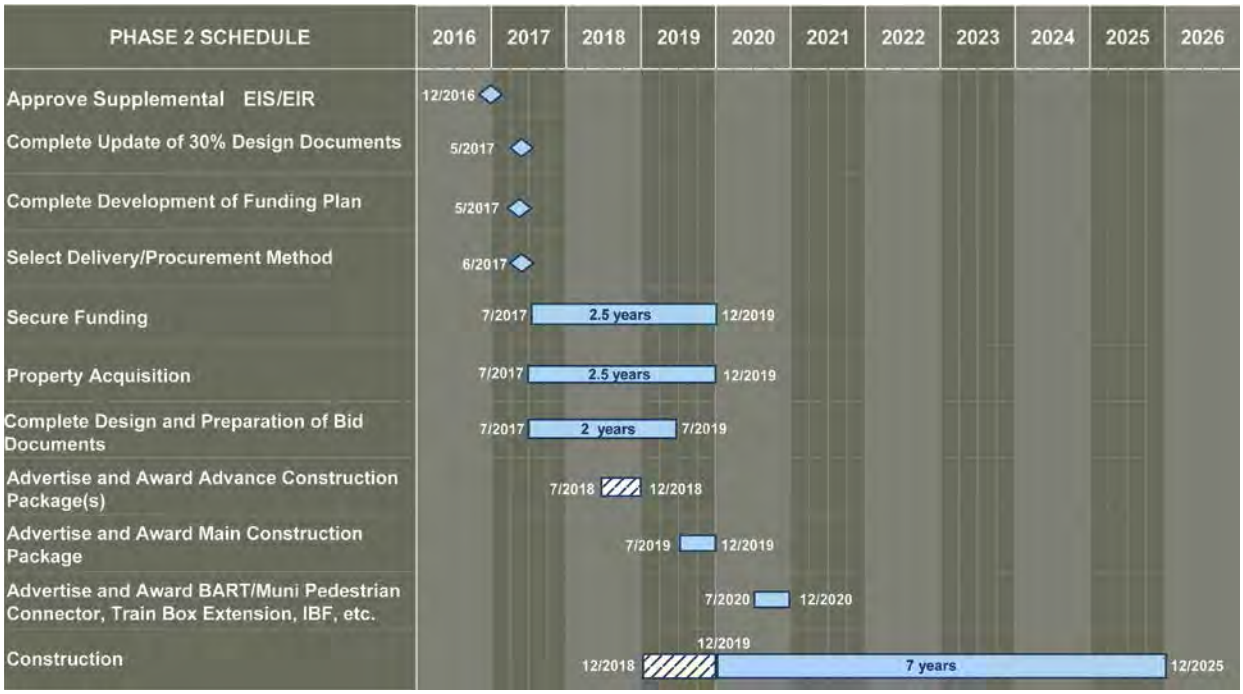

Figure 2.2 – Anticipated Phase 2 Project Schedule

2.3. Design and Build

Principal to the goals of the TJPA, Phase 2 must be designed and constructed in a manner that is both on time and on budget and that achieves the optimal transfer of risk and responsibility of design and construction to the private sector, provided there is no compromise to the quality of the work.

Key needs and characteristics of the Phase 2 design work are summarized as follows:

- A new underground Caltrain station located at Fourth and Townsend streets;
- Track gradient that can accommodate both Caltrain and CHSRA rolling stock;
- Tunnel boxes that can accommodate both Caltrain and CHSRA vehicle envelopes;

- Track layout that resides within the public right-of-way, and that seeks to preserve as many existing buildings as possible;
- Alignment layout that can best minimize the length of the tunnel structure;
- Design that can accommodate the variable and specific geotechnical make-up of the existing soil stratification present through the alignment;
- Vertical and horizontal connectivity to the Transbay Transit Center;
- Flexibility to accommodate the station and operational requirements of both Caltrain and CHSRA;
- An approved Supplemental EIS/EIR that seeks to minimize the environmental impacts created by the Phase 2 work to the greatest extent possible;
- A sustainable and high-quality outcome that meets or exceeds the intended design life; and
- A design that meets the safety and security design guidance criteria established by the Program's risk and vulnerability assessment.

Key needs and characteristics of the Phase 2 construction work are summarized as follows:

- Construction that is on time and on budget;
- Construction that minimizes potential claims, scope creep, extras, conflicts, and litigation;
- Procurement and construction that encourages creativity, innovation, ingenuity, best practices, and minimized risks to the owner;
- Scheduling that brings forth the maximum amount of flexibility and advanced works to shorten the construction length of specific works, and of the Phase 2 work overall;
- High-quality materials, workmanship, and outcomes that reduce maintenance work to the most reasonable extent;
- Construction that minimizes disruptions to vehicle and pedestrian traffic, residents, and businesses that may be affected by the Phase 2 work;
- Construction that places importance on early and advanced work while design is being finalized;
- Construction that seeks to minimize noise, dust, and vibration impacts, to the greatest extent possible;
- Integrated construction so that all elements of the Phase 2 work and the work of Caltrain and CHSRA are properly accounted for, scheduled and completed; and
- A highly qualified and experienced contractor team that can provide a high-quality outcome.

2.4. Financing

Funding, which is discussed in detail in Sections 5.3 and 5.4, ranks among the most critical needs of Phase 2. Construction financing, short-term financing, and long-term financing may be applicable to the Phase 2 work, as described in the analysis of the project delivery options in Section 6.

The main need of the TJPA related to financing the Phase 2 work is construction financing. The ability to manage the flow of funds from the multiple sources committed to the TJPA centers on its

ability to distribute those funds in a disciplined and strategic manner. Careful planning of the financing must also be managed so that the cost of financing is not excessive and does not reduce the effective amount of funding that has been arranged.

Short-term and long-term financing solutions should be considered, given that a significant funding gap and timing issues currently exist. Project delivery options that provide financing must be carefully considered to ensure and validate that private sector financing is not greater in cost when compared to financing available through the public sector.

2.5. Maintenance and Operations

The maintenance and operations aspects of a project, which require a long-range funding strategy, are often given less consideration than required for such important aspects in the life of a project. If not properly accounted for early in the planning of a project's funding strategy, significant gaps can be created in the ability to meet those needs financially and functionally. The TJPA is well aware of these needs and has undertaken a thoughtful examination of these elements in its work.

Current planning indicates that the TJPA will have limited maintenance responsibility for the Phase 2 rail components. The TJPA is expected to maintain elevators and escalators, the variable messaging system, and informational signage. Janitorial services, routine maintenance, and general upkeep of the Transit Center's public areas will be managed by a master lessee to be engaged by the TJPA.

Routine, preventative, asset preservation, and life-cycle maintenance of the majority of the Phase 2 rail components will be the responsibility of the rail operators Caltrain and CHSRA. This includes the DTX tunnel; emergency exits/ventilation structures; train platforms; rail systems such as trackage, signaling, and overhead catenary systems; and railway operations/moving assets. Similarly, the TJPA will not be responsible for train schedules or operations; again, these are the responsibility of the train operators Caltrain and CHSRA.

Therefore, this study did not evaluate long-term and life-cycle procurement options that consider maintenance as a principal portion of the solution, nor did it evaluate options that include operations. Greater focus should be on options that can provide extended warranties and insurance elements that can be delivered at a good value and are easily transferrable to Caltrain, CHSRA or another agency.

High-quality design and construction will greatly influence the project outcome, its life span, and maintenance needs. Emphasis should be placed on options that can provide the highest quality outcome.

3. Project Risk Profile

3.1. Introduction & Approach to the Risk Profile

The most important aspect of any successful project is the identification, definition, allocation and mitigation of the project-specific risks. Further, these risks must be determined and evaluated on an enterprise basis so that all aspects of a project (i.e., planning, permitting, procurement, community impact, design, construction, life cycle, and political, geotechnical, environmental considerations) are examined and their impacts considered and included. In addition, risks must be examined for their impact on both cost and schedule.

This Report does not seek to repeat all of the risks identified in previous work, but rather to identify and examine the impact of the greatest and most critical risks that may be affected by a specific project delivery option or aspect of the Phase 2 work. Importantly, the identification of critical risks served as the foundation of the discussions held during goals and objectives workshops. The focus was to bring into this evaluation the high-level risks, and understand how these risks were identified, defined, and included in the risk profile. When a mitigation approach was identified, this mitigation was measured against each project delivery option to examine if any benefit or limitation would be introduced.

As the risk profile derives from the needs and characteristics of the Project, the risk profile serves as the foundation for the analysis and work contained in his Report. The overall stepped process is illustrated in Figure 3.1.

Figure 3.1 – Project Risk Driven Report Evaluation and Ranking Process

While risk transfer is very important to the public sector, the transfer of risk must be reasonable, equitable to all parties, and provide an achievable value when those risks are proposed to be transferred to the private sector. The rule most often employed when evaluating risk transfer is to allocate the risk to the party that is most capable of managing the risk. Therefore, risks need to be understood, defined, factored into the evaluation, and capable of being measured. For example, a risk appropriately and typically transferred to the private sector is construction cost overruns, while a risk not typically transferred would be the risk associated with property acquisition.

The high-level risks were weighted equally during the evaluation. This was done to avoid overemphasizing or underemphasizing any particular risk and, thus, skewing the outcome in each project delivery option group.

3.2. Past Risk Studies & Work

The URS AFP team began its evaluation by considering the specific high-level risks for Phase 2. The team led a series of risk review workshops in 2013 to identify the current risks. A Phase 2 Risk Assessment and Risk Management Report, published in July 2008, was reviewed, and additional workshops were conducted in 2015, with the input of staff from the TJPA, PMPC, Parsons, and Sperry Capital, to update specific high-level risks from the 2008 report.

3.3. High-Level Risk Definition & Discussion

The 2008 Phase 2 risk register (Appendix E of the July 2008 report) and the results of the 2013 workshops resulted in a detailed risk listing. Risks were screened into a focused list of high-level risks for the purposes of this study using the following screening factors:

- Highest probability of occurrence;
- Most significant impact on the Phase 2 cost; and
- Most significant impact on the Phase 2 schedule.

Table 3.3 describes each high-level risk along with its potential cost and schedule impact (moderate (M) or significant (S)), and associated mitigation measures.

Table 3.3 – High-Level Phase 2 Risks

Key Risk Factor	Risk Description	Impact		Risk Mitigation Measure	Comment
		Cost	Schedule		
Funding Commitment and Availability	▪ Insufficient initial and final funding ▪ Timing of funds is delayed ▪ Competition for funding ▪ Not receiving full commitment on all required funds	S	S	▪ Aggressively and continually seek and gain commitments (via funding agreements) of funds ▪ Leverage and engage private capital to cover short-term gaps	Risk is significant to all project delivery options
Cost Overrun and Budget Adherence	▪ Inability to meet the project affordability limit, without incurring non-budgeted extra costs ▪ Inability to control the budgeted allocation for escalation and contingencies ▪ Inability to match the available fund commitments to the budget	S	M	▪ Refine budget and costs with proper and realistic escalation factors ▪ Seek project delivery options that provide guaranteed maximum price protection ▪ Account for and carry contingencies that are reasonable and realistic	Measure this risk against the project delivery options to provide a pricing guarantee
Scope Creep	▪ Risk associated with changes in scope of work that result in cost increases ▪ Undefined or loose scope of work requirements that lead to claims and extra work	S	S	▪ Create well-defined project requirements, with respect to the final outcomes ▪ Ensure clear, consistent and non-contradictory requirements that are internally challenged prior to tender, to reduce inconsistency and potential for extras	Measure this risk against the ability of performance-driven specifications to aide in control of out-of-scope work
Schedule Achievement and Synchronization	▪ Synchronization of schedule with Caltrain and CHSRA so Phase 2 is ready to accommodate these partners ▪ Alignment of construction work with funding availability	M	S	▪ Implement extensive communication and coordination with all agencies and partners ▪ Create various schedule and timing scenarios ▪ Continue work to define timing and amount of funds that will be available	Evaluation to measure project delivery option's ability to provide schedule flexibility and outcome certainty

Key Risk Factor	Risk Description	Impact		Risk Mitigation Measure	Comment
		Cost	Schedule		
Tunnel Construction and Geotechnical Risk Transfer	▪ High-risk item due to variable and inconsistent soil stratification ▪ Impact of tunneling work on existing properties ▪ Unforeseen conditions, including contamination and archaeological discovery ▪ High seismic zone risks	S	S	▪ Continue in-depth and detailed pre-transaction due diligence ▪ Engage private sector at RFQ stage for additional targeted exploration work ▪ Establish communication method to disclose extent and depth of previous work undertaken by TJPA ▪ Examine effective risk transfer techniques in case study projects	Measure Phase 2 risk profile against successful risk transfer methods employed for comparable projects, including Ottawa Light Rail Transit Project, which included a 4-km underground segment through its central business district
Right-of-Way (ROW) and Property Acquisition	▪ Acquisition of required surface and sub-terrain properties or rights ▪ Escalation costs of property acquisition ▪ Timing of acquisitions so as to not cause un-warranted construction delays	S	S	▪ Pre-purchase key properties ▪ Continue work with City and other entities in securing rights to work in the public way ▪ Reduce and minimize impact footprint ▪ Perform due diligence to minimize impact and duration of disruptive work ▪ Clearly identify all needs and locations of property and ROW	ROW and property acquisition are public sector controlled risks that are difficult to transfer to the private sector
Permitting	▪ Timing and achievement of clearance and approval of the Supplemental EIS/EIR ▪ Fulfillment and application of permits required for construction in the public way, and the impacts this work may introduce	M	M	▪ Continue work to secure approval of Supplemental EIS/EIR ▪ Communicate and work with City and other agencies	Risks are public sector controlled and presently being managed and mitigated successfully

Key Risk Factor	Risk Description	Impact		Risk Mitigation Measure	Comment
		Cost	Schedule		
Utility Relocation and Protection	▪ Schedule and cost of identifying the relocation, replacement and in-place protection of key utilities ▪ Risk to condition of utilities that may be aged ▪ Encountering of unknown or unidentified utilities	S	S	▪ Continue early identification of all utilities in type, size and location ▪ Perform due diligence on utilities that feed adjacent properties, including their tap locations ▪ Continue due diligence on condition of utilities ▪ Continue communication and coordination with utility companies ▪ Continue identification of utilities that can be cleared or relocated prior to construction commencement	None
System Integration and Inter-Agency Coordination	▪ Risk of integrating Caltrain and CHSRA train control and operating systems ▪ Development and integration of a joint central command center for train operations ▪ Risk of incompatible or specialty safety, security, wayside and SCADA requirements	M	S	▪ Continue communication, coordination and interface with City, Caltrain and CHSRA ▪ Interface with other agencies and entities that are stakeholders in the operational elements of train operations ▪ Continue interface on platforms, boarding/detraining, ticketing and security matters with stakeholders	None

Key Risk Factor	Risk Description	Impact		Risk Mitigation Measure	Comment
		Cost	Schedule		
Access for Businesses, Vehicles and Pedestrians	▪ Risk of significant and long-lasting impacts to local businesses due to restricted or limited access during construction ▪ Risk of cost and schedule impacts when construction activity causes longer or more problematic traffic (pedestrian and vehicle) disruption, inconvenience and re-routing	S	S	▪ Continue communication with affected businesses and residents that may be impacted by construction ▪ Develop strong contractual requirements that impose proper damage regime if schedule delays are encountered ▪ Ensure creative, user-friendly and accessible pathways during construction	While typically this is a public sector risk, determine the extent to which project delivery options can provide techniques and experiences to support the mitigation strategies

Notes: M = Moderate Impact; S = Significant Impact

4. Project Goals & Objective

4.1. Purpose and Approach

Building upon the high-level risks and mitigation strategies identified in Section 3, this section discusses a set of goals and objectives that can be measured against an evaluation criterion. These goals and objectives extend beyond the risk profile by including additional factors not otherwise captured. For example, items such as ensuring that the project delivery option is biddable and bankable and that value and quality are key deliverables are introduced and included in the evaluation, providing additional insight into the potential procurement solution for Phase 2.

