

# Guidebook for Value for Money Assessment

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# 1 Introduction

## 1.1 This guidebook is part of the FHWA P3-Value Toolkit

The Federal Highway Administration's (FHWA) Office of Innovative Program Delivery (OIPD) has developed a Public-Private Partnership (P3) Toolkit comprising tools and guidance documents to assist in educating public sector policymakers, legislative and executive staff, and transportation professionals. The P3 Toolkit forms the basis of a broader P3 capacity-building program that includes a curriculum of P3 courses and webinars. The P3 Toolkit addresses both Federal requirements related to P3s and four key phases in P3 implementation: (1) Legislation and Policy Development; (2) Planning and Evaluation; (3) Procurement; and (4) Monitoring and Oversight.

## 1.2 The purpose of this guidebook is to provide an advanced understanding of Value for Money assessment

In addition to other guidance, the FHWA's P3 toolkit includes the *Value for Money Assessment for Public-Private Partnerships: A Primer*, the *Public Sector Comparator Tool and User Guide*, and the *Shadow Bid Tool and User Guide*.<sup>1</sup> The primer provides an introduction to Value for Money (VfM) assessment. The Public Sector Comparator Tool and Shadow Bid Tool are Microsoft Excel tools that demonstrate how a VfM assessment can be conducted.

This guidebook is intended to be an intricate and detailed follow-on to the Primer and covers more challenging and advanced VfM assessment topics. As such, this document presumes that the reader has read and understood the material in the Primer. It is designed to enhance the overall understanding of VfM assessment and to provide hands on guidance for practitioners in the field.

To make the guidebook as useful as possible to practitioners, this document provides an advanced understanding of the practical applications for assessing and allocating project life cycle risks, and addresses the numerous challenges faced when doing this.

## 1.3 Value for Money assessment: Which delivery method is the best deal?

The primer on VfM Assessment for Public-Private Partnerships defines VfM as “the optimum combination of life-cycle costs and quality (or fitness for purpose) of a good or service to meet the user's requirement”. The VfM concept is used to compare P3 and conventional delivery methods

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<sup>1</sup> All tools can be found at <http://www.fhwa.dot.gov/ipd/p3/toolkit/index.htm>.

for the same investment project. Therefore, VfM in this context answers the question, “Which delivery method provides the ‘best deal’ for implementing a specific project from the perspective of the government?”

The VfM assessment process discussed in this document can be utilized on a case-by-case basis to compare the aggregate benefits and costs of a P3<sup>2</sup> against those of the conventional alternative. It supports government officials when determining if, when entering into a P3 agreement, they are likely to obtain a better deal compared to conventional procurement for the same project.

## **1.4 What we can learn from previous Value for Money assessments**

On the basis of experience with VfM assessments across the world, there are many lessons for practitioners to bear in mind when conducting this type of analysis. Creating and maintaining a robust knowledge base of previous projects is **recommended**. This knowledge pool insures that both prior lessons learned and useful transferable data are incorporated in contemporary projects, enhancing the effectiveness of VfM assessments and thereby the success rate of P3 projects.

### **1.4.1 Value for Money assessment is crucial in preparing, procuring, and implementing P3 projects**

The VfM assessment is occasionally viewed as an exercise performed only once, in the early stages of a project, to determine which delivery method is “the best deal”. However, the VfM assessment can also be used throughout the preparation and procurement of a project. In some jurisdictions, it is common to do a VfM assessment just before awarding a contract. A VfM assessment may be conducted to support the decision on a delivery method in the project preparation phase, but also at the start of consecutive project phases and at contract award. *The VfM assessment may be useful in the ongoing monitoring, structuring, and negotiation of P3 deals.*

### **1.4.2 Value for Money assessment should create an understanding of the differences between P3 and conventional delivery methods**

While many practitioners have found value in using the VfM assessment process to compare the P3 option to the conventional delivery method, some have found that the VfM analysis can also provide useful information about the potential value-driving mechanisms of the P3 option. This information may be useful in supporting public outreach efforts..

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<sup>2</sup> In a P3, a private entity assumes responsibility for more than one development phase, accepting risks and seeking rewards. This document is concerned primarily with forms of P3s where the private sector partner (called the “concessionaire”) enters into a long-term contract to perform most or all the responsibilities conventionally procured separately and coordinated by the government.

### **1.4.3 It is better to be roughly right, than exactly wrong**

Because of the inherent uncertainty associated with the inputs to the analysis, this guidebook encourages practitioners to 1) use ranges of results instead of an exact number, and 2) be explicit about the uncertainties and impacts that could not be reflected in the outcomes of the VfM assessment. This philosophy provides decision makers with better information to determine and optimize all of the project delivery alternatives.

### **1.5 The focus of this guidebook is the financial perspective - not the social perspective**

This guidebook focuses on the use of VfM to determine value from the financial perspective of a government entity and not the perspective of the entire economy. This distinction primarily affects the valuation section, because the valuation is not based on benefit-cost methods from the perspective of society, but is rather based on financial pricing techniques from the perspective of the public agency or taxpayer.

As with most VfM assessment methodologies, the starting point is the financial calculation. A government agency may, however, want to include social factors in the decision-making process when deciding whether to undertake a P3 project. This is why the financial VfM calculation may be complemented by relevant non-financial and socio-economic considerations.<sup>3</sup> This approach makes the outcome of the VfM analysis clearer and easier to understand for all parties involved. The goal of the VfM analysis is to facilitate decision-making from a broader perspective when choosing whether to undertake a conventional procurement or a P3.

### **1.6 This guidebook is developed for transportation staff involved in P3 projects**

The intended audience for this material includes the staff at the FHWA, individual state departments of transportation, executive branch departments and agencies submitting P3 requests, metropolitan planning organizations, and other transportation management agencies that are considering a P3 approach or are preparing, procuring, and implementing a P3 project. With this guidebook in hand the user will gain the ability to:

- ▶ Better explain the concepts of VfM;

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<sup>3</sup> This guidebook qualitatively discusses these non-financial and socio-economic effects. FHWA is developing further guidance on a Benefit-Cost Analysis-based approach for the quantitative assessment of these effects in the context of a VfM assessment.

- ▶ Coordinate and monitor a team of specialized advisors; and
- ▶ Perform state-of-the-art VfM assessment.

### **1.7 The structure of this guidebook mirrors the steps performed in an actual Value for Money assessment**

The guidebook is organized to take the user through the different stages of a VfM assessment in the same manner that any practitioner would expect to perform this from start to finish. To improve the understanding of the concepts introduced in this guidebook, a hypothetical example is provided highlighting some of the unexpected challenges that may arise.

## **A hypothetical example: Introduction to the I-13 Project**

The State of Pennorado has decided to expand a highway, Interstate 13 (the Project). The Project is in the early stages in which its feasibility is being assessed, and different delivery methods are being compared in a Value for Money (VfM) assessment. Ms. Brown (the Project manager) and Mr. Regan (the risk manager) work with the Pennorado Department of Transportation (PDOT) on the Project team that is responsible for the planning, contracting, and implementation of this project. Currently the team is performing a risk assessment as part of the VfM assessment. The question is whether the Project should be contracted in the conventional way - design, bid, build (DBB) - or if it should be contracted in a P3 arrangement. The P3 contract may include either a toll concession, or exclude toll revenues and utilize availability payments only.

### **Project history**

The search for a regional transportation solution to the increased traffic congestion and accidents on I-13 started in 2003. In addition to the congestion and accidents, increased freight traffic, and transportation to and from the regional airport need to be addressed. An investment study conducted in 2004 concluded that even with the large planned investments in transit in the region, the expansion of the I-13 corridor was the only alternative that can address the transportation needs outlined above. A Final Environmental Impact Statement (FEIS) was issued in January 2009.

### **Project description**

The Project is located on I-13, an existing four-lane highway connecting two metropolitan areas. The highway corridor is 78-miles long, with major arterials intersecting the roadway. Within the Project area the I-13 corridor consists of a number of communities, including eight cities and five counties. Upon completion, I-13 will be eight lanes wide (four in each direction), four of which will be managed lanes (two in each direction). Carpools, buses, hybrid vehicles with permits, and motorcycles will use the lanes toll-free. The Project also includes bus rapid transit (BRT) service improvements.

### **Project objectives**

The objectives of the proposed I-13 corridor improvements are:

- ▶ Support local and regional comprehensive planning and development;
- ▶ Maintain the efficiency of existing roadways in the immediate vicinity of the airport terminals;
- ▶ Relieve local congestion;
- ▶ Serve airport freight operations, reduce travel times between airport and freight destinations;
- ▶ Improve regional mobility and safety;
- ▶ Design Project in an environmentally responsible manner;
- ▶ Complete the expansion on time to prevent relocation of an airline due to congestion issues; and
- ▶ Provide cost-effective alternatives and solutions.

### **Project status**

- ▶ Design: The preliminary design is 80% complete.
- ▶ Planning and Environmental Approvals: The environmental impact statement (EIS) and record of decision (ROD) were issued in 2009. Tolling was not included in the original I-13 National Environmental Policy Act (NEPA) documentation; additional analysis would be required to reflect the impacts from managed lanes.
- ▶ Right of Way Acquisition: 95 of the 223 parcels needed for the Project have been purchased. The Project assumes the full right-of-way corridor will be purchased through construction may be phased.
- ▶ Toll authorization: Legislative toll authorization would be required and is not available yet.
- ▶ Support: Most cities and all counties, the Port Authority, and the freight community support the Project.
- ▶ Investment cost estimates: Recent estimates for overall design and construction costs are \$865 M (1/1/2014).

## 2 Framework VFM Assessment

### 2.1 The purpose of a VfM assessment is to facilitate decision-making for a variety of delivery methods

In the preparation stages of a project, different financial and economic decisions need to be made and analyses carried out. Typically, the analyses are as shown below:

**Table 2-1. Financial and Economic Analysis**

	Analysis	Tool	Technical description	Key question to be answered
1	Economic feasibility	Benefit-cost analysis	Net Present Value (NPV) calculation of all social and financial costs and benefits of the project	“Is the project attractive from the perspective of society?”
2	Financial feasibility	Financial viability assessment	NPV calculation of all financial cash flows of the project, and comparison of cash flows to available budget	“Is the project financially feasible?” or “Can we afford the project?”
3	Value for Money	VfM assessment (public sector comparator vs. shadow bid or actual bid)	Comparison of the NPVs of (expected) P3 cash flows and expected conventional delivery method cash flows	“What is the optimal delivery method?” or “Is the actual P3 bid still more attractive than the conventional fall back?”

This guidebook focuses on the use of VfM assessment for the delivery method decision. The tool used for this decision is the VfM assessment, comprising a comparison between the public sector comparator and the shadow bid. VfM assessment assumes that, at this stage in the process, the decision to proceed with the project has already been made. The VfM assessment does not provide an answer to the question of whether or not the project is a good use of societal resources. However, it will guide decision makers to determine which delivery method returns the greatest value when comparing different delivery methods.

The VfM assessment does not determine whether the project is affordable. Because budgetary constraints are usually a crucial consideration when deciding to undertake a project or choose a delivery method, it is important to conduct a separate affordability or financial feasibility assessment.

Although the type of analysis, tools, and the timing generally differ – for instance using Benefit Cost Analysis (BCA) in the early stages and VfM in later stages – the elements of the underlying methodologies (for instance life cycle valuation) are the same for each instrument. This also means that the elements of the analyses are interchangeable and must be consistent.

The purpose of a VfM assessment is to provide a structured approach for a government to assess the value for money it can expect from a project using the P3 approach. The VfM assessment provides the government with:

- ▶ An approximate quantitative range of VfM outcomes;
- ▶ Sensitivity analysis and scenario analysis to determine the robustness of the outcomes; and
- ▶ Qualitative considerations.

### **I-13: The current stage of the project and the decisions that must be reached**

Ms. Brown and Mr. Regan have just finalized a risk assessment of the I-13 project. They are now facing the question “which delivery method is optimal for the I-13-project?” As in the risk assessment, they compare the conventional approach (design, bid, build) to two P3 arrangements, a toll concession P3 and an availability payment P3. In order to do so, the Public Sector Comparator (PSC) and a shadow bid must be constructed.

Once they decide which contract arrangement is most suitable, they will initiate the procurement process.

## **2.2 VfM assessment is used to decide on the delivery method**

Often the first time a VfM assessment is conducted is when the project delivery method is to be chosen. In the assessment, the most realistic conventional delivery method is compared to a P3 procurement. The P3 delivery option can be an availability payment P3 or a toll concession P3, and both may vary greatly in form and scope. The Public Sector Comparator (PSC) represents the cost for procuring a project using the conventional delivery method, whereas the Shadow Bid provides the cost for a P3 delivery of the same reference project. The comparison of the two provides an answer to the question “Which delivery method offers the best value for money?”

After the initial assessment, the VfM assessment may be used for continuous optimization within the chosen delivery method. Risk allocation is still relevant during the procurement stage because there is an excellent opportunity for practitioners to gain market insight on the optimal risk allocation through a market dialogue, and VfM assessment assists decision makers with specific choices regarding this. VfM assessment can also assist decision makers with choices regarding scope changes.<sup>4</sup>

The PSC can be used again later, after the bids are received. The public agency then has the opportunity to assess whether the original expectation of VfM by the P3 delivery method is reflected in the actual prices offered by the market. Ultimately, the PSC can be used as a threshold

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<sup>4</sup> An example of a scope change is including additional maintenance on nearby roads in the contract; addendums such as these – and many others – may require updates to the VfM assessment.

to determine whether the P3 bids deliver Value for Money - which may even lead to reconsideration of the contract award.

### I-13: Using the PSC later in the procurement process

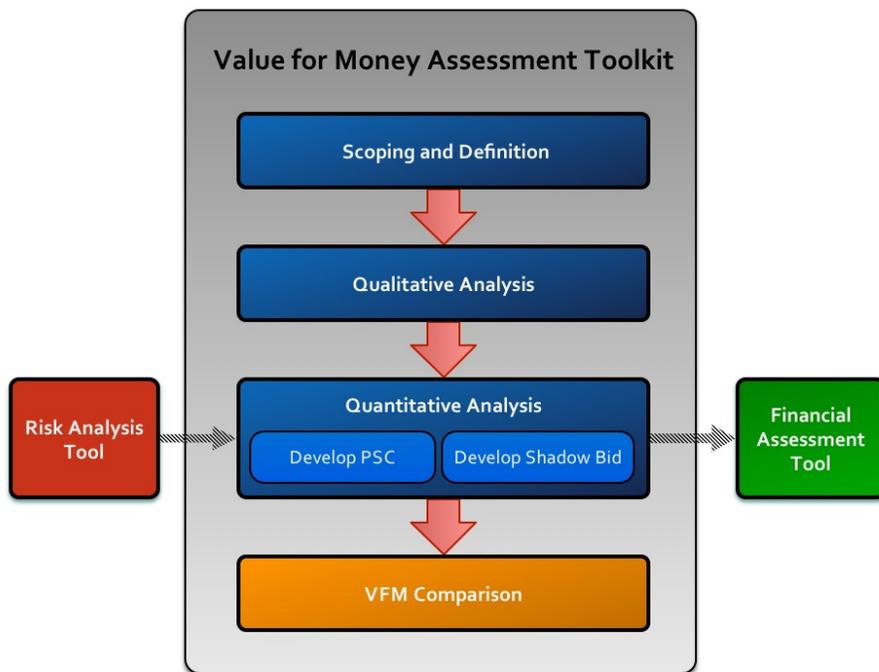
Although Ms. Brown and Mr. Regan are still in an early stage of the Project, they are looking ahead and are already considering using the PSC more than once. The PSC is not only a useful tool in the contract choice process, but they know that it can also be used later on in the actual bidding procedure. At that time Ms. Brown and Mr. Regan can use the PSC to compare the actual incoming bids with the conventional fallback option.

In addition to using the PSC as a benchmark, they also gain valuable insights for future P3 projects, such as: what are the actual cost differences between the public option and the P3 arrangement, and how does the private entity value the transferred risks?

## 2.3 VfM assessment comprises four essential steps

To perform a VfM assessment four main steps must be carried out, as shown in Figure 2-1.

Figure 2-1. Value for Money Assessment Process



The guidebook structure follows the steps in the table above. Chapter 3 provides guidance on how to perform the first step - scoping and definition. Chapter 4 continues the process with the qualitative analysis. Chapter 5 outlines the quantitative analysis. Finally, Chapter 6 demonstrates how to compare the conventional and P3 delivery based on the assessment. After describing the different steps in detail, each chapter provides further guidance with respect to process, timing, information, and the experts needed.

### **I-13: The steps in the I-13 VfM assessment**

To perform the VfM assessment, Ms. Brown and Mr. Regan follow the 4 steps shown in Figure 2-1 above. An important input for the process is the risk assessment, which they completed in advance with the help of the FHWA's *Risk Assessment Guidebook*.

Ms. Brown and Mr. Regan develop the plans for the VfM assessment, including setting up a team, a timeline, and determining the number and composition of invitees for the workshops. They decide to conduct three workshops, one for the scoping phase, one for the qualitative assessment, and one for the quantitative assessment and actual comparison. In addition to these workshops, they plan to conduct one-on-one interviews with cost experts during the quantitative analysis.

While planning for the workshops, they are cognizant of the need to ensure that all required expertise is represented. This collective knowledge includes cost estimate experts, risk experts, legal experts, financial experts, a financial modeler, and representatives of different stakeholder groups. They choose two representatives from the counties and cities that are adjacent to the interstate. In addition, they invite a representative of the Port Authority who is also an expert on freight transportation, and a P3 expert from FHWA.

With regard to the timeline, Ms. Brown and Mr. Regan make sure to plan well in advance, taking into account the limited availability of a large number of the workshop's expert participants.

#### **Step 1: Scoping Workshop** (Two weeks – including preparation time and time for developing reports)

This step includes one workshop on scoping and introduction to P3. Since not all of the workshop participants are familiar with P3s, a theoretical introduction to P3 practice is provided before the project is introduced in greater detail. The workshop is important because it provides the participants with the proper background for the qualitative workshop.

#### **Step 2: Qualitative Impacts Workshop** (Four weeks – including preparations and report writing)

The second step includes a workshop as well. Here, qualitative impacts such as value drivers are discussed in theory and then applied to the I-13 project. The workshop participants identify structural differences between P3 and the conventional delivery method, therefore participation in the first workshop on scoping and introduction is a prerequisite. Again, as most stakeholders are not familiar with P3s and VfM assessment, time is devoted to the theory and project examples are shared with the participants. Mr. Regan and Ms. Brown understand that this is a complicated, yet crucial step. They plan sufficient time for this aspect of the workshop and make sure there is a preparatory period before and a feedback period after the workshop.

