



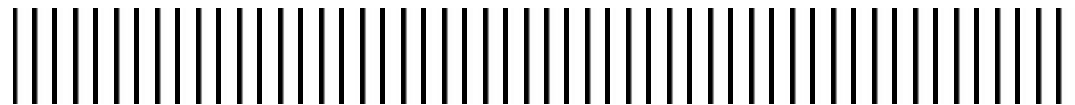
West Basin Municipal Water District

17140 South Avalon Blvd Suite 210 – Carson, CA 90746

Ocean Water Desalination Program Master Plan (PMP)

Project Delivery Plan (PDP)

January 2013



Report Prepared By:

Malcolm Pirnie
The Water Division of ARCADIS

8001 Irvine Center Drive
Suite 1100
Irvine, CA 92618
949-450-9901

5052-016



The Water Division of ARCADIS

Table of Contents

1. Introduction	1-1
1.1. Objective	1-1
2. Alternative Project Delivery Methods	2-1
2.1. Alternative Project Delivery Methods	2-1
2.2. Design-Bid-Build (DBB)	2-1
2.3. Design-Build (DB)	2-2
2.4. Design-Build Operate (DBO)	2-4
2.5. Construction Manager (CM) at Risk	2-5
2.6. Design Build Own Operate Transfer (DBOOT).....	2-6
2.7. Alliance Contract.....	2-7
3. Evaluation of Alternatives	3-1
4. Risk Profile of Preferred Delivery Methods	4-1
5. Delivery Method Cost & Schedule Comparison	5-1
5.1. Cost & Schedule Comparison.....	5-1
5.2. Project Schedules	5-1
6. Contractor Procurement Process	6-1
6.1. Introduction	6-1
6.2. DBB Contractor Procurement	6-1
6.3. DB Contractor Procurement.....	6-2
6.4. DBO Contractor Procurement.....	6-2
6.5. Contract Operations Procurement	6-3
7. Conclusions	7-1
7.1. Conclusions.....	7-1

List of Tables

Table 3-1: Advantages/Disadvantages for DBB Delivery Method.....	3-5
Table 3-2: Advantages/Disadvantages for DB Delivery Method	3-6
Table 3-3: Advantages/Disadvantages for DBO Delivery Method	3-7
Table 3-4: Advantages/Disadvantages for CM@Risk Delivery Method.....	3-8
Table 3-5: Advantages/Disadvantages for DBOOT Delivery Method	3-9
Table 3-6: Advantages/Disadvantages for Alliance Delivery Method	3-10
Table 4-1: Project Risk Factors	4-1
Table 4-2: DBB, DB, and DBO Risk Profiles	4-3
Table 5-1: Relative Schedule/ Cost Comparison for DBB, DB, and DBO.....	5-1

List of Figures

Figure 2-1: Participants Under DBB	2-2
Figure 2-2: Participants Under DB.....	2-4
Figure 2-3: Participants Under DBO.....	2-5
Figure 2-4: Participants Under CM@Risk	2-6
Figure 2-5: Participants Under DBOOT.....	2-7
Figure 2-6: Participants Under Alliance.....	2-9
Figure 3-1: Project Flexibility/ Owner Control.....	3-4
Figure 7-1: Example Program Delivery Model	7-2

Appendices

8:A. Project Schedules

Acronyms Used in the Technical Memo

ACOE	Army Corps of Engineers
APD	Alternative Project Delivery
CDPH	California Department of Public Health
CM	Construction Manager
DB	Design-Build
DBB	Design-Bid-Build
DBO	Design-Build Operate
DBOOT	Design Build Own Operate Transfer
DDC	Design Develop and Construct
DEIR/DEIS	Draft Environmental Impact Report/Draft Environmental Impact Statement
GMP	Guaranteed Maximum Price
JPA	Joint Powers Authority
NEPA	National Environmental Policy Act
OWDPMP	Ocean Water Desalination Program Master Plan
RWQCB	Regional Water Quality Control Board

1. Introduction

1.1. Objective

This Technical Memorandum on the Project Delivery Plan (PDP) was prepared for the West Basin Municipal Water District (West Basin) to accomplish the following:

- Provide an overview of the Alternative Project Delivery (APD) options,
- Highlight the advantages and disadvantages of each APD option, and
- Provide a more detailed comparison of Design-Bid-Build, Design-Build, and Design-Build Operate, including an analysis of cost and schedule impacts and contractor procurement requirements for project delivery.

The APD options, and associated advantages and disadvantages, presented in Sections 2 and 3 of this Technical Memo include:

- Design-Bid-Build (DBB)
- Design-Build (DB)
- Design-Build Operate (DBO)
- Construction Manager (CM) at Risk
- Design Build Own Operate Transfer (DBOOT)
- Alliance

In Sections 4-6, a comparison of DBB, DB, and DBO options for the OWDPMMP is provided to highlight the key differences of these approaches. Included in this comparison is a review of Project Costs and Schedules.

2. Alternative Project Delivery Methods

2.1. Alternative Project Delivery Methods

For each Project Delivery option discussed below, a general description of the approach is provided highlighting key features. Also, the allocation of risk between the Owner and the private sector (for options other than DBB) is discussed in this section

The Project Delivery methods have been arranged in approximately increasing order of private sector involvement.

- Design-Bid-Build (DBB)
- Design-Build (DB)
- Design-Build Operate (DBO)
- Construction Manager (CM) at Risk
- Design Build Own Operate Transfer (DBOOT)
- Alliance (Note that this is discussed only for informational purposes, since there is currently no legal precedent for use of this method in the U.S.)

2.2. Design-Bid-Build (DBB)

This Project Delivery method involves the Owner appointing a Project Manager to sequentially manage performance requirements/demand, investigation, and planning approvals followed by separate stages for design and construction. Construction is by lowest cost competitive bidding. The Owner takes over and operates the delivered project after acceptance tests. The participants and their interrelationships under design-bid-build are illustrated in **Figure 2-1**.

The Owner typically is involved throughout the project and provides its input at each stage. The Owner requirements can be incorporated in regard to design issues and operational requirements.

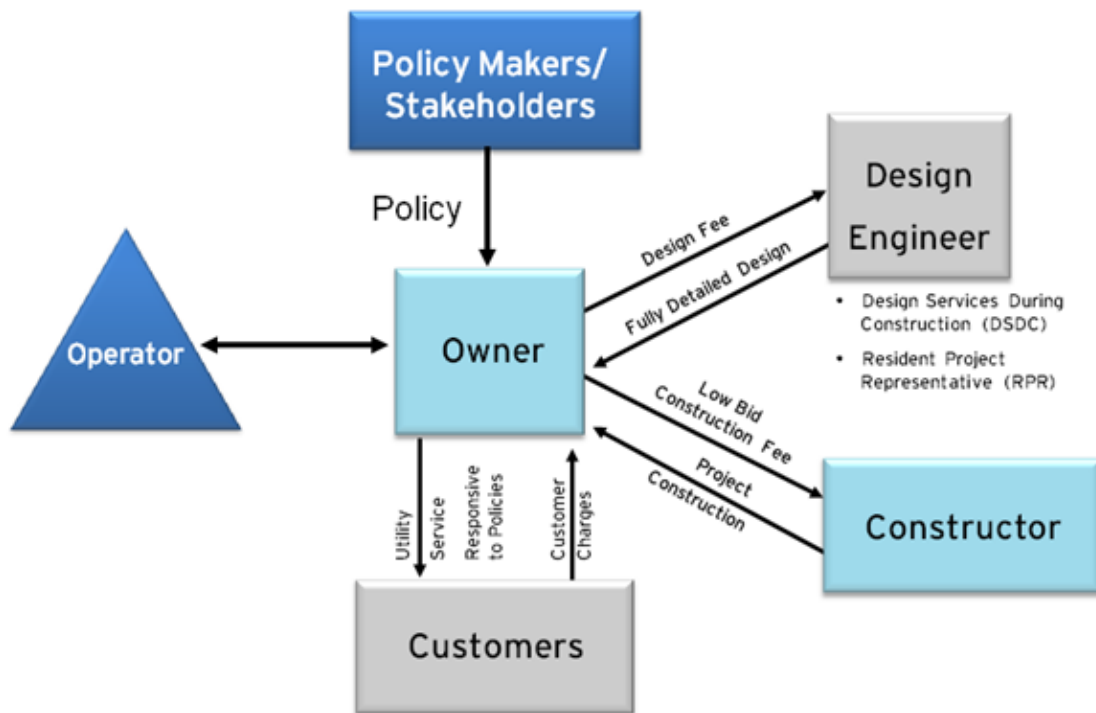
DBB relies on the skill and experience of the concept designer together with value management, etc. to obtain a best value capital facility solution rather than the market place pressure provided by other methods.