The approach to the goals and objectives work relied upon the input, expertise, and experience of TJPA staff and other participating stakeholders, which included staff from PMPC, Parsons, and Sperry Capital. The approach also focused on building upon not only the risk mitigations but also the needs and characteristics of the Phase 2 work, which when combined produce goals and objectives that are high in value and capture the overall purpose and goals of the TJPA in undertaking the Phase 2 work.

4.2. Workshop Inputs & Results

The workshops to develop the goals and objectives were undertaken through in-person workshops and teleconferences in May 2015. Refer to Appendix B for workshop dates and attendees. The focal point of these workshops was to develop concrete, tangible goals directly linked to the Phase 2 risks and characteristics, built upon the foundation of appropriate risk transfer and a project with a high-quality outcome. In order to address and include the inputs of as many experts as possible, the URS AFP team facilitated eleven individual workshop sessions.

The sessions conducted with the input groups included the following topics:

- Project Scope and Schedule;
- Procurement and Legal Matters;
- Property and Right-of-Way;
- Archaeology and Environmental;
- Utilities and Agency Coordination;
- Interagency Coordination;
- Construction Cost, Budget and Escalation;
- Funding and Project Finance;
- Systems Integration;
- Maintenance Responsibility; and
- Tunnel Construction and Geotechnical Parameters.

Workshop participants were encouraged to focus on their own expertise and experience as well as articulate complementary and ancillary goals to the topic under discussion. This approach created a natural overlap of some goals and objectives, and provided a comprehensive examination of how the project characteristics, needs and risks formed the key goals that were of the highest importance to the TJPA and in making Phase 2 a success. This work did not emphasize a specific project delivery option to avoid favoring one option over another in this particular step of the process.

4.3. Goals & Objectives Discussion

The workshops and discussions held with the TJPA and Phase 2 stakeholders beginning in 2013 produced the following list of goals and objectives, summarized and organized under seven goal categories.

Community Impact and Engagement

- Minimize disruptions concerning access and impacts to local businesses and residences;
- Maximize pedestrian and vehicular access to impacted properties during construction; and
- Engage stakeholders in work progress during planning and construction.

Cost Certainty

- Provide certainty of construction cost;
- Develop and obtain comprehensive project funding and cash flow program;
- Obtain certainty for maintenance work and responsibility;
- Obtain the highest value for money proposition, to protect funding contributors; and
- Reduce and control exposure to claims.

Design and Construction Quality

- Support and link life-cycle quality outcome for a 100-year service life;
- Maintain a flexible procurement to provide performance-driven work, while retaining sufficient prescriptive design requirements for critical systems;
- Shift risk of design and construction work to private sector, while maintaining quality; and
- Drive interface connectivity quality between Phase 1 and Phase 2 systems and work.

Maximize Competition

- Ensure international top-tier, experienced, firms pursue work;
- Foster large local and historically disadvantaged firm participation by fostering mentorship; and
- Maximize best practices, ingenuity and innovation from private sector.

Risk Definition, Mitigation and Allocation

- Establish risk transfer balance for the TJPA and partnering stakeholders;
- Transfer environmental risks to private sector, via due diligence materials (reports, data and information) whereby specific risk costs are inferable from the materials;
- Transfer geotechnical and tunnel risk elements to private sector;
- Link life-cycle and asset preservation risks to design and construction outcomes, and transfer to private sector; and
- Transfer completion dates and scope creep responsibilities to private sector.

Schedule Certainty

- Deliver Program within an overall holistic, and key phased milestone schedule;
- Maintain flexibility to obtain and secure properties, if needed, in a progressive manner if funding is progressive;
- Allow for early work starts, as appropriate; and
- Open Phase 2 within one year of Caltrain electrification (this goal may be unachievable given estimated Phase 2 construction duration).

Transparency and Fairness

- Develop and run an open, fair and transparent procurement process.

5. Construction Cost & Funding Discussion

5.1. Background

A Phase 2 Baseline Budget of $2.996 billion was presented to the TJPA Board of Directors and adopted by the Board on March 20, 2008. The 2008 adopted budget was based on the conceptual designs and pricing available as of the end of 2007 and included a 4% escalation rate. The budget assumed a design-bid-build delivery method and anticipated the beginning of construction in 2011, with Caltrain operations beginning in 2018. The following main scope elements were reflected in the 2008 Phase 2 Baseline Budget:

- An underground station at Fourth and Townsend streets;
- Two-track lead into the DTX tunnel system;
- DTX tunnel (three tracks) running east on Townsend Street turning north on Second Street and turning east into the Transit Center;
- Tail tracks extending below-grade from the east end of the Transit Center under Main Street;
- All mining construction, cut-and-cover construction, and installation of rail and operating systems necessary to construct and commission the train extension to the Transit Center;
- Minor modifications for DTX construction to the existing Caltrain yard; and
- Reconstruction of the existing Caltrain station at Fourth and King streets.

In 2008, Phase 2 also encompassed construction of the below-grade portion of the Transit Center, consistent with the Program's "top down" construction methodology at the time. The top-down approach called for construction of the Transit Center's foundation and above-grade levels during Phase 1 followed by excavation and construction of the below-grade train station during Phase 2. Thus, the major Transit Center scope elements incorporated into the 2008 Phase 2 Baseline Budget included excavation and construction of the inner perimeter structural walls of the building; construction of the basement slab and two below-grade rail levels; and all interior construction, including vertical circulation, architectural finishes, and mechanical, electrical and plumbing services necessary for the below-grade facilities.

Table 5.1 shows a breakdown of the 2008 budget.

Table 5.1 – 2008 Phase 2 Baseline Budget (in $ millions)

Item Description	Program Phase 2		
	Transit Center	DTX	Total
Construction Cost	$ 474	$1,426	$1,900
Construction Contingency	$ 47.5	$ 142.5	$190
Subtotal-Construction	$521.5	$1,568.5	$2,090
ROW			$209
Program-wide Costs			$545
Program Reserve			$152
Total			**$2,996**

In 2010, concurrent with the award of $400 million in federal funds, the Program adopted a "bottom up" construction approach, which incorporated the design and construction of the core and structural shell of the below-grade levels of the Transit Center (train box) into the Phase 1 scope. The interior fit-out of the train box remains in the Phase 2 scope of work. A revised Phase 1 budget that incorporated the expanded scope and associated cost was adopted by the TJPA Board on May 13, 2010. The Phase 2 budget was reduced to $2.596 billion, to reflect the $400 million transfer; however, a revised Phase 2 Baseline Budget was not presented to the Board.

Since 2008, cost estimates for various Phase 2 elements have been completed at intervals generally corresponding to scope refinements and Program milestones:

- In July 2010, DTX designer Parsons completed the 30% preliminary engineering documents and estimated construction at $1.171 billion (in 2010 base year dollars, including design contingency and excluding escalation). This scope included the DTX tunnel, trackwork, and systems; a below-grade station at Fourth and Townsend streets; and reconstruction of construction-affected facilities at the Caltrain surface station and yard at Fourth and King streets.
- In June 2012, the Transit Center designer completed the 50% construction documents for the Transit Center and provided an estimated construction cost of $194.3 million (in 2011 base year dollars, including design contingency) for the Phase 2 Transit Center elements, including fit-out of the train box, train box extension, and the Intercity Bus Facility.
- Subsequent stakeholder requirements and design improvements introduced new elements affecting the Phase 2 scope of work and schedule. Among these are the ventilation/egress structures along the DTX alignment, and refinements to the tunnel and tracks, which are currently being evaluated in the Program's draft Supplemental EIS/EIR (refer to Sections 1.3 and 1.4).
- In October 2013, the scope changes were incorporated into a full Phase 2 cost estimate that assumed a 2024 operations date. The rate of escalation was revised to 3%, consistent with the Consumer Price Index 10-year average, which is 2.4%; CHSRA's escalation rate, which was 2% for 2013-15 and 3% for 2016 and beyond; and the escalation rate of 2.2% used in the MTC's Plan Bay Area. Costs for right-of-way were increased.

In summary, the major changes to the 2008 Phase 2 Baseline Budget are as follows:

- Added train box extension and widened throat structure
- Deleted tail tracks
- Added Intercity Bus Facility
- Added maintenance-of-way and turn-back tracks
- Added tunnel stub box to accommodate grade separation
- Increased right-of-way acquisition budget
- Revised train operations date to 2024
- Revised escalation from 4% to 3%

5.2. Current Anticipated Construction Cost

The October 2013 Phase 2 cost estimate (excluding the BART/Muni Pedestrian Connector) is $3.004 billion. The 2013 estimate included an escalation rate of 3% and assumed Caltrain operations would commence in 2024, with high-speed rail service commencing shortly thereafter. Table 5.2.a shows the cost categories of the 2013 Phase 2 estimate.

Table 5.2.a – 2013 Phase 2 Cost Estimate (in year of expenditure dollars – in $ millions)

	Cost
Construction	$1,290,320
Design Contingency	$205,816
Subtotal	**$1,496,136**
Escalation	$449,240
Construction Cost w/Design Contingency and Escalation	**$1,945,376**
ROW	$266,200
Programwide	$418,590
Program Cost	**$2,630,166**
Construction Contingency	$183,819
Program Reserve	$190,750
Subtotal Contingency and Reserve	**$374,569**
Total Program Cost	**$3,004,735**

5.2.1. MTC Phase 2 Cost Review

In 2015, MTC undertook a formal review of the Phase 2 budget to assess the reasonableness of the 2013 estimated costs and to provide a high-level evaluation of the project procurement options for Phase 2. The MTC's review focused primarily on the preliminary engineering plans and cost estimate prepared by Parsons in 2010, taking into consideration subsequent design, scope and estimate changes. Detailed analyses were conducted on the following six cost areas: project escalation, fee/profit, indirect cost markup, productivity, missing items, and project contingency.

MTC reviewers made recommendations in the following areas:

- Project escalation – Increase the rate to 5% on the basis of an analysis of historical California highway construction cost indexes published by Caltrans and an adjustment for current market conditions.
- Fee/profit – Increase fee/profit to 10% to account for the scope, risks, and complexity of Phase 2.
- Project contingency – Increase contingency to 27% to account for project conditions and the current design status, and in accordance with FTA guidelines.
- Project indirect cost markup – Maintain the current 26% indirect cost markup.

Reviewers identified items that had not been included in the 2010 estimate: protective traffic cover to account for excavation from Townsend Street to points south/west, turnback and maintenance-of-way tracks, and temporary utility relocation. They also recommended reviewing and revising, if necessary, productivity and cost assumptions related to heavy civil elements, deep excavation, and dirt disposal. The BART/Muni Pedestrian Connector, which had not been included in the Phase 2 Baseline Budget or in subsequent cost estimates, was also identified.

On the basis of its evaluation of the documents provided and the workshops held with the TJPA team and funding partners, MTC concluded that the cost estimate for select major project elements is reasonable at the current stage of the project, provided that the escalation rates and fee/profit are adjusted appropriately. MTC also concluded that the seven-year construction period anticipated by the TJPA is also reasonable. MTC's recommended budget adjustments are summarized in Table 5.2.b.[6]

Table 5.2.b – MTC's Recommended Program Construction Capital Estimate Adjustment Summary

	Cost
Project Escalation	$433,296,270
Fee/Profit	$100,148,877
Indirect Cost Markup	$0
Items not included in 2010 estimate*	$57,781,934
Project Contingency	$92,862,800
Total Adjustments (YOE)	$684,089,881
TJPA Base Estimate (YOE)	$3,004,731,000
Adjusted Estimate (less BART/Muni Pedestrian Connector)	**$3,688,820,881**
BART/Muni Pedestrian Connector	$120,000,000–$310,000,000
TOTAL Adjusted Estimate	**$3,808,820,881–$3,998,820,881**

* Protective traffic cover, a turnback and maintenance-of-way tracks, and temporary utility relocation

5.2.2. 2016 Phase 2 Cost Refresh

In June 2016, TJPA completed a refreshed Phase 2 estimate, reviewing scope elements from the previous DTX cost estimates line item by line item and updating the costs for labor and materials based on current market rates. The refreshed estimate also incorporated MTC's recommendations from its review of the 2013 cost estimate. The current estimate (Table 5.2c) assumes a year of operation of 2025 and a 5% escalation rate, and includes the following scope:

- fit-out of the below-grade levels of the Transit Center
- extension of the train box to Main Street
- cut-and-cover widened throat structure
- a mined tunnel along Townsend and Second streets and cut-and-cover along Townsend Street
- ventilation and emergency egress structures
- underground station at Fourth and Townsend streets
- reconstruction of facilities affected by DTX construction in the Caltrain Yard
- turnback and maintenance-of-way tracks, and at-grade trackwork
- tunnel stub and U-wall
- IBF and BART/Muni Pedestrian Connector

[6] *Transbay Transit Center Project Phase 2 Cost Review & Project Procurement Analysis Report*. Metropolitan Transportation Commission with T.Y. Lin International, Abtahi Engineering Management Consulting, and BayPac Consult Inc. Draft Final November 2, 2015.