#### **Step 3: Cost Estimates** (Two weeks – including preparation and report writing )

The cost estimates are already available for construction, maintenance, and revenues. Therefore, the financial modeler who is experienced in VfM assessment can start right away with the quantitative comparison. Mr. Regan and Ms. Brown make sure to inform the cost estimate experts that there might be some questions raised during this period.

#### **Step 4: VfM Outcomes Workshop** (Two weeks – including preparation and report writing)

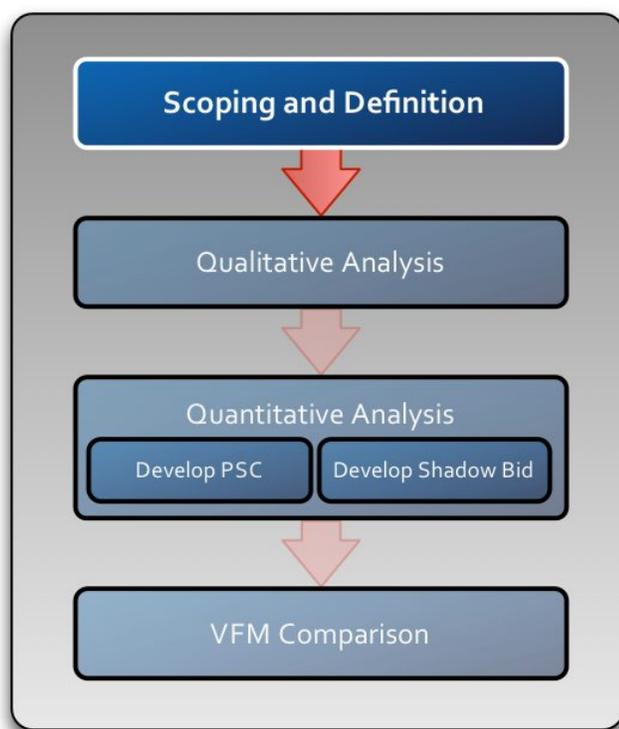
The last step includes the third workshop, where the participants discuss the outcomes of the model. Here the actual comparison takes place. In order to understand the meaning of the numerical outcomes, a sensitivity analysis is applied to a selection of assumptions and inputs.

## 3 Scoping and Definition

### 3.1 Defining the scope is the starting point of a fair VfM comparison

It is paramount to clearly define the scope of the project from the outset of any analysis. This requires explicitly defining: 1) the geographical scope, 2) the functional scope, and 3) the temporal scope. Figure 3.1, below, shows the Scoping and Definition process.

**Figure 3-1. Scope and Definition Process**



#### 3.1.1 Geographical scope

Inevitably, most transportation projects will interact with – and sometimes encroach upon – other built environments. This is the nature of transportation projects, and some of the challenges these interactions create include:

- ▶ Intersections with other forms of infrastructure (road, rail, pipelines, etc.);
- ▶ Entrances and exits; and
- ▶ Construction synergies.

Construction synergies provide opportunities to combine construction with other work on nearby projects, building economies of scale. Examples of these synergistic effects are combining maintenance with a nearby road network, combining the building of a new tunnel with the reconstruction of an existing tunnel, or combining the reconstruction of local roads with the construction of entrances and exits to the highway.

#### **I-13: A difficult railroad intersection – which agency is responsible?**

Most infrastructure projects impact surrounding infrastructure such as light rail, heavy rail, or the existing road network. The I-13 Project is no exception. There is one specific spot where I-13 has a railroad overpass. Ms. Brown and Mr. Regan came across this issue while defining the scope of the project. The expansion of the road means that the existing railroad overpass will have to be expanded. Ms. Brown and Mr. Regan contact the railway infrastructure manager and learn that the overpass was already due to be replaced. However, the infrastructure manager prefers not to include the overpass in the I-13 contract. Therefore, both parties agree to a timeline where the overpass is expanded before I-13 is built. From now on, the timely expansion of the railroad overpass is included as a risk for the I-13 project.

### **3.1.2 Functional scope**

The second step when defining the scope is to determine which activities should be included in the VfM assessment. These include all of the activities that might be allocated to the private entity in the P3 delivery method. Functions that remain within the realm of the public entity, regardless of the delivery method, do not need to be included unless they result in differences between delivery methods when the comparison is made. Another reason to include these functions in the scope is to minimize discrepancies between cash flows in the VfM assessment and cash flows in the project financial feasibility assessment.

### I-13: Functional scope

In cooperation with the legal and technical experts, Mr. Regan developed the list of functional scope items and the allocation in the P3 that is used as a starting point.

Activity	Contractor	PDOT	Remarks
Preliminary and final design	X		
Construction	X		
Oversight		X	
Relocation of cables and pipes	X		Relocation is straightforward, no excessive risks
Right-of-way acquisition		X	PDOT has already started acquisition and will probably finish before financial close
Archeological findings		X	Unmanageable by private entity
Permits	X	X	Most permits need to be acquired by the contractor; one specific environmental permit is unmanageable by the contractor and remains with PDOT
Communication with users and general public	X	X	This will largely be a joint effort; the communication plan will describe a more precise allocation of responsibilities
Snow and ice removal	X		The scale of project is large enough, therefore subcontracting with contractors in the same region is feasible
Major maintenance	X		
Routine maintenance	X		
Traffic information systems	X		
Incident management	X		
Traffic management		X	PDOT wants to retain control of all traffic management for the whole region
Imposing, collecting, and enforcing tolls	X		

### 3.1.3 Time scope

An important third step in scope definition is the duration of the contract. This is an especially acute issue because maintenance and/or operation are included in the contract. It is consistent with the value drivers of a P3 to include at least one cycle of major maintenance in the contract. This transfers the risks of designing and building the structure to the private entity more effectively, enhancing the incentives for the private entity to improve the quality of the design and construction because future maintenance costs are considered. Duration depends on the type of asset; the minimum duration of a P3 contract is usually 15 years.

Expected environmental changes are another factor to consider when determining the duration. In an environment where rapid change is expected—for instance in a downtown metropolitan

environment – it can be optimal to limit the duration of the contract, because scoping issues are likely to arise in the future.

Availability payment-based P3 contracts typically have a life cycle of between 30 and 50 years. For contracts that include toll revenues, a separate consideration is the revenue model and the time required to reach a market-based rate of return; this may require more time and can drive a longer-term contract.

### **I-13: Duration**

The I-13 project assessment considers a scope of 50 years of operation on top of a 3-year construction period. The area surrounding I-13 will be changing due to industrialization around the airport. However, no major infrastructure changes concerning I-13 are expected in the near future.

Mr. Regan and Ms. Brown assume there will be some questions at the workshops concerning the management of long-term contracts, because the idea of planning 50 years ahead is unusual for some of the participants. In anticipation they search for examples of success stories and lessons learned from other projects.

## **3.2 Defining delivery alternatives is crucial**

After the project scope is defined, it is necessary to determine the exact definition of the delivery alternatives. In addition to P3 alternatives the conventional delivery method also needs to be defined.

### **3.2.1 Selecting the P3 delivery method**

For the P3 delivery method, a choice needs to be made concerning which types of contracts are to be considered. Most importantly, there is the distinction to be made between toll concession P3s and availability payment P3s.

This guidebook focuses on long-term contracts typical of availability payment P3s and toll concession P3s. The primary difference between these two types of contracts is that the revenue risk is transferred to the private entity in a toll concession. For roads where tolling is not a consideration, the choice is simple because this automatically leads to an availability payment P3. If tolling is a major part of the scope, the choice is whether to allocate toll revenue risk to the public agency or the private entity.

A separate decision must be made concerning the operation and collection of tolls. In some availability payment P3 transportation projects where tolling is part of the scope, collection is included in the contract as an activity performed by the private entity. In other projects, state tolling agencies with existing local operations or procuring agencies are responsible for toll collection.

When in doubt, multiple P3 delivery options can be considered at the same time. However, too many options will inevitably lead to complicated discussions about the justification of small

differences between similar contracting alternatives, distracting from the more prominent key decision-making issues. It is also important to make sure that the scope considered is equivalent for all of the options. For example, when an availability payment P3 and a toll concession P3 are considered, the availability payment P3 alternative must explicitly include costs of tolling if it will be the responsibility of the public entity.

#### **I-13: Defining the delivery methods**

For the I-13 Project, design-bid-build is the conventional delivery method. This has been the method used for most of the other highways in the state. Because this is standard procedure, the contractual terms are easily defined. In contrast, Ms. Brown and Mr. Regan have more work to do while defining the availability payment P3 and toll concession P3.

### **3.2.2 Selecting the conventional delivery method**

By definition, the conventional approach is usually the most reasonable fall back option in any decision. Typically, a P3 consists of integrated contracts, whereas the conventional delivery method will be a combination of several contracts and insourcing by the public entity - depending on the level of expertise within the organization. For construction or reconstruction, the conventional delivery method can be Design-Bid-Build (DBB), Design-Build (DB) or another contracting model – essentially whatever the public agency is familiar with. Design-Build-Finance (DBF) can also be considered as an alternative delivery method, particularly in cases where agencies are constrained by short-term borrowing limitations; in this situation DBF is an alternative way to leverage future available work program funds. Selecting the conventional delivery model is not about defining the most traditional delivery method, but should be the most reasonable fall back if a P3 is not selected.

### I-13: Conventional delivery method

PDOT experts put together a typical list of contracts for the conventional approach.

Activity	Contract #	Remarks
Preliminary and final design	1	Contracted out to an engineering firm
Construction	2	Contracted out to a consortium of local contractors through a DBB contract
Oversight	3	Contracted out to an engineering firm
Relocation of cables and pipes	2	Contracted out to a consortium of local contractors through a DBB contract
Right-of-way acquisition		Carried out by PDOT
Archeological findings	4	If necessary, contracted out to a specialized firm
Permits	1	Carried out by PDOT, with some support from an engineering firm
Communication with users and general public		Carried out by PDOT
Snow and ice removal	5	Contracted out in a larger scale contract for entire region
Major maintenance	6	Contracted out to a construction company
Routine maintenance	7	Contracted out to a construction company specializing in maintenance, in 3-year blanket fee-for-service agreements (risk remains with PDOT)
Traffic information systems	8	Contracted out to a construction company specialized in maintenance
Incident management		Carried out by PDOT
Traffic management		Carried out by PDOT
Imposing, collecting, and enforcing tolls	9	Contracted out to a toll system operator

### 3.3 Risk allocation is key in scoping and definition

Risk allocation between the public agency and private sector entity is one of the core principles of P3s. Therefore, risk allocation by definition is a crucial element in describing the alternative delivery methods. The definition of delivery methods already determines the risk allocation on a high level. In this step the more precise allocation of risks is determined.

### I-13: Risk allocation

Mr. Regan has already carried out a risk assessment, which now provides an excellent starting point for the risk allocation. The team determines the expected risk allocation for each delivery method. Below is a snapshot of eight risks (nos. 14-21) taken from the risk allocation table included in the risk register (containing 127 risks).

	Risk	Risk allocation DBB		Risk allocation AP P3		Risk allocation toll P3	
		Public	Private	Public	Private	Public	Private
14	Toll authorization procedure delayed.	X		X		X	
15	Governor decides to change scope because of local interests.	X		X		X	
16	Cost increase because of rising oil prices.	X			X		X
17	A concrete truck hits a construction worker.		X		X		X
18	Vandalism during operational period.	X			X		X
19	Leakage in excavation for tunnel during construction.	X			X		X
20	Decision makers unavailable during election period.	X		X		X	
21	Uncertainty in cost estimates due to preliminary stage of design.	X			X		X

### 3.4 Input from the market can be used to define a realistic scope and delivery alternative

Part of the scoping and definition phase can be engaging in a market consultation or a request for information (RFI). This is especially useful when the project is out-of-the-ordinary in any way. Some examples of these issues are whether or not to include reconstruction of existing assets, or relying on a large debt financing component at a time when financial markets are unstable.

Depending on the specific issue at hand, private experts and companies can be interviewed to provide their views on the definition of scope of the project, the feasibility of delivery methods, and risk allocation. For reconstruction issues, it is logical to interview a construction company or technical expert. For financial market concerns it is logical to interview a banking or financial expert.

The information collected from the market consultation can be weighed and used to optimize the scope and definition of delivery methods.

### **I-13: Bus rapid transit – an out of the ordinary issue**

Up to this point, bus rapid transit has not been implemented in Pennorado state. They are not familiar with this type of transit system and the cost estimation team chooses to do a market consultation in order to get a cost indication.

However, the company they ask to provide a cost indication has a monopolistic position in this area; therefore the price estimate is elevated. In order to improve the price indication, team engages in a second consultation, this time contacting two other cities that have experience with bus rapid transit. The three cost indications together paint a more accurate picture of what costs to expect.

## **3.5 Process, timing, information and expertise needed**

The scope and definition phase defines the main inputs for comparison; therefore it is useful to convene a meeting with the relevant stakeholders and experts to consider the choices to be made. This can be done on a bilateral basis or in a half-day workshop. To make the discussion more efficient, the workshop needs to be planned in such a way that the project specific issues discussed in this chapter are raised.

Preparatory work includes producing an inventory of the following items:

1. Potential scoping of the project and alternatives
2. Definition of potential P3 delivery methods and the conventional method
3. Key actors and stakeholders
4. Key inputs required for the VfM assessment

Not all participants invited to the workshop may be knowledgeable about P3 contracting or the specific project. Therefore, an introduction including an overview of P3s and the main characteristics of the project can be a helpful starting point and examples can be drawn from the 'P3 Defined' section of the FHWA P3 toolkit. Workshop facilitators should explain VfM assessment, what contributions are expected from the participants, and the approach and processes.

The workshop will mainly consist of a discussion with all interested parties on the key issues. A facilitator can manage the discussion, making sure that every point of view is expressed. Facilitators should focus on eliciting the actual arguments behind every opinion, and whenever possible they should try to find a resolution for each issue. Naturally, some of these issues may require further research.

Relevant participants need to reflect different sets of expertise (project management, legal, financial, technical, and organizational) and should represent the relevant parts of the public entity that will be procuring the project (project managers, maintenance department, legal, etc.). In addition, knowledge about P3 and conventional delivery methods is necessary.

### I-13: Workshop for scope definition

To avoid overlooking important details, Ms. Brown and Mr. Regan organize a workshop to gather input with regard to the scope and have it validated by a group of experts. Not all of the participants of the workshop are familiar with P3 projects, so Ms. Brown provides an introduction to the general theory and practice of P3s. She uses the “Project Profiles” section of the FHWA P3 toolkit to provide some examples.

There are two participants representing the cities and communities I-13 passes through. These two participants appreciate the introduction because they have not been involved in P3 projects before. It becomes clear that although their knowledge is limited regarding P3s, they have important details to add when it comes to the stakeholder analysis. They are familiar with the local environmental and neighborhood interest groups, and they provide valuable insights into the interests and goals of these groups.

## 3.6 Output: Starting points can be described in a VfM assessment scoping memorandum

When all of the issues regarding the scoping and definition have been successfully discussed and concluded, it is important to summarize these in a scoping memorandum. Apart from the content, this scoping memorandum may contain the plan for the rest of the analysis—including the information and experts needed, a communication plan, a timeline, and a budget.

### I-13: Recipient of the scoping memorandum

To more accurately focus their efforts, Mr. Regan and Ms. Brown ask themselves the question, “Who is the audience for the scoping memorandum?” They discover that the readers of the memorandum are not a homogeneous group. In addition to the people on the team who have been involved in the set-up of the project and analysis, Mr. Regan and Ms. Brown decide to circulate the memorandum among the local counties and cities as well.

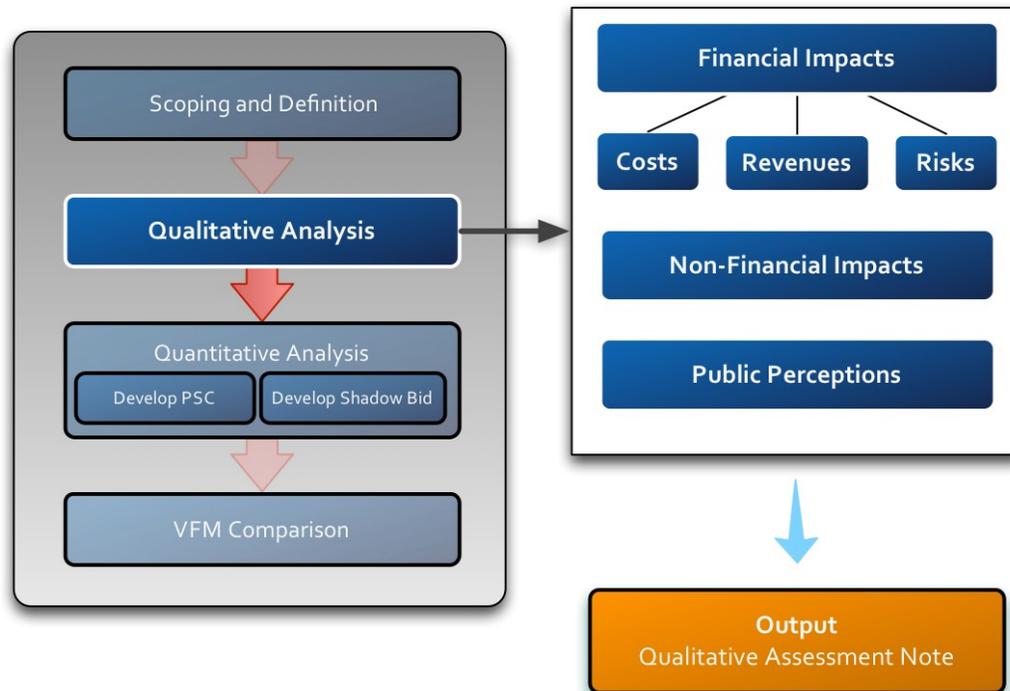
This is the table of contents they develop:

1. Introduction: Why this analysis?
2. Description of the project
3. Assumptions regarding scope
  - a. Geographical
  - b. Functional
  - c. Temporal
4. Definition of delivery alternatives
  - a. Conventional delivery
  - b. Toll concession P3
  - c. Availability payment P3
5. Key actors and stakeholders
6. Key inputs required
7. Organization
  - a. VfM team makeup
  - b. Timeline
  - c. Budget
  - d. Communications

The project team also decides to add additional information such as a list of abbreviations and an overview of definitions of project specific terms (for example the technical terms) to the memorandum in order to facilitate understanding for people who are not involved in this project.