In this method, the risk of negligent design lies with the design consultant. Construction risk lies with the Contractor given adequate contract documentation. The Project

Manager is allocated the risk associated with poor contract administration. The Owner assumes risks associated with operation, financial, and planning components such as plant capacity.

There is standard documentation for supply of professional services, and low contractual risk because of the large amount of work done this way. The technical documentation needs to be of a high standard to minimize contractual disputes.

Figure 2-1: Participants Under DBB



2.3. Design-Build (DB)

In this method, a single entity takes the responsibility for the design and construction of a project. The design of the project is based on meeting explicit performance requirements for the operating facility. The company may subcontract some of the tasks required, for example a contractor often uses a separate consulting company to undertake some technical design tasks. When the construction of the facility is completed, the Owner is responsible for subsequent operation or for retaining an operator. The participants and their interrelationships under design-build are illustrated in **Figure 2-2**.

There are numerous examples of this delivery mode in the water and wastewater sector, and in other sectors. The method can in some cases deliver assets in a shorter total time

than DBB. Costs can be reduced for some types of assets because the design is driven by the contractor with a focus on winning a competitive bid. All of the bidders have to complete a proportion of the design to finalize their financial bids; hence, there is a duplication of design effort but an opportunity to assess different design approaches. The degree of specification for the contract will reflect the potential for innovation and cost savings. Over specification for example will provide less potential for innovation than a DB project which involves a performance only specification.

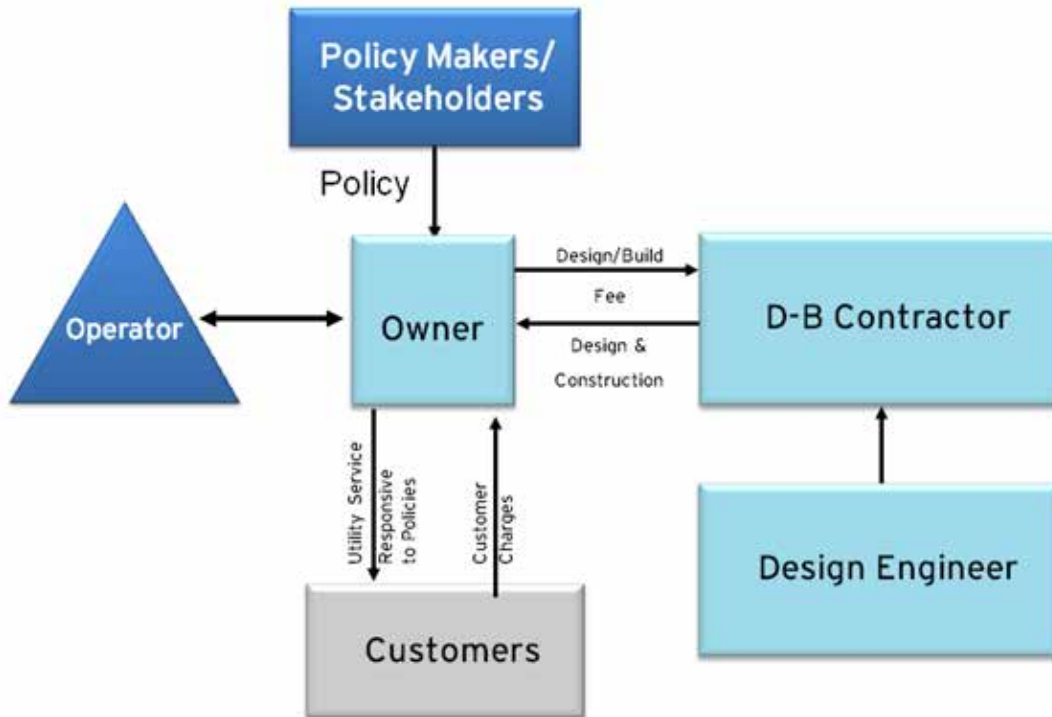
The design risk in this method is allocated to the private sector. Construction risk is also the responsibility of the private sector. However, there is some extension of time risk to the Owner, and there is much greater risk to the Owner due to variations if changes are initiated by the Owner. The operation, financial, demand, and planning process risk are with the Owner.

There is standard documentation for DB contracts and these are now well understood in the market place.

The Owner needs to be able to unambiguously specify the performance requirements of the project and be able to effectively assess the relative merits of different processes and systems. This is not a simple task and warrants careful attention.

This method can be more or less prescriptive depending on the client's preferences and can sometimes take a form that is more similar to DBB than traditional DB.

Figure 2-2: Participants Under DB



2.4. Design-Build Operate (DBO)

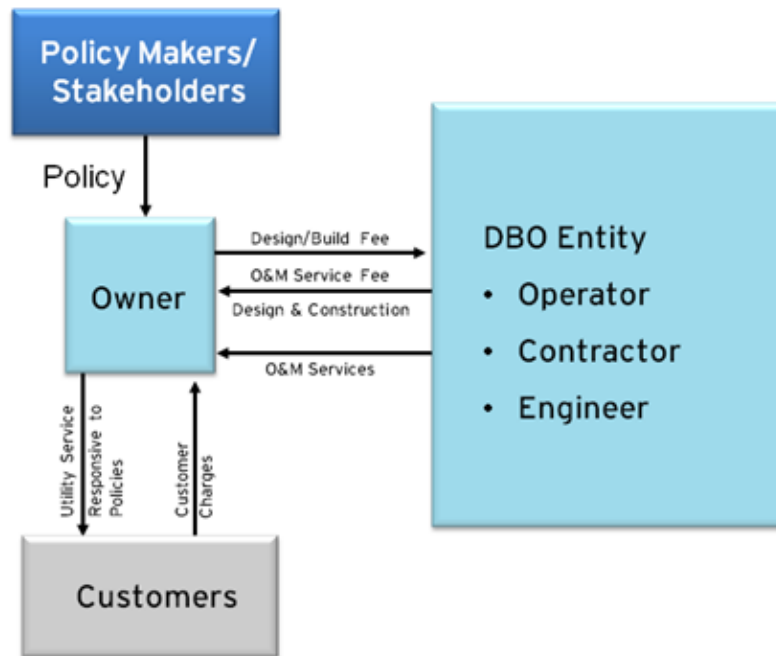
In this method, a company contracts to design, construct and operate a facility, and upon completion, transfers the ownership to Owner. The Owner then enters into a lease agreement with the contractor to operate the facility for a specified time period (typically 10 to 25 years). Longer operating contracts tend to ensure that higher quality equipment is used in the construction of the facility, since the Contractor will be responsible for the satisfactory operation of the equipment for a longer period. It also helps ensure that the Contractor performs the necessary maintenance to maximize the life of the equipment over the contract period. The Contractor is typically reimbursed for operations on a fixed cost plus variable payment structure. The contract is based on meeting specified performance requirements during the build and operate phase. The construction is funded by the Contractor, but upon completion and subject to meeting performance requirements, is reimbursed by the Owner. The participants and their interrelationships under design-build-operate are illustrated in **Figure 2-3**.