Table 5.2.c – 2016 Phase 2 Cost Estimate Refresh (in year of expenditure dollars)

Phase 2 Construction		Direct Costs	Design Contingency	Total Cost
DTX				**$1,467,777,900**
	Segment 10 Fourth & King Surface Station and Yard Upgrade	$0		$0
	Segment 9 At Grade Trackway	$707,000		$707,000
	Segment 8 U-Wall Segment	$57,906,000		$57,906,000
	Segment 7 Cut and Cover West of Fifth St	$92,220,000		$92,220,000
	Segment 6 Cut and Cover Fourth & Townsend Station	$123,721,000		$123,721,000
	Segment 5 Cut and Cover East of Fourth St	$82,069,000		$82,069,000
	Segment 4 NATM Mined Tunnel	$387,981,000		$387,981,000
	Segment 3 Cut and Cover Throat Structure	$151,037,000		$151,037,000
	Segment 2 Transit Center	$889,000		$889,000
	Trackworks	$82,775,000		$82,775,000
	Systems	$92,662,000		$92,662,000
	Allowances	$90,162,000		$90,162,000
	Design Contingency		$199,551,900	$199,551,900
Allowance for Properties Demolition		$3,000,000		$3,000,000
Tunnel Stub Box		$99,876,000	included	$99,876,000
DTX Vent Structures (heighting of structures)		$3,222,000	included	$3,222,000
Transit Center Building (TCB)				**$247,203,907**
	Transit Center Fit Out	$150,255,780	$7,512,576	$157,768,356
	Allowance for RVA for above at 5%	$7,512,789		$7,512,789
	Train Box Extension	$55,631,840	$2,782,176	$58,414,016
	Allowance for RVA for above at 5%	$2,781,592	$514,738	$3,296,330
IBF - PCPA 95% CD Estimate item 2.3 plus 16.8% for escalation to 2016		$12,582,864	$629,552	$13,212,416
Allowance for IBF Escalator and Elevator from Beale street to Below Grade Train Box		$5,000,000		$5,000,000
Allowance for Main Street Utility Relocation		$2,000,000		$2,000,000
Subtotal DTX and TCB Construction excluding escalation		**$1,503,991,865**	**$210,990,942**	**$1,714,981,807**
DTX and TCB Construction Escalation at 5% to mid construction (2023)				$583,257,836
Subtotal DTX and TCB Construction including escalation				**$2,298,239,643**
ROW**				$266,200,000
Programwide @ 22.5% of above excluding ROW				$517,103,920
	Subtotal Program Costs			**$3,081,543,562**
Construction Contingency @ 10%				$229,823,964
Program Reserve @ 15% of Subtotal Program Costs				**$462,231,534**
Total Program Cost excluding BART/Muni Pedestrian Connector				**$3,773,599,061**
BART/Muni Pedestrian Connector - Direct Construction Cost		$109,525,767	included	$109,525,767
BART/Muni Pedestrian Connector - Escalation				$37,249,236
BART/Muni Pedestrian Connector - Construction Contingency				$14,677,500
	BART/Muni Pedestrian Connector Total Cost			$161,452,503
	Total Program Cost including BART/Muni Pedestrian Connector	**$1,613,517,632**	**$210,990,942**	**$3,935,051,564**

* Total Contingency/Reserves is $903 million or 29.3% of Total Program Costs excluding BART/Muni Pedestrian Connector

** ROW number was last updated with the 2013 Phase 2 cost estimate

5.3. Sourcing and Anticipated Contribution of Funding

The Phase 2 work will rely on funding from a combination of sources and funding streams. Table 5.3 details the potential funding plan, including potential sources and projected amounts:

Table 5.3 – Potential Funding Sources Identified for Phase 2 ($ millions)

Source	Amount (Range)	Assumed Term	Status
San Francisco County Sales Tax	$83	2016-2019	Committed
San Mateo County Sales Tax	$19	N/A	Committed and spent
Committed MTC/BATA Bridge Tolls	$7	N/A	Committed and spent
Regional Transportation Improvement Program	$18	N/A	Committed
Tax Increment (after repayment of existing TIFIA loan)	$200–$340	2019-2050	Committed
Mello-Roos Special Tax	$275–$375	2020-2025	Committed
Future San Francisco County Sales Tax	$350	2019-2026	Subject to SFCTA or voter approval
FTA New Starts	$650	2019-2026	Subject to federal approval
New MTC/BATA Bridge Tolls	$300	2019-2026	Subject to MTC/BATA and voter approval
Future California High-Speed Rail Funds	$557	2019-2026	Subject to federal/state approval
Land Sales	$45	2018	Contingent upon sale
Potential Passenger Facility Charges or Maintenance Contribution	$865–$1,920	2026-2060	Subject to CHSRA and/or Caltrain approval
Total	**$3,369–$4,664**		

A brief summary of each anticipated Phase 2 funding source follows:

San Francisco County Sales Tax. Proposition K is a half-cent local transportation sales tax approved by San Francisco voters in 2003 for transportation infrastructure improvements. Prop. K is forecast to generate $2.35 billion (in 2003 dollars) over 30 years for all Prop K projects, and currently generates about $77 million annually for the Program.

The SFCTA manages the Prop. K sales tax program, and the Prop. K Strategic Plan has committed $83 million to Phase 2. Of this amount, about $50 million has already been allocated and mostly spent on the Phase 2 design. Phase 2 may be able to receive up to $350 million of additional Prop. K local sales tax funds. This amount is based on the Phase 2 funding plan included in Plan Bay Area, which is the Bay Area's regional transportation plan.

San Mateo County Sales Tax. The San Mateo County Transportation Authority is an independent agency formed to administer the proceeds of a county-wide half-cent sales tax. Voters approved Measure A, which established the program, in June 1988. Measure A sales tax collections began in January 1989. In 2004, county voters overwhelmingly approved a reauthorization of Measure A through 2033. Resolution 3434, the Regional Transit Expansion Policy, includes approximately $19 million of Measure A sales tax funds for Phase 2. These funds have been spent on the design phase of Phase 2.

Committed MTC/BATA Bridge Tolls. On March 2, 2004, voters passed Regional Measure 2, raising the toll on the seven state-owned toll bridges in the San Francisco Bay Area by $1.00. This extra dollar funds various transportation projects within the region that will reduce congestion or improve travel in the toll bridge corridors, as identified in SB 916. The currently committed capital funds total $7 million for Phase 2, and those funds have been spent on design.

Regional Transportation Improvement Program. The State Transportation Improvement Program (STIP) is the State's spending plan for state and federal funding. The STIP is comprised of the Regional Transportation Improvement Program (RTIP) and the Interregional Transportation Improvement Program. MTC and the SFCTA, acting as the San Francisco Congestion Management Agency, program Regional Improvement Program funds for inclusion in the RTIP. RTIP funds for the Transbay program are planned to come from the Public Transportation Account, and are subject to fluctuations in the state budget and the condition of the economy. The STIP is updated every two years and currently covers a five-year period. Currently $18 million in RTIP funds have been allocated to Phase 2.

Tax Increment. A redevelopment plan providing tax increment financing (TIF) was created around the Transit Center in 2005 to help fund the Program (including Phase 2). The assessed value of properties within the TIF plan area at the time the authorizing legislation was approved was recorded at $0. Net property tax proceeds derived from any increase in the assessed value of those properties above their 2005 levels has been committed to funding the Transit Center. The most recent estimate forecasts over $1.15 billion of property tax increment value. The Phase 2 potential funding from the remaining tax increment assumes financings ranging from $200 to $340 million.

Land Sales. Sales proceeds of the TJPA-controlled Block 4 within the Transit Center District, the Temporary Terminal site, have been designated for Phase 2. Block 4 is currently committed for bus operations during the construction of the Transit Center and cannot be sold until completion of Phase 1 in late 2017. The TJPA estimates that $45 million of sales proceeds will be allocated to Phase 2 (depending on the execution of the Block 4 option agreement with F4 Transbay Partners LLC and the amount of affordable housing required for that block).

Mello-Roos Special Assessment. A Mello-Roos Community Facilities District (CFD) is a method of financing supporting infrastructure within an area by authorizing the City to levy a special assessment or tax on property owners within the CFD. The Transit Center District Plan (TCDP), enacted in August 2012, called for a CFD around the Transit Center. The Mello-Roos CFD formation legislation was adopted and signed into law in January 2015. The special assessment CFD will apply to new construction within the TCDP area that meets certain specified criteria. The CFD will exist for 75 years, and individual properties will pay annual assessments for a 30-year period, beginning when a certificate of occupancy is received, based upon building area and type of occupancy roughly equivalent to a 0.55% property tax on the assessed valuation. Property values are currently very high in the TCDP area and are expected to climb even higher when Phase 2 is completed. Although a portion of CFD financing proceeds will be used to complete Phase 1, approximately $275 million to $375 million is forecast to remain available to fund Phase 2.

FTA New Starts. The FTA's discretionary New Starts program is the federal government's primary financial resource for supporting locally planned, implemented, and operated major transit capital investments such as Phase 2. The New Starts program funds new transit systems and extensions to existing transit systems including rail, bus rapid transit, and ferries.

Proceeding through the New Starts pipeline involves a significant effort to meet FTA requirements over several years. As the transportation planning and finance organization for the San Francisco Bay Area, MTC has included Phase 2 in the region's 2013 Plan Bay Area with a New Starts commitment target of at least $650 million. The timing of those funds depends on how quickly the region is able to line up all non-federal funds. New Starts funding would not be available until all non-federal funds are committed.

Additionally, Phase 2 would not be able to start receiving New Starts funds until the two existing regional projects with full funding grant agreements (FFGAs) from FTA receive the full amounts committed in those FFGAs via annual federal appropriations. Both regional projects currently obtaining New Starts funding (Central Subway and BART Silicon Valley Phase 1) are on schedule to receive committed funds by fiscal year 2018. Phase 2 will be next in the queue for New Starts funds once a request to formally enter the New Starts pipeline is submitted to and accepted by the FTA; it is expected that these funds could begin flowing between 2020 and 2022 and would be fully paid out over a 5 to 8 year period.

If the FTA selects Phase 2 for New Starts funding, that money would be contingent on congressional reauthorization of transportation legislation and annual appropriations for the Program.

New Future MTC/BATA Bridge Tolls. Toll revenues from the seven state-owned bridges in the Bay Area are administered by MTC. MTC estimates that if approved by the region's voters, a new regional measure funded with incremental bridge tolls would bring a total $2.7 billion through 2040, of which approximately $300 million has been designated in Plan Bay Area for allocation to Phase 2.

Future California High Speed Rail Funds. Proposition 1A, the High-Speed Passenger Train Bond Act approved by California voters in November 2008, approved the issuance of $9.95 billion of State of California general obligation bonds for the 800-mile high-speed train project (including the Transit Center) under the supervision of the CHSRA. Approximately $5 billion has yet to be designated for particular projects. Each bond issuance requires approval by the California State Legislature. The funding outline in Plan Bay Area calls for $557 million in Prop 1A or other high speed rail (federal or state) funding to be directed to Phase 2. These funds could potentially come from newly enacted state cap and trade funds. As the Transit Center is the northern terminus for California High-Speed Rail, Phase 2 is an eligible use of those funds.

Future San Francisco County Sales Tax. Phase 2 may be able to receive up to $350 million of additional Prop. K local sales tax funds. This amount is based on the Phase 2 funding plan included in Plan Bay Area. Future Prop K funds are contingent on voter approval of a ballot measure to increase the Prop K sales tax and to include the DTX as a recipient in the measure's funding plan.

Caltrain & CHSRA Passenger Facility Charges. A ridership fee or passenger facility charge (PFC) for Caltrain and/or CHSRA rail passengers into the Transit Center is a possible source of funding for Phase 2. The implementation of a PFC would need to be negotiated between the TJPA and rail operators and would likely be based on the operators' share of the overall operations and maintenance costs for the facility and any upfront capital contribution from the operators.

A projection for PFC-secured financings for Phase 2 would be from $865 million to $1,920 million The boards of Caltrain and CHSRA would need to adopt any PFCs dedicated to Phase 2.

5.4. Projected Flow of Project Funding

The TJPA's Phase 2 funding sources will become available to the TJPA both during the construction period and over a considerable length of time after substantial completion. This is typical in multibillion-dollar transit projects. Currently, it is assumed that Phase 2 will have a construction start date of 2019, with a seven-year construction period, and with revenue commencement and operations starting in 2026. We have assumed that committed funding sources will require financings to be available during the construction period.

As of December 31, 2015, approximately $76 million of the committed funding has been spent on the design, predevelopment and environmental work for Phase 2. These amounts were funded by committed bridge tolls and sales tax receipts from SFCTA and San Mateo County Transportation Authority. The remaining $33 million of the aggregate of $109 million to come from these sources will be utilized to complete the Phase 2 environmental process and advance the project before construction begins. The TJPA also anticipates that the net proceeds generated from selling the final formerly state-owned parcel Block 4 (currently a portion of the Temporary Terminal) will be available for Phase 2 before construction begins.

Phase 2 also has two other committed funding sources that are currently providing funds for Program development: net tax increment revenues and Mello-Roos special tax assessments. Although the net tax increment revenues are pledged to repay the TJPA's loan with U.S. DOT's TIFIA credit assistance program to fund Phase 1, the revenues that remain after loan repayment will be used for Phase 2. Similarly, certain Mello-Roos special tax assessments will fund the Phase 1 completion, but the remaining revenues will be used for Phase 2. Although these tax increment revenues and Mello-Roos special assessments will be generated for a significant period after the proposed construction period, the TJPA has assumed that it will be able to use long term financings to generate proceeds during the construction period.

Per MTC's Plan Bay Area, Phase 2 expects to receive future SFCTA sales tax revenues, future bridge tolls, future CHSRA funds and potential PFCs. This study assumes that those funds will predominantly be available during the Phase 2 construction period. Plan Bay Area also assumes that FTA's Section 5309 New Starts grants will be available for Phase 2. These grant monies are assumed to become available to the TJPA during the construction period. Similar to the tax increment revenues and the Mello-Roos special assessments, the PFCs are assumed to be used to secure long-term financings, which will generate the proceeds shown in Table 5.3 during the construction period.

Appendix D, Current Anticipated Funding Sources and Flow, contains the currently anticipated funding sources (assuming the high scenario), the yearly amounts anticipated from each source, and a running total by year. This information indicates that in 2019 (the anticipated start of construction) that approximately $1,998 million of the funding needed will be available to the TJPA. In 2026, approximately $4,570 million will be available to the TJPA. Although the TJPA continues to focus on identifying potential funding sources for Phase 2, it is evident that not all of the required funding will be collected and available at the beginning of construction.

6. Project Delivery Options Assessed

Project delivery options include a range of contractual models that stipulate roles and responsibilities for the public and private sectors and allot risk for the delivery and completion of an infrastructure project. Procurement and delivery of an infrastructure project must include all aspects that may, or will, affect the performance of the asset during both initial construction and its life cycle. These aspects include preliminary engineering work, design, construction, and, in some cases, financing, maintenance, and operation of the asset.

The effectiveness of a particular option, therefore, depends on how well tailored the option is to the needs and characteristics of the project. For example, if a procurement requires only design and construction services, there is little purpose in considering an option that includes long-term financing or maintenance.

Figure 6.0.a shows the project delivery options evaluated in this study and how risks associated with specific project aspects are typically transferred to the private sector under each option, as well as the group each option was assigned to, as explained below. While additional options were initially considered, the six options evaluated are widely used in transit and rail procurements and can meet the needs of the work for Phase 2.

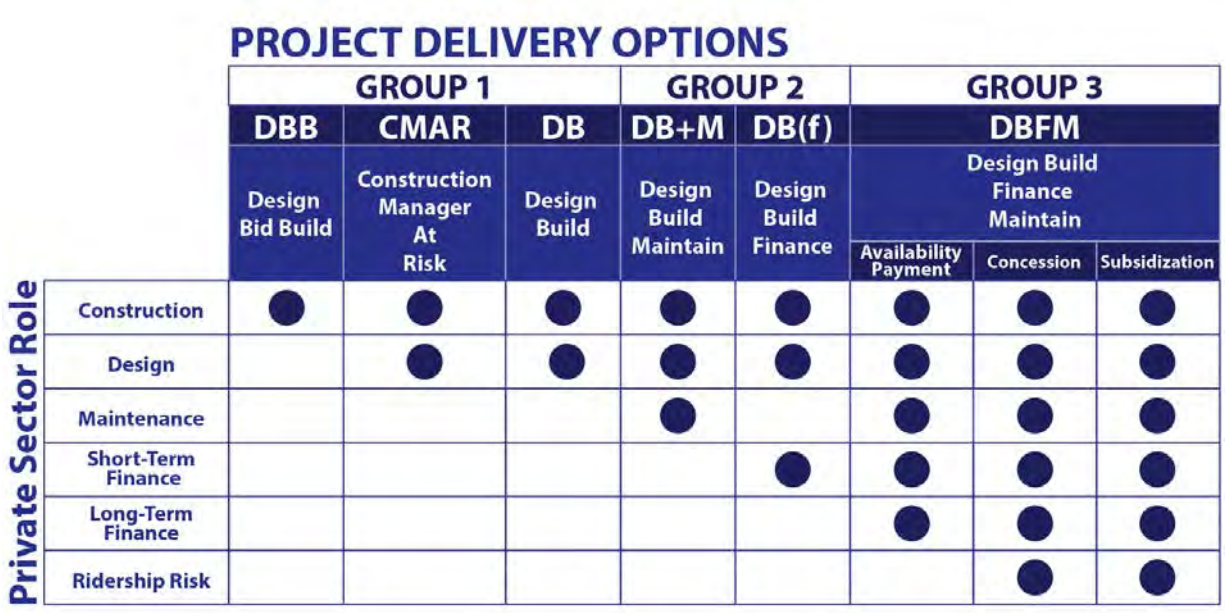

Figure 6.0.a – Project Delivery Options Evaluated in this Report

This section introduces a method for evaluating the various options, given that the final financing approach has not yet been finalized and a governance structure with rail operators and other stakeholders needs to be established. The project delivery options were grouped according to the type of risk each option can address and effectively transfer to the private sector: Group 1–Design and Build Only Options; Group 2–Short-Term Finance and Maintenance Additive Options; and Group 3–Long-Term Finance and Maintenance Additive Options.