## 4 Qualitative Analysis

Figure 4-1: VfM Assessment and Qualitative Analysis



### 4.1 VfM Assessment begins and ends with an understanding of what drives VfM

The purpose of the qualitative analysis is to identify the expected differences between a P3 solution and the conventional approach, to prepare for the monetization of these differences in the quantitative analysis. Typically, the differences are linked to costs, revenues, and risks. The qualitative differences between delivery methods addressed during brainstorming sessions are typically broader than those related only to financial cash flows. Therefore, it is important to distinguish between:

- 1 Financial impacts: these are directly related to financial cash flows or can be directly reflected in the financial cash flows.
- 2 Non-financial impacts: these are not related to financial cash flows, but are relevant for the comparison between delivery methods. Quality differences, organizational impact of change in delivery methods and loss of flexibility are examples of non-financial effects.
- 3 Public perceptions: these are not actually differences, but stem from unfamiliarity with the P3 concept. Examples of this are perceptions that “long term contracts do not work”, and that “after 30 years the project will be left in a deplorable state”.

Financial impacts are important to list because they provide the basis for the quantitative analysis. The non-financial impacts are mentioned in the final comparison, but always remain qualitative in nature. Managing public perceptions requires practitioners to possess a sufficient level of training and communication skills when working with P3 contracts. Generally speaking, the lack of knowledge about P3s leads to tenuous misperceptions. It often proves to be very useful to discuss these public perceptions in a VfM assessment, to empower stakeholders to effectively clarify the concepts of P3 and to deal with public mistrust and misperceptions.

### **I-13: Public perceptions vs. non-financial impacts**

During the workshop, Ms. Brown, who is experienced in VfM assessments, explains the topic of “readiness of the organization,” which she encountered in other prior workshops.

Some differences in impacts that are unearthed in workshops are categorized as so-called “public perceptions”. Especially in organizations unfamiliar and inexperienced with P3, negative sentiments and arguments against the P3 delivery options can prevail. One topic that must be carefully examined is the “readiness of the organization.” In this regard, it is challenging to distinguish between two sorts of impacts: a non-financial impact and a public perception.

Organizations that are inexperienced with P3s may have a tendency to think that the “good old way” is better. One has to dig deeper to find the underlying reasoning: is the organization against engaging in a P3 contract because it does not know how to do it? Or is the organization averse to a P3 procurement because they do not believe in P3s? In other words, is the organization unprepared for a P3 because of a lack of experience, or a lack of willingness?

In the case where the organization lacks experience and knowledge, one has to consider that experience can only be built after taking the first initial steps. Keeping this in mind, there might be a case for P3 if the VfM assessment’s outcome is indifferent between the conventional and the P3 approach. Arguments related to a lack of knowledge and experience can be categorized as public perceptions.

In case the organization does not believe in nor support P3, it is difficult to implement a project with this approach. If sentiments against P3 are strongly prevailing in the organization, these should not be ignored, since they could impact the agency’s diligence in project implementation. They may be based on perceptions, like the public perception issues discussed above, but have different implications, because they have a direct impact on the feasibility of implementing the project. Therefore, they should be included in the analysis as non-financial impacts.

In the case of I-13, the workshop group concludes that the public perception issue is present. Some people feel insecure about P3 because of their lack of knowledge and experience. The group decides to arrange additional training sessions, and Mr. Regan and Ms. Brown distribute more P3 background information.

The drivers of the financial impacts - and ultimately the VfM assessment - are triggered by the differences in the governance structure and incentive mechanisms between the conventional delivery and P3 delivery contracts. This is the essence of a VfM assessment and structuring P3 transactions. A clear understanding about these concepts leads to a stronger foundation for the quantitative analysis and an excellent starting point for communication about P3s and expected VfM. A better understanding about P3 enables stakeholders to deal with public perceptions and sensitivities. For example, the expectation is not that a P3 may lead to VfM because ‘private entity staff is smarter than public agency staff’, but because of structural differences in governance and incentive mechanisms. Table 4-1 lists the different drivers of financial impacts between a conventional delivery and a P3 delivery.

**Table 4-1. Drivers of Financial Impacts**

<b>Governance mechanism</b>	<b>Conventional delivery</b>	<b>P3 delivery</b>
Integration	Multiple contracts, public entity is integrator	One contract, private entity is integrator
Specification	Input specification, determining design and engineering solutions in detail	Output specification, allowing for creative solutions and life cycle costing
Financial incentives	The payment mechanism usually follows the cost structure of the contractor; milestone payments are an example of this	The payment mechanism is related to the output specifications and payments are therefore related to performance.
Competition	Depending on the public entity, portions of the project can be insourced and are therefore not subject to a competitive bidding process	Competitive bidding for the entire contract
Risk management	Traditionally risks are not always explicit; most risks are retained by the public entity	Risks are explicit and allocated according to the principle of “whoever is best able to manage the risk” will be responsible
Complexity	Contracts are standardized and relatively simple	Contracts are more complex and require financial and legal expertise from both the public and the private entity

All of the positive drivers of financial impacts require the proper structuring of P3s. For example, badly structured incentives can lead to adverse effects: in the case where a long-term contract is required to optimize life cycle costs, the lengthy nature of this contract becomes a disadvantage because it limits the competition incentive for the maintenance provider. This is why proper scope definition, risk allocation, and other structuring of the P3 contract are essential.

#### **4.2 Expected differences based on previous projects and expert judgment**

The differences in the governance structure of the contracts lead to expected differences in terms of costs, revenues, and risks. These differences are achieved through the qualitative mechanisms shown in Figure 4-2.

**Figure 4-2. Drivers of Financial Impacts**


The integration of different components of the project, such as construction and maintenance, makes it possible to create synergies between these two stages. This mechanism is called **life-cycle cost optimization**. In the conventional delivery method, it is often the case that two separate divisions within the public agency are responsible for construction and for maintenance, and there is very little interaction between the two. In a P3, the integration of both into one contract -- combined with competitive market pressure -- creates incentives for the private entity to seek life cycle optimizations to achieve cost reduction and enhance the probability of winning the procurement.

**I-13: Life cycle costing**

Two examples of life cycle optimization given by the FHWA expert from experience in other P3 transactions are:

- ▶ The choice to use Light Emitting Diode (LED) lights. They are more expensive to install, but cheaper to operate and replace over the total life cycle of the project.
- ▶ Using a newer type of asphalt that is more expensive, but features increased wear resistance and longevity.

**Output specifications** provide the freedom for the private entity to be innovative or creative with designs or use of new materials. In practice this has led to innovations in the types of asphalt used and various other innovations that make maintenance simpler, reducing the need to close traffic lanes for repair. However, this requires specific definition of output. In practice, challenges remain for the private market to take advantage of this optimization flexibility, because they are accustomed to the public entity providing highly detailed specifications.

**I-13: Focusing on output instead of input minimizes traffic disruptions**

Ms. Brown shared an example with the workshop group on the topic of output specification. In another interstate project, the public authority refrained from strict input specifications. Instead, they focused on output specification and left room to the consortium to define the input and “how to” of construction. They did not specify how streetlights had to be constructed, but provided the consortium with the freedom to come up with their own design. The consortium picked a streetlight that was flexible enough to be pulled over to the side strip so that maintenance can be performed without having to close down lanes.

In a P3 procurement, the combination of direct **financial incentives**, through **payment mechanisms** in the contract and competition in the procurement, catalyzes the private entity to focus on active risk management and cost reduction.

**I-13: Financiers focus on risks**

The private entity in both P3-delivery methods will have to finance part of their investment themselves. In contrast to public entities, financiers and investors have a strong focus on the value of risks and the importance of risk management. In order to receive a credit facility the private entity has to show that it understands the risks of the projects and that proper risk management is in place.

**I-13: Payment mechanisms**

The payment mechanism incorporated in P3 contracts motivates the private entity to deliver good quality throughout the entire contract duration. Not only does the client demand quality, the bank also closely monitors the performance of the private entity. For example, a failure to repair damage on I-13 within the defined time period would result in a reduction of the payment to the private entity. The financiers that provide debt to the private entity demand timely interest and principal repayment. It is not in their interest if the private entity were to receive less payment because this puts the coverage of their debt service at risk.



Figure 4-3. Example Qualitative Assessment Survey

Qualitative Assessment: I-13 Project					
<b>1. Risk Management</b>					
Risks are allocated to the party best able to handle the risk.	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	<input type="radio"/>				
Arguments:					
<input type="text"/>					
<b>2. Life Cycle Optimization</b>					
The costs are optimized over the life cycle of the project because one party is responsible for both phases.	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	<input type="radio"/>				
Arguments:					
<input type="text"/>					
<b>3. Economies of Scale</b>					
The private entity has a relative advantage because it can buy larger quantities and therefore negotiate lower prices.	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	<input type="radio"/>				
Arguments:					
<input type="text"/>					
<b>4. Innovation and Creative Solutions</b>					
By asking for output the private entity stimulates the market to come up with innovative solutions.	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	<input type="radio"/>				
Arguments:					
<input type="text"/>					

The second step in the process is a discussion between all interested parties. The facilitator inventories the scores and arguments, and the most discussion is generated when the scores differ among participants.

The relevant participants need to reflect different sets of expertise (project management, legal, financial, technical, organizational) and need to reflect the relevant parts of the public agency that will be procuring the project (e.g., project initiators, maintenance department). In addition, knowledge about both P3 and tradition delivery methods is a must.

#### 4.4 Output: The arguments from the qualitative discussion are summarized in a memorandum

The results of the qualitative discussion can be summarized in a memorandum. This memorandum may be an addition to the scoping memorandum, adding a chapter on qualitative analysis. In the memorandum the distinction between the three types of impacts (financial, non-financial and public perceptions) is maintained.



### **I-13: Summarizing the outcomes enhances understanding and communication**

After the I-13 workshop on differences in delivery methods, Ms. Brown and Mr. Regan summarize the outcome of the session in a Memorandum. Writing down the arguments and scores of the workshop serves two main goals: communication and specification.

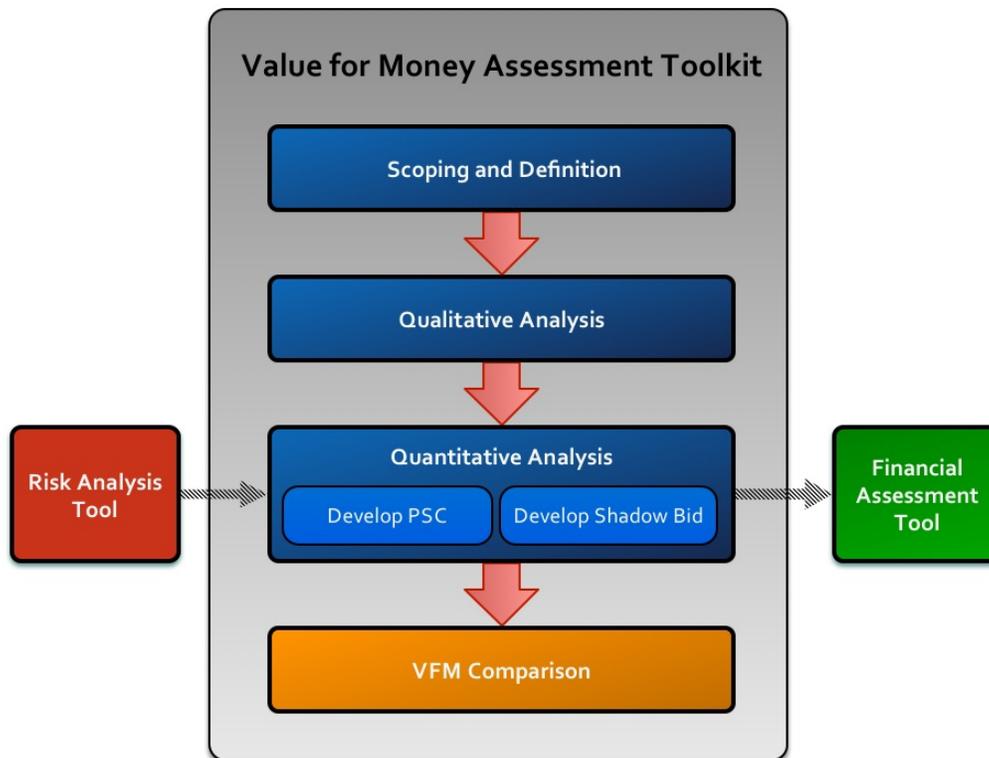
First, the outcomes of the session are communicated to non-participants as well as stakeholders. Ms. Brown and Mr. Regan use the same recipient group from the first memorandum.

Second, writing down the arguments forces the project team to understand the impact in more detail. Which part of the costs is impacted? For example, complexity of contract management is more costly in preparation but less costly during operation.

Writing down the outcomes helps the project team ensure the completeness of the impacts and connects the qualitative assessment to the quantitative part of the analysis.

## 5 Quantitative Analysis

Figure 5-1. The Qualitative Analysis Step



### 5.1 The Public Sector Comparator reflects all cash flows in the conventional approach

To understand the overall financial outcome of a conventional approach, the Public Sector Comparator (PSC) is developed and then used as a benchmark against which the financial consequences of the P3 delivery method will be compared. Figure 5-1 displays the Vfm process and shows the inputs into the quantitative analysis section.

Some helpful guidance for developing the PSC:

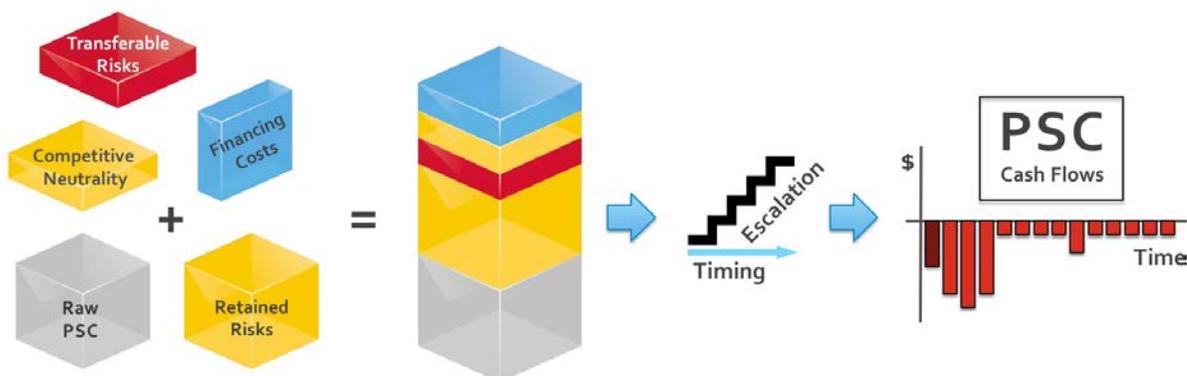
- ▶ The PSC is calculated on a cash flow basis rather than an accrual basis. Therefore only cash flows are included, whereas costs that do not qualify as cash flows, such as depreciation, are not included in the PSC.
- ▶ The PSC should reflect the financial consequences of a conventionally delivered project alternative as realistically as possible. This is accomplished by using cash flows reflecting the situation as if the PSC will be implemented. Realistic efficiency savings should be included. However, unfounded wishful thinking about cost savings has no place in the cash flow analysis. In addition, it is important to note that the PSC is a

reflection of the expected costs and *not the available budget*. Finally, estimates should reflect fully loaded cost estimates for internal costs, including so-called ‘hidden costs’ such as overhead and pensions.

- ▶ For the PSC to provide an appropriate benchmark for the shadow bid or actual bids, it must contain a realistic and fair reflection of the **value of all risks** attached to delivering the project, according to the same scope and requirements that are applicable to the shadow bid. *Please refer to FHWA’s Guidebook on Risk Assessment for further guidance on identification and valuation of risks.* All risks should be categorized as to whether they are retained or transferable after they have been identified and valued.

The PSC estimates the overall cash flows of the conventional approach, both for costs and revenues including adjustments for the value of risks. Figure 5-2 shows the PSC cash flows beginning with the major building blocks and then adjusting the cash flow based on timing and escalation factors.

**Figure 5-2. PSC Cash Flow**



### 5.1.1 Raw PSC

The raw PSC includes all investment, operating and maintenance costs, and revenues within the scope of the project. Because risks and uncertainties are addressed separately, allowances and contingencies should not be incorporated in the estimates for the raw PSC.

Cost estimates include:

- ▶ Planning and permitting
- ▶ Project administration
- ▶ Procurement (public and private)

- ▶ Design and engineering
- ▶ Routine maintenance
- ▶ Long-term (major) maintenance
- ▶ Operations
- ▶ Contract management and oversight
- ▶ Administrative and indirect costs
- ▶ Construction, also including:
  - ▶ Public outreach
  - ▶ Right-of-way acquisition
  - ▶ Utility relocation
  - ▶ Addressing environmental concerns and environmental mitigation
  - ▶ Third-party costs
  - ▶ Quality assurance
  - ▶ Transportation demand management
  - ▶ Transportation system management
  - ▶ Tolling system equipment and technology

Revenue estimates include:

- ▶ Toll revenues
- ▶ Other revenues, potentially including:
  - ▶ Easement fees
  - ▶ Service plaza concessions, rental, and lease revenues
  - ▶ Development rights, including cell towers and fiber optics

Public agencies are expected to have information on realistic cost estimates available based on the validation of prior projects delivered under conventional methods. It is not always easy to develop reliable cost estimates, particularly for long-term costs. Textbox 1 discusses the challenges of realistic maintenance cost estimation, and provides practical ways to deal with these challenges.

### Textbox 1: Realistic maintenance cost estimation

It is often the case that neither governments nor contractors have reliable information about maintenance expenses and/or the life cycle of the asset, two related long-term project cost issues. The challenges to generating reliable maintenance cost estimates are magnified when there are long-term quality standards contractors must meet, which is the case in a P3 contract. In public governance systems, it is not always quality standards that determine the amount of spending for maintenance programs; indeed the availability of funding also determines the level of maintenance. If funding is not available then maintenance is usually deferred. This causes quality to fall below official public maintenance standards.

In a P3 contract there are financial incentive mechanisms enforcing quality standards, often leading to higher and more consistent quality levels in terms of safety and availability. Therefore, government maintenance budgets are not a fair reflection of the real maintenance costs.

The practical ways to deal with this issue are:

- ▶ Developing maintenance cost estimates that reflect higher quality standards. This often proves to be quite challenging, because of the lack of reliable data and reference material for cost estimates under a strict incentive mechanism.
- ▶ Qualitatively addressing this discriminating factor when comparing bids to the PSC. This may result in an underestimation of the VfM, but does provide a qualitative argument for comparison in addition to the quantitative VfM assessment.

### I-13: How to account for improved infrastructure quality in P3 contracts

A question that arises in the preparation of the PSC is how one should account for differences in quality. Ms. Brown and Mr. Regan expect that the P3s will deliver higher quality in service and road maintenance. Since, under a toll concession, the contractor benefits directly from increased use of the highway, and the P3 contract also requires certain minimum standards, quality differences in comparison to a conventional approach can arise. But how can the difference in quality be incorporated in the analysis?