A high level of Owner involvement would be required at an early stage to define performance requirements both in the build and operate phase. As the Contractor only gets paid according to meeting performance requirements very clear acceptance testing

procedures need to be developed. There is an ongoing requirement for the Owner to administer operational performance (availability, volume, and service).

The risks associated with design, construction, and operation are allocated to the private sector.

Figure 2-3: Participants Under DBO



2.5. Construction Manager (CM) at Risk

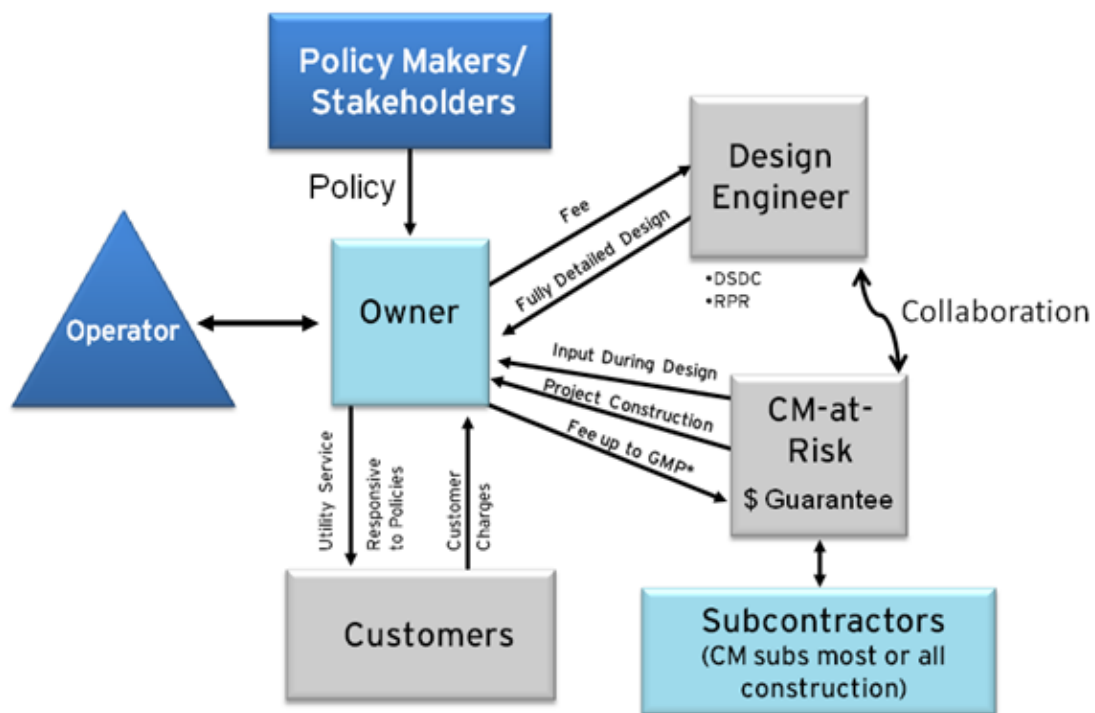
This method is a modification to the DBB delivery method that provides for qualifications-based selection, early in the design phase, of the general contractor that will ultimately construct the project. The owner holds the contracts of the design engineer and CM@Risk contractor separately during the design and construction phases. The participants and their interrelationships under CM@Risk are illustrated in **Figure 2-4**.

The CM@Risk contractor and the design engineer work together as a team to develop a constructible and biddable set of contract documents for the project. The design engineer retains responsibility for the quality of the finished design. The CM@Risk contractor retains responsibility for management of the cost and schedule models during design to the point where a guaranteed maximum price (GMP) proposal can be submitted to the owner for the construction. The GMP proposal can be requested by the owner at any time in the design development process, which maintains the validity of the cost and schedule

models throughout design. However, the GMP is generally accepted from the CM@Risk contractor after all work on the project has been bid to the contracting community.

If the CM@Risk contractor wishes to self-perform any of the work, the owner can request them to bid for the work with the contracting community. If successful, they can self-perform. If not, they receive their fee during the construction phase to serve as the construction manager for the project, but they remain at risk for delivery of the work within GMP proposal provisions. The construction phase contracting mechanism is optimally recommended as a cost plus fixed fee contract with a guaranteed maximum price, but lump sum delivery is an option following receipt of project bids.

Figure 2-4: Participants Under CM@Risk



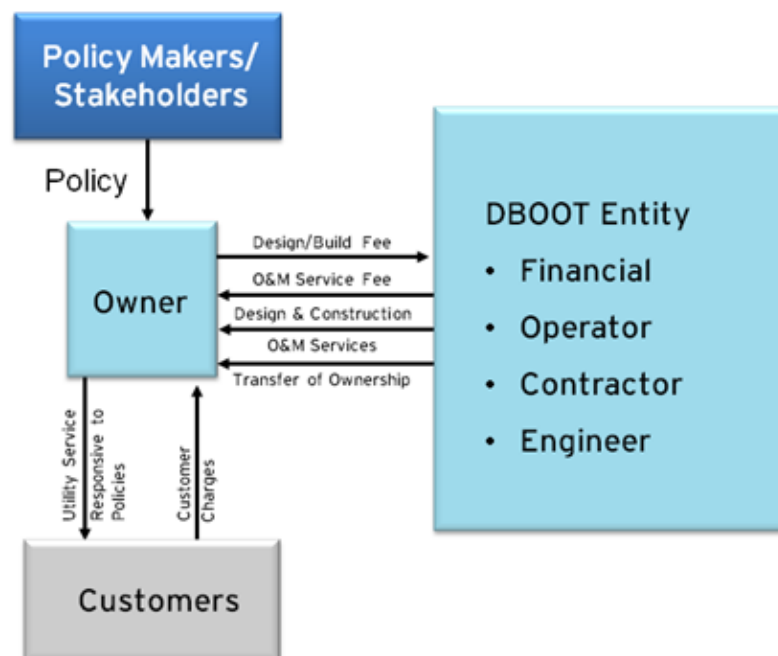
2.6. Design Build Own Operate Transfer (DBOOT)

In this method, a consortium is chosen to build, own, operate, and eventually transfer the asset back to the Owner after an agreed period. A high level of Owner involvement is required at an early stage to define all project requirements. The participants and their interrelationships under design-build-own-operate-transfer are illustrated in **Figure 2-5**.

Close monitoring of performance is required over the life of the project to administer payment to the consortium. The risks associated with design, construction, operation, financial, and commerce are allocated primarily to the private sector. The degree of allocation is dependent on individual contract arrangements.