The Group 1 options were evaluated first to determine the optimal method for procuring the base services of design and construction, which are the foundation of the TJPA's core purpose. The Group 2 and 3 options were then evaluated to determine whether the additional private sector services each model uniquely offers would benefit the TJPA. This approach is illustrated in Figure 6.0.b. This logic-driven and additive group approach provides a holistic consideration of all potential delivery options for Phase 2 that are also flexible in meeting the future needs of the TJPA.

Sections 6.1 through 6.4 describe each option along with general benefits and limitations. Section 7 discusses the assessment of each option relative to the needs the Phase 2 work and the goals and objectives of the TJPA.

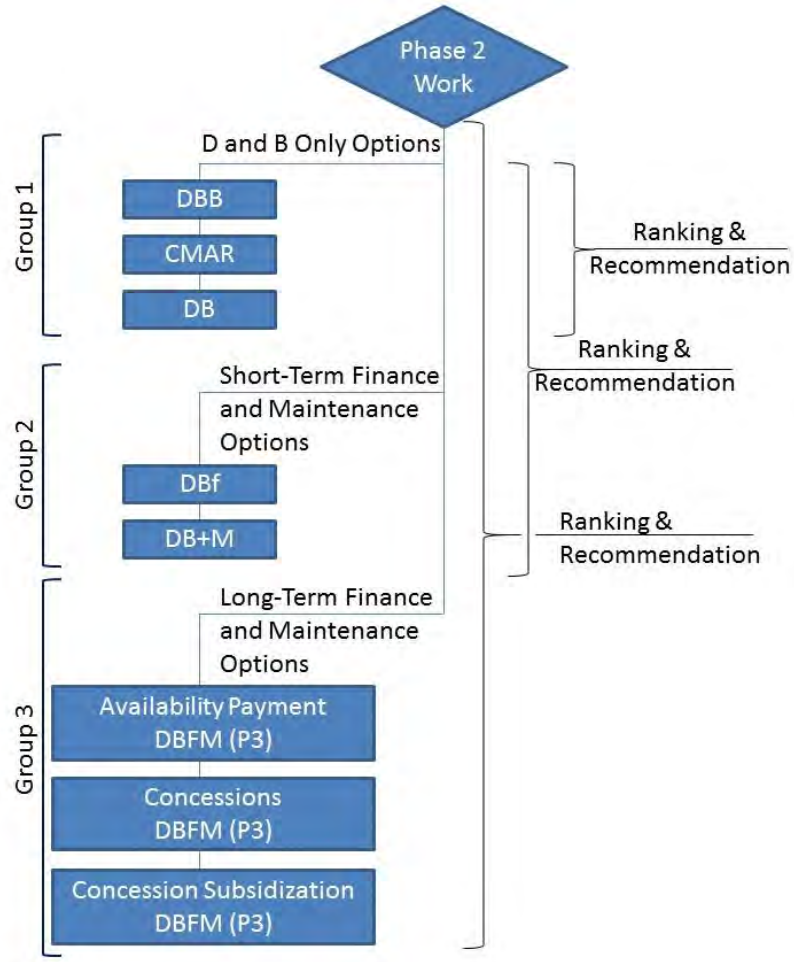

Figure 6.0.b – Project Delivery Option Decision Tree

6.1. Group 1—Design & Build Options

6.1.1. Design-Bid-Build

Design-Bid-Build (DBB) is the most traditional and widely employed project delivery method utilized in the United States, in all types of infrastructure projects. DBB typically evolves from three distinct and sequential phases: the design phase, which requires the services of a designer who will design the project; the bid phase, when a contractor is procured; and a build or construction phase, when the project is built by the contractor. This sequence leads to the sealed bid, fixed price construction contract.

Under DBB, the design is brought to full completion before the package is issued for bid, resulting in procurement documents that are well defined and prescriptive. The contract is awarded to the low bidder, and the public sector assumes nearly all the risks for design and its relation to the construction. Typically, the contractor is eligible to bid after being pre-qualified by a public agency, and seeks to gain the winning bid by supplying the lowest cost. The contractor's work is covered by a performance bond, and the payment structure consists of progress payments as work is completed. If multiple contracts are awarded, the public sector bears the responsibility for the overall coordination and interface among contractors.

Key Benefits of DBB:

- Certainty of design outcome (due to public sector control over design process and the prescriptive nature of procurement documents);
- Well defined and understood roles of each party; and
- High acceptance and comfort within the marketplace.

Key Limitations of DBB:

- No integration of design and construction work;
- Minimal private sector innovation, ingenuity, or value reductions available;
- Competitive tension is present, but selection considerations are limited to construction pricing;
- Quality of contractor is based on a prequalification basis, and does not typically include an evaluation beyond that determination ranking;
- Historically, highly susceptible to cost overruns, claims and litigation;
- Limited warranty for work performed, 12–24 months typically, following substantial completion;
- Asset life-cycle integration is not considered as part of the bid process;
- Minimal risk transfer to the private sector; and
- Minimal to no price certainty.

6.1.2. Construction Manager at Risk

Under the Construction Manager at Risk (CMAR) delivery method, the owner engages a construction team early in the development process, and depending on the structure of the contract, the CMAR often can provide a commitment to deliver the project for a guaranteed maximum price (GMP). The

public sector will also engage a designer team via a separate contract. The designer and CMAR are both agents of the public sector entity whose goal is to define, design, cost, and deliver the determined scope of work. The CMAR structure allows for an open, transparent, and collaborative approach. Risk management is accomplished through open discussion as the scope and design are progressing, and later tallied within the GMP. Under CMAR, construction costing is also an open and on-going process, whereby critical factors such as design, quality, schedule, scope and overall budget decisions are reached collaboratively. CMAR delivery can be very effective when the infrastructure is very complex, and the scope of work is undefined, variable, or requires significant development.

As is the case with DBB, payment of work under CMAR delivery is accomplished by progress or milestone payments, and private financing is not required. Also like DBB, life-cycle integration and those costs, risks and responsibilities remain with the public sector. However, the warranty period aligns more with DBB in that it is very limited. Principal to the success of this method is a clear and transparent identification and acceptance of all of the project risks, and the true costs of these elements.

Key Benefits of CMAR:

- Method can lead to an increase in the overall completion time and slower progress than desired by the public sector;
- Intends to strengthens coordination between the designer and contractors;
- Increases collaboration and enhances synergies between public sector, designer and contractors;
- All costs and fees are transparent (diminishing adversarial relationships between parties);
- High degree of price and risk certainty can be achieved if GMP is properly employed); and
- Innovations and best practices folded into work as scope and costs develop.

Key Limitations of CMAR:

- Very low level of competitive tension;
- More complex relationships, as compared with DBB and DB (discussed in the following section), due to selection and contractual nature of the method;
- High reliance that the entire risk profile is understood and articulated prior to the final GMP, which if not properly accomplished can erode value, increase end-costs, and reduce effectiveness of the method;
- Balance between quality and price can be compromised during negotiations if trade-offs are required to meet a specific budget price, and the CMAR's value proposition fails to meet the public sector's performance requirements; and
- Delayed or unbalanced schedule can occur if design, risks and construction are not resolved proactively.

6.1.3. Design-Build

With Design-Build (DB), the public sector contracts with a single private sector design-builder, which carries out the final design and completes construction of the asset, based upon a set of "bridging" or preliminary engineering drawings (typically to a 30% and up to a 60% level of completion). This option integrates the design work and the construction roles with one private sector entity and transfers the design and coordination risks to the private sector. In addition, schedule savings may be achieved as both the design and construction can proceed concurrently.

DB has gained in popularity and is now widely accepted in the marketplace. The procurement of the private entity is typically a two-step procurement process, beginning with issuance of a request for qualifications (RFQ) to prequalify designer/contractor teams based on quality, and then a request for proposals for price, which is based on a fixed firm or lump-sum fee. Life-cycle integration beyond the design-life requirements and many other risks and responsibilities remain with the public sector, but the quality of the work is typically addressed in part by a 1- to 2-year limited warranty following substantial completion, and the contractor's work is covered by a performance bond. Similar to the DBB method, with DB, the public sector pays for the work through progress or defined milestone payments, based on the value of the work completed; therefore, the design-build team does not have to source significant amount of short-term financing.

Key Benefits of DB:

- Increased price certainty (due to lump-sum based fee);
- Increased schedule certainty and compression as contractor has incentive to complete on or before schedule to maximize its profit margin;
- Opens opportunity for innovation through private sector participation in design;
- Historical results generally indicate overall cost reduction compared to DBB;
- Integrated team for completion of design and all construction;
- Transfer of significant design and construction risk to the private sector;
- Acceptance and engagement of DB within the marketplace;
- Good competitive tension, which drives value;
- Designer/contractor teams evaluated based on quality and price; and
- Limited term warranty (1–2 years).

Key Limitations of DB:

- Skewed and less-defined roles and division of responsibilities than in traditional project delivery methods, which may result in internal conflicts within the DB team;
- Owner cedes final design control;
- Susceptibility to cost overruns, but typically less than with DBB and CMAR;
- Disputes and litigation still can occur; and
- Selection criteria of the design-build team can be more complex, and procurement requires proper structuring.

6.2. Group 2—Short-Term Finance or Maintenance-only Additive Options

6.2.1. Design-Build-Finance

As with the DB delivery option, Design-Build-Finance (DBf) integrates the design and construction work with one private sector entity. However, the key difference from DB is the introduction of a short-term finance component. This structure requires the private sector to obtain construction financing from lenders, typically in the range of 1 to 5 years; while not common, financing terms can be longer in certain circumstances where a longer term is necessary. At substantial and final completion, a majority of the total construction payment due to the private sector is made, while the remainder is repaid on a predefined schedule later in the contract term. This approach introduces two key features: (1) a highly defined repayment structure, and (2) the ability of the public sector to accrue cash in hand of the committed or required funding over a longer term.

Key Benefits of DBf:

- Provides additional schedule certainty as compared to DB (as lenders impose additional financial discipline);
- Greater opportunity for the implementation of innovations, ingenuity, and best practices;
- Can provide total overall price reduction as compared to DB;
- Integrated design and construction team, and oversight of lenders;
- Very good competitive tension, as with DB, as more than construction cost solutions are required;
- Increases construction risk transfer, due to an extended warranty period; and
- Allows public sector to defer a portion of payment to private sector, although funding commitments must be in place prior to contract agreement.

Key Limitations of DBf:

- Public sector retains life-cycle risks;
- Introduces some loss of control over traditional elements as delivery is outcome-based and guided by performance specifications, as opposed to prescribed in detail by the public sector, as with DBB; and
- Procurement and evaluation is more complex than with DB and DBB, as value of finance is introduced.

6.2.2. Design-Build + Maintain and Design-Build-Maintain

Often public sector entities may not have dedicated maintenance forces or may seek to engage experts in the fields of routine maintenance and asset preservation. These situations have led some public sector agencies to consider Design-Build + Maintain (DB+M) and Design-Build-Maintain (DBM). Under a DB+M procurement, the private sector entity is engaged to design and construct the asset and provide limited maintenance, and under a separate and distinct contract the public sector hires a contractor to provide the majority of maintenance work. A DBM procurement has the private entity include a maintenance contractor with its team as early as during the RFQ process. Greater success has been gained when the design-builder employs the maintenance contractor, as the risk of latent defects is more easily and completely transferred to the private sector. However, in this study DB+M would be the better choice for the Phase 2 work. It is assumed that long-term maintenance of

the rail infrastructure will be the responsibility of the rail operators, as the 1.3-mile DTX will be an extension of a much larger 50-mile track system currently being maintained by Caltrain (refer to Section 2.5).

Another important factor in this method is the payment of the maintenance work. With DB+M, typically a schedule of values that matches the articulated maintenance responsibilities is defined in the agreement. To detail this concept further, upon identification of required maintenance work if the work is addressed by the agreement, the DB+M team will notify the public sector agency, and the work will be approved prior to commencement, including the fee for such work. If the work is not included in the agreement, the public sector then seeks to have that work transferred to that agency or party that holds that agreed upon responsibility. Often DB+M contracts will include a set of labor and material rates, along with the appropriate escalators for the maintenance work. The term for the maintenance work can vary from 5 to 15 years, with renewals or re-procurement steps built into the agreement. A principal example of where this has been employed is the Hudson-Bergen Line in New Jersey, which employs a similar approach whereby routine and preventative maintenance is performed by the DB+M entity, but life-cycle and rehabilitation work is covered by the public sector agency (New Jersey Transit). Refer to the case studies in Appendix C.

Key Benefits of DB+M:

- Maintenance experts and firms, if engaged by the private sector during design and construction, can seek to enhance the quality of the work, and the outcome;
- Increased price certainty on design and construction work (due to lump-sum based fee);
- Increased schedule certainty;
- Provides opportunity for innovation, ingenuity, and best practices to be integrated into the work depending on the level of maintenance responsibility transferred to the private sector;
- Greater transfer of design and construction risk to the private sector; and
- Designer, contractor and maintainer team can be evaluated based on quality and price.

Key Limitations of DB+M:

- If maintenance team is procured separately, internal tension can turn to conflict and in-fighting;
- Owner cedes more design, construction and routine maintenance control;
- As life-cycle maintenance is paid for as it develops and is encountered, the public sector is less certain of that pricing amount and impact;
- Warranty is not as effective as with DB or DBf, as maintenance costs are directly reimbursable;
- Growing in use, but not as market-tested as other project delivery options;
- Limited risk transfer still a factor, as price remains the driver;
- Disputes and litigation are still common; and
- Selection criteria can be complex, and procurement requires proper structuring.

6.3. Group 3—Long-Term Finance & Maintenance Additive Options

Over the past decade, public-private partnerships, or P3 solutions, have risen in utilization, popularity and market acceptance. While P3 solutions can take various forms, their main feature is a more comprehensive transfer of risks from the public sector to the private sector. Principal to this risk transfer and common to all P3 solutions is the transfer of design (D), construction/build (B), long-term financing (F), and life-cycle or whole-life maintenance (M).

Design and construction risk transfer in a P3 solution is very similar to the previously presented alternative delivery methods, with the exception that the contract structure is significantly more performance-based. This approach invites and encourages private sector ingenuity, innovation and best practices. In addition, this approach ideally opens pathways for significant value savings beyond just cost, which can fuel unique technical solutions and schedule reduction. Importantly, control of risk transfer in a P3 solution is achieved by two main mechanisms: (1) a whole-life or life-cycle maintenance approach, and (2) a payment mechanism that provides incentive to the private sector in a way that aligns public and private sector interests. These aspects of the P3 agreement, if properly structured, protect the public sector so that it receives a high quality asset over the long run. If the private sector delivers a lesser quality asset, it suffers a loss of revenue due to imposed deductions through the payment mechanism. These potential revenue losses serve as a powerful behavior incentive for the private sector to increase short-term and long-term performance and quality.