Ms. Brown and Mr. Regan discuss potential approaches for incorporating the higher than usual quality standards:

1. Increased toll revenues in the shadow bid, due to better quality of the road
2. Increased social benefits in the shadow bid, due to better quality of the road
3. Adjustment of maintenance cost estimates for the PSC, reflecting higher quality standards
4. Qualitative discussion of the benefits of a potentially higher quality road in the VfM comparison

The team does not have any reliable data to use the first approach. Ms. Brown wants the VfM assessment to be a purely financial assessment, which is why the second and the fourth approaches are not chosen. The cost estimate experts have data to estimate maintenance costs according to different quality standards, which is why the team decides to go for approach three. Because the team also believes these data are not entirely reliable, it decides to do a sensitivity analysis and qualitatively discuss the potentially higher quality road in the VfM comparison.

## 5.1.2 Retained risks

Retained risks are those risks that the government bears itself and does not transfer to the market. Once all of the risks have been identified and valued, and the retained risks have been identified, each of these risks can be separately presented in the PSC.

In order to create a complete overview, it is preferable to include all retained risks. If certain risks are retained in both the conventional approach and the P3 and there are no differences in risk valuation to be expected, it is not absolutely necessary to include these risks – particularly when valuation turns out to be complicated. However, it should be noted that it would be a mistake to leave these out of a financial feasibility analysis, so it may be preferable to include them for consistency. Please see FHWA’s *Guidebook on Risk Assessment* and subchapter 6.2 for further information on risk valuation.

### 5.1.3 Transferable risks

Transferable risks are those that the government explicitly transfers to the private entity under a P3 arrangement, but retains in a conventional contract. Some risks may not be fully transferred to the private entity in a P3, but are instead shared to a certain degree. The value of a transferred risk is equal to the price a private entity would request for accepting that risk. Please see FHWA’s *Guidebook on Risk Assessment* for further information on risk valuation.

#### I-13: Raw PSC and risk valuation

Ms. Brown and Mr. Regan received all of their inputs from the cost estimate experts and the risk assessment. This leads to the following PSC inputs:

Construction phase (million USD, 1/1/2014)	P50	P70	P90	Timing
Planning and permitting costs	(43.25)	(44.55)	(46.71)	yr 1 - yr 2
Project administration costs	(21.63)	(22.27)	(23.36)	yr 1 - yr 4
Procurement costs	(4.33)	(4.45)	(4.67)	yr 2
Design and engineering costs	(86.50)	(89.10)	(93.42)	yr 1 - yr 2
Construction costs	(709.30)	(730.58)	(766.04)	yr 3 - yr 4
Pure risks	(103.80)	(106.91)	(112.10)	yr 1 - yr 4
Total	(968.80)	(997.86)	(1,046.30)	

Operations phase (million USD, 1/1/2014)	P50	P70	P90	Timing
Maintenance costs	(6.00)	(6.30)	(6.66)	Annually
Long term maintenance costs	(80.00)	(84.00)	(88.80)	yr 15 & yr 45
	(160.00)	(168.00)	(177.60)	yr 30
Operations costs	(8.00)	(8.40)	(8.88)	Annually
Contract management and oversight costs	(3.00)	(3.15)	(3.33)	Annually
Pure risks	(2.55)	(2.68)	(2.83)	Annually

The T&R forecasts show an increase of real toll revenues of 4% per year.

### 5.1.4 Competitive neutrality

Competitive neutrality is the adjustment for the virtual advantages or disadvantages of the conventional approach over P3 approaches, and net competitive advantages or disadvantages accruing to a government business by virtue of its public ownership. These are discussed below.

1. The virtual advantages and disadvantages in the first category are virtual in nature because they are economically irrelevant from a macro perspective. Examples of this are differences in taxation (land or property taxes, local government rates exemptions, payroll taxes, corporate taxes) leading to higher costs for the P3 private entity which eventually translate into higher costs for the government. At the same time, a P3 may also lead to higher revenues if the private entity is able to charge higher toll rates than the government would.
2. Net competitive advantages or disadvantages accrue to a government by virtue of its public ownership. Examples of this are increased administrative requirements, reporting requirements or material requirements/legislation/regulation (e.g. building permits). One can argue that differences in requirements lead to differences in projects and/or project scope, hampering a fair comparison.

Competitive neutrality adjustment allows the PSC and shadow bid/actual bids to be compared on an equivalent basis and neutralizes any competitive advantages or disadvantages that the public agency maintains due to its unique status.

#### **I-13: Competitive Neutrality Adjustment**

Ms. Brown consults her tax advisor to determine the P3's Competitive Neutrality Adjustment for State and local taxes. They conclude that the SPV structure of the P3 indeed leads to additional State taxes that not only increase the bid, but equally increases revenues to the State. Instead of first including the State taxes in the shadow bid and then adjusting for this effect, they decide not to include the State taxes in the shadow bid.

They also decide on the procedure for the Competitive Neutrality Adjustment for the comparison of the PSC to the actual bids later on in the process. The procedure is that the bids will be adjusted for projected State taxes, as reflected in the financial models that the bidders will provide. To make sure that the financial models explicitly show this information, they decide to include this as a formal requirement for the financial bid.

There are two potential approaches for dealing with competitive neutrality with respect to taxes:

1. Adjust for competitive neutrality for tax obligations at the state level only: for example, in the case where a state is preparing a P3, the shadow bid/actual bid will be quantitatively adjusted for tax obligations levied on the private sector at the state level. Local and federal tax obligations may be qualitatively (or even quantitatively) addressed, but not included in

the adjustment. The perspective of the VfM analysis in this approach is that of the state taxpayer.<sup>5</sup>

2. Adjust for competitive neutrality for tax obligations at all government levels: for example, in the case where a state is preparing a P3, the shadow bid/actual bid will be quantitatively adjusted for tax obligations levied on the private sector on the local, state, and federal level. The perspective of the VfM analysis in this approach is that of the U.S. taxpayer, which is obligated to pay federal, state, and local taxes.

### 5.1.5 Financing costs

Many infrastructure projects carried out via conventional delivery methods are financed by bonds supported by project revenues, or supported by other specific or general public sector obligations. The extent to which financing is taken into consideration in the VfM assessment differs. Generally, there are two approaches:

1. Analysis based on operational cash flows. This analysis includes arrangement fees and underwriting fees, but not debt service.
2. Analysis based on financing cash flows. This analysis includes all financing cash flows, replacing the operational cash flows that are being financed.

The first approach with operational cash flows can only be used if the financing itself is not a discriminating factor in the VfM comparison. This may seem like an odd statement, because the financing costs in a conventional delivery method are often lower than those in P3 financing. But this is akin to “comparing apples to oranges”, because the financing costs of a P3 reflect the market pricing of part of the risk of the P3 project, whereas public financing reflects only the creditworthiness of the public agency or the risk of the cash flow that is being pledged.

The operational cash flow approach can be used if there is no reason to assume that the financing costs would be different for the public agency if it were to finance a project on the basis of the same risk profile as under a P3 approach. In other words, the financing itself does not result in a relevant difference in terms of VfM. This relates directly to whether or not to incorporate systematic and special purpose vehicle risks in the discount rate, which will be discussed later in **Textbox 7**.

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<sup>5</sup> Note that the perspective of the state taxpayer is different from the perspective of the agency, since the state corporate income taxes usually do not yield in additional funding flowing to the agency.

### **Textbox 2: Tax Exempt or Subsidized Debt**

A specific issue is how to deal with tax exempt or subsidized debt, for example with a Transportation Infrastructure Finance and Innovation Act (TIFIA) loan, in a VfM comparison. This requires an assessment of the extent to which the use of tax exempt or subsidized debt is a discriminating factor.

If tax exempt or subsidized debt can be applied in both the conventional and the P3 approach, this is not a discriminating factor and the first approach can be used; the issue does not require additional attention from a fair comparison perspective. However, if the use of tax exempt or subsidized debt is limited to only one of the delivery options, the first approach is not applicable and the comparison should reflect this difference. In line with the discussion on competitive neutrality, it is recommended to clearly indicate the (implicit) subsidy in the VfM comparison (the U.S. taxpayer's perspective). This can be done by calculating the difference in debt service on the basis of market based interest rates and tax exempt or subsidized debt.

The second approach, using financing cash flows, provides additional insight into budgetary consequences and ensures that most necessary inputs for the financial assessment are collected. If the financial cash flow method is used, assumptions must be made about the financing arrangements for the project. This can be discussed with the finance department of the public agency. This department can provide inputs on:

- ▶ Financing structure (direct loan, bonds);
- ▶ Interest rates and required return on capital employed, where appropriate;
- ▶ Drawdown and repayment schedules;
- ▶ Transaction fees (arrangement and advisory fees); and
- ▶ Other financing conditions such as:
  - ▶ Annual Debt Service Coverage Ratio (ADSCR);
  - ▶ Loan Life Coverage Ratio (LLCR); and
  - ▶ Project Life Coverage Ratio (PLCR).

The best way of simulating all of the financing cash flows is to build a model reflecting the financing structure. Instead of constructing a full-fledged financial model, a simple model may be used to derive the financing cash flows using operational cash flows and a weighted average cost of capital (WACC) or an average interest rate on debt.

#### **5.1.6 Timing and escalation**

The next step is to transform all inputs into cash flows. This means placing all of the costs, revenues, and risks on a timeline. Therefore the information required for all inputs is the timing and escalation index:

- ▶ The construction schedule, the timing of major maintenance, and the annual growth factor for toll revenues are the key inputs for the timing of the cash flows.
- ▶ For every cash flow one should determine whether escalation is expected, and if so, what the appropriate index should be.

Some further guidance with respect to determining appropriate indices:

- ▶ It is best to use forward looking indicators from indices. Some of the sources for these are:
  - ▶ Industry specific indices, such as the oil price index published by Energy Information Administration (EIA)<sup>6</sup>;
  - ▶ Regional consumer price index (CPI) publications for major metropolitan areas;
  - ▶ Forecasts prepared by the Congressional Budget Office (CBO) or other federal agencies;
  - ▶ The difference in yields between long-term government bonds, comparing those that are indexed to inflation and those that are not; and
  - ▶ CPI swaps.
- ▶ When there is no reliable projection for an index, a long-term historical average can be used as a starting point. This still requires an assessment of whether there are reasons to deviate from the historical average.
- ▶ Be careful not to make too many distinctions between different indexation categories, because that typically does not contribute to the reliability of the analysis.
- ▶ The indexation of revenues should not be higher than the (average) indexation of costs.
- ▶ The actual escalation will likely be different from the expectation, therefore it is recommended to include this as part of the sensitivity analysis (as discussed in subchapter 6.3).

The Statistical Abstract of the United States<sup>7</sup> is a very good source of “gateway” information that can be utilized here, including Consumer Price Indices (CPI). Also, Engineering News Record

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<sup>6</sup> [http://www.eia.gov/forecasts/aeo/er/early\\_prices.cfm](http://www.eia.gov/forecasts/aeo/er/early_prices.cfm)

<sup>7</sup> <http://www.census.gov/compendia/statab/>

(ENR)<sup>8</sup> publishes both a Construction Cost Index and a Building Cost index that are referenced by the construction industry.

### **I-13: Indexation**

The PSC for I-13 distinguished different costs and revenues and their indexation. Using national and local historic statistical data, the team prepares several indexations for multiple categories of costs and revenues. On the basis of analysis conducted with historical data, Ms Brown decides there is insufficient justification to use distinctive indexes. The 10-year historical average of the Consumer Price Index (CPI) is chosen as a proxy for indexation of all revenues and costs.

## **5.1.7 PSC Cash Flows**

All preceding steps lead to cash flows, reflected in a financial model. Preferably, the financial model:

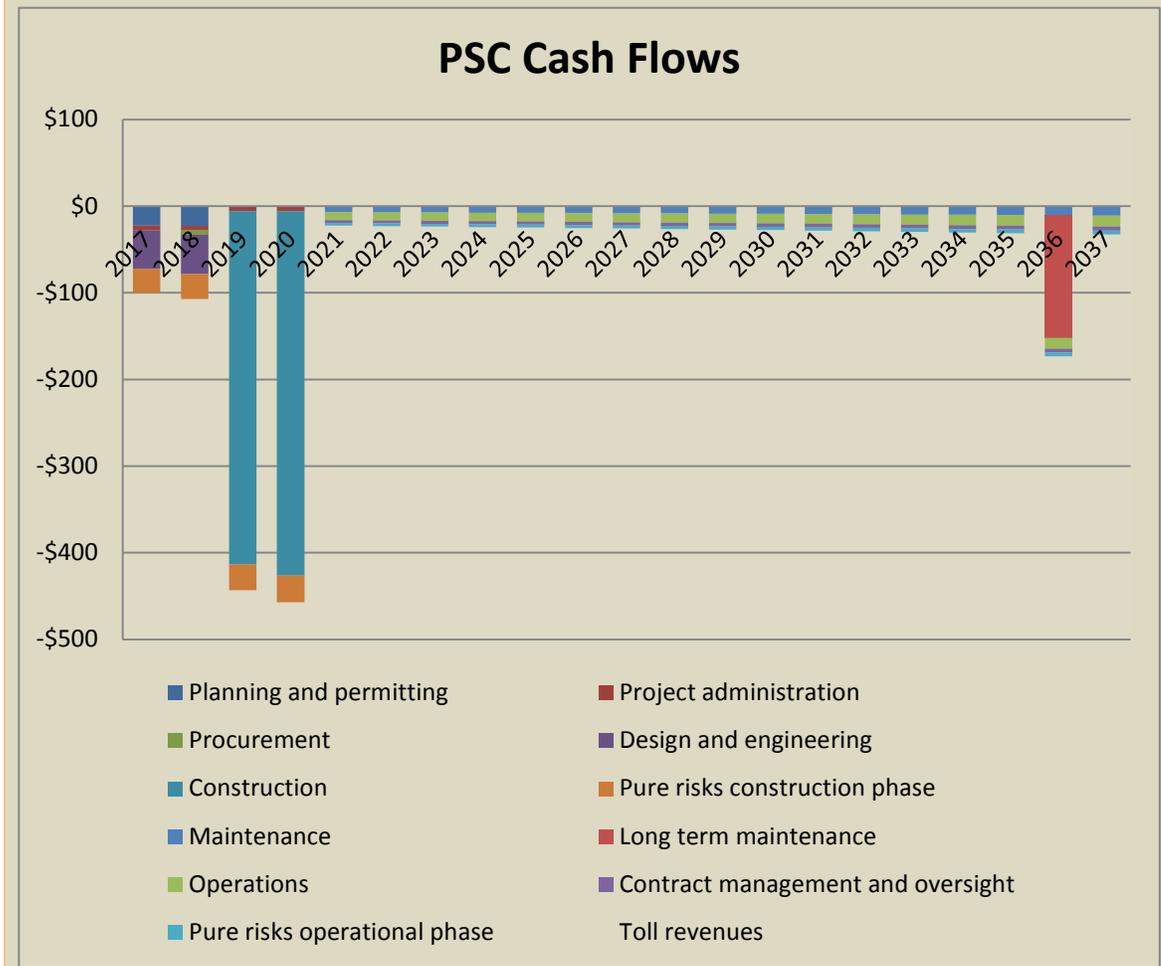
- ▶ Is flexible enough to deal with future changes;
- ▶ Provides graphs and indicators that facilitate decision making; and
- ▶ Reflects both the PSC and shadow bid in order to automatically update joint assumptions.

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<sup>8</sup> <http://enr.construction.com/economics/>

### I-13: PSC Cash Flows

The financial advisor of the I-13 project has developed a financial model reflecting the PSC cash flows. One of the outputs of the financial model is the following cash flow profile.



## 5.2 The shadow bid uses the PSC input, but reflects differences based on the P3 approach

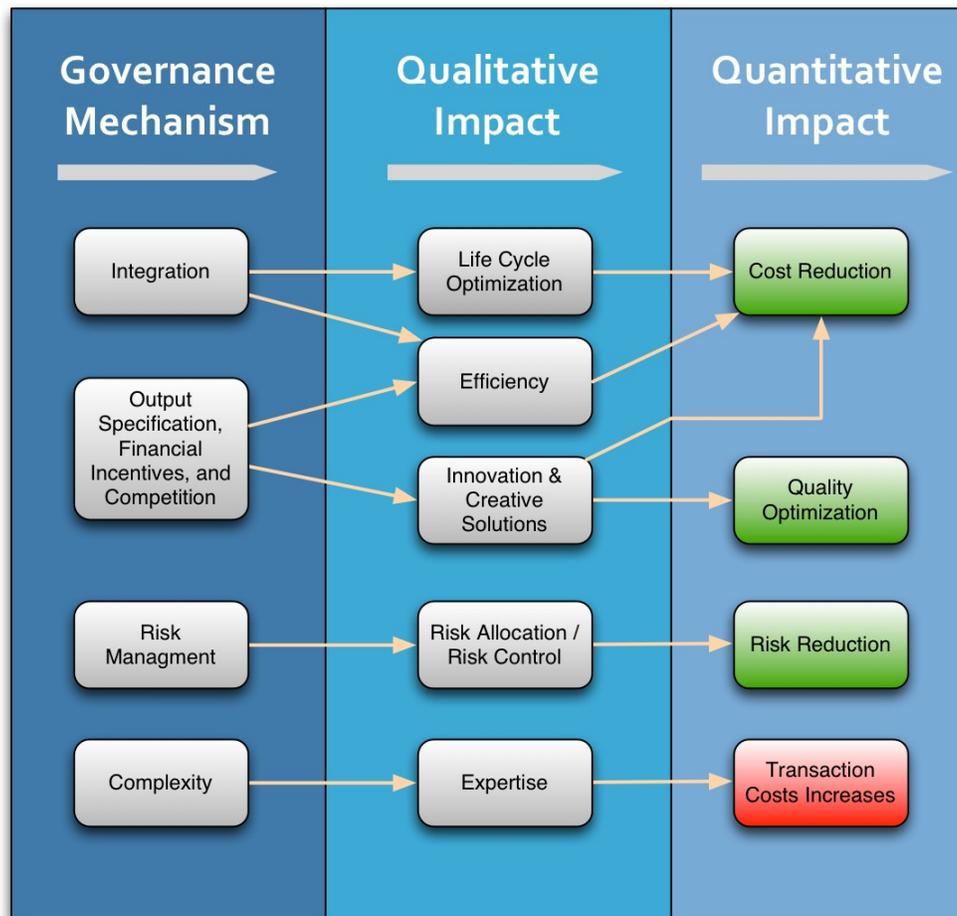
The shadow bid is defined as the estimated cost to the public agency if the project would be delivered under a P3. The cost, revenue, and risk estimates in the PSC are used as starting points for the inputs in the shadow bid. The qualitative assessment, which addressed to what extent a P3 is expected to lead to differences in cost, revenue, and risk, is now translated into a quantitative assessment.