Since the legal arrangements must cover all aspects of the project including design, construction, operation, financing, and transfer of asset, they are clearly substantial documents.

Figure 2-5: Participants Under DBOOT



2.7. Alliance Contract

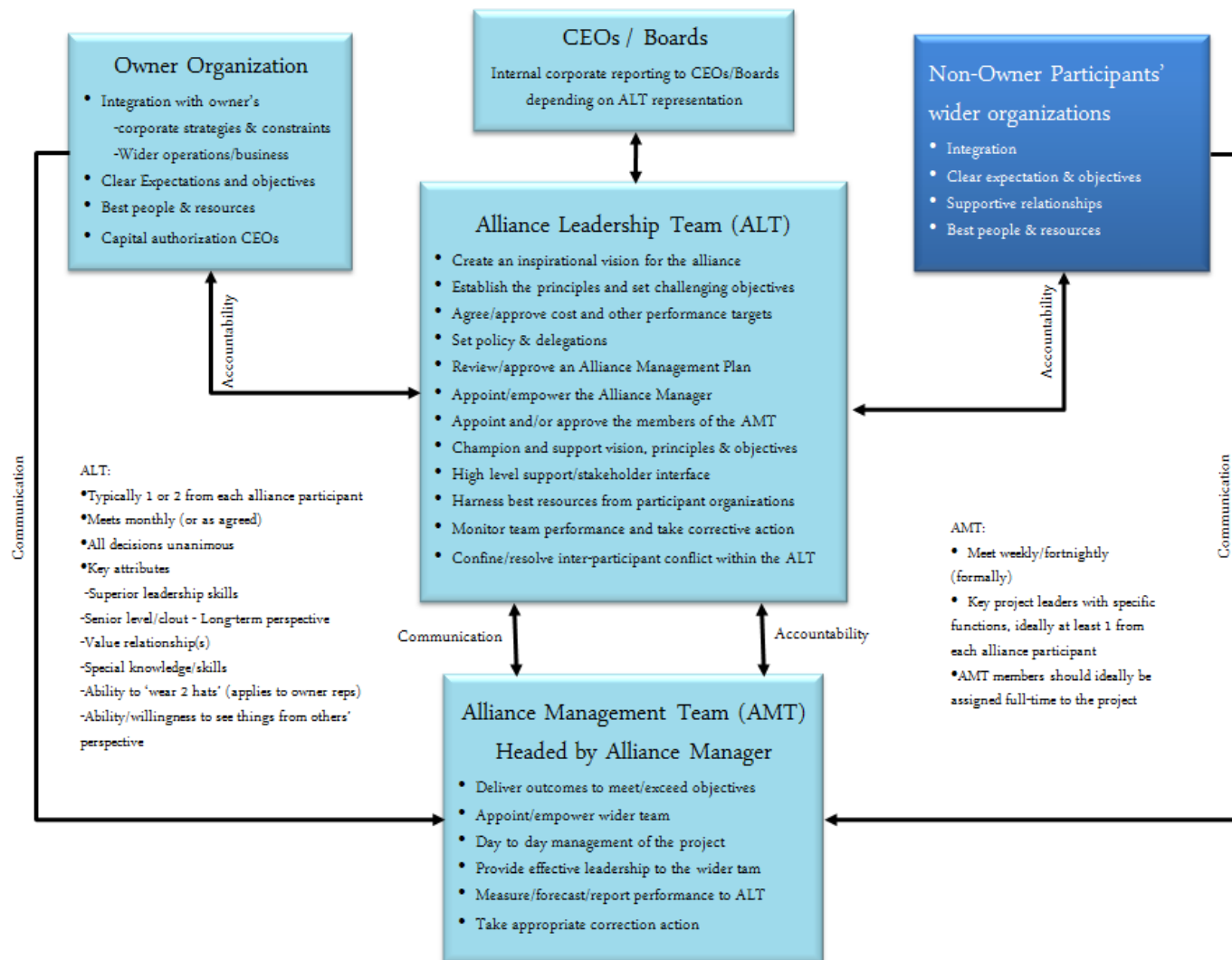
In this method, in order to deliver a large project, several companies, agencies and/or the Owner work together as partners in an “Alliance” to deliver the project. The Alliance partners enter into an agreement with the Owner to deliver a new asset on an agreed fee basis. The partners apportion tasks and the overall profits or losses that accrue. The participants and their interrelationships under Alliance are illustrated in **Figure 2-6**.

This form of Project Delivery provides a focused team that includes the Owner, designer, builder and operator that combine to deliver the best product. This has been employed for very large projects, such as construction of an oil platform and has been used for the Northside Storage Tunnel in Sydney and desalination plants, such as the Gold Coast Desalination Plant. The method is ideally suited to projects where risk cannot be

quantified at time of bid. This can happen due to overwhelming time constraints, e.g. the Northside Storage Tunnel which needed to be in operation prior to Sydney Olympics. It can also happen when risks are extremely difficult to quantify and to do so prior to awarding the contract could see the Owner pay an excessive risk premium under traditional methods of delivery.

This type of delivery mechanism is unlikely to be attractive for small projects or those that have a low degree of technical complexity. The Owner needs to be able to accurately determine the project costs for other delivery methods and be prepared to participate in the alliance as an equal but not dominant partner. As all decisions must be unanimous this can be difficult for owners accustomed to a traditional method of delivery. In this method risks are shared between the participants but ultimate risk lies with the Owner.

Figure 2-6: Participants Under Alliance



3. Evaluation of Alternatives

The selection of the Project Delivery method which best meets the requirements of West Basin needs to be made in the context of the overall strategic plan for the organization. This strategic plan will outline the organizational objectives, principles, and vision. Then, once having clearly understood the strategic context of the decision, the Owner is in a good position to assess the wide range of delivery methods open to them including:

DBB

DB

DBO

CM@Risk

DBOOT

There are a number of factors which should be taken into consideration when making this assessment and these include:

Capital cost and complexity of project

Government policy

Finance

Regulatory approvals

Timing

Design

Type of site (Brownfield or Greenfield)

Operations

Owner resources, staffing and experience

Project risk

Project Flexibility / Owner Control

These factors are explained below:

Capital Cost and Complexity of Project

In general as the scale and complexity of project increases more delivery methods become feasible. For smaller projects which are simple in nature the DBB method has a proven track record and minimizes the cost of bidding to the industry.

As the project value increases larger contractors become more interested in bidding and they offer innovations in the design, construction and operation of facilities. They are also prepared to invest more in developing their ideas if the ultimate reward is large.

Government Policy

Some government policies may preclude certain methods of delivery. This is particularly true of private ownership of assets. In this case the DBB, DB, and DBO methods would still be feasible options. In some jurisdictions owners may not be able to share risks which they are not directly responsible for.

Finance

In the U.S., as a result of the availability of tax exempt financing, the relatively high cost of private financing makes it a less common approach than in the rest of the world, where tax exempt financing is not available. There are some advantages to private financing, however, including increased flexibility in operating contract compensation (e.g. commodity based concessions), limiting impact on bonding capacity, and the possibility of lower overall cost due to more financial control. Regardless of the financing method, a rate increase will likely be required, which may make revenue bonds more difficult to obtain. This is less likely to affect West Basin, on account of the District being a water wholesaler requiring approval from the California Public Utilities Commission (PUC).

Regulatory Approvals

Where detailed designs are needed to obtain regulatory approval, DBB is one of the best suited options.

Timing

For projects where very tight delivery times are required, the best suited options include DB and DBO delivery methods.