The whole-life or life-cycle maintenance responsibility that is transferred to the private sector comprises three main components, each driving behavior and quality for the asset:

- Routine maintenance (daily and weekly care of the asset);
- Asset preservation (maintenance that is both preventative and seeks to preserve the quality and function of the asset); and
- Hand-back or expiry requirements (the residual life and quality metrics required at the end of the P3 agreement, so that the public sector is returned a functioning and useful asset).

P3 solutions seek to form a long-term risk transfer to the private sector through an agreement that is comprehensive in nature. These agreements establish contractual partnerships that can span, for example, from 30 years (as with an Availability Payment structure) to 75 years or more (with a Concession structure). A private entity is fully responsible for long-term (possibly 30-year) private finance and life-cycle maintenance, rehabilitation and hand-back at the end of the agreement. This methodology uses performance-based contracting, which allows for flexibility, innovation, ingenuity and the imposition of further discipline by the investors/lenders.

Critical to all of the P3 solutions presented in this Report, the public sector maintains ownership of the asset at all times; it is never ceded in part or in whole to the private sector. Typically, a P3 is limited to providing only a limited-term business license to perform the elements of the DBFM as described and defined in the project agreement.

Overall Key Benefits of P3 Solutions – DBFM:

- Increased price certainty in both short-term (construction) and long-term (life cycle);
- Increased schedule certainty (as oversight of lenders is a further discipline mechanism in meeting the construction schedule);
- Greatest opportunity for innovation, ingenuity, and best practices;

- Greatest increase in ability to drive cost reduction and generate value;
- Highly integrated team that is also highly incentivized for long-term quality;
- Excellent competitive tension, as competition is multi-discipline, including financing, which drives value;
- Financial incentives/deductions to private sector drive long-term quality, behavior and responsiveness; and
- Maximizes risk transfer to the private sector.

Overall Key Limitations of P3 Solutions – DBFM:

- Complex delivery method that spans many years, and must be procured in the proper manner;
- Loss of owner control on many traditional elements, as delivery is truly outcome based;
- One-off nature of transaction typically can increase in-house procurement costs as specialty advisors and a training and education process is required due to complex nature of P3;
- Financing solutions, and/or revenue generation sources must be biddable, bankable, and acceptable to the private sector prior to execution of the agreement; and
- Cost of private financing can be greater than equivalent rates for public finance.

The following additive options to the DBFM methodology are discussed in Section 6.3.1–6.3.3: Availability Payments, Concession Agreements, and Concession Subsidizations. Because they are untested in the procurement of large transit systems, the Concession P3 options were not considered in this study. However, they are described to provide a comparison to the Availability Payment P3 option.

6.3.1. Availability Payment

The most common, successful, and industry acceptable P3 solution is the Availability Payment structure. Prevalent examples of this option in North America are numerous and include and range from Presidio Parkway in San Francisco to the Canadian transit P3 structures, including the Confederation Line Light Rail Transit Project (Ottawa) and the Canada Line Elevated Transit Line (Vancouver). The principal reason for the widespread acceptance and success of the Availability Payment structure is that the public sector retains full control of the asset's revenue stream (user fees, if any) and the private sector relies on the public sector's creditworthiness and ability to pay as opposed to an uncertain revenue stream for payment.

Availability Payment structures are founded on the principle that the focus and responsibility of the private sector should be to design, build and maintain the asset to a defined and prescribed quality outcome that is established at the out-set and sustained throughout the asset's life cycle. The private sector's equity investment in the project and its desire to maximize return on that investment provides incentive to maintain quality. Typically, at final completion or revenue commencement, the private sector is paid anywhere from 75% to 90% of the capital construction cost (either as a lump-sum, or through a series of milestone payments). The remaining 25% to 10% of the capital construction cost (along with interest, other financing costs, and maintenance costs) is paid through performance based monthly service payments (MSP) over the term of the agreement. An Availability Payment structure can have any duration that is reasonable, but recent transactions have typically employed a 30-year term. If the asset is functioning as required and "open and available" for use, then the private sector receives its full MSP. However, if for some reason the asset is not performing

as required, the MSP is reduced in a manner to encourage a step-change in behavior, and increased performance and quality. These reductions are governed by key performance indicators, and administered through the payment mechanism in the project's P3 agreement.

Additional benefits and limitations to this particular P3 structure include the following:

Key Additional and Specific Benefits of an Availability Payment P3:

- Powerful, effective and proven behavior mechanism through the payment of the MSP;
- Ongoing revenue streams, such as fare-box revenues, received by the public sector can be employed to offset the MSP to some extent;
- Private sector can focus on design, construction and maintenance risks and work, not on revenue risk, over which it generally has less control; and
- Great driver of ingenuity, innovation and best practices, as payment mechanism is tied directly to the quality of the outcome and performance of the asset.

Key Additional and Specific Limitations of an Availability Payment P3:

- All funding must be committed and/or guaranteed (via specific contractual language and commitment agreements with the funding partners) prior to the execution of the agreement with the private sector, as investors/lenders require this;
- The payment mechanism and project agreement can be very complex, and oversight is required to ensure compliance with the contractual requirements; and
- Somewhat higher cost of private capital employment as compared to public sector tax-exempt financing if private sector financing is excessive.

6.3.2. Concession Agreements

Concession Agreements (also referred to as long-term lease agreements) transfer not only the design, construction and maintenance to the private sector but also one or several revenue streams (user fees for example) generated by the asset. The private sector in accepting the revenue risk also accepts the funding and financing profiles generated by those streams throughout the term of the agreement. Importantly, the Concession Agreement will seek to protect the public by indexing the user fee revenue stream to reasonable annual increases tied to well-known indices such as the Consumer Price Index (CPI) or Gross Domestic Product. For this type of P3 solution, fare-box return and maintaining riders that use the system entail large and volatile uncertainties known as "ridership risk." The critical measure of success for the private sector is its ability to maintain the asset in a manner where the customer base utilizes the asset, while protecting its planned investment rate of return.

Traditionally, Concession P3 solutions have been employed for existing and new highways and other assets, and have not been employed in transit types of P3 solutions, as fare-box recovery is typically substantially less than the cost to design, build and maintain the asset. This P3 solution has been included solely to provide a comparison to the benefits of the Availability Payment P3 solution.

Additional benefits and limitations to this particular P3 structure include the following:

Key Additional and Specific Benefits of a Concession P3:

- The public sector funding is limited or not required if the revenue streams from the asset are ample enough to repay the required debt financing and provide sufficient return on equity, where the debt and equity financing pay for design, construction, and maintenance; and
- Rely on the incentive gained by consumer-based satisfaction; if satisfaction declines or eliminated the revenue stream it provides the private sector also declines.

Key Additional and Specific Limitations of a Concession P3:

- Introduces significant risk to the private sector, as ridership revenue stream is very uncertain;
- Historically, the P3 solutions that have defaulted have been Concession structures;
- User fees can become unbalanced and unpredictable over a very long-term, as transportation use and costs can be variable and volatile; and
- Rating agencies will devalue the projected revenue stream to account for high risks and preserve down-stream profit.

6.3.3. Concession Subsidizations

As another P3 comparator to the Availability Payment P3 solution, this subsection addresses Concession Subsidization. This P3 solution blends concepts contained in both a full Concession structure and Availability Payment structure. This method is employed when the public sector: (1) has or anticipates that it has a limited amount of the full funding requirement available at the time of final completion; and (2) the revenue stream risk is not desired to be retained by the public sector, whereby a benefit can be gained by transferring this risk to the private sector. The public sector makes available to the private sector at the time of bid a predefined maximum amount of funding, which is defined as the public sector subsidy. The private sector then seeks to assemble its own finance and funding model to determine if the projected revenue stream made available with the public sector subsidization addresses all the costs and profits it requires in undertaking all work required for the asset in its life.

Although this type of P3 solution is being examined and in some cases employed, Concession Subsidization P3 solutions generally are less risky, depending on how they are structured compared to the full concession model discussed in Section 6.3.2. The only U.S. projects that are similar are those undertaken by the Texas Department of Transportation (North Tarrant Express highway, and the new LBJ Managed Lanes), which were generally successful, but are only recently completed. The key differentiator with those two transactions is that they are both high-volume toll road projects in jurisdictions accustomed to high user fees for the time and convenience benefits they offer.

As with the Concession Agreement P3, the Concession Subsidization P3 is included solely to provide a comparison to the benefits of the Availability Payment P3.

Additional benefits and limitations to this particular P3 structure include the following:

Key Additional and Specific Benefits of Concession Subsidization P3s:

- Harnesses the benefits and behavior/performance mechanisms of both full Concession structures and Availability Payment structures;
- Seeks to reduces the need for all funding to be obtained and/or "in-hand," at the end of construction as ridership revenue (if sufficient) can be used to repay debt and provide a return on equity to the private sector, transferring that risk away from the public sector; and
- Provides another style of a deferred payment structure.

Key Additional and Specific Limitations of Concession Subsidization P3s:

- Most complex and difficult to negotiated transaction, that rely on many external factors, projections and risk appetite; and
- Market acceptability in the transit sector is not present and will entail a steep learning curve, by the industry.

6.4. Project Delivery Method vs. Potential Value Savings to Project Costs

Debate has occurred among industry leaders, owners, consultants and lenders attempting to find the appropriate and real cost savings when employing a non-traditional project delivery method. As part of the work in validating the reasonableness of the savings an alternative delivery method can provide, the URS AFP team reviewed recently published analyses, which concur with the premise that alternative project delivery methods do provide an overall value savings. Cost savings would typically be evaluated by way of a Value for Money assessment, which compares a traditional project delivery method (such as DBB) to the proposed alternative delivery method under consideration. A Value for Money assessment for Phase 2 will be an appropriate step after the risk model has been fully updated to address cost and schedule impacts and the potential procurement methodology has been narrowed to several choices.

The URS AFP team relied on findings from Canadian transactions, as data for U.S. transactions that are comparable to Phase 2 is not comprehensive. The November 2015 Lawrence National Centre for Policy Management of Western University (London, Ontario) issued a report entitled *The Procurement of Public Infrastructure: Comparing P3 and Traditional Approaches*, which summarizes the following:

> Taken together, it appears that while the private sector is better placed to assemble and retain the necessary expertise to execute large public infrastructure projects, the incentives and risk management practices embedded in P3 projects are a separate and essential ingredient. The private sector's comparative advantage in retention of in-house expertise, robust oversight structure, and better alignment of incentives to minimize whole-of-life costs of a particular project gives it a unique edge in fulfilling project obligations on schedule and on budget. [7]

The Auditor-General of Ontario in the 2014 annual report concluded the following regarding Alternative Finance and Procurement (AFP), which is the same as the term P3:

[7] *The Procurement of Public Infrastructure: Comparing P3 and Traditional Approaches*. Lawrence National Centre for Policy Management of the Western University, London, Ontario. November 2015.

> Based on our audit work and review of the AFP model, achieving value for money under public-sector projects would be possible if contracts for public-sector projects had strong provisions to manage risk and provide incentives for contractors to complete projects on time and on budget, and if there is a willingness and ability on the part of the public sector to manage the contractor relationship and enforce the provisions when needed. Total costs for these projects could be lower than under an AFP and no risk premium would need to be paid. [8]

The Lawrence National Centre for Policy Management analyzed the Montreal Subway Extension to Laval (traditional procurement), the Toronto-York Spadina Subway Extension (traditional procurement), and the Canada Line Project, Vancouver (P3 procurement). The assessment of these three transit projects suggests that major scope changes, cost overruns, and major coordination failures were fewer with the P3 approach, and translated into a value to the public sector.

In another recent analysis, *TR2015 - Infrastructure Ontario Track Record 2015 Report,* Hanscomb, a cost planning and control services firm, highlighted that its study of 45 projects that have reached substantial completion as of March 2015 as P3 projects, compared to 7 projects delivered by traditional, or direct delivery, found:

- For P3 project delivery, 98% of the projects were on budget; and
- For traditional project delivery, 71% of the projects were on budget.[9]

Historically, traditional delivery methodologies for infrastructure projects hold the highest risk for cost increases, overruns, extra work due to poorly defined or undefined elements, and contradictory specifications. This is not provided to diminish DBB, but rather to explain why DB and P3 solutions have been employed with greater frequency over the past 25 years. The specific percentage savings is variable and often difficult to assess, as extras, claims and litigation results are not fully incorporated into a well updated databank. Also, advocacy groups for particular delivery methods can provide information that supports their cause. Lastly, critical information on financing, long-term maintenance and lending agreements in P3 solutions are protected by confidentiality agreements and escrows with the public sector, thereby providing less reportable data than desired.

What does appear to be clear is that once project delivery elements such as design, build, maintain, operate and finance are incorporated to a greater extent, the whole-life cost of an asset is reduced. These savings are due to a variety of factors including but not limited to competitive tension across many project delivery elements; risk transfer to the party that can best control and manage that risk; the drive to provide a better life-cycle quality; introduction of more innovation, ingenuity and best practices into the project; flexibility in the approach to construction sequencing and schedule; and economies of scale in the purchase price for materials and labor.

[8] *Annual Report of the Office of Auditor-General – Infrastructure Ontario—Alternative Financing and Procurement).* Ontario Office of Audit-General. 2014.
[9] *TR2015 – Infrastructure Ontario Track Record 2015 Report*. Hanscomb. 2015.

7. Assessment & Ranking of Project Delivery Methods

The next step in the assessment and analysis of the project delivery options contains two key decision points:

- The analysis should include a quantitative assessment, focusing on how the project delivery options best meet and achieve the developed goals and objectives, as evaluated and measured against evaluation criteria; and
- As obtaining funding commitments is an ongoing activity, a qualitative analysis should also be included in the assessment; this key factor must be assessed as it may introduce a need for short-term or long-term financing.

In addition to the quantitative and qualitative assessments, the following key points of understanding were part of this assessment and are summarized here, due to their importance:

- The goals and objectives were not weighted in this analysis, as participants in the goals and objectives workshops strongly suggested that the goals and objectives had relatively equal importance for the Phase 2 work;
- Only the Availability Payment P3 solution is included in the analysis and evaluation; while viable, the Concession Agreement and Concession Subsidization methods are not tested in the procurement of large transit systems similar to the work required in Phase 2;
- Project delivery options that include operations by the private sector were not included, as it is presently assumed that operations of their respective systems within the DTX will be performed by Caltrain and CHSRA as part of their overall systems; and
- The project delivery options were grouped according to the type of risk each option can address and effectively transfer to the private sector; the Group 1 options were evaluated first to determine the optimal method for procuring the base services of design and construction, followed by the Group 2 and 3 options to determine whether the additional private sector services each model uniquely offers would benefit the TJPA.

7.1. Quantitative Assessment

In collaboration and discussion with the TJPA and PMPC, the URS AFP team established a set of detailed evaluation criteria in order to assess and rank each of the project delivery options considered for Phase 2. The focus of this work was to ensure that the criteria are measureable and achievable, and in alignment with the TJPA's core business and public policy objectives.

The following five evaluation criteria were established:

1. Does the project delivery option assist in controlling the initial construction cost, provide a predictable whole-life cost, reduce claims, and control scope creep?
2. How well does the project delivery option achieve the stated goal and objective?
3. Does the project delivery option achieve a good value through risk transfer?
4. Does the project delivery option provide the proper incentives for schedule and cost control?
5. How well does the project delivery option encourage and introduce innovation, ingenuity and best practices, to create an asset that is sustainable and of high quality over its whole life?