The shadow bid should cover the same scope as the PSC. In order to create a shadow bid that is comparable to the PSC, it should be adjusted for the costs, revenues, and risks that are retained by the public agency. These include transaction costs, public oversight costs, and retained risks, and

they must all be taken into consideration. In fact, the shadow bid is not just a shadow bid; it is an estimation of *all* costs, revenues, and risks for the public agency, including the expected bid price.

In developing the shadow bid, the differences between governance mechanisms discussed in the qualitative analysis are now translated into quantitative effects.

**Figure 5-2: Drivers of Financial Impacts**



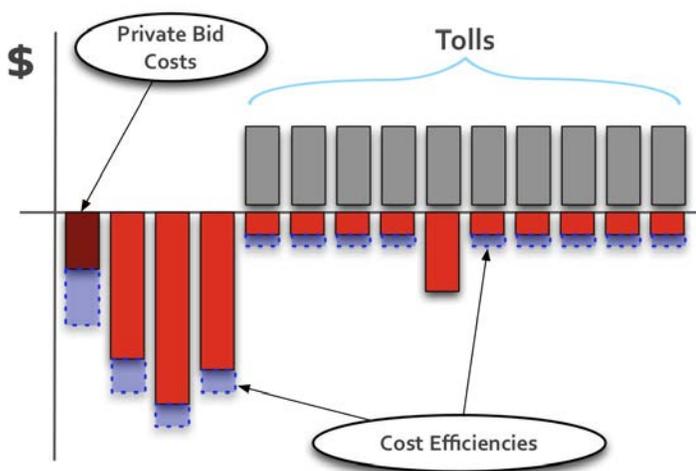
Because we already have the PSC inputs, this part of the analysis focuses entirely on the expected differences between a P3 and the conventional approach reflected in the PSC. These may include:

- ▶ Private sector efficiencies;
- ▶ Risk adjustments;
- ▶ Differences in toll revenues;
- ▶ Higher transaction costs;

- ▶ Different tax structures; and
- ▶ Different financing structure.

### 5.2.1 Private sector efficiencies

Figure 5-3: Private Entity Cash Flows



The project-specific qualitative analysis is now used to estimate the quantitative difference between the P3 and the conventional approach. This requires an understanding of the project characteristics, expert opinions, and reference materials consisting of evaluations and scientific research on VfM. It is recommended to apply a bandwidth of potential outcomes instead of a point estimate, reflecting the uncertainty with respect to this monetization of expected differences.

### Textbox 3: Dealing with timing differences <sup>9</sup>

One potential difference between a conventional approach and a P3 is the timing of completion. P3 procurements typically run longer than traditional procurements. On the other hand, the financial incentives imbedded in a P3 contract often lead to more timely and earlier completion than under a conventional delivery method. Considering this, without further adjustment the potential acceleration of the project will lead to several effects:

- ▶ Lower NPV of construction costs due to lower time based (indirect) costs and lower impact of inflation;
- ▶ Higher NPV of construction costs due to the front loading of these costs;
- ▶ Higher NPV of revenues due to the front loading of revenues; and
- ▶ Higher NPV of availability payments due to the front loading of these payments.

Depending on the extent to which the acceleration is valued, the NPV calculation can be neutralized for these effects. For example, if early completion leads to a higher availability payment that is not fully recovered by higher revenues, the public agency may still want to stimulate early completion because of the beneficial social effects. For comparison purposes, the government may therefore look at the different cash flows as if completion happens at the same time, or even reward early completion in the comparison.

A distinction between earlier completion and more certainty about timely completion can be made. The following are typical ways of dealing with expected differences in timing of completion:

1. Require completion on the same specified date in all delivery methods, so that the scope of all delivery methods is directly comparable. The cost estimates for both the PSC and shadow bid should then reflect everything that is needed to achieve that completion date.
2. Allow for differences in timing of completion, but then neutralize the NPV effects of these differences for the purpose of comparison. This is accomplished by assuming the exact same completion date in the calculations, whereas in reality the dates are different.
3. Use same approach as approach 2, but combine it with a bonus for early completion, reflecting the social benefit of early completion (for example, expressed in a value per day)

If the chances of achieving any specified completion date are better in a P3 solution, that aspect can be either qualitatively discussed or quantified on the basis of a probability analysis. In the latter, the probability distribution of a potential completion date can be developed, reflecting a wider distribution for the conventional approach. On the basis of an acceptable confidence level and the value of early completion per day (based on cost savings of time-based costs and additional revenues per day), the value of this effect can be quantified.

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<sup>9</sup> This guidebook focuses on financial effects and qualitatively discusses non-financial and socio-economic effects. FHWA is developing further guidance based on Benefit-Cost Analysis for quantitative assessment of these effects in the context of a VfM assessment.

## 5.2.2 Risk adjustments

The P3 delivery method features a larger transfer of risks to the private entity; therefore there will be a difference in retained risk and transferable risk between the P3 and the conventional delivery. Not only is the allocation different, but the valuation changes as well. For the risks actually transferred to the private sector, a lower valuation of these risks is expected through better risk management due to stronger financial incentives.

The extent to which that applies to the project depends on the project's characteristics as further analyzed in the qualitative analysis. The assumptions with regard to risk adjustments should always be supported by project-specific analyses. Because the private sector explicitly values risks and uncertainties - and also expresses a portion of the risks in the cost of capital - the values of these risks are visible, whereas they often remain hidden in the conventional delivery method. One should be careful not to hastily conclude that the risk transfer to the private sector is more expensive because of this transparency; checks should also be made to determine whether the market price is fair and not unrealistically high.

In P3 contracts many of the risks are transferred to the private entity. In fact, the starting point is to assume that the private entity is responsible for all risk unless the contract states differently. Typical risks retained by the government in P3 contracts are:

- ▶ Scope changes initiated by the public agency;
- ▶ Delays caused by the government;
- ▶ Right-of-way acquisition; and
- ▶ Force Majeure.

In availability payment transactions, the payment often is based on the calculated availability payment and an indexation formula. The indexation formula effectively allows the private entity to transfer the indexation risk back to the public agency.

The relief, compensation, or delay events in the P3 contract define the retained risks in greater detail. It is recommended to use this for further detailing the allocation between retained, transferred, and shared risks.

### I-13: Risk adjustments

The risk allocation was determined in the scoping and definition phase (as described in 3.3). A thorough analysis of the risk allocation leads to the conclusions that:

1. In both the availability P3 and toll concession P3 contracts 70% of the pure risks in the construction phase are transferred to the private entity, in comparison to 25% under a DBB contract. These will be treated as such in the shadow bid calculation, whereas the remaining 30% is included as retained risk.
2. For the operational phase the equivalent percentage is 60% (in comparison to 10% under a DBB contract).
3. All of the regular uncertainties (100%) that are related to costs transferred to the private entity are transferred as well.

Due to better risk management capabilities of the private entity and financial incentives to effectively do so, this leads to efficiencies, as noted below for risks 14-21:

		$\Delta$	Justification
14	Toll authorization procedure delayed.	0	Risk allocation remains the same (retained).
15	Governor decides to change scope because of local interests.	0	Risk allocation remains the same (retained).
16	Cost increase because of rising oil prices.	-\$ 2.2 M	The private entity will effectively hedge this risk by long term agreements with subcontractors (transferred).
17	A concrete truck hits a construction worker.	0	Risk allocation remains the same (transferred).
18	Vandalism during operational period.	-\$ 1.4 M	The private entity now has the incentive to minimize this risk. Therefore, the consortium will choose vandalism proof materials in the design stage and will carry out a strict enforcement policy in cooperation with local authorities (transferred).
19	Leakage in excavation for tunnel during construction.	-\$ 0.6 M	It is expected that the private entity will choose a design solution that will minimize the leakage risk (transferred).
20	Decision makers unavailable during election period.	0	Risk allocation remains the same (retained).
21	Uncertainty in cost estimates due to preliminary stage of design.	0	The private entity has the incentive to minimize this risk (transferred).

Particularly on the general risks that are related to life cycle responsibility, for example design errors and construction – maintenance interface risks, it is expected that the mechanisms in the P3 agreement will incentivize the private entity to do a better job of risk management. Overall, the expected saving on transferred pure risks in the construction phase is 7.2% and in the operational phase it is 4.7%.

### 5.2.3 Toll revenue differences

The starting point for determining the toll revenues in the shadow bid is the toll revenues in the PSC. In a toll concession P3 the revenue risk is transferred to the private entity. This incentivizes the private entity to maximize toll revenues. Keeping this in mind, one of the most important

governance mechanisms is rate setting. The extent to which the private entity has the freedom to set toll rates largely determines the expected additional toll revenues, and this must be assessed on a project-specific basis. A P3 may also lead to smaller innovations, for example with improved access points to the managed lanes, thus helping to increase demand and revenue. In general, the expectation is that the private entity will not significantly increase toll revenues, but can sometimes make a difference. Whereas the scope of the P3 is the same as the scope of the PSC, this can lead to differences in cash flows.

#### I-13: Toll revenues

The team extensively discussed the likelihood of the P3 operator generating more toll revenues. The team had access to some data from previous projects, but these did not convincingly show increases in revenues due to a P3. The team decides not to include increased toll revenues in the shadow bid base case, but will include increased toll revenues in the sensitivity analysis.

### 5.2.4 Greater transaction costs

P3 contracts are more complicated and create additional transaction costs compared to the conventional approach. These additional costs consist of:

- ▶ Costs of determining the output specifications for the project. The change from defining detailed technical specifications to defining output specifications - focusing on the objectives and leaving much more room for creativity and alternative solutions - often proves challenging, time consuming, and costly.
- ▶ Costs of developing a P3 contract. Each project is unique and requires a project-specific P3 contract. Of course, standard contracts and guidebooks can prove very useful and save resources, but the specific tailoring is still time consuming and creates increased transaction costs. Due to the fact that the specific legal, financial, and technical expertise required is scarce and experience is limited, portions of this effort often require outsourcing.
- ▶ The procurement of a P3 contract is more complex and involves more communication and negotiations with the bidders. This also requires legal and financial expertise, both from the public and the private entity. As P3s become more mainstream, the cost of this expertise should decrease.
- ▶ In most P3 procurements, more design activities are transferred to the market. Typically, public agencies do less design and engineering in the project preparation, to encourage efficient and novel solutions by bidders. Design and engineering solutions may even be an important part of the evaluation criteria. Also, the bidders will have to prepare designs in order to develop the reliable cost estimates they need for submitting a committed bid. Depending on the number of bidders, multiple designs will be made during the procurement, saving the public entity money on design costs. *Note that the private transaction costs are only reflected in the VfM comparison to the extent that they lead to a*

*higher expected bid or higher public costs. Uncompensated transaction costs by losing bidders from this perspective are irrelevant, although they do influence the market appetite for P3s in general.*

- ▶ P3 contracts involve project finance. Since the financing costs are a determining factor in any bid, bidders often spend a great deal of time and money structuring and arranging a project finance solution. Also, the financing requires legal, financial, and technical due diligence for the project and the contract. These costs are typically higher in a P3 than in a conventional financing solution.
- ▶ The governance mechanisms in the P3 contract will lead to more active monitoring by the private entity, but also by the financiers and insurance companies. This results in additional oversight costs. Monitoring by the public agency is also typically higher in early P3 transactions, but can become lower than in a conventional delivery method if there is enough P3 deal flow with similar projects.

The project specific estimate of additional transaction costs largely depends upon:

- ▶ The maturity of the P3 market;
- ▶ The complexity of the project; and
- ▶ The duration of the procurement.

### I-13: Private sector efficiencies

In the quantitative analysis workshop the team comes up with the following expectations with respect to private sector efficiencies and transaction costs in the availability payment P3 model.

Construction phase	$\Delta$	Justification
Planning and permitting	0	On the basis of previous projects, the team concludes there is no reason to assume significant differences between P3 and a conventional approach with respect to planning and permitting.
Project administration	+ \$ 2 M	Because this is one of the first P3s, the team expects higher monitoring and contract management cost. The team expects this number to be lower for future projects.
Procurement	+ \$ 7.5 M	On the basis of previous projects, the additional procurement costs due to the complexity of the P3 contract and the additional design activities during procurement, are estimated at \$ 3.5 M for PDOT and \$ 4 M for the private entity.
Design and engineering	0	The team expects innovative design solutions, but not lower design costs.
Construction	-15%	On the basis of experiences in previous projects, the team expects significantly lower construction costs, because of the financial incentives in the procurement and the P3 contract in combination with output specifications, leading to design innovations and life cycle optimizations.
Pure risks	-7.2%	The team expects slightly lower pure risks, because 1) the private entity is better able to manage some of the risks that are now transferred and 2) the financial incentives will lead to better risk management by the private entity.
Operations phase	$\Delta$	Justification
Routine maintenance	-20%	On the basis of experiences in previous projects, the team expects significantly lower operations and maintenance costs, because of the financial incentives in the procurement and the P3 contract in combination with output specifications, leading to design innovations and life cycle optimizations.
Long term maintenance	-15%	
Operations	-10%	
Contract management and oversight	+ \$ 2 M	The team expects additional contract management and oversight costs due to the complexity of the P3 contract of about \$ 2 M per year.
Revenues	0	The team does not have any reason to assume differences in revenues between the conventional approach and the P3 approach.
Pure risks	-4.7%	The team expects slightly lower pure risks, because 1) the private entity is better able to manage some of the risks that are now transferred and 2) the financial incentives will lead to better risk management by the private entity.

#### 5.2.5 Different tax structure

P3s require varied organizational and legal structures for the private entity. Typically, the private entity is a special purpose vehicle (SPV) with various subcontracts with companies carrying out components of the project, and with financing agreements reflecting the project finance structure. The organizational and legal structure of the SPV leads to additional tax obligations. On the subcontractor level there are also tax obligations, but these are similar or equal to the tax

obligations in a conventional approach and are often assumed to be implicitly included in the cost estimates.

Depending on the tax treatment decision as discussed in the competitive neutrality section, the estimate of tax obligations can be either more or less significant in the VfM assessment. The precise estimation of tax obligations requires the development of a full-fledged financial bid model. This can be time-consuming and costly. As a fair approximation of the expected tax obligation, benchmark information from bids on similar projects can be used. A simple metric reflecting the effective tax pressure in previous deals – for example using a market based pre-tax return on equity rather than a post-tax return on equity – can be a fair indication.

#### **Textbox 4: Calculation of indication of effective tax pressure**

An indication of the effective tax pressure can be calculated as follows

1. Calculate the equity distributions on the basis of a pre-tax Equity IRR as experienced in other transactions
2. Calculate the equity distributions on the basis of a post-tax Equity IRR as experienced in other transactions
3. Deduct the cash flows as calculated under #2 from the cash flows as calculated under #1

The result of #3 is the indication of effective tax pressure.

### **5.2.6 Different financing structure**

As described in 5.1.5, the extent to which financing is taken into consideration in the VfM assessment can differ. If the VfM assessment is based on operational cash flows (approach 1), the financing is not relevant. If the VfM assessment is based on financing cash flows (approach 2), the shadow bid should reflect the financing structure and conditions. The best way to do this is by building a simulated financial bid model. Typically, the most important part of the financial bid model is the financing structure, which can be extremely large and complicated.

Instead of building a full-fledged bid model, one can also use a simplified model based upon operational cash flows using a market-based weighted average cost of capital (WACC) to reflect the financing section of the bid. This approach is particularly the viable during earlier stages of the project. It still requires a calculation of the project-specific WACC, but is much easier than developing a full-fledged bid model.

### Textbox 5: Market-based WACC

What is needed for determining a good estimate of a market-based WACC:

- ▶ Project-specific information:
  - ▶ Capital Expenditures (CAPEX) and construction schedule;
  - ▶ Operations and Maintenance (O&M) costs and the timing of major maintenance; and
  - ▶ Repayment schedule (based on revenue projections).
- ▶ Market-based information:
  - ▶ Expected financing structure and facilities;
  - ▶ Duration of financing facilities;
  - ▶ Interest rates for respective facilities; and
  - ▶ Required return on equity.

On the basis of this information, a financing expert determines the expected overall WACC of the project (reflecting changes in capital structure over time) by building a simple Microsoft Excel model, which in turn can be used to calculate the bid. A way to validate this approach is to determine the WACC for an existing bid in this simplified manner and then compare the actual bid price received to the calculated bid price with this estimated WACC.

The WACC should exclude any taxes, meaning that it should be based only on a post-tax Equity IRR that does not take into account any benefits of the tax shield arising from interest expenses. In the shadow bid, the taxes still to be included are in a separate cash flow. All other uses of the WACC as described in this guidebook require a WACC excluding taxes.

It is important to realize that a substantial portion of the project risk profile is reflected in the WACC. Risks that are subcontracted are not included, but the risks that are explicitly or implicitly retained by the SPV – typically systematic risk categories (inflation, interest rate, and toll risk) and risk categories that are associated with the long-term and integrated characteristics of the contract (long-term performance risk and project coordination risks). This needs to be carefully taken into consideration to avoid double-counting, and for consistency when comparing the PSC to the shadow bid/actual bid. For instance:

- ▶ If the cash flows of a project include an interest rate swap, transferring the variable interest rate risk to a swap counterparty will result in higher cash flows, because the interest rate will now include a premium for the swap transaction. The interest rate risk is now valued in the cash flows and should no longer be reflected in the discount rate. This means that the discount rate should now be based on a floating or variable risk base rate, not a fixed rate.
- ▶ If the WACC reflects the toll revenue risk, the toll revenue cash flow should be based upon the P50 forecast (expected value). If the P90 toll revenue forecast (which is lower) is the starting point, using a WACC reflecting the toll revenue risk would be considered double counting and would lead to an even lower NPV. This means that the

discount rate should not include a risk premium for toll revenue risks, if P90 toll revenue forecasts are included in the cash flows.

### I-13: Determining the WACC

For the Availability Payment P3 deal the expected project finance structure consists of 85% debt at a 4.7% blended interest rate – the TIFIA loan and private activity bond (PAB) solution -- and 15% equity at a 14% blended required return after tax (pure equity and subordinated debt). The team calculates a simple average cost of capital of 6.1% ( $85\% \times 4.7\% + 15\% \times 14\%$ ).

The financial expert makes a somewhat more sophisticated calculation in a simple financial model, reflecting:

- ▶ Changing gearing (percentage equity / debt) over time
- ▶ A sculpted repayment structure (following operational cash flows)
- ▶ Other financing conditions (PLCR, DSCR, debt tail, reserve accounts)

On the basis of this calculation, the WACC is 6.7%. The financial advisor confirms that this is in line with similar deals in the current P3 market.

In general, this approach is a fair proxy. Developing a full bid model is very time consuming and costly, and is based on an even greater number of assumptions than the simplified method. In the early stages of the project, it is recommended to keep these calculations as simple as possible. Because of the high amount of uncertainty, and the numerous assumptions that must be made, a very detailed approach will lead to false precision and would not contribute to a better understanding of the expected VfM and the differences between P3 and a conventional approach.