Design

Where the contractor/operators are highly skilled to undertake the design then DBO, DBOOT and Alliance models can be preferred.

Type of Site (Co-Location vs. Previously Undeveloped)

Where there are existing assets and operators which need to be taken into account (i.e., co-location) then the DBB method allows a high level of client/owner interaction.

For Greenfield projects which have a high degree of complexity and the potential for innovation is high then DB, DBO, and DBOOT delivery methods are best suited.

Operations

Where the Owner has a high level of skill in operations and this is seen as core business then DBB and DB models are best suited.

Where operations is not a core skill, or current operators are at lower than industry benchmark levels, then DBO, and DBOOT are favored. A separate operations contract could also be written to accompany the DBB and DB models. The operations contract would need to be highly prescriptive and may include periodic contract negotiations/renewals to help ensure that long term performance requirements are met satisfactorily. Such a highly prescriptive contract should be acceptable to most contract operators considering present desalination project offerings and prevailing economic factors.

The current model implemented by West Basin for their Recycled Water Facilities is to employ contract operations. The delivery model for these facilities has been predominantly a design-build method, with a prescriptive specification for the facilities. The contract operations have been supplied on a time reimbursable basis. See Owner Resources, Staffing and Experience section below for more detail on West Basin's historical experience with project delivery.

Owner Resources, Staffing and Experience

Similar to operations skills, the owner may be better suited for methods with more or less owner control depending on their available resources, staffing and experience.

West Basin has historically utilized a descriptive approach to DB project delivery for several of its existing treatment plant expansions. This approach has typically included a 20-30% level preliminary design, pre-qualification stage, and RFP process for Best-Value DB team selection. West Basin's most recent DB projects have utilized this prescriptive approach primarily to maintain continuity with existing processes and operational considerations. This prescriptive approach also provides West Basin a higher confidence level in ensuring contractual customer water quality and capacity requirements are met. For West Basin, selection of project delivery approach has been evaluated on a project-by-project basis and does not mandate use of prescriptive or performance based delivery methods.

Project Risk

Where project risks are well understood or where there is a high likelihood of performance requirements changing, then the DBB method is preferred.

If demand/load projections are likely to change dramatically then it is best to avoid methods with long-term operational terms. In this case, DBB and DB methods are preferred.

Project Flexibility / Owner Control

The amount of control afforded to the owner differs among project delivery methods. **Figure 3-1** presents a graphical representation of how project flexibility and owner control compares among the methods.

Figure 3-1: Project Flexibility/ Owner Control

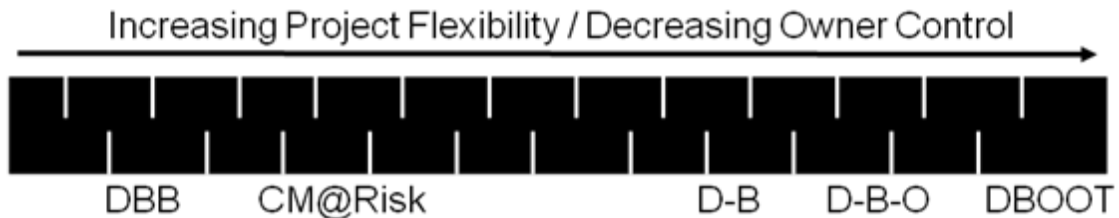


Table 3-1: Advantages/Disadvantages for DBB Delivery Method

Advantages	Disadvantages	Projects Suited to Method
<p>This method of Project Delivery is commonly used in the U.S. and most water agencies are generally comfortable with the approach for typical water infrastructure.</p> <p>The Owner chooses the design consultant, has close control of concept and detailed design development, and can ensure that the features the Owner wants in the infrastructure are incorporated.</p> <p>The Owner can obtain competitive prices for construction of its chosen design.</p> <p>Within reason the Owner can adjust the design and extent of work and can cope with varied ground conditions by paying for actual conditions.</p>	<p>The process can be lengthy as tasks are sequential.</p> <p>When construction or operational problems occur, disputes on responsibility (Owner, Project Manager, designer, and Contractor) can be difficult to resolve.</p> <p>Limited opportunity for innovation and hence cost savings once the concept design has been adopted.</p> <p>Interface/lack of integration between designer, constructor, and operator.</p> <p>The Owner is responsible for finding skilled operations staff, which can be difficult for complex systems and if they don't currently have these skilled operators employed.</p> <p>Litigation is a risk as the form of contract is adversarial in nature.</p>	<p>Where, because of the nature and location of the works, there is little scope innovation, DBB is often the best approach. This method should include schedule of rates items where there are large costs associated with uncertainty in foundation or excavation conditions.</p> <p>DBB is also suited for projects involving augmentation of existing works where most of the project parameters have been set and there is a need to conform to the overall design of the facility.</p>

Table 3-2: Advantages/Disadvantages for DB Delivery Method

Advantages	Disadvantages	Projects Suited to Method
<p>Contractor has a clear responsibility to deliver a facility which meets performance requirements and thus is responsible for adequacy of both design and construction. This minimizes problems in responsibility and resolution of faults.</p> <p>The method is often adopted to shorten the delivery time. However, time savings vary widely with the type of project.</p> <p>If site conditions are predictable and scope is well defined, control of the design by the contractor should lead to a low capital cost facility.</p> <p>In some cases, design and construction contractors have process knowledge, patented equipment not available to design consultants.</p>	<p>A thorough knowledge of the performance requirements is needed prior to soliciting qualifications/bids/proposals.</p> <p>It is not suitable when the Owner objectives may change during project execution.</p> <p>Although proposals should be evaluated on the basis of life cycle costs, proposers may concentrate on reducing the capital cost as they are not responsible for long-term operation; this could lead to high operational costs. However, recent proposals have a proving period of up to three years to overcome this concern.</p> <p>A high level of expertise is required to define performance requirements and incorporate these into contractual documents.</p> <p>Litigation is a risk as the form of contract is adversarial in nature.</p>	<p>DB is well suited to projects with simple investigation and planning approval needs where the time frame to completion is required to be shortened.</p> <p>DB is well suited to large projects (e.g. treatment works or major pumping stations) where there are a number of options which could satisfactorily meet performance.</p> <p>It is more suited to assets where most of the total life cycle cost is in the initial capital cost. If it is to be used for assets with high operating costs (like desalination plants) then these costs need to be provided in the proposal and a proving period incorporated in the contract to demonstrate their appropriateness.</p>