The goals and objectives presented in Section 4 were evaluated to assess how well the project delivery option achieves the specific goal and objective. This scoring technique employed is summarized as follows:

- ● Strongly Achieves Goals & Objectives 3 points
- ⊙ Mostly Achieves Goals & Objectives 2 points
- ○ Achieves Some Goals & Objectives 1 points

Tables 7.1.1 through 7.1.7 present the results of the quantitative assessment organized according to the seven goal categories (refer to Section 4.3). Each table includes a summary numeric score. Table 7.1.8 summarizes the results of all seven tables.

Table 7.1.1 – Community Impact & Engagement

Goal Category & Detailed Objectives	Project Delivery Methodologies						Comment
	Group 1			Group 2		Group 3	
	DBB	CMAR	DB	DBf	DB+M	(DBFM)	
Minimize disruptions concerning access and impacts to local businesses and residences	⊙	⊙	●	●	●	●	Generally equivalent, but schedule driven methodologies scored slightly higher
Maximize pedestrian and vehicular access to impacted properties during construction	●	●	●	●	●	●	Generally equivalent
Engagement of Stakeholders in work progress during planning and construction	⊙	●	●	●	●	●	Methods that include and integrate both design and construction as a team scored slightly higher
Cumulative sub-section numeric score	**7**	**8**	**9**	**9**	**9**	**9**	**(9 Points Maximum)**

Table 7.1.2 – Cost Certainty

Goal Category & Detailed Objectives	Project Delivery Methodologies						Comment
	Group 1			Group 2		Group 3	
	DBB	CMAR	DB	DBf	DB+M	(DBFM)	
Provide certainty of construction cost	○	⊙	●	●	●	●	Methods that include a fixed or guaranteed maximum price scored higher
Develop and obtain comprehensive project funding and cash flow program	●	●	●	●	●	⊙	DBB & DB work can be phased, while DBFM is holistic and requires strong funding commitments due to lender requirements
Obtain certainty for maintenance work and responsibility	○	○	○	⊙	⊙	●	DBf only assists in a limited fashion as period of repayment can function as limited extended warranty. DB+M is limited to only routine maintenance as Caltrain and CHSRA will assume the majority of maintenance
Obtain the highest value for money proposition, to protect funding contributors	○	⊙	⊙	⊙	⊙	●	Goal is to preserve and protect the taxpayer
Reduce and control exposure to claims	○	⊙	⊙	⊙	⊙	●	Methods that integrate more elements such as design, construction and maintenance scored higher
Cumulative sub-section numeric score	**7**	**10**	**11**	**12**	**12**	**14**	**(15 Points Maximum)**

Table 7.1.3 – Design and Construction Quality

Goal Category & Detailed Objectives	Project Delivery Methodologies						Comment
	Group 1			Group 2		Group 3	
	DBB	CMAR	DB	DBf	DB+M	(DBFM)	
Support and link life-cycle quality outcome for a 100-year service life	○	◎	◎	◎	◎	●	Life-cycle and asset preservation responsibilities drive better overall quality business cases; CMAR scored slightly higher due to collaborative work with owner
Maintain a flexible procurement to provide performance-driven work, while retaining sufficient prescriptive design requirements for critical systems	○	◎	◎	◎	◎	●	Flexibility in outcomes, while maintaining some prescriptiveness will be required due to multiple agency interface
Shift risk of design and construction work to private sector, while maintaining quality	○	●	●	●	●	●	Risk profile to TJPA is sought to be as minimal as practicable
Drive interface connectivity quality between DTX Phase 1 and Phase 2 systems and work	◎	◎	◎	◎	◎	◎	Generally equivalent, as all method face same issues
Cumulative sub-section numeric score	**5**	**9**	**9**	**9**	**9**	**11**	**(12 Points Maximum)**

Table 7.1.4 – Maximize Competition

Goal Category & Detailed Objectives	Project Delivery Methodologies						Comment
	Group 1			Group 2		Group 3	
	DBB	CMAR	DB	DBf	DB+M	(DBFM)	
Ensure international top-tier, experienced, firms pursue work	⚬	⚬	⚬	⚬	⚬	●	Slight advantage with DBFM as it can generate more international expertise and partnerships
Foster large local and historically disadvantaged firm participation by fostering mentorship	●	●	●	●	●	⚬	All methods achieve goal, but more traditional methods provide more proven results
Maximize Best Practices, ingenuity and innovation from private sector	⚬	⚬	●	●	●	●	Objective seeks to instill innovation, linked with value savings to control cost with risk transfer; CMAR scored slightly lower due to sole sourcing, which narrows inputs
Cumulative sub-section numeric score	**7**	**7**	**8**	**8**	**8**	**8**	**(9 Points Maximum)**

Table 7.1.5 – Risk Definition, Mitigation and Allocation

Goal Category & Detailed Objectives	Project Delivery Methodologies						Comment
	Group 1			Group 2		Group 3	
	DBB	CMAR	DB	DBf	DB+M	(DBFM)	
Establish risk transfer balance for TJPA and partnering stakeholders	○	◎	◎	◎	◎	●	Critical goal, as balance in risks to party best able to manage the risk is a core success measure
Transfer environmental risks to private sector, via due diligence materials (reports, data and information) whereby the specific risk's costs are inferable from the materials	○	◎	◎	◎	◎	◎	Build platform from precedent transactions where this was provided successfully
Transfer geotechnical and tunnel risk elements to private sector	○	◎	◎	◎	◎	◎	Build platform from precedent transactions where this was provided successfully
Link life-cycle and asset preservation risks to design and construction outcomes, and transfer to private sector	○	○	○	○	○	●	Seek to strongly link life-cycle and asset preservation responsibilities to design & construction risk mitigations. DB+M is limited to only routine maintenance as Caltrain and CHSRA will assume majority of maintenance
Transfer completion dates and scope creep responsibilities to private sector	○	◎	◎	◎	◎	●	Synchronizations of schedule with delivery of partner agency work will be essential
Cumulative sub-section numeric score	**5**	**9**	**9**	**9**	**9**	**13**	**(15 Points Maximum)**

Table 7.1.6 – Schedule Certainty

Goal Category & Detailed Objectives	Project Delivery Methodologies						Comment
	Group 1			Group 2		Group 3	
	DBB	CMAR	DB	DBf	DB+M	(DBFM)	
Deliver Program within an overall holistic, and key phased milestone, schedule	⊙	⊙	⊙	●	⊙	●	All generally equal, with slightly higher score to those methods that include finance component, as lender and equity discipline will become additional pressure to meet schedule
Maintain flexibility to obtain and secure properties, if needed, in a progressive manner if funding is progressive	●	⊙	⊙	⊙	⊙	⊙	Traditional methods can gain advantage if work is let in a non-sequential manner
Allow for early work starts, as appropriate	⊙	⊙	⊙	⊙	⊙	⊙	Generally equivalent, as all solutions can provide flexibility
Open DTX within 1 year of Caltrain electrification	⊙	⊙	⊙	●	⊙	●	DBFM solutions offer most extensive penalty regime if schedule is not met, due to ties to financing structure; DBf scores slightly higher, as lender discipline will become additional pressure to meet schedule
Cumulative sub-section numeric score	**9**	**8**	**8**	**10**	**8**	**10**	**(12 Points Maximum)**

Table 7.1.7 – Transparency and Fairness

Goal Category & Detailed Objectives	Project Delivery Methodologies						Comment
	Group 1			Group 2		Group 3	
	DBB	CMAR	DB	DBf	DB+M	(DBFM)	
Develop and run an open, fair and transparent procurement process	●	○	●	●	●	⊙	CMAR is devalued as price and final scope negotiations are done with only 1 entity, after their selection; DBFM scored slightly lower due to complexity of procurement documents
Cumulative sub-section numeric score	**3**	**1**	**3**	**3**	**3**	**2**	**(3 Points Maximum)**

Table 7.1.8 – Summary of Results of Quantitative Assessment for Seven Goal Categories

Goal and Objective Category	Project Delivery Methodologies					
	Group 1			Group 2		Group 3
	DBB	CMAR	DB	DBf	DB+M	DBFM
Table 7.1.1 Community Impact & Engagement **(9 Point Maximum)**	7	8	9	9	9	9
Table 7.1.2 Cost Certainty **(15 Points Maximum)**	7	10	11	12	12	14
Table 7.1.3 Design and Construction Quality **(12 Points Maximum)**	5	9	9	9	9	11
Table 7.1.4 Maximize Competition **(9 points Maximum)**	7	7	8	8	8	8
Table 7.1.5 Risk Definition, Mitigation and Allocation **(15 Points Maximum)**	5	9	9	9	9	13
Table 7.1.6 Schedule Certainty **(12 Points Maximum)**	9	8	8	10	8	10
Table 7.1.7 Transparency and Fairness **(3 Points Maximum)**	3	1	3	3	3	2
Quantitative Scoring Summary & Total (75 Points Maximum)	**43**	**52**	**57**	**60**	**58**	**67**

7.2. Qualitative Analysis

Phase 2 is large and complex and part of a larger transportation solution that includes the Phase 1 work. As a result, it was determined that a qualitative review should be conducted. Importantly, the qualitative analysis seeks to factor into its assessment elements that cannot fully be captured in the goals and objectives or are of critical importance to the successful outcome of Phase 2.

The five key/critical screening factors listed below were derived from the team's project delivery experience and the case studies of major transit projects with characteristics similar to the Phase 2 work and served as metrics in the qualitative analysis:

1. Is the project delivery option reliant upon 100% of the funding to be committed during the procurement?
2. Is the project delivery option market-tested (by successful precedent) in transit and tunnel type projects?
3. Based on the project needs, characteristics and risks, does the project delivery option present a transaction that, if private finance is required, would be considered by lenders to be both biddable and bankable?
4. Does the project delivery option maximize competitive tension such that a better quality project is provided at a better value?
5. As the TJPA is a joint powers authority and not an operating or maintenance unit of a transit system, what importance and benefit does the project delivery option offer if an asset is required to be managed by the TJPA, and how does that solution create cost certainty?

The assessment results showing in Table 7.2 are primarily binary in nature in that the screening factors are intended to provide a pass/fail test, with the inclusion of a neutral position to the evaluation if the project delivery option has not been as tested and accepted in the marketplace. If one of the screening factors is not achieved (as indicated by a "no"), the project delivery method is not necessarily deemed unworkable or prohibited; rather, the option likely possesses a significant obstacle that must be overcome.

Table 7.2 – Assessment of Project Delivery to Qualitative Screening Criteria

Qualitative Screening Factor	Project Delivery Methodologies					
	Group 1			Group 2		Group 3
	DBB	CMAR	DB	DBf	DB+M	DBFM
1. If not 100% of funding commitment in place, can it be transacted?	Y*	-	Y*	Y	-	N
2. Market-tested in transit and tunnel type projects?	Y	-	Y	Y	-	Y
3. Would the industry consider the method supportive of a biddable and bankable transaction?	Y	Y	Y	Y	Y	Y
4. Driver to deliver a better quality project, and a better value?	N	-	Y	Y	Y	Y
5. Protect investment during the maintenance term?	N	N	N	N	Y	Y

Notes:
Y = Yes, the project delivery option fulfills the screening factor
N = No, the project delivery option does not fulfill the screening factor
Y* = Yes, but only if the multiple bid packages are solicited
- = Neutral, or not enough comparative transactions are known

7.3. Progressive Ranking of Delivery Methods by Group

No one project delivery option will fulfill every goal, risk transfer requirement, project need, or objective that the TJPA desires. Therefore, the team examined each group's qualitative results with the quantitative results so that the best option can be selected in a progressive manner. This approach first ranks Group 1 (design and build only options) as design and construction form the core mission of the TJPA. If short-term finance or maintenance (represented by the Group 2 options) are added to the needs of the TJPA, a separate ranking is included that considers the options for both Group 1 and Group 2. If long-term financing and maintenance (Group 3) are added to the needs of the TJPA, an additional ranking is included that considers the project delivery options for all three groups.

7.3.1. Group 1—Design & Build Only Options

Group 1 considered the most viable and market acceptable project delivery options that are focused on transferring risk during design and construction; these are DBB, CMAR and DB. Based on the quantitative analysis and qualitative analysis, evaluation and scoring, the following ranking is provided in Table 7.3.1.

Table 7.3.1 – Group 1 Only Ranking

Project Delivery Option		Evaluations			Comment
		Quantitative Scoring (Table 7.1.8)	Qualitative Results (Table 7.2)	Overall Ranking	
Group 1	DBB	43	Meets 3 factors; does not meet 2	**3**	Good solution, with flexibility on schedule and segmenting construction (if required), but it does not transfer the risk as much as other options. It also discourages innovation and value engineering.
	CMAR	52	Meets 1 factor; does not meet 1; is neutral on 3	**2**	Largely untested in delivering horizontal and transit infrastructure.
	DB	57	Meets 4 factors; does not meet 1	**1**	Remains highly ranked, as it is a well-accepted solution that transfers the design and construction risk, is well accepted in the marketplace, and has been successfully used in transit infrastructure projects.

DB scored the highest in both quantitative and qualitative evaluations, and therefore is the highest ranked design and build-only option. In addition, DB transfers the full design and construction to the private sector. Further advantages include acceptance in the marketplace, utilization on other large transit projects, historically shortened construction schedules, and good control of construction costs due to a fixed price.

7.3.2. Group 2—Short-Term Finance or Maintenance-Only Additive Options to Group 1

The current Phase 2 estimate is approximately $3,935 million. The funding plan shows that in 2019 (the anticipated start of Phase 2 construction) approximately $1,998 million of the funding needed is expected to be available to TJPA, with additional funds becoming available over a considerable length of time after substantial completion of Phase 2.

Maintenance agreements and a governing structure for Phase 2 are not yet finalized, which may require the TJPA to assume additional maintenance responsibility compared to what is presently understood. Considering these factors, the Group 2 options were added to address the possibility that the private sector would provide short-term financing or short-term maintenance.

Based on the quantitative analysis and qualitative analysis, evaluation and scoring, the following ranking is provided in Table 7.3.2, which includes both Group 1 and Group 2.

Table 7.3.2 – Group 1 and Group 2 Combined Ranking

Project Delivery Option		Evaluations			Comment
		Quantitative Scoring (Table 7.1.8)	Qualitative Results Table 7.2)	Overall Ranking	
Group 1	DBB	43	Meets 3, and Does Not Meet 2	3	Good solution, with flexibility on schedule and segmenting construction (if required), but it does not transfer the risk as much as other options. It also discourages innovation and value engineering.
	CMAR	52	Meets 1, Does Not Meet 1, and 3 Neutral	2	Largely untested in delivering horizontal and transit infrastructure.
	DB	57	Meets 4, and Does Not Meet 1	**1**	Remains highly ranked, as it is a well-accepted solution that transfers the design and construction risk, is well accepted in the marketplace, and has been successfully used in transit infrastructure projects.
Group 2	DBf	60	Meets 4, and Does Not Meet 1	**1** (if short term F is included)	If short-term financing is deemed to be required while a greater amount of funding is collected and accrued, DBf would be optimal.
	DB+M	58	Meet 3, and 3 Neutral	**1** (if limited M is included)	If additional maintenance responsibilities are undertaken by TJPA, DB+M provides a solid solution. For this analysis, the maintenance understood to be undertaken by TJPA is limited. If life-cycle maintenance is undertaken, the option can shift to a DBM model.

The introduction of the potential need for short-term maintenance and short-term finance alters the Group 1 rankings, as DBf and DB+M are specific solutions to address these needs, and results in DBf being the highest ranked option if short-term financing is required and DB+M being the highest ranked if short-term maintenance is required. Both of these options are closely followed by DB, as all three options (DB, DBf and DB+M) transfer the full design and construction risk to the private sector.