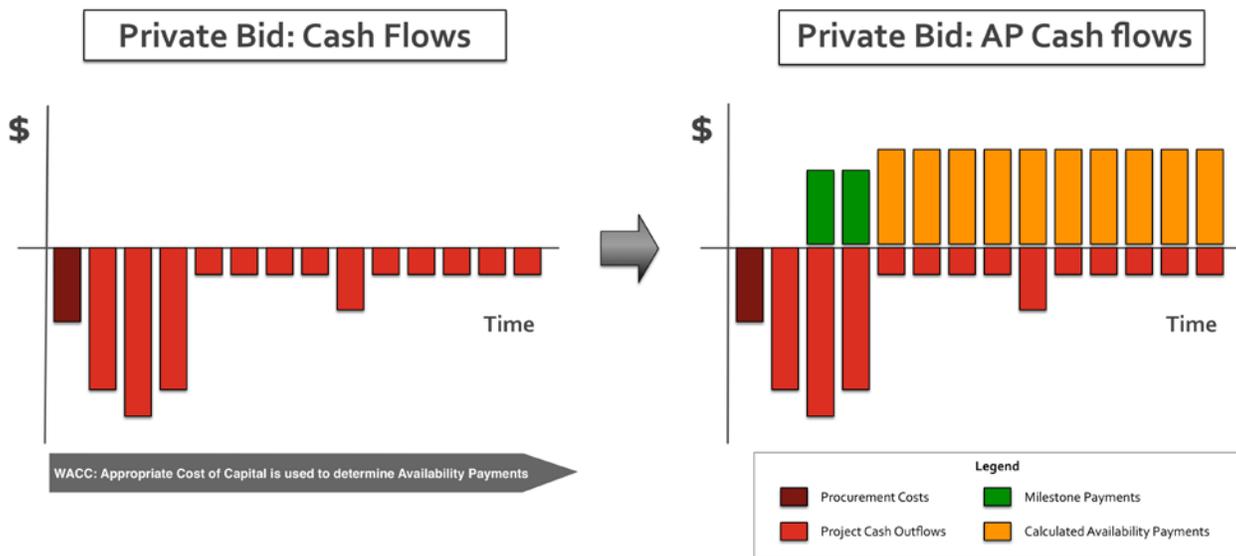
### 5.2.7 Shadow Bid Cash Flows

The calculation of the expected private bid focuses on the scope of activities and risks of the private entity. The bid – either a periodic availability payment or a different payment structure – can be calculated by determining which payments are needed to meet all of the costs of capital obligations. There are different ways to calculate this:

- ▶ Goal seeking of a bid price that results in the required Equity internal rate of return (IRR);
- ▶ Goal seeking of a bid price that results in a Project IRR equal to the overall project WACC; and
- ▶ Goal seeking of a bid price that results in an NPV of zero, if discounted on the basis of the overall project WACC.

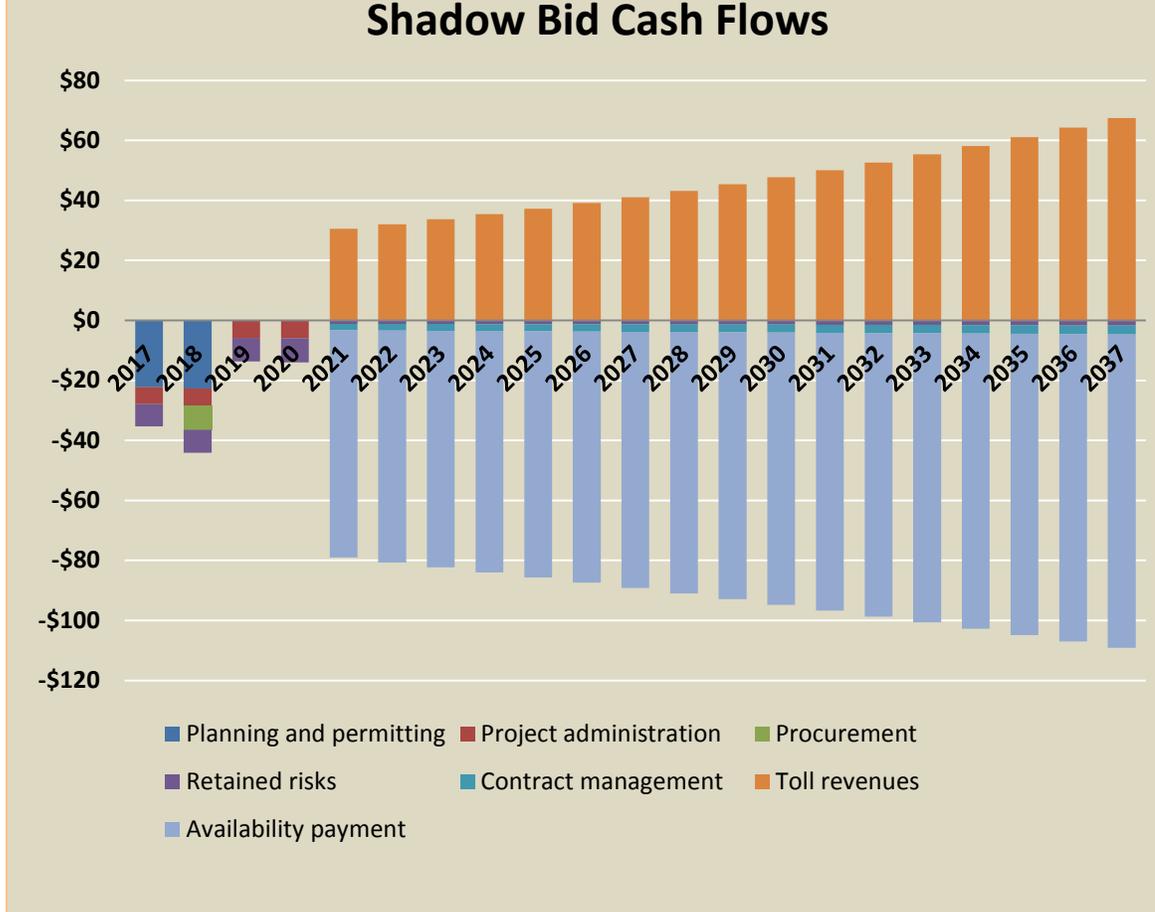
In addition to the expected bid by the private entity, the shadow bid financial model also reflects the costs and risks retained by the public agency. Figure 5-3. Calculating Availability Payments, shown below, provides an example of cash flows over time.

Figure 5-3. Calculating Availability Payments



### I-13: Shadow Bid Cash Flows

The financial advisor of the I-13 project has developed a financial model using the Shadow Bid cash flows. One of the outputs of the financial model is the following cash flow profile for the Availability Payment P3:



### 5.3 Once the actual bids are received, they can be compared to the PSC

During procurement, the actual bids are received. Because the shadow bid is a proxy for the actual bid, these actual bids can now be compared to the PSC to assess VfM. However, the actual bids require specific adjustments to incorporate the same information contained in the PSC. These adjustments are the public agency costs – for example procurement and contract management – and the retained risks by the public entity. In so far as the allocation of costs and risks are equal to the assumptions in the shadow bid, then the same values for these may be used. If the allocation of the costs and risks has changed, or if the bidders were allowed to vary this allocation, then a specific adjustment is needed in the PSC or the actual bid.

### 5.4 Process, timing, information, and expertise needed

The most important inputs for the quantitative analysis are cost estimates, revenue projections, risk assessment, and financing assumptions. This means that the quantitative analysis can only result in meaningful results once these key inputs are available. A large portion of the quantitative analysis is carried out by financial advisors, Traffic and Revenue (T&R) consultants, and cost estimation experts. Also, developing financial models requires specific modeling skills.

This relates to another topic, that of objectivity. In some cases VfM assessment may be viewed as a black box or – even worse – as a manipulative instrument. As the purpose of the VfM assessment is to provide neutral and objective information for optimal decision-making on delivery methods, objectivity is paramount – particularly in the quantitative assessment. Some techniques to safeguard this objectivity are:

- ▶ Focusing on getting high-quality individual building blocks, then putting everything together into the overall calculation;
- ▶ Checking all of the assumptions and the reasonableness of the outcomes in a session with the full VfM team; and
- ▶ Organizing an independent review by an expert who has not been involved in the development of the VfM assessment.

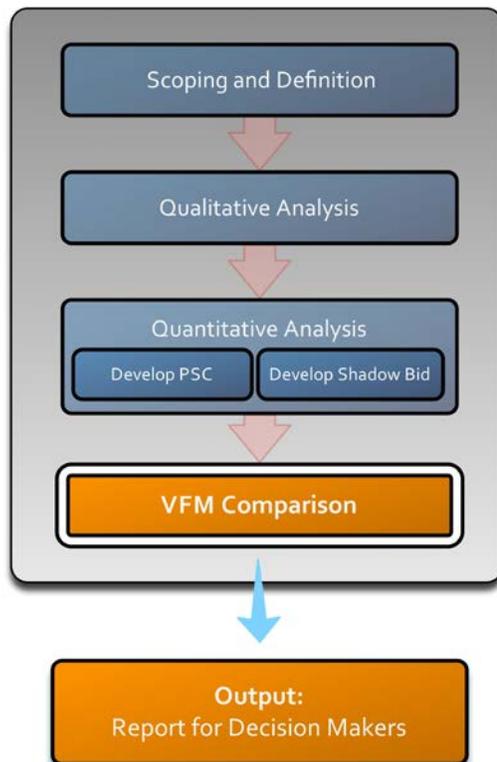
Although most elements of the quantitative analysis require specific expertise, it is important to include the other VfM team members in this step to create a common ground for conclusions on the basis of this assessment. Since the qualitative analysis will now be “translated” into real numbers, it is important that the team is capable of recognizing these numbers. Therefore, it often proves useful to organize a separate session with the VfM team to discuss the preliminary results. In this session all of the quantitative assumptions will be assessed, and typically the greatest attention will be focused on the quantitative differences between the PSC and shadow bid.

## **5.5 Output: The quantitative analysis results in two cash flow calculations**

The quantitative analysis results in two cash flow projections. Additionally, it is recommended to describe the key assumptions and outcomes in a memorandum that will eventually become a chapter in the VfM assessment report.

## 6 VfM comparison

Figure 6-1. VfM Comparison



### 6.1 Ensure that the PSC can be compared to the shadow bid

To make a fair VfM comparison between the PSC and the shadow bid (or an actual bid), it is important to undertake an “apples to apples” comparison. Figure 6-1 displays the VfM process and shows the output, a report for decision makers. Some of the typical distortions that occur when attempting to make a fair comparison were discussed in detail in **chapter 5**. Most importantly, it is essential to do the following:

- ▶ The shadow (or actual) bid should be adjusted for the risks and costs retained by the public agency;
- ▶ The appropriate competitive neutrality adjustments should be applied; and
- ▶ The project scope and risk profile should be reflected in both the PSC and shadow bid.

As indicated before, both the PSC and shadow bid may require continuous updates because of changes to the scope and risk profile throughout the project’s preparation and procurement. It is

important that the comparison remains fair; for example this means that the PSC is not adjusted for innovations and specific solutions that the P3 bidders come up with (innovations that were never considered in the conventional approach). In order to control the change process and prevent the VfM assessment from becoming a “black-box”, agencies can develop a change protocol when the first VfM assessment is conducted. A change protocol defines the list of issues that the PSC and shadow bid can be adjusted for after the initial assessment. Examples include:

- ▶ Changes in scope as reflected in the P3 contract;
- ▶ Changes in risk allocation as reflected in the P3 contract;
- ▶ Changes in discount rates and WACC, due to changes in financial markets; and
- ▶ Errors and omissions.

A related issue is to decide whether the VfM assessment will be used for decision-making purposes at that specific point in the procurement process, or if it should be used as a pure VfM assessment based on the overall project, regardless of timing. The following textbox elaborates the relevance and consequences of this distinction.

#### **Textbox 6: Timing of the VfM assessment**

There is a distinction to be made between VfM assessments for decision-making purposes at the moment of contract award, and overall VfM assessments made regardless of timing:

- ▶ The first (at contract award) does not take into account “sunk costs” because these are not relevant to the decision of whether or not to continue the P3 procurement. These sunk costs are the transaction costs made prior to the point in time of the VfM assessment.  
*Example: is it more attractive to continue the P3 procurement now or stop the procurement and take the conventional route?*
- ▶ The second type of assessment includes all sunk costs (and cost differences) throughout the entire project.  
*Example: would it be more attractive to procure a P3 contract or a conventional contract if we were examining the options from the beginning of the process, which would include all conventional and P3-related transaction costs?*

Therefore, when timing is taken into consideration, one must clearly determine the exact question that the VfM assessment is answering.

## **6.2 Calculating the net present value of the cash flows**

Financial theory states that a dollar tomorrow is not the same as a dollar today. Consequently, in order to determine the value of any delivery method, the cash flows over time cannot simply be added together. To correct for time and risks, a discount rate is used. This method is called *net present value analysis* and can be calculated using a spreadsheet program such as Excel (*see Appendix 2 for further guidance on determining a discount rate*).

This discount rate is applied according to the formula:

$$NPV = \sum_{t=0}^T \frac{CF_t}{(1+r)^t}$$

Where:

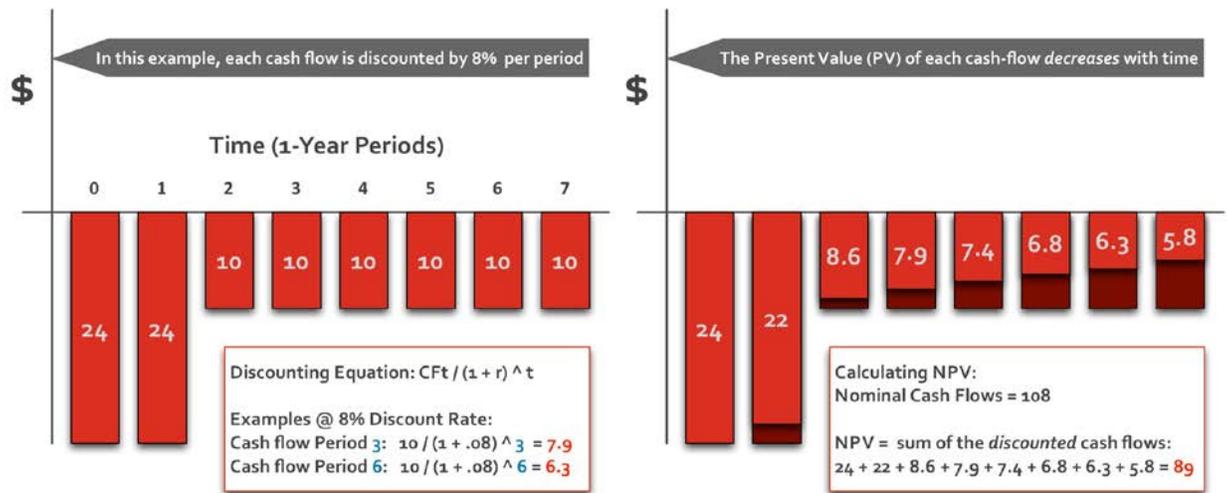
$NPV$  = Net Present Value

$t$  = time

$CF_t$  = cash flow at a certain point in time ( $t$ )

$r$  = discount rate

Figure 6-2. Visualizing the Time Value of Money and NPV Calculation



There are two potential discount rates in a VfM assessment:

1. Risk free discount rate
  - a. This discount rate is often based on financing costs of government or municipal bonds. If this discount rate is used in a PSC, project risks are not included in the discount rate and are accounted for in the project cash flows. In this context, “risk free” means “not including project risks,” i.e., the discount rate reflects the risk associated with the creditworthiness of the public agency. This discount rate is recognizable and very easy to determine. The challenge in using this discount rate is that the project-specific risks in a P3 approach that are typically included in the risk premium (as equivalently reflected in the WACC) must now be explicitly priced in a different way.
2. Discount rate with project-specific risk premium

- a. A discount rate with a project-specific risk premium reflects the risk profile of the cash flows. In project finance deals the financing costs reflect the risk profile of a project, which is why this discount rate is market-based. To use market-based information on the cost of capital one should carefully analyze the way the private bidder structures its organization and allocates and values risks (see the following textbox). This discount rate is in line with the private sector approach to risk valuation. The challenge in using this discount rate is that determining a reliable rate is more difficult, and can result in extensive debate or criticism of this methodology.

#### **Textbox 7: Special Purpose Vehicle and Weighted Average Cost of Capital**

In a P3 transaction, the government transfers a set of tasks and risks to a Special Purpose Vehicle (SPV), a project entity that is established for the sole purpose of entering into a P3 contract with the public agency and delivering the services as described in the contract. Risk pricing follows the organizational structure of a P3 SPV. Most of the risks are typically subcontracted out by the SPV and are therefore reflected in the cash flows of the bid. Some of the risks are explicitly or implicitly retained by the SPV (for example, through caps on liabilities in subcontracts). These risks not only include the typical systematic risk categories (e.g., inflation, interest rate, and toll revenue risk) but also other risks that cannot be subcontracted and that are associated with the lengthy and integrated characteristics of the contract: long-term performance risk and project coordination risks. The financiers -- both debt and equity -- incorporate these risks in their required rates of return, as reflected in the project's weighted average cost of capital (WACC). This WACC will be higher than the government's discount rate, because there are more and greater risks to the SPV that are accounted for. The precise risk allocation needs to be carefully taken into consideration to avoid double-counting and to provide consistency when comparing the PSC to the shadow bid/ actual bid.

In the PSC, systematic risks, long-term-performance risks, and project coordination risks are typically retained by the public agency. Across the world different jurisdictions have found four ways of dealing with these categories of risks, resulting in the use of different discount rates.