Table 3-3: Advantages/Disadvantages for DBO Delivery Method

Advantages	Disadvantages	Projects Suited to Method
<p>Contractor is responsible for design, construction, and operation and this should help achieve a minimum cost solution provided reasonable design freedom is possible and foundation cost, and process uncertainties are not overly significant.</p> <p>The Owner retains ownership of the facility and thus has some control to cope with unexpected changes in performance requirements.</p> <p>In some cases, DBO contractors have process knowledge and patented equipment not available to design consultants.</p> <p>AS with DB, the DBO method has the potential to utilize alternate proposals to obtain creative solutions. The owner may choose to request proposals as a combination of a base bid (with rigid prescriptive requirements) for some project components and an alternate bid (where a number of options could satisfactorily meet performance requirements) for other components.</p> <p>The DBO method helps manage risk by transferring much of it to the private sector, which is particularly advantageous given the cost and complexities of desalination technology.</p>	<p>This method requires intensive effort from the Owner to define project requirements and risks prior to initiating the bidding process. Significant bidding costs are involved.</p> <p>Extensive administration over the life of the project is also required.</p> <p>Changes cannot be made after awarding the contract without significant technical, administrative, and commercial effort.</p> <p>Litigation is a risk as the form of contract is adversarial in nature.</p>	<p>One of the main drivers to using DBO is to allocate technology risk to the private sector. Worldwide desalination projects are largely developed via full service methods given the costs and complexities of designing, constructing, and operating these technologies.</p> <p>The DBO method suits projects with capital values exceeding \$5M involving a water treatment works or sewage treatment works.</p> <p>The method ensures operation factors are considered.</p> <p>The method is more suited to projects where operational costs are a significant proportion of total life cycle costs.</p> <p>The method is suited to Owners who do not wish to transfer ownership of facilities to the private sector but wish to introduce a competitive model into their existing system. At a minimum, it would provide useful benchmarking data for Owners other facilities.</p> <p>The method is suited to Owners where operation of facilities is not seen as core business.</p> <p>The method is suited to Owners looking to achieve minimum cost solutions and to lock these in over a long time frame.</p>

Table 3-4: Advantages/Disadvantages for CM@Risk Delivery Method

Advantages	Disadvantages	Projects Suited to Method
<p>Significant contractor input into the design development.</p> <p>Delineation during design by the prospective contractor of risk elements that the owner may elect to manage separately, as opposed to within the contract.</p> <p>Reduced bid phase pricing volatility.</p> <p>Opportunity for the owner to construct a synergistic team of the design engineer and the contractor who will ultimately construct the project.</p>	<p>May not be well known by the local contracting community.</p> <p>Requires an investment of time and energy on the part of the owner not typically required under DBB or DB to deliver.</p> <p>Requires careful development of contract documents and management of the project development to maintain compliance with procurement laws.</p> <p>CM@Risk has not been established in California. For a municipality that has not already adopted CM@Risk as an acceptable alternative, it will be challenging to implement.</p>	<p>Projects that require specific contractor capabilities and project conditions that can be most properly addressed with a qualification-based selection process.</p> <p>The owner wants to maintain an independent relationship with its design engineer.</p> <p>Significant risk elements that are best managed with the input of a competent contractor.</p> <p>Requires significant construction phase operations coordination that is best coordinated and priced prior to commencing construction.</p>

Table 3-5: Advantages/Disadvantages for DBOOT Delivery Method

Advantages	Disadvantages	Projects Suited to Method
<p>The method obtains competition for design, construction, operation, and finance of the project. It should therefore achieve a minimum cost solution provided reasonable design freedom is possible and uncertainties, such as foundation costs are not overly significant.</p> <p>The vast majority of project risk is allocated to the private sector.</p> <p>The interface between maintenance and replacement costs is eliminated during the Operations phase of the project.</p>	<p>This method requires intensive effort from the Owner to define project requirements and risks prior to initiating the bidding process. Very significant bidding costs and complex negotiations are required before signing the contract.</p> <p>The Owner has less control than under DBO to deal with unexpected changes in performance requirements since the site and the asset are under the control of the consortium.</p> <p>This method is not flexible, e.g. changing regulatory requirements or changing demand.</p>	<p>Greenfield projects over \$20M are suited to this method.</p> <p>Projects where the operational costs are a significant proportion of total life cycle costs.</p> <p>Projects with some complexity and scope for innovation are suited to this method.</p> <p>Projects which are easily separable from the rest of the Owners business are suited to this method.</p> <p>The method is suited to Owners where operation of water supply and sewerage facilities is not seen as core business.</p> <p>The method is suited to Owners looking to achieve minimum cost solutions and to lock these in over a long time frame.</p>

Table 3-6: Advantages/Disadvantages for Alliance Delivery Method

Advantages	Disadvantages	Projects Suited to Method
<p>It can deliver a project quickly.</p> <p>Where projects have objectives other than cost, this method can directly incorporate these considerations into the reimbursement of the Alliance members. For example, in the Northside Storage Tunnel the project had time, environment, safety and community objectives in addition to cost. This allows the focus of the team to be more balanced than in the DBB method.</p> <p>It allows risks to be managed in an equitable manner and generally reduces potential for conflict.</p> <p>All costs are open book and therefore transparent to the Owner and Project Partners, which builds trust.</p> <p>It encourages all participants to focus on solving problems in a collaborative manner.</p> <p>Changes to scope are priced in a transparent manner with no opportunity for windfall profits to be made by Project Partners.</p> <ul style="list-style-type: none"> · It can include an operating period if required. 	<p>It requires a high level of expertise of team members from all Alliance parties.</p> <p>Value for money can be difficult to prove objectively.</p> <ul style="list-style-type: none"> · There is no precedent for Alliance in the United States, as it is currently not a legal approach. 	<p>Projects where the history of existing methods of delivery projects is poor (e.g. tunnels, ocean works). This being due to the inability to fairly allocate and quantify risk at the time of bid.</p> <p>Projects where the required outcomes are developed during the currency of the project. For example, projects where community consultation strongly influences project details.</p> <p>Projects where time is of the essence.</p> <p>Projects where objectives other than cost rank highly in the Owner’s opinion. This could be operation, safety, environment and maintenance objectives.</p> <p>High level of interaction with existing assets.</p> <p>Projects which require all parties to closely collaborate in order to determine optimum solution.</p>

Preferred Delivery Methods

A project delivery workshop was conducted on April 11th 2012 to provide West Basin with an overview of the alternatives and discuss some specific drivers in the delivery method selection. At the workshop, the following drivers were noted by West Basin to be of importance:

- Based on multiple years of project development and site specific understanding gained, West Basin is likely in a more knowledgeable position on the preferred treatment system performance than industry. As such, West Basin would likely consider providing the definition on the technical/treatment components (i.e. prescriptive approach).
- Technically qualified and experienced staff in alternative delivery
- Flexibility in contractor selection – ability to select based on best value
- Cost impacts
- Schedule (no regulatory constraints for expedited schedule)

By comparing the advantages/disadvantages identified above with the initial preferences/concerns provided by West Basin during the project delivery workshop, the CM@Risk, DBOOT and Alliance methods fall out of consideration. DBOOT and Alliance methods rely on private financing which is typically cost prohibitive and relinquishes some control of the project to the private sector. For a municipality that has not already adopted CM@Risk as an acceptable alternative, implementation would be challenging since the method has not been established in CA. There is also currently no legal precedent for the Alliance contracting method in the U.S.

The OWDPMP project can be broken down into three distinct components: the Intake/Discharge Structure, the Desalination Plant, and the Conveyance System. Among these components, the Desalination Plant and the Conveyance System components can be clearly defined by West Basin and a descriptive method of procurement may be warranted. For these two components, a traditional DBB, or descriptive specified DB method, could be appropriate. The Conveyance System requirements would need to be closely specified from the outset in order to satisfactorily integrate into the local distribution system. With more risk associated to the intake/discharge structures, and the industry proprietary solutions associated with this component, a procurement method with performance based requirements may be considered. DBO should also be included in the preferred delivery options as it presents the unique advantage of incorporating long term operational considerations into design and construction.

4. Risk Profile of Preferred Delivery Methods

To present an overview of the preferred Project Delivery options, a framework is provided in this section to address the following two questions in terms of general or typical applications:

- What are the potential Project Risk Factors?
- When is it most appropriate to use which model?

The major Project Risk Factors are shown below in **Table 4-1**.