7.3.3. Group 1, Group 2, and Group 3 Ranking

If TJPA finds during the course of finalizing funding agreements and negotiations with Caltrain and CHSRA that long-term financing and/or full life-cycle maintenance is required, the DBFM–Availability Payment option has been incorporated into this analysis.

Rankings for all Group 1, Group 2, and Group 3 options, based on the scoring and results of the quantitative and qualitative analyses, are shown in Table 7.3.3:

Table 7.3.3 – Group 1, Group 2 and Group 3 Combined Ranking

Project Delivery Option		Evaluations			Comment
		Quantitative Scoring (Table 7.1.8)	Qualitative Results Table 7.2)	Overall Ranking	
Group 1	DBB	43	Meets 3 factors; does not meet 2	3	Good solution, with flexibility on schedule and segmenting construction (if required), but it does not transfer the risk as much as other options. It also discourages innovation and value engineering.
	CMAR	52	Meets 1 factor; does not meet 1; is neutral on 3	2	Largely untested in delivering horizontal and transit infrastructure.
	DB	57	Meets 4 factors; does not meet 1	**1**	Remains highly ranked, as it is a well-accepted solution that transfers the design and construction risk, is well accepted in the marketplace, and has been successfully used in transit infrastructure projects.
Group 2	DBf	60	Meets 4 factors; does not meet 1	**1** if short term F is included	If short-term financing is deemed to be required while a greater amount of funding is collected and accrued, DBf would be optimal.
	DB+M	58	Meets 3 factors; is neutral on 2	**1** if limited M is included	If additional maintenance responsibilities are undertaken by TJPA, DB+M provides a solid solution. For this analysis, the maintenance understood to be undertaken by TJPA is limited. If life-cycle maintenance is undertaken, the option can shift to a DBM model.
Group 3	DBFM	67	Meets 4 factors; does not meet 1	**1** if long-term finance and maintenance are included	Provides all the benefits of DB, and addresses long-term financing and maintenance should they become requirements of the TJPA.

As with the Group 2 options, Group 3 alters the Group 1 rankings. DBFM (Availability Payment P3) is the specific solution to address long-term maintenance and long-term finance need, and therefore results in DBFM being the highest ranked option, as DBFM, maximizes the risk transfer to the private sector. DBFM addresses many of the Phase 2 needs, risks, goals and objectives effectively. It has been employed in U.S.-based transit projects such as RTD FasTracks and the recently announced Purple Line in Baltimore. These transactions, along with numerous Canadian transactions, including the Ottawa Light Rail Transit Project, illustrate that DBFM (Availability Payment) structures are accepted in the marketplace (refer to Appendix C).

As 100% of the required funding is typically accrued over time, lenders investing in the DBFM will seek a guarantee from the funding sources that the funds committed will be allocated as understood. In addition, lenders will also see to have an agency that can guarantee payment if one of the funding sources is altered in some manner in amount or schedule of funds. These two items are present in most of the project delivery options, but become critical if selecting the DBFM method.

8. Conclusions & Considerations

This Report presents a logic driven approach to evaluating the project delivery options most applicable to the needs, characteristics, goals and objectives of the Phase 2 work. This section summarizes the conclusions of this Report, considerations for future decision making, and recommended next steps.

8.1. Conclusions

The following summarizes the conclusions from the assessment discussed in Section 7:

- If design and construction only are to be delivered with the Phase 2 work, a DB solution ranks the highest over DBB and CMAR, as it achieves the majority of the desired risk transfer requirements presently understood;
- If short-term financing is introduced as a need of the TJPA, DBf provides the best option in meeting both the short-term finance and design and construction requirements;
- If short-term maintenance (in addition to the routine and janitorial requirements presently understood, but not full life-cycle maintenance) is introduced as a need of the TJPA, DB+M provides the highest-ranking option in meeting both the routine and janitorial requirements in addition to the design and construction requirements. If the maintenance responsibilities of Phase 2 increase for the TJPA beyond only routine and janitorial requirements, then a DBM method would be the optimal solution; and
- If long-term financing and life-cycle maintenance are introduced to the Phase 2 scope, then a DBFM (Availability Payment) solution provides the highest-ranking option in maximizing the desired risk transfer by the TJPA.

8.2. Considerations

The following should be taken into consideration as Phase 2 progresses:

- This Report provides a basic overview the most applicable project delivery options for the Phase 2 work, but additional validation effort will be required as the next steps (such as funding, maintenance responsibilities, financing requirements, etc.) are finalized;
- One of the most critical elements to consider is finalizing and gaining written commitments for all of the funding amounts and sources for Phase 2;
- Once funding nears completion, a firm project cost update is in place, an updated risk assessment is available, and a project delivery option has been recommended, a risk-based comparative cost analysis should be performed to validate and support the final project delivery method; and
- If either DB, DBf or DBFM is determined the best method for Phase 2, the TJPA should embark on market sounding with developers and financial institutions to understand whether the bidding environment is robust and ready to engage in the project.

8.3. Next Steps

The following steps are required to advance Phase 2 and are directly linked to the work of selecting a project delivery option:

- Complete 30% PE drawings
- Perform risk assessment
- Update Program cost estimate (& peer review)
- Complete development of funding plan (& peer review)
- Finalize and approve the selected project delivery method
- Update budget

Additional validation efforts will be needed as funding and financing requirements are refined. These efforts include:

- Finalizing and gaining written commitments for all of the funding amounts and sources required for Phase 2.
- Undertaking a risk-based comparative cost analysis of the preferred project delivery option. A risk-based comparative cost analysis compares a traditional project delivery method to the proposed alternative delivery method and should occur when the funding plan and project financing plans near completion, a firm project cost update is in place, an updated risk assessment is available, or a project delivery option has been recommended.
- Embarking on a market sounding with the design, construction and financing industry to understand whether the bidding environment is robust and ready to engage in the project.

Appendix A
Abbreviations & Glossary

Abbreviations

AC Transit	Alameda-Contra Costa Transit District
AFP	alternative finance and procurement
BART	Bay Area Rapid Transit
Caltrans	California Department of Transportation
CFD	community facilities district
CHSRA	California High-Speed Rail Authority
City	City and County of San Francisco
CMAR	Construction Manager at Risk
DB	Design-Build
DBB	Design-Bid-Build
DBf	Design-Build-Finance
DBM	Design-Build-Maintain
DBFM	Design-Build-Finance-Maintain
DB+M	Design-Build + Maintain
DTX	Downtown Rail Extension
EIS/EIR	Environmental Impact Statement/Environmental Impact Report
FFGA	full funding grant agreement
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
GMP	guaranteed maximum price
MSP	monthly service payment
MTC	Metropolitan Transportation Commission
Muni	San Francisco Municipal Railway (bus)
P3	public-private partnership
PCJPB	Peninsula Corridor Joint Powers Board
PMPC	Program Management/Program Controls
Program	Transbay Transit Center Program
ROW	right-of-way
SamTrans	San Mateo County Transit District
SB	Senate Bill
SFCTA	San Francisco County Transportation Authority
TCDP	Transit Center District Plan
TIF	tax increment financing

TIFIA	Transportation Infrastructure Finance and Innovation Act of 1998
TJPA	Transbay Joint Powers Authority
URS AFP team	URS Alternative Finance and Procurement Advisory team
U.S. DOT	U.S. Department of Transportation
WestCAT	Western Contra Costa Transit
YOE	year of expenditure

Glossary

Availability Payment	A P3 structure whereby the private sector is paid anywhere from 50% to 90% of the capital construction cost at final completion or revenue commencement, and the remaining capital construction cost are paid through performance based monthly service payments over the term of the agreement.
BART/Muni Pedestrian Connector	An underground pedestrian tunnel to connect the east end of the Lower Concourse with the BART/Muni Embarcadero Station, to be completed in Phase 2 component.
bottom-up approach	Conventional construction sequence currently used on the Program whereby shoring, excavation and foundation work preceded construction of the above-grade structure.
business case study	Documented study of the specified project delivery option to confirm and validate it financially, contractually and commercially can achieve all of its intended outcomes.
Caltrain	The public sector agency that manages the commuter rail service between San Francisco and San Mateo and Santa Clara counties.
capital construction cost	Cost of the project related to the construction, financing and other project costs associated with the implementation of the project. Capital construction costs do not include costs associated with operations, or lifecycle activities.
case study	A comparative transit project used in this analysis.
certificate of occupancy	A document issued by a local government agency or building department certifying a building's compliance with applicable building codes and other laws, and indicating it to be in a condition suitable for occupancy.
competitive tension	The awareness and motivation experienced by proponents bidding on a project whereby they perceive a credible threat to their ability to win the bid.
Concession or Concession Agreement	A P3 structure that transfers not only the design, construction and maintenance of an asset to the private sector but also one or several revenue streams generated by the asset.
Concession Subsidization	A P3 solution that blends concepts contained in both a full Concession structure and Availability Payment structure.
concessionaire	A private sector consortium formed with one or more equity investors to design-build-finance-maintain the asset under a Concession Agreement with the public sector.
Construction Manager at Risk (CMAR)	Delivery method whereby an owner engages a construction team (the CMAR) very early in the development process, and the CMAR provides a commitment to deliver the project for a guaranteed maximum price.

Design-Bid-Build (DBB)	Traditional and widely employed delivery method involving three distinct and sequential phases: the design phase, the bid phase, and a build or construction phase.
Design-Build (DB)	Delivery method whereby the public sector contracts with a single private sector design-builder, which carries out the final design and completes construction of the asset, based upon preliminary engineering drawings.
Design-Build + Maintain (DB+M)	Delivery method whereby a private sector entity is engaged to design and construct the asset and provide limited maintenance, and under a separate contract the public sector hires a contractor to provide the majority of maintenance work.
Design-Build-Finance (DBf)	Delivery method that integrates the design and construction work with one private sector entity and introduces a short-term finance component.
Design-Build-Finance-Maintain (DBFM)	P3 solution that involves the transfer of risks from the public sector to the private sector that include design, construction/build, long-term financing, and life-cycle or whole-life maintenance.
Design-Build-Maintain (DBM)	Delivery method whereby the private sector entity includes a maintenance contractor.
Downtown Rail Extension (DTX)	Project to extend Caltrain commuter rail from its current terminus at Fourth and King streets and deliver future high-speed service to the new Transit Center, to be completed in Phase 2.
evaluation criteria	Set of detailed criteria used to evaluate each of the project delivery options.
extended warranty	A defined period of time whereby the entity that constructed the asset provides a guarantee of the quality of the work, and all repairs required, if encountered during that time period, all of which is consider longer than the industry standard.
Fourth and Townsend Street Station	New underground station serving Caltrain commuters, to be built in Phase 2.
goals and objectives	The goals and objectives derived by the Phase 2 work and identified as part of this study.
governance structure	The corporate or business framework and agreement that defines the explicit and implicit contracts between the stakeholders for distribution of responsibilities, rights, and rewards.
guaranteed maximum price	A contractual form of agreement wherein a maximum price for the work is established based on an agreed-to scope.
high-level risks	Risks that impose the largest cost and schedule impacts to the success of the project, and which may include many ancillary risks not individually defined, but included in the particular risk.

Intercity Bus Facility	A two-level bus station across the street from the east end of the Transit Center and between Beale and Main streets dedicated to intercity bus services such as Greyhound and Amtrak. Phase 2 component currently being evaluated in the Supplemental EIS/EIR.
key performance indicators	Measuring criteria to determine if an asset is performing as required.
Lower Concourse	First below-grade level of the Transit Center, to be built out in Phase 2. Contains rail ticketing, passenger waiting areas, and support spaces and connects at its east end to the Intercity Bus Terminal and the BART/Muni pedestrian tunnel leading to the Embarcadero BART/Muni station.
Mello-Roos Community Facilities District (CFD)	Geographic area where a special property tax on real estate is established by a local government as a means of obtaining additional public funding to pay for public works and some public services.
monthly service payment (MSP)	The monthly pro rata amount that the public sector receives if the asset is maintained and operates as required by the agreement in an Availability Payment structure.
New Starts	The FTA's primary grant program for funding major transit capital investments.
outcome-based specifications or work	Work completed in a manner whereby the public sector pays for pre-agreed 'outcomes' rather than for prescribed products and services.
P3 solution	A project delivery option that employ a public-private partnership.
payback period	The calendar length and terms, as contractually agreed upon, under which a defined amount of monies is paid to the owed party.
payment mechanism	A contractual methodology employed with Availability Payment structures that assesses a defined monetary penalty regime when and if the asset does not meet its performance criteria.
Phase 2	The second phase of the Transbay Transit Center Program.
PMPC	Program Management/Program Controls team employed by TJPA.
project agreement	A contract between the public sector a private sector consortium that sets out the requirements and obligations of both parties to complete the project.
project delivery option	A procurement method that embodies a given allocation of roles and responsibilities between the public and private sectors for the delivery of a project.
Proposition 1A—The Safe, Reliable High-Speed Passenger Train Bond Act for the 21st Century	Bond measure passed by California voters in 2008 and now Chapter 20 of the California Streets and Highways Code allocating $9.95 billion to the California High-Speed Rail

	Authority for construction of high-speed rail line from San Francisco to the Los Angeles area and improvements to local railroad systems connecting to the high-speed system.
Proposition H— Downtown Caltrain Station City of San Francisco	Ballot measure passed by San Francisco voters in 1999 making it City law to extend the Caltrain tracks to a new or rebuilt regional transit station on the site of the Transbay Terminal at First and Mission Streets.
Proposition K— Sales Tax for Transportation City of San Francisco	A half-cent local sales tax for transportation approved by San Francisco voters in November 2003 and administered by the SFCTA.
public-private partnership	A long-term contract between a private sector entity and a public sector entity (the owner), undertaken for the purposes of providing a public asset or service, in which the private party bears significant risk and management responsibility, and remuneration is linked to performance.
request for proposals	The second set in a two-stage procurement process in which the public sector solicits competitive bids for the completion of the project scope from prequalified bidders passing the RFQ stage.
request for qualifications (RFQ)	The first step in a two-step procurement process in which the public sector solicits qualifications from private sector consortia for a potential project, resulting in a shortlisting of a selected number of consortia.
ridership risk	The financial risk associated with obtaining a return on the amount of riders that use a transit system
Senate Bill (SB) 4	Senate Second Extraordinary Session Bill 4, allowing transportation P3s in California.
substantial completion	Milestone at which the stage of completion of a project is fit for occupancy and use for its intended purpose.
top down	Proposed construction approach for phasing construction of the Program prior to 2010, which called for construction of the Transit Center's foundation and above-grade levels during Phase 1 followed by excavation and construction of the below-grade train station during Phase 2.
train box	The below-grade structure encompassing the rail level and the lower concourse levels of the Transit Center.
Train Platform	Lowest level of the Transit Center, to be built out in Phase 2. Contain six tracks and three platforms for Caltrain commuter and high-speed rail service.
Transit Center	New multimodal transit station being built to replace the former Transbay Terminal in downtown San Francisco. The Transit Center is composed of four levels above-ground and two levels below and in additional to connecting eleven

	transit agencies under one roof will contain active pedestrian, shopping, dining, and recreational areas.
Transportation Infrastructure Finance and Innovation Act (TIFIA) of 1998	U.S. Department of Transportation's federal credit assistance in the form of direct loans, loan guarantees, and standby lines of credit to finance surface transportation projects of national and regional significance.
Value for Money Assessment	A quantitative comparison of the project lifecycle costs under a P3 and traditional procurement approach.
year of expenditure	Year of expenditure dollars are dollars that are adjusted for inflation from the present time to the expected year of construction.