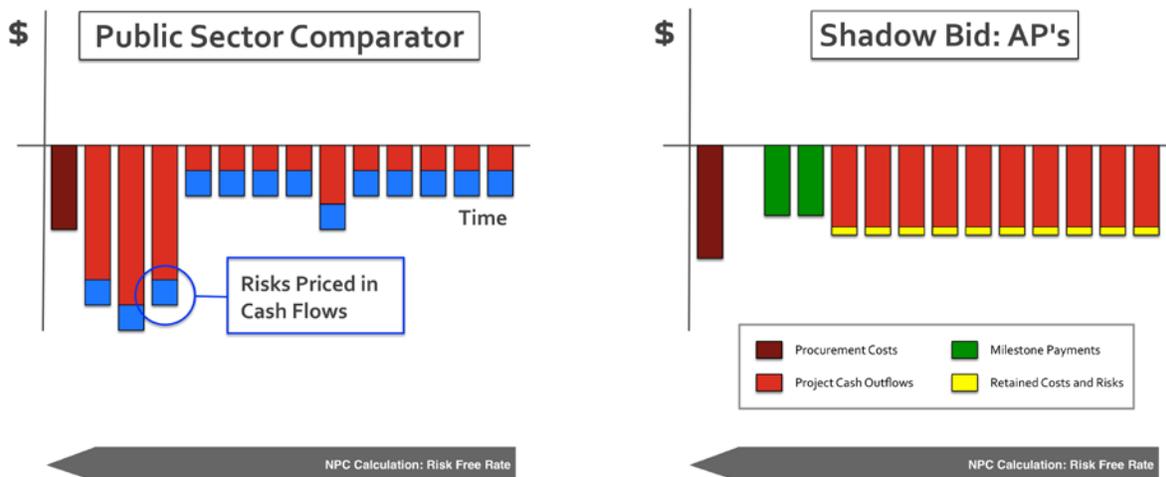
#### **Approach 1: Value the risks in the cash flows**

Valuing risks in the cash flows of the PSC means using the appropriate theoretical and market-based valuation methods to incorporate all risks in the cash flows of the PSC, not in the discount rate.<sup>10</sup> In the shadow bid the appropriate cost of capital will be used to reflect the value of the same risks. The Net Present Value (NPV) of both cash flows – PSC and shadow bid – are calculated on the basis of a risk-free discount rate. Figure 6-3. Pricing Risk in Cashflows, shows an example of risks being incorporated into cashflows for the public sector comparator.

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<sup>10</sup> The concepts of net present value and discount rates are further explained in subchapter 6.2.

Figure 6-3. Risks Priced in Cashflows

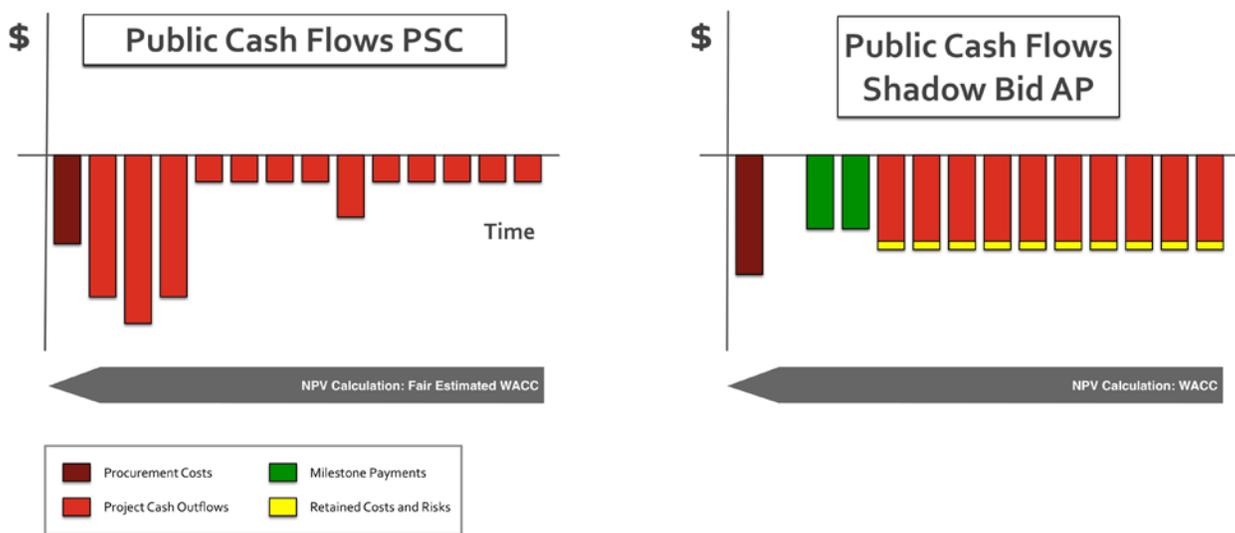


#### Considerations:

The advantage of this method is that - in theory – it is straightforward and easy to understand. However in practice the valuation often proves to be very complicated, particularly with regard to the valuation of typical SPV coordination and interface risks - categories associated with the long-term and integrated characteristics of the contract. This can threaten a fair comparison with the shadow bid.

#### Approach 2: Use a market-based discount rate

In this approach the risks in this category are valued in the PSC by applying a market-based discount rate for the NPV calculation. This uses a fair estimate of an appropriate discount rate reflecting SPV risks for discounting all cash flows, based on market information on the weighted average costs of capital (WACC) of similar projects. Since these similar projects include both costs and revenues, the use of a single discount rate – as opposed to multiple discount rates for separate cash flows – may be justified. In the shadow bid the appropriate cost of capital will be used to reflect the value of similar risks. The discount rate that is based on the WACC is also used for calculating the NPV of the shadow bid.

**Figure 6-4. Market-Based Discount Rate**

**Considerations:**

This approach is more difficult to understand and explain than approach 1. However, the advantage of this approach is that there is market-based information available for risk pricing, and the risks are priced in the same way in both the PSC and the shadow bid, making them directly comparable. Using this approach with solely negative cash flows (as in an availability payment project) may lead to counterintuitive results: a higher discount rate leads to a better outcome. Also, this effect hampers the link with the financial viability assessment. Additionally, public costs and costs of risks retained by the public agency under the P3 option may be inadvertently (and inappropriately) discounted using the higher WACC-based discount rate, so special care must be taken to ensure that this does not occur. Figure 6-5. Comparing PSC to Toll Concession, provides an example of a comparison of the PSC to a Shadow Bid in a toll concession.

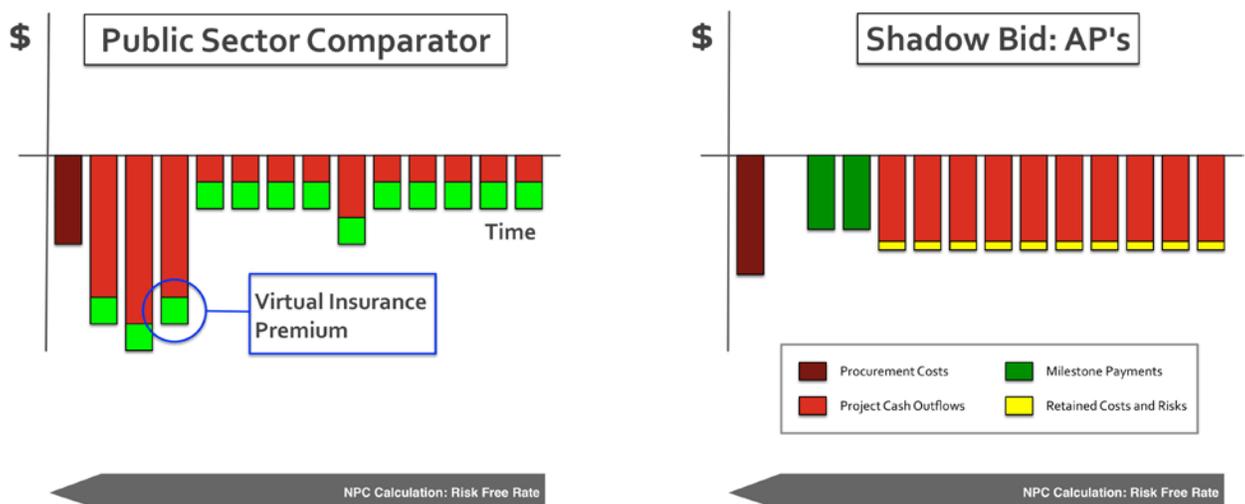
Figure 6-5. Comparing PSC to Toll Concession



Approach 3 Calculate a virtual insurance premium

The risks in this approach are valued in the cash flows of the PSC by applying a “virtual insurance premium”. This is determined by calculating the difference between the cost of capital on the basis of the applicable public financing interest rate, and the cost of capital based on a market-based WACC, expressed in constant cash flows over the life time of the project. In the shadow bid the appropriate cost of capital is used to reflect the value of the same risks. The NPV of both cash flows – the PSC and the shadow bid – are calculated on the basis of a risk-free discount rate.

Figure 6-6. Virtual Insurance Premium, provides an example of the virtual insurance premium component of a PSC.

**Figure 6-6. Virtual Insurance Premium**

**Textbox 8: Calculation of virtual insurance premium**

The virtual insurance premium can be calculated as follows:

1. Calculate the bid price cash flows using the guidance in 5.2.7 on the basis of a market based discount rate.
2. Calculate the bid price cash flows using the guidance in 5.2.7 on the basis of a risk free discount rate.
3. Deduct the cash flows as calculated under 2 from the cash flows as calculated under 1.

The result of step 3 is the virtual insurance premium cash flow.

**Considerations:**

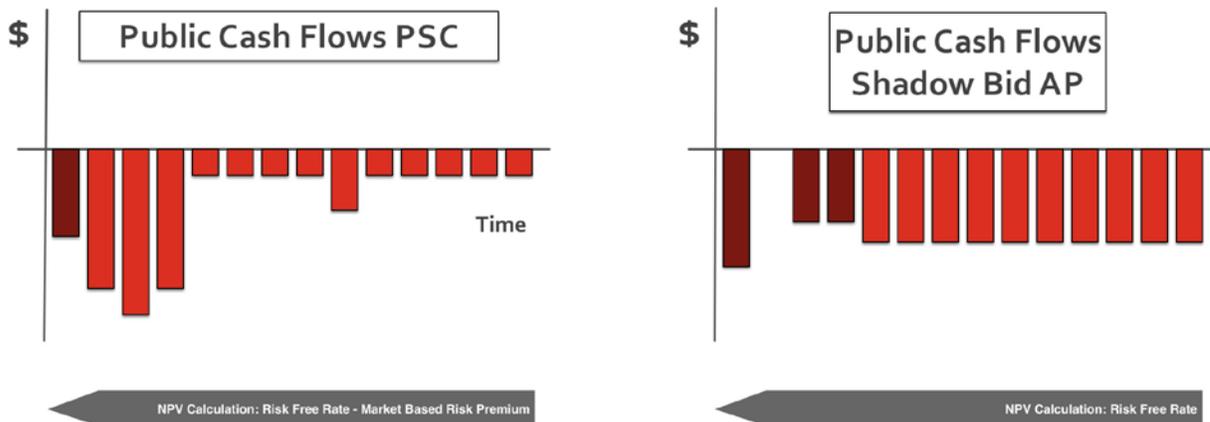
The advantage of this approach is that the concept of an insurance premium is easy to explain. The assumptions can be based upon the same market based information as in the second approach, making the shadow bid and PSC directly comparable. A disadvantage is that the insurance premium clearly is not a reflection of a real cash flow, which can – despite the familiar concept – lead to less recognition of this approach by users and stakeholders.

**Approach 4: Use a negative risk premium**

In this approach the risks in this category are valued in the PSC by applying a negative, yet market-based risk premium for the NPV calculation. The risk premium is defined as the difference between 1) a fair estimate of an appropriate discount rate reflecting SPV risks for discounting all cash flows, based on market information on similar projects, and 2) a risk free discount rate. In the shadow bid the appropriate cost of capital will be used to reflect the value of similar risks, leading to higher cash flows, which will be translated into an NPV using the risk free discount rate. Figure 6-7. Comparing the PSC to the Shadow Bid Using the Negative Risk Premium Approach, provides an example of the comparison between a PSC public cash flow and a Shadow

Bid.

Figure 6-7. Comparing PSC to the Shadow Bid Using the Negative Risk Premium Approach



Considerations:

The advantage of this approach is that for a purely negative cash flow project, the NPV calculation based on this negative risk premium leads to results that are intuitively right (higher risk leads to a less attractive NPV). This addresses the issue with approach 2 relating to counterintuitive results. The assumptions can be based upon the same market-based information as in the second approach, making the shadow bid and PSC directly comparable. Disadvantages are that the use of two different discount rates (i.e., one for the NPV of the PSC, and another for the NPV of shadow bid) may be confusing.

Whatever the choice of approach, it needs to be both consistent and err on the side of simplicity of explanation:

- ▶ If governments are making decisions on multiple projects, the discount rate should be chosen in the same way for all projects
- ▶ VfM assessment should facilitate the decision-making process between delivery methods, and do so in a transparent way. VfM should not be a black box that only financial experts can understand, because the VfM assessment is also an important communications tool for explaining the concept of value for money to the general public. In this regard the government should consider which approach it can best explain.

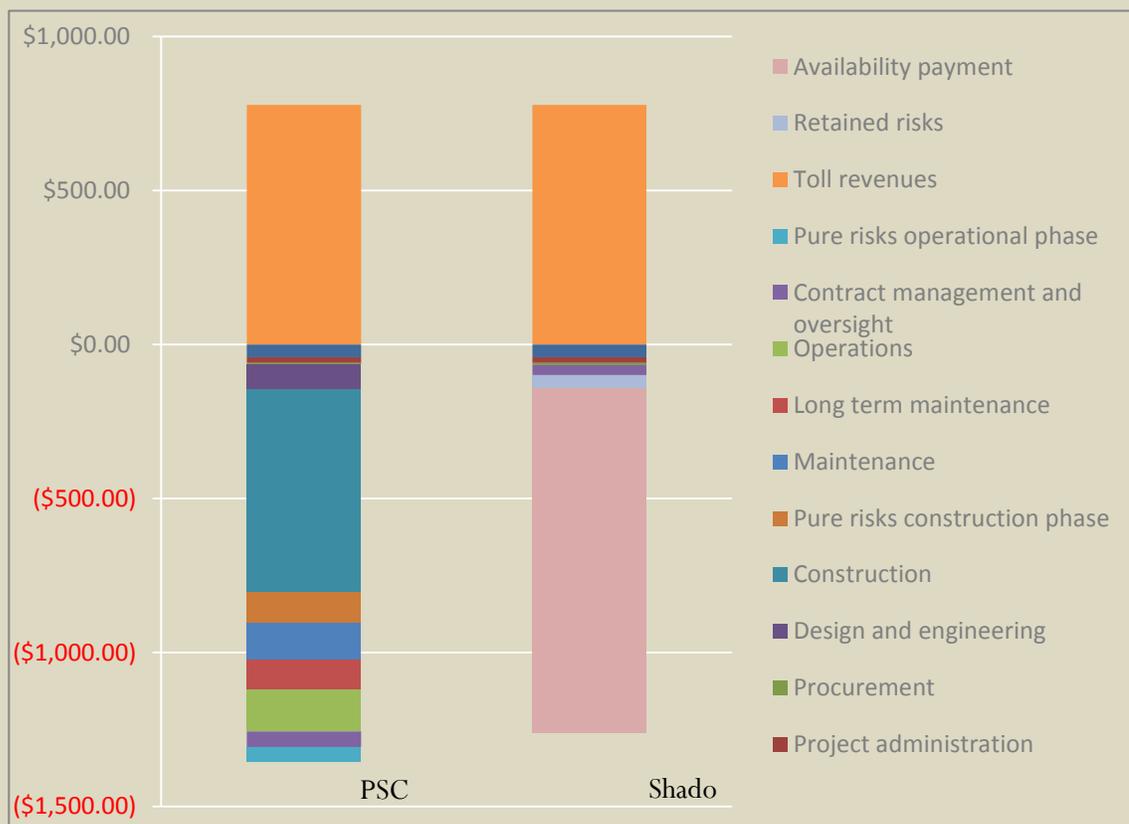
As there will always be some uncertainty surrounding the appropriate discount rate, and variations in the discount rate can significantly affect the outcomes of the VfM assessment, outcomes may be presented for a bandwidth of potential discount rates. Not representing this uncertainty may create false precision in the results.

### I-13: NPV comparison

The financial advisor has developed a financial model. Based on this model the NPVs of the PSC and Shadow Bid cash flows can be compared:

NPV (6.7%, 01 Jan 2017)	PSC	Shadow Bid AP P3
Total Project Costs	-\$1,353.70	-\$1,261.73
Toll Revenues	\$778.14	\$778.14
Net project cost	-\$575.56	-\$483.59

According to this comparison the VfM expected is \$ 92 M (NPV 01 Jan 2017), or 6.8% of total project costs.



The team noted that the toll revenues are the same in both options – which could have justified focusing on the costs only – but still decided to include the revenues in the presentation of the results, to present the full financial picture as also presented in the financial viability assessment.

### 6.3 The outcome of a VfM assessment is a bandwidth and not a precise number

The VfM assessment supports decision making on delivery method preference, but does so based upon a series of assumptions made with incomplete knowledge at a specific point in time.

The net present value calculation results in a single value. However, in real life there is uncertainty about assumptions, which is why a sensitivity analysis is recommended. The sensitivity analysis does not replace the risk assessment, because the PSC and shadow bid should still reflect a valuation of all risks and uncertainties. A sensitivity analysis demonstrates the robustness of the PSC to potential changes in the key input variables, facilitating a better understanding of the meaning of the outcomes.

By running these sensitivities a range of realistic outcomes can be determined. This output can then be presented as a bandwidth rather than a precise outcome.

#### I-13: Sensitivities

In the quantitative analysis workshop the team comes up with the following expectations with respect to private sector efficiencies and transaction costs in the availability payment P3 model:

Variable	Min	Max
Inflation	-0.5%	+0.5%
Discount rate	-0.5%	+0.5%
Additional procurement costs P3	-\$ 2.5 M	+\$ 2.5 M
Additional monitoring costs P3	-\$ 0.5 M	+\$ 0.5 M
Construction costs	-10%	+10%
Construction costs efficiencies P3	-5%	+5%
Maintenance costs	-25%	+25%
Maintenance costs efficiencies P3	-10%	+10%
Pure risks	-20%	+20%
Pure risks efficiencies P3	-5%	+5%
Revenues	0	+10%

The team discusses the potential use of multiple scenario analyses, i.e., coherent sets of sensitivities. Because they believe this would lead to false precision, and at this point they just want to have a better feel for the robustness of the VfM comparison, they decide to run the sensitivity analyses separately. Based on this analysis Mr. Regan and Ms. Brown conclude that 1) the construction cost efficiency is the primary determining variable, and 2) the expected VfM of the Availability P3 lies between 2% and 13% of the total project costs, or approximately between \$ 25 M and \$ 175 M (NPV on January 1, 2017).

### 6.4 Non-financial considerations complement the quantitative comparison

As pointed out in **subchapter 4.1**, not all of the differences between delivery methods are reflected in the financial cash flows (e.g., non-financial effects). Also, some of the financial differences may have been too difficult to monetize (non-monetized financial effects). To provide

the most robust information for decision-making purposes, these non-financial effects and non-monetized financial effects should be discussed as well.

### **I-13: Non-financial considerations**

Ms. Brown decides to include all non-financial considerations that have been brought up and analyzed throughout the VfM process. They include the following:

- ▶ The cost estimate experts have done their best to acknowledge the higher quality standards of the P3 procurement in their cost estimates; however it is fully expected that this cost estimate does not completely account for the higher quality level. Therefore, one of the non-financial effects is the higher quality due to the payment mechanism in the P3 contract.
- ▶ This is the first P3 contract for PDOT, therefore capacity building is required and some resistance to change is expected.
- ▶ The long term P3 contract inevitably leads to some level of inflexibility, in the sense that all future changes have to be dealt with in the context of the P3 agreement with the private entity. It is unclear to what extent the lack of competition will lead to inefficiencies.