Table 4-1: Project Risk Factors

Type of Project Risk Factor	Description
Performance Requirements/Demand	This is the risk that actual performance requirements and/or demand will differ from those planned
Planning/Permitting Approvals	This is the risk that outcomes from environmental studies and community consultation processes may affect project viability
Design	This is the risk that the design of the project is faulty and may lead to unexpected construction costs or operational problems in meeting performance requirements
Construction	This is the risk that construction will exceed budgeted cost, contain faults and be completed late
Operation	This is the risk that required performance will not be achieved because of operational problems
Financial	This is the risk associated with changes to interest rates, inflation, availability of finance, taxation, financial ability and security on loans
Commercial	This is the risk that changes to the corporate environment, e.g. structure of company, taxation, insurance, viability and other rates and charges may affect project viability
Government Policies	This is the risk that government may change policies, which may affect project viability
Political	This is for public perception or criticism, i.e. ultimate responsibility for performance of the system

As the methods allocate risk differently between the Owner and the private sector it is necessary to examine the implications for the Owner of choosing a one method over the

other. It is also important that the Owner understand the implications of the Project Delivery options and associated risks. The Owner will need to define the project which will require some basic investigation and initial planning approvals.

This section provides a detailed comparison between DBB, DB, and DBO. Using the Project Risk Factors presented above, **Table 4-2** provides a relative comparison of risks to the Owner associated with the three approaches.

Table 4-2: DBB, DB, and DBO Risk Profiles

Type of Risk	Design Bid Build (DBB)		Design Build (DB)		Design Build Operate (DBO)	
	Description of Impact	Risk Level	Description of Impact	Risk Level	Description of Impact	Risk Level
Performance Requirements/ Demand – performance requirements and/or demand differing from planned.	Risk is with Owner. Performance requirements are well defined prior to initiating bidding but not as intensively as in DB and DBO. The Owner’s contractual relationship with the design consultant allows for owner input throughout concept and detailed design, helping to manage performance and demand risks.	Medium to High	Risk is with Owner. Performance requirements are well defined prior to initiating bidding. Contractor is responsible for adequacy of both design and construction. However, performance and demand changes during design phase are less easily accommodated than in DBB approach.	Medium	Some risk transferred to private sector. Performance requirements and risks are thoroughly defined prior to initiating the bidding process and therefore carry a low risk of differing from the plan. However, there may be problems in making changes to long-term operational contracts if there are changes to the performance requirements.	Low to Medium

Table 4-2: DBB, DB, and DBO Risk Profiles (Continued)

Type of Risk	Design Bid Build (DBB)		Design Build (DB)		Design Build Operate (DBO)	
	Description of Impact	Risk Level	Description of Impact	Risk Level	Description of Impact	Risk Level
Planning/Permitting Approvals – environmental studies and community consultation may affect project viability.	Risk is with Owner. Where detailed design information is needed to obtain regulatory approval, DBB is well suited due to relatively early start to design.	Low	Risk is primarily with Owner. Due to ongoing nature of design, complete detailed design information may not be readily available for obtaining regulatory approval.	Low to Medium	Allocation of risk is dependent on contract arrangement. Some risk can be transferred to private sector. Permitting generally begins prior to design on account of a lengthy DBO team procurement process, meaning that detailed conceptual design information may not be readily available for use in permit applications.	Medium

Table 4-2: DBB, DB, and DBO Risk Profiles (Continued)

	Design Bid Build (DBB)		Design Build (DB)		Design Build Operate (DBO)	
Type of Risk	Description of Impact	Risk Level	Description of Impact	Risk Level	Description of Impact	Risk Level
Design – faulty design leading to higher construction costs or operational problems.	Risk is with designer. The Owner has close control of concept and detailed design development, can adjust the design and extent of work, and can cope with varied ground conditions by paying for actual conditions and quantities through a schedule of rates contract.	Low	Risk is with DB Contractor. A high level of expertise is required to define performance requirements and incorporate these into contractual documents. Contractor is responsible for design and construction which helps ensure that construction costs are considered. However, since the DB Contractor is not responsible for long-term operation and may concentrate on reducing capital cost, high operational costs and problems could result. Including a proving period helps to reduce operational risk.	Medium	Risk is with private sector. This method requires intensive effort from the Owner to define project requirements and risks prior to initiating the bidding process. Contractor is responsible for design, construction, and operation which helps ensure that all related factors including construction cost and operational issues are considered.	Low to Medium

Table 4-2: DBB, DB, and DBO Risk Profiles (Continued)

Type of Risk	Design Bid Build (DBB)		Design Build (DB)		Design Build Operate (DBO)	
	Description of Impact	Risk Level	Description of Impact	Risk Level	Description of Impact	Risk Level
Construction – construction finished over budget, with faults or completed late.	Risk is with Contractor. When construction or operational problems occur, disputes on responsibility (Owner, Project Manager, designer, and Contractor) can be difficult to resolve.	Medium to High	Risk is with DB Contractor. Contractor is responsible for both design and construction. This helps to minimize problems in responsibility and resolution of faults.	Low to Medium	Risk is with private sector. Contractor is responsible for design, construction, and operation. This further minimizes potential problems in responsibility and resolution of faults as most risk is transferred to private sector.	Low
Operation – required performance not achieved due to operational problems.	Risk is with Owner. May be problems with DBB approach managing interfaces and allocating responsibilities for operational problems.	High	Operational risk is mostly with Owner. Fewer interface problems than with DBB approach. Tight performance specification is required.	Medium	Operational risk is with private sector. Managing the interfaces and resolution of interface problems are a matter for the private sector operator.	Low

Table 4-2: DBB, DB, and DBO Risk Profiles (Continued)

Type of Risk	Design Bid Build (DBB)		Design Build (DB)		Design Build Operate (DBO)	
	Description of Impact	Risk Level	Description of Impact	Risk Level	Description of Impact	Risk Level
Financial – changes in interest rate, loan availability, taxation, etc.	Risk is with Owner. DBB does not transfer risk associated with financing of project.	Medium	Risk is with Owner. DB does not transfer risk associated with financing of project.	Medium	Risk is with Owner (except during construction). DBO does not transfer risk associated with financing of project.	Medium
Commercial – changes in the corporate environment e.g. company structure, taxation, etc.	Risk is with Contractor.	Low	Risk is with Contractor.	Low	Risk is with private sector.	Low
Governing Policies – impact of changes in government policies on project viability.	Risk is with Owner. Risk of policy changes can be best managed under a Sequential approach.	Medium to High	Risk is primarily with Owner.	Medium	Allocation of risk is dependent on the contract arrangements.	Low to Medium
Political – ultimate responsibility for performance of system.	Risk is with Owner. Owner bears ultimate responsibility for performance of system.	High	Risk is with Owner. Owner bears ultimate responsibility for performance of system.	High	Risk is primarily with Owner. Owner primarily bears responsibility for performance of system.	Medium to High

5. Delivery Method Cost & Schedule Comparison

5.1. Cost & Schedule Comparison

Table 5-1 below presents a general comparison of cost and schedule for the three delivery methods. An explanation of the primary differences in activities and durations among the three methods are presented in Section 5.2.