Appendix B
Goals & Objectives Workshops Dates & Attendees

URS Alternative Finance & Procurement consultants held workshops with TJPA staff and TJPA's consultants on May 19, 20, 21 and 28, 2015. The TJPA and consultant staff who participated in the workshops are listed below and indicated along with the workshop topics in the table that follows.

Transbay Joint Powers Authority
Scott Boule, Legislative Affairs & Community Outreach Mgr.
Sara DeBord, Chief Financial Officer
Brian Dykes, Principal Engineer
Dennis Turchon, Senior Construction Manager

Program Management/Program Controls Consultant
Mark O'Dell, Program Manager
Cathy Westcot, Program Controls Manager
Guy Hollins, Infrastructure Project Manager
Meghan Murphy, DTX Project Manager
Joyce Oishi, Program Coordinator
Jason Partin, Scheduling Supervisor
Will Spargur, Engineering/GIS Coordinator

URS—Alternative Finance & Procurement Consultant
George Tapas, Vice President, Project Execution, Integrated Delivery & Development Enterprise Growth Solutions
Tom Ness, Director of Operations, P3 Advisory

Parsons Transportation Group—DTX Designer
Chukwuma Umolu

Shute, Mihaly & Weinberger—General Legal Counsel
Deborah Miller, Attorney

Sperry Capital—TJPA Financial Consultant
Lisa Amini, Principal Consultant
Bryant Jenkins, Principal

Workshop Topic	Attendees
Archeology & Environmental	G. Tapas, T. Ness, J. Oishi, M. Murphy, G. Hollins, W. Spargur
Construction, Cost, Budget & Escalation	G. Tapas, T. Ness, B. Dykes, S. DeBord, M. O'Dell, C. Westcot, B. Jenkins, L. Amini
Funding & Project Finance	G. Tapas, T. Ness, B. Dykes, S. DeBord, M. O'Dell, C. Westcot, B. Jenkins, L. Amini
Interagency Coordination	G. Tapas, T. Ness, B. Dykes, M. O'Dell, J. Oishi, M. Murphy, W. Spargur
Maintenance Responsibility	G. Tapas, T. Ness, M. Murphy, M. O'Dell, C. Umolu
Procurement & Legal Matters	G. Tapas, T. Ness, B. Dykes, S. Boule, S. DeBord, B. Jenkins, D. Miller
Project Scope & Schedule	G. Tapas, T. Ness, B. Dykes, J. Partin, M. Murphy
Property/ROW	G. Tapas, T. Ness, S. DeBord, S. Boule, M. O'Dell, J. Oishi, M. Murphy, G. Hollins, W. Spargur
Systems Integration	G. Tapas, T. Ness, M. Murphy, C. Umolu
Tunnel Construction/ & Geotechnical Parameters	G. Tapas, T. Ness, D. Turchon, B. Dykes, M. O'Dell, M. Murphy
Utilities & Agency Coordination	G. Tapas, T. Ness, B. Dykes, J. Oishi, M. Murphy, G. Hollins, W. Spargur
Workshop Recap/Next Steps	G. Tapas, T. Ness, B. Dykes, M. O'Dell, M. Murphy

Appendix C
Case Studies

Appendix C – Case Studies

The analysis and considerations of the key benefits and key limitations for each delivery model discussed in this report were derived from the following case studies of major transit projects.

Project Name	Location	Delivery Method(s)	Year Completed or Current Status	General Project Description	Construction Cost (USD unless specified)
Ottawa Light Rail Transit System (Confederation Line)	Ottawa, ON	DBFoM	Under Construction (Scheduled completion in 2018)	The Confederation Line is the first of what will be an interconnect system of light rail transit lines through the capital of Canada. This project included 14 km of new light rail trackwork, including 4 km of underground tunnels. 13 stations (3 underground) feed and support the system, which is the primary public transit corridor in the east-west direction, and serves the central business district. The Confederation Line replaces the existing Bus Rapid Transit Line that has a tremendously high ridership that has grown over the years, and serves as a healthy contributor to the long-term operations and maintenance portion of the funding and financing solution. The project was procured as a DBFoM. The lower-case "o" is based upon the fact that the operational aspect of this project is shared between the City of Ottawa (OCTranspo) and the private sector entity. The project is a P3 Availability Payment Solution. Principal risk transfer included geotechnical and tunnel risks. The method employed was to allow for a flexible bidding option scenario whereby the private sector, by taking or buying the risk transfer, could select a transfer tool that was equitable to their business practices. Three possible solutions were provided, each transferring increasing risk, for a deducted Net Present Value (NPV) bid, as the lowest NPV is the determinate for winning along with a technical score. A requirement was placed on the bidders such that they must achieve the pre-defined affordability limit of $2.1 billion (CDN). The term of this transaction was 30 years from the point of revenue service commitment, and includes routine maintenance, asset preservation and hand-back requirements.	$2.1 billion (CdN)
RTD FasTracks	Denver, CO	DBFOM	Q4 of 2016	The second transit rail P3 in the United States (Hudson-Bergen was the first), the Eagle P3 is part of RTD's Regional Transportation District of Denver 2004 voter-approved FasTracks plan to expand transit across the Denver metro region. This project comprises the East Rail and Gold lines, the first segment of the Northwest Rail Line to Westminster, procurement of 54 commuter rail cars and a commuter rail maintenance facility. In 2009 RTD entered into a 34-year agreement with Denver Transit Partners (DTP) under which it will pay DTP to design, build, finance, operate and maintain the system. The 4 main parts of the project are as follows: • East Rail Line (the "A" Line) -- 22.8-mile electric commuter rail corridor between Denver's Union Station and Denver International Airport; • Gold Line (the "G" Line) -- 11.2-mile electric commuter rail corridor between Union Station and Ward Road in Wheat Ridge that will pass through northwest Denver, Adams County and Arvada; • Northwest Rail Line (the "B" Line) -- 6.2-mile first segment running between Union Station and Westminster Station ; and • Commuter rail maintenance facility (CRMF): located at 5151 Fox St., where vehicles serving the four FasTracks commuter rail corridors will be repaired, cleaned and stored.	$2.2 billion
Dallas Area Rapid Transit (DART) Orange Line Extension (I-3)	Dallas and Irving, TX	DB	All sections opened in September 2014	This 14.5-mile project is being opened in three sections, and is the DART Orange Line, light rail transit line extension connecting downtown Dallas with the City of Irving and Dallas/Fort Worth (DFW) International Airport northwest of Dallas. The line runs concurrently with the existing Green Line (which opened in 2009/2010) from Downtown Dallas to Bachman Station in Northwest Dallas. From Bachman Station, the Orange Line heads northwest to the Las Colinas Urban Center and the newly constructed Irving Convention Center and on toward DFW Airport. The 3 sections (I-3) are as follows: • Irving-1: Bachman Station to Irving Convention Center Station (5.4 miles, 3 stations) • Irving-2: Irving Convention Center Station to Belt Line Rd. (3.9 miles, 2 stations) • Irving-3: Belt Line Rd. to DFW Airport Terminal A (5.2 miles, 1 station @ DFW Airport)	$1.3 billion
Dulles Corridor Metrorail Project	Fairfax and Loudon Counties, VA	DB	Phase 1 – Opened for service July 2014 Phase 2 – January 2019 (excepted opening)	The Dulles Corridor Metrorail Project is a new 23-mile extension of the current Metrorail system, branching from the Orange Line's East Falls Church Station in Arlington, Virginia to the Washington Dulles International Airport and west to eastern Loudoun County. The project will add 11 stations, and it includes the construction of a new rail yard on Dulles Airport property and procurement of 128 railcars. Upon completion of the project, operation will be transferred to the Washington Metropolitan Area Transit Authority (WMATA), the operator of the existing Metrorail system. The project is being constructed in two phases. • Phase 1 runs 12 miles from East Falls Church to Wiehle Avenue in Reston, and includes five stations to the Silver Line, including four in Tysons Corner. • Phase 2 will continue 11 miles from Wiehle Avenue to eastern Loudoun County. This phase will add six stations, including stops in Reston, Herndon, Dulles Airport, and in Ashburn.	Phase 1: $2.906 billion Phase 2: $2.788 billion (estimated)

Project Name	Location	Delivery Method(s)	Year Completed or Current Status	General Project Description	Construction Cost (USD unless specified)
Hudson Bergen Light Rail Transit Line	Hudson County, NJ	DB+OM	Phase 1 – April 2000 Phase 2 – January 2011	The Hudson Bergen line is part of a light rail transit system for New Jersey's waterfront corridor. The project was conducted in three phases: Phase 1 (Initial Operating System [IOS]): 9.5 miles, including bridges, 16 stations and 5 parking lots Phase 2 (Subsequent Operating System [SOS]): 6 miles, 7 stations (extending the system to additional nodes) Phase 3 (Future Operating System [FOS]): further short extensions to additional nodes The DBOM contract included the following scope: (a) design, build, operate and maintain the IOS system, including vehicles and maintenance and storage facility and (b) provide systems (vehicles, signals, and operations) for SOS and FOS. The operation and maintenance (O&M) term was 15 years with an option for an additional 5 years.	Phase 1: $1 billion Phase 2: $1.2 billion Phase 3: Under development
Houston Guided Rapid Transit (METRO Lines)	Houston, TX	DBOM	3 principal lines completed at various times, with the Green Line's completion in May 2015	The Houston Guided Rapid Transit Project expanded Houston's existing light rail system and included more than 30 new stations and 20 miles of track at the city's core. The project occurred in two phases, and includes the Red, Purple and Green lines: Phase 1: preliminary design; pricing for DB and O&M work, vehicle procurement documents, financing solutions, and other preliminary work Phase 2: design, construction, and operation The development agreement did not specify duration for the O&M work; 15 years was considered, but a term of 5 years was ultimately agreed upon.	$1.4 billion (Estimated)
Portland Light Rail (Blue Line Extension)	Portland, OR	DBM	2001	Expanded upon an existing system with an 18-mile line, 20 stations and 9 park and ride interchanges. The Westside Extension was fully funded by the public sector. The private sector assumed responsibility for elements of design, construction and maintenance at Orenco Station, a community west of Portland.	$1.46 billion
Air Train at JFK Airport	New York, NY	DBOM	December 2003	Air Train JFK is an elevated light rail system serving JFK International Airport, and providing connectivity to transportation systems in other boroughs of New York City. The project was awarded as a DBOM to a private consortium with an initial term of 5 years of operation, and the option for two 5-year renewals. Paid for through a combination of existing passenger facility charges and Port Authority funds.	$1.5 billion
RAV/Canada Line	Vancouver, BC	DBFOM	August 2009	The Richmond-Airport-Vancouver Line is rail connector for the greater Vancouver area (including downtown Vancouver, central Richmond, and the Vancouver International Airport and maintenance center) and comprises 12 miles of track and 16 stations. The scope of work included design, construction, testing, commissioning, financing, and O&M for 35 years. Service was established three months ahead of schedule.	$2.0 billion (CdN)
Tranvia de Parla Light Rail System	Madrid	DBFO	2007	Tranvia de Parla is a 5-mile light rail system serving the city of Parla, and connecting to the main rail system in Madrid. The DBFO agreement has a term of 40 years; the concessionaire receives availability payments for the first 5 years of operation and shadow toll-based payments for the final 35 years.	$197 million
Edinburgh Trams	Edinburgh	DB	June 2014	The Edinburgh Trams project comprised two phase: Phase 1 is 11.25 miles of track and 22 stations; Phase 2 is 3.75 miles of track and 9 stations. The vehicle supply contract was assigned to the DB consortium by the public sector. Payment is milestone-based. The project experienced significant delays and cost overruns.	$1 billion

Appendix D
Current Anticipated Funding Sources and Flow of Funds

The following assumptions are related to the anticipated contribution of funding to Phase 2:

- The remaining San Francisco County sales tax (Proposition K) funds will be used to continue to fund planning and design efforts in the near term (2016 to 2019); this timing may differ based on the TJPA actual expenditures and planning;
- The remaining tax increment revenues assume the current term of the tax increment collection period; and assumes a certain amount of net tax increment is dedicated to Phase 1 completion financing and that certain payments are made to the capital replacement reserve. The amounts shown represent the net bond proceeds available through a long term financing;
- The Mello-Roos special tax assumes net bond proceeds from the City and assumes a certain amount of Mello–Roos bond proceeds are dedicated to completing Phase 1 construction;
- Passenger facility charges assume substantial completion and revenue commencement of Phase 2 (i.e., Caltrain and CHSRA have commenced revenue operations). This amount assumes a passenger facility charge based solely on Transbay boardings during operations. The amounts shown represent the net bond proceeds available through a long term financing;
- The land sales timing assumes Block 4 reaches financial close in 2018; and
- The Plan Bay Area funds timing assumes that funds are available as needed. For the purposes of this analysis, funds are shown distributed equally over a seven-year construction period for Phase 2.

Appendix D

FY	Remaining SF County Sales Tax	Tax Increment (TI)		Mello Roos		Future SF County Sales Tax	Passenger Facility Charges (PFC)		Land Sales		New Starts	New MTC/BATA Bridge Tolls	Future California High Speed Rail Funds	Regional Transportation Improvement Program	TOTAL Each Year (Based on High Values)	TOTAL Running Total (Based on High Values)
		Low	High	Low	High		Low	High	Low	High						
2016																
2017	$11,000,000														$11,000,000	$11,000,000
2018	$11,000,000								$45,000,000	$45,000,000					$56,000,000	$67,000,000
2019	$11,000,000						$865,000,000	$1,920,000,000							$1,931,000,000	$1,998,000,000
2020				$73,494,583	$173,494,583	$50,000,000					$92,857,143	$42,857,143	$79,571,429		$438,780,297	$2,436,780,297
2021		$200,000,000	$340,000,000			$50,000,000					$92,857,143	$42,857,143	$79,571,429		$605,285,714	$3,042,066,012
2022				$13,904,884	$13,904,884	$50,000,000					$92,857,143	$42,857,143	$79,571,429		$279,190,598	$3,321,256,610
2023						$50,000,000					$92,857,143	$42,857,143	$79,571,429		$265,285,714	$3,586,542,324
2024						$50,000,000					$92,857,143	$42,857,143	$79,571,429		$265,285,714	$3,851,828,038
2025				$188,498,156	$188,498,156	$50,000,000					$92,857,143	$42,857,143	$79,571,429		$453,783,870	$4,305,611,909
2026						$50,000,000					$92,857,143	$42,857,143	$79,571,429		$265,285,714	$4,570,897,623
2027																$4,570,897,623
2028																$4,570,897,623
2029																$4,570,897,623
2030														$18,000,000	$18,000,000	$4,588,897,623
2031																$4,588,897,623
2032																$4,588,897,623
2033																$4,588,897,623
2034																$4,588,897,623
2035																$4,588,897,623
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2045																$4,588,897,623
2046																$4,588,897,623
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2055																$4,588,897,623
2056																$4,588,897,623
2057																$4,588,897,623
2058																$4,588,897,623
2059																$4,588,897,623
2060																$4,588,897,623
TOTAL	**$33,000,000**	**$200,000,000**	**$340,000,000**	**$275,897,623**	**$375,897,623**	**$350,000,000**	**$865,000,000**	**$1,920,000,000**	**$45,000,000**	**$45,000,000**	**$650,000,000**	**$300,000,000**	**$557,000,000**	**$18,000,000**	**$4,588,897,623**	**$4,588,897,623**