## **6.5 Process, timing, information and expertise needed**

As a follow up or even logical part of the session on the quantitative analysis, a session may be organized with the full VfM team to discuss the comparison. In addition to discussing the “technical” outcomes of the VfM comparison, it is also important to discuss the interpretation of the outcomes that lead to conclusions and recommendations.

It may also be good to discuss how to present the information in a way that both facilitates decision-making and can be used for public outreach.

## **6.6 Output: The comparison results in a report which provides input for decision-making**

The results of the VfM comparison can be summarized in a memorandum, which can be the final chapter of the VfM report. On the basis of the financial outcomes of the comparison, sensitivity analysis, and additional considerations of the P3 approach, this memorandum – which is typically the final chapter of the VfM assessment report – will describe the conclusions of the VfM assessment and provide recommendations for the next steps of the procurement process.



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## Appendix 2 Determination of the discount rate

### Definition of discount rate

In risk valuation there is a distinction between categories of risk. The discount rate may be used to value systematic uncertainties. The FHWA guidebook on risk assessment offers guidance on how to value the other risk categories:

**Table A-2-1: Categories of Risk**

Category	Example	Description
Decision uncertainties	Change in toll technology	Decisions affecting the project (scope)
Risks before contract close	Delay in go decision on project due to elections	Decisions affecting mainly time before the project starts
Systematic uncertainties	Inflation risk	Uncertainties due to market circumstances
Pure Risks	Accident at construction site	Potential project-related events with a negative impact
Regular uncertainties	Uncertainty in volume of asphalt	Uncertainties in quantities or prices, related to the level of design of the project

Depending on which theoretical framework is used, the term discount rate can refer to different rates:

**Table A-2-2: Discount rates**

Rate	Excluding inflation	Including inflation
Risk free	Real risk free rate	Nominal risk free rate
Including standardized risk premium	Real rate including risk	Nominal rate including risk
Including project-specific risk premium	Real rate including project-specific estimation of systematic risk	Nominal rate including project-specific estimation of systematic risk

The main purpose of the discount rate is to make it possible to compare cash flows over time. In deciding upon the most appropriate discount rate several decisions need to be made:

1. Preference for simplicity and consistency (standardized discount rate) or preference for best possible valuation (project-specific discount rate).
2. Preference for explicit risk valuation of systematic risk (in the numerator through cash flows) or implicit valuation of systemic risk (in the denominator through discount rate).

We note that various countries have guidelines recommending different discount rates for different types of appraisal. For instance:

- ▶ Australia uses a nominal rate including risk for both project appraisal and bid evaluation.
- ▶ The Netherlands uses a real rate including project-specific risk for project appraisal and a nominal rate including project-specific risk for bid evaluation and VfM analysis.
- ▶ The UK has used a real risk free rate since 2003 (and a real rate including risk prior to that), arguing that risks should be made transparent in the cash flows of a project.

Discussed below are several approaches to the determination of different components of the discount rate. Note that it is almost never possible to derive the “true” project-specific discount rate because it is almost always necessary to use historical or peer group data. The discount rate will always be an educated guess based on available benchmarking information.

### **Determination of risk free rate**

From a financial perspective, the risk free rate is determined by accounting for the most recent market information. The asset that is traded in the markets that best approaches “risk-free” is a Federal government bond. For a standardized discount rate, governments tend to look at long-term historical averages. For instance the Netherlands used a discount rate of 4% (real risk free rate) until 2008, and then subsequently reset it to 2.5%. We note that in financial markets only the nominal rate is observable, therefore to determine the real rate a correction has to be made for inflation. For instance, if a 15-year government bond has an interest rate of 3.5%, and the average Consumer Price Index (CPI) has been 2% over the last ten years, then the real discount rate would be approximately 1.5%.

The risk free rate of the project should be determined in relation to the respective financing terms. Overall financing can be sliced into “tranches” with different durations based on the project cash flows. The tranches with early repayment have a shorter duration, which is reflected in the interest rate. In addition, in this case the rate should be the forward expected rate. The rate needs to account for the fact that the first drawdowns will occur after the date of the VfM assessment, therefore forward prices should be used to determine this expected rate. In similar fashion to the pricing of an interest rate swap, blended rates can be determined for all tranches together, facilitating the use of a single discount rate.

Pricing is a complicated exercise, and it is important to consider whether this approach is necessary for the sole purpose of conducting a VfM assessment. During the early stages of the project in particular this is often not the case, and a simpler alternative on the basis of today’s rates for the indicative average duration can be used. However, after receipt of the bids this simpler approach should be abandoned because it inhibits a fair comparison.

## Determination of the risk premium using a theoretical approach

If systematic risk has not been incorporated in the cash flows of a project, then it should be accounted for in the discount rate. Financial theory offers the Capital Asset Pricing Model (CAPM) to determine the relevant risk premium. The CAPM states that each asset has a correlation (beta) to the general market risk ( $r_m$ ). For a relatively low risk asset the beta is below one and for high-risk assets the beta is above one; therefore the beta is used to assess how the market's movements affect the magnitude of the value of an asset's movements. Typically, government projects such as highways are not traded on financial markets. To determine a beta for a specific highway project (or highway projects in general) it is possible to select assets (companies) that are traded on markets that best reflect the risk profile of the project, deriving a beta for this "peer group" that can be applied to the project.

The alternative to estimating a project-specific premium is to use a shortcut stating that the average beta for all assets is 1 (true by definition) and therefore the standardized risk premium equals the market risk premium. This approach can either lead to an overestimation of risk for low-risk projects - such as building extra capacity for a busy road - or an underestimation of risk for high-risk greenfield technological innovation projects.

The market risk premium can be estimated or derived from available literature. In this literature, the market risk premium is estimated to be between 3% and 9%.<sup>11</sup> If a specific highway project has a beta of 0.5 (based on benchmark analysis of highway projects) and the average market risk premium is 6%, then the risk premium for this project would be 3%.

## Determination of the risk premium using market-based information (WACC)

An alternative way to estimate the risk premium for projects is to look at information from bids on previous similar projects. We can then apply the weighted average cost of capital (WACC) formula to derive the average cost of finance, which is an estimate for the discount rate.

The Weighted Average Cost of Capital formula is:

$$WACC = (1 - \tau_c) \frac{D}{V} r_d + \frac{E}{V} r_e$$

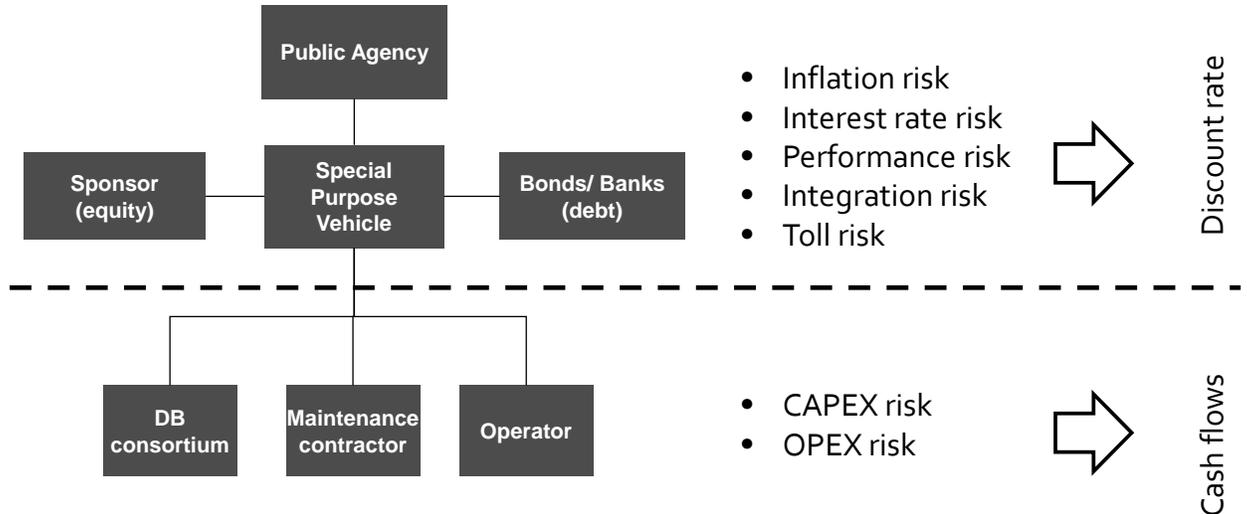
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<sup>11</sup> For instance: MorningstarUS, International Cost of Capital Report, Bloomberg, Damadoran  
<http://pages.stern.nyu.edu/~adamodar/>

Where  $\tau_c$  is the tax rate,  $D$  is the total amount of debt,  $V$  is the total amount of financing,  $r_d$  is the interest rate on debt,  $E$  is the total amount of equity, and  $r_e$  is the return on equity. Bids from similar projects can provide clues for as to the value of all of these variables, although typically this information is confidential.

In a P3 approach, a substantial portion of the risk profile is reflected in the WACC. The pricing follows the organizational structure of a P3 special purpose vehicle (SPV). Most of the risks are typically subcontracted and therefore shown in the cash flows in the bid. Some of the risks are explicitly or implicitly retained by the SPV (for example through caps on liabilities in subcontracts). These are not only typical systematic risk categories (for example inflation, interest rate, and toll risk) but also risk categories that are associated with the long-term and integrated characteristics of the contract (long-term performance risk and project coordination risks). This needs to be carefully taken into consideration to avoid double-counting, and for consistency when treating the PSC and shadow bid/actual bid. For instance, if the cash flows of a project include an interest rate swap, transferring the variable interest rate risk to a swap counterpart will result in higher cash flows, because the interest rate will now include a premium for the swap transaction. The interest rate risk is now valued in the cash flows and should no longer be reflected in the discount rate.

**Figure A-2-1: P3 Organizational Structure**



The figure shows that depending on the risk allocation some systematic risk may be valued through the discount rate and some risk may be valued in the cash flows. For the cash flows a probability analysis based on Monte Carlo analysis may be used for risk valuation. Since risks are not valued in both the discount rate and the cash flows, the confidence level chosen for the probability analysis is not related to the risk premium in the discount rate.



Combined with the previous method this gives two estimates, which together yield a range of possible discount rates.

## Appendix 3 Glossary of Terms

**Allocation:** The act of assigning responsibility for a given risk to the public or private entity, or both if the risk is shared between the two.

**Availability Payment:** Compensation paid to a private concessionaire for its responsibility to design, construct, operate, and/or maintain a tolled or non-tolled roadway for a set period of time. The public agency makes these payments based on the availability of the infrastructure (in terms of meeting performance standards) and also when certain milestones are met (see *milestone payments*).

**Benefit Cost Analysis (BCA):** A method to monetize the costs and benefits of a specific procurement method; in a P3 analysis this is also used to quantify the social benefits and costs of a project.

**Bidder:** A respondent to a request for Expressions of Interest or an invitation to submit a bid in response to a Project Request for Proposals (RFP). Typically, a bidder will be a consortium of parties, each responsible for a specific element, such as constructing the infrastructure, supplying the equipment, or operating the business. Government normally contracts with only one lead party (bidder) who is responsible for the provision of all contracted services on behalf of the consortium.

**Brownfield:** A project that requires modification, renovation, or demolition of previously built infrastructure.

**BRT (Bus Rapid Transit):** A bus-based rapid transit system that incorporates design features often utilized in rail transit (stations, platforms, dedicated right-of-way, etc.). BRT's are designed to remove delays and reduce congestion along a bus route.

**CAPM:** Capital Asset Pricing Model (*see appendix 2 for an explanation*).

**Consumer Price Index (CPI):** A measure that examines the weighted average of prices of a basket of consumer goods and services, such as transportation, food and medical care. The CPI is calculated by taking price changes for each item in the predetermined basket of goods and averaging them; the goods are weighted according to their importance.

**Contingency:** An allowance included in the estimated cost of a project to cover unforeseen circumstances.

**Concessionaire:** Private entity that assumes ownership and/or operations of a given public asset (e.g., highway, train station, bus operation) under the terms of a contract with the public sector.

**Debt Service Coverage Ratio:** The amount of cash flow available to meet annual interest and principal payments on debt, divided by the amount of debt service payments.

**Design-Build (DB):** Under a DB, the private sector delivers the design and construction (build) of a project to the public sector. The public sector maintains ownership, operations, and maintenance responsibility for the asset.

**Design-Bid-Build (DBB):** Under a DBB, the private sector delivers a design and bids for construction of a project in two separate processes. Once the private sector has been awarded the construction contract, it assumes responsibility of project construction (build).

**Design-Build-Finance-Operate-Maintain (DBFOM):** Under a DBFO or a DBFOM, the private sector delivers the design and construction (build) of a project to the public sector. It also obtains project financing and assumes operations and maintenance of an asset upon its completion.

**Discount rate:** The discount rate is a percentage by which a cash flow element in the future (i.e., project costs and revenues) is reduced for each year that cash flow is expected to occur.

**Environmental Impact Statement (EIS):** An EIS is a full disclosure document that details the process through which a transportation project was developed. It includes consideration of a range of reasonable alternatives, analyzes the potential impacts resulting from the alternatives, and demonstrates compliance with other applicable environmental laws and executive orders. The EIS process is completed in the following ordered steps: Notice of Intent (NOI), draft EIS, final EIS, and record of decision (ROD).

**Endogenous Risks:** Created within a project or under the direct influence of the key project stakeholders.

**Exogenous Risks:** Caused by external events.

**Force majeure:** An event occurring from nature, i.e., not manmade (i.e. earthquakes, hurricanes).

**Greenfield:** A greenfield project is one that is designed from the beginning with no constraints from the existence of prior facilities that need to be modified or removed.

**Ground Conditions:** Conditions (often underground) that are unforeseen and can cause delays in construction. Examples include underground rivers, discovery of hazardous materials, etc.

**Handback:** The process of returning a privately operated and maintained asset to the public after a concession expires.

**HAZMAT:** Hazardous Materials.

**Interest Rate Swap:** A transactional agreement between two counterparties to exchange one stream of future interest payments for another based on a specified principal amount. Interest rate swaps often exchange a fixed payment for a floating payment that is linked to an interest rate.

**Leveraging:** Leveraging is the degree to which an investor or business is utilizing borrowed money; the leverage ratio is defined as the ratio of borrowed money to equity, and can reach high levels in project finance.

**Loan Life Coverage Ratio (LLCR):** A financial ratio used to estimate the ability of the borrowing company to repay an outstanding loan. The Loan Life Coverage Ratio (LLCR) is calculated by dividing the net present value (NPV) of the cash available for debt repayment over the term of the loan by the amount of senior debt owed by the company.

**Monte Carlo Simulation:** A problem solving technique used to approximate the probability of certain outcomes by running multiple trial runs, called simulations, using random variables. Often conducted during risk assessments and value for money assessments to determine the probability of risk outcomes.

**NEPA (National Environmental Policy Act):** Requires federal agencies to integrate environmental values into their decision making processes by considering the environmental impacts of their proposed actions and reasonable alternatives to those actions, leading to an *environmental impact statement* (see above definition of EIS).

**NPV:** Net Present Value.

**OIPD (Office of Innovative Program Delivery):** The OIPD is a part of the FHWA that provides tools and expertise regarding innovative finance approaches including P3s.

**P3:** Public Private Partnership. In a P3 a private entity assumes responsibility for more than one development phase, accepting risks and seeking rewards. This document is concerned primarily with forms of P3s where the private sector partner enters into a long-term contract to perform most or all the responsibilities conventionally procured separately and coordinated by the government.

**PAB:** Private Activity Bonds are a new type of financing that provides private developers and operators with access to the tax-exempt bond market, lowering the cost of capital significantly.

**Project Life Cover Ratio (PLCR):** The PLCR is the ratio of the net present value of the Cashflows Available for Debt Service (CFADS) over the remaining full life of the project to the outstanding debt balance in the period. This ratio is similar to LLCR, however in LLCR the CFADS is calculated over the scheduled life of the loan, whereas the cashflow for PLCR is calculated over the life of the project or term of the P3 concession.

**PSC (Public Sector Comparator):** A PSC represents the most efficient public procurement cost (including all capital and operating costs and share of overheads) after adjustments are made for competitive neutrality, retained risk, and transferable risk to achieve the required service delivery outcomes. This benchmark is used as the baseline for assessing the potential value for money of private party bids in projects.

**Retained risk:** The value of those risks or parts of a risk that a government proposes to bear under a P3 arrangement.

**Risk Relation Map (RRM):** A diagram demonstrating the cause-and-effect relationships between risks, clearly demonstrating their hierarchy and linkages.

**RFP:** Request for Proposals.

**RFQ:** Request for Qualifications.

**Risk Allocation Matrix:** A table used as a management tool throughout the procurement process to provide an overview of the major risk categories to be considered when developing procurement, to explain why the risks are transferred, shared, or retained under different procurement options. As each deal will have project-specific risk, the Risk Allocation Matrix is only a tool to help understand the principles regarding risk allocation. For each project, the actual risk allocation will need to consider the principles of allocation and the circumstances of the deal.

**Risk Free Rate ( $R_f$ ):** The “risk free rate” is the theoretical rate of return of an investment with zero risk. U.S. Treasury Bonds (with a matching maturity to the loan) are generally used as a proxy for the risk free rate.

**Risk Register:** A document that provides an overview of all identified risks and describes the key characteristics of the risks.

**Risk Transfer:** The process of moving the responsibility for the financial consequences of a risk from the public to the private sector.

**ROD:** Record of Decision (see EIS).

**ROE (Return on Equity):** The amount of net income returned to investors as a percentage of the shareholder’s equity. In a P3 the return on equity is used to compensate investors for the riskiness of the project.

**Scope:** A project management term for the combined objectives and requirements necessary to complete a project. Properly defining the scope of a project allows a manager to estimate costs and the time required to complete the project.

**SPV:** Special Purpose Vehicle: An SPV is a legal entity comprised of multiple shareholders created for a specific project to reduce risk exposure of its individual members and to protect the project

from unrelated liabilities of its individual members. In a typical P3, an SPV is created to bid on a project and to obtain project financing.

**Systematic Uncertainties:** Uncertainties due to market circumstances; these risks are not diversifiable by a single actor (also referred to as *market risk*).

**Value for Money (VfM):** The procurement of a P3 project represents VfM when, relative to a public sector procurement option, it delivers the optimum combination of net life cycle costs and quality that will meet the project objectives.

**WACC (Weighted Average Cost of Capital):** In project finance the WACC is used to help determine the discount rate used. The WACC is a cost of capital weighted as a percentage of debt and equity (see **appendix 2**).