Table 5-1: Relative Schedule/ Cost Comparison for DBB, DB, and DBO

Delivery Method	Cost w/ Operations	Cost w/o Operations	Schedule
Design-Bid-Build (DBB)	DBB Capital Cost (baseline for comparison) DBB Life Cycle Cost (baseline for comparison)	DBB Capital Cost (baseline for comparison) DBB Life Cycle Cost (baseline for comparison)	DBB (baseline for comparison)
Design-Build (DB)	Lower than DBB Capital Cost (15-35% lower) Higher than DBB Life Cycle Cost (5-15% higher)	Same as DBB Capital Cost Same as DBB Life Cycle Cost	Shorter than DBB (0 to 10% shorter)
Design-Build-Operate (DBO)	Lower than DBB Capital Cost (10 to 25% lower) Lower than DBB Life Cycle Cost (10 to 25% lower)	N/A N/A	Shorter than DBB (0 to 10% shorter)

5.2. Project Schedules

Included in this comparison of DBB, DB, and DBO are more detailed project schedules developed for each approach. These Project Schedules are included in **Appendix 8:A**.

As illustrated in the project schedules, the primary differences are:

- Retaining Owners Representatives: This activity is associated with the DB and DBO approaches. For the DB and DBO approaches, this activity reflects a significant duration, including the following sub-activities and durations.

RFP/ Retain Project Team	6 months
Project Description	6 months
Construction Impacts Report	6 months
Preliminary Engineering and DB Bid Package	9 months
Preliminary Opinion of Project Cost	2 months

For the DBB approach, some of the associated sub-activities (i.e., Project Description, Construction Impacts Report, Preliminary Design, and Preliminary Cost Estimate) roll up under the Designer/Engineering responsibilities, and therefore, do not reflect a significant difference in the Project Schedules.

- DB/DBO Team Procurement: For a two step DB/DBO approach, which includes prequalification and sort listing of teams prior to the RFP, this activity reflects a significant duration, including the following sub-activities and durations.

Prepare RFQ/ SOQ Submittal	4 months
Short List DB/DBO Teams	2 months
Prepare RFP/ Basis of Design	4 months
DB/DBO Response	6 months
Review/Select/Approval	2 months

With the DBB approach, these activities are replaced with Design Engineer Procurement, reflecting a shorter duration of approximately six months. However, the DBB approach also typically involves a longer design period, a longer contractor bidding and selection period, and a longer construction period (i.e., as a result of more involved submittal process).

Despite the activity and schedule differences between the approaches, given typical conditions and requirements, there is not a significant difference in the total project implement schedules. However, should an expedited schedule be required, as does not appear to be the case for the OWDPMP project, a DB or DBO approach can be a more effective tool in requiring and realizing a shorter project duration.

6. Contractor Procurement Process

6.1. Introduction

The contractor procurement process is different for each of the delivery methods discussed. The following sections describe the contractor procurement process associated with each method, including the following:

- Purpose of the procurement process,
- Scope and format of the procurement documentation, and
- Assessment of the time and budget needed for contractor procurement.

A description of procuring a separate operations contract is also provided.

6.2. DBB Contractor Procurement

The Design-Bid-Build method is typically used on projects where the Owner wishes to exhibit a fair amount of control over the technical aspects of the project. In the Design-Bid-Build method, the Design Engineer is procured and the Contractor is chosen through a contractor bidding and selection period following design. Procurement of the Design Engineer typically follows the format below:

- Owner prepares Design RFP which describes the Design Engineer's scope for the project.
- Design Engineers submit proposals and/or Statement of Qualifications (SOQ) to Owner providing justification for their abilities to complete the required scope.
- Owner reviews proposals and/or SOQs and short lists Design Engineers who may then be asked to interview before final selection.

Following design and potential pre-purchase of equipment, the Contractor is chosen through a bidding and selection period.

Design Engineer Procurement typically has a shorter duration compared to DB Contractor Procurement and DBO Contractor Procurement. However, the DBB approach also typically involves a longer design period, a longer contractor bidding and selection period, and a longer construction period, as discussed in Section 5.2. The additional activities required in the DBB approach, combined with the additional level of effort associated with the design and contractor bidding phases typically make a DB or DBO

approach less costly, depending on the owner's experience and the specific nature/scope of the project.

6.3. DB Contractor Procurement

The Design-Build method can often be used for requiring and realizing a shorter project duration, incorporating best-value team selection and potential cost savings. Prescriptive forms of this method can also grant the Owner a fair amount of control over technical aspects of the project. In the Design-Build method, the Owner's Representatives are retained and the DB Team is procured. DB Team Procurement typically follows the format below.

- Owner prepares Owner's Representative RFP and retains Project Team (Engineering, Technical, Permitting, & Management).
- Owner's Representatives prepare Project Description/Construction Impacts Report, Preliminary Engineering (10-30%) and DB Bid Package, and Preliminary Opinion of Project Cost.
- Owner prepares DB RFQ which describes the DB Team's scope for the project.
- DB Teams submit Statement of Qualifications (SOQ) to Owner providing justification for their abilities to complete the required scope.
- Owner reviews SOQs and short lists DB Teams.
- Following pre-qualification, DB Teams submit bids on the project and include Contract Documents prepared to a level required for adequate cost estimation of work and bid development.
- Owner reviews DB Team bids and technical proposals and makes final selection.

DB Contractor Procurement typically has a longer duration compared to Design Engineer Procurement and about the same as DBO Contractor Procurement. However, the DBB approach also typically involves a longer design period, a longer contractor bidding and selection period, and a longer construction period, as discussed in Section 5.2.

6.4. DBO Contractor Procurement

The Design-Build Operate method is often used on projects where the long term operation of the facility is an important component of the project's life cycle cost. DBO helps to ensure that operation factors are considered during design and construction. In the Design-Build Operate method, the Owner's Representatives are retained and the DBO Team is procured. DBO Team Procurement typically follows the format below.

- Owner prepares Owner's Representative RFP and retains Project Team (Engineering, Technical, Permitting, Legal, & Management/Financial).
- Owner's Representatives prepare Project Description/Construction Impacts Report, Preliminary Engineering (10-30%) and DB Bid Package, and Preliminary Opinion of Project Cost.
- Owner prepares DBO RFQ which describes the DBO Team's scope for the project.
- DBO Teams submit Statement of Qualifications (SOQ) to Owner providing justification for their abilities to complete the required scope.
- Owner reviews SOQs and short lists DBO Teams.
- Following pre-qualification, DBO Teams submit bids on the project and include Contract Documents prepared to a level required for adequate cost estimation of work and bid development.
- Owner reviews DBO Team bids and technical proposals and makes final selection.

DBO Contractor Procurement typically has a longer duration compared to Design Engineer Procurement and about the same as DB Contractor Procurement. However, the DBB approach also typically involves a longer design period, a longer contractor bidding and selection period, and a longer construction period, as discussed in Section 5.2.

6.5. Contract Operations Procurement

Contract O&M, when properly implemented, is used to provide greater accountability for operations and to transfer operation risk to the private sector. Fixed pricing and technical expertise are major benefits to using Contract O&M. A Contractor with a proven track record is essential for achieving the maximum benefit from a Contract O&M. As such, the procurement process should be similar to that used for procuring other professional services like those above. Specifically, Contract O&M procurement should include a RFP with a process for submitting and evaluating qualifications and selections should not be based solely on bid price.

Contract O&M can take on a variety of forms due to the length of the contract period and the scope of services describing how facilities are to be operated and maintained and the criteria against which the Contractor's performance will be measured. Typically Contract O&M will measure performance based on guaranteeing a certain effluent or product water quality and quantity (which can put the Owner at risk if influent quality is uncontrolled) or by requiring a certain level of staffing and for providing appropriate maintenance materials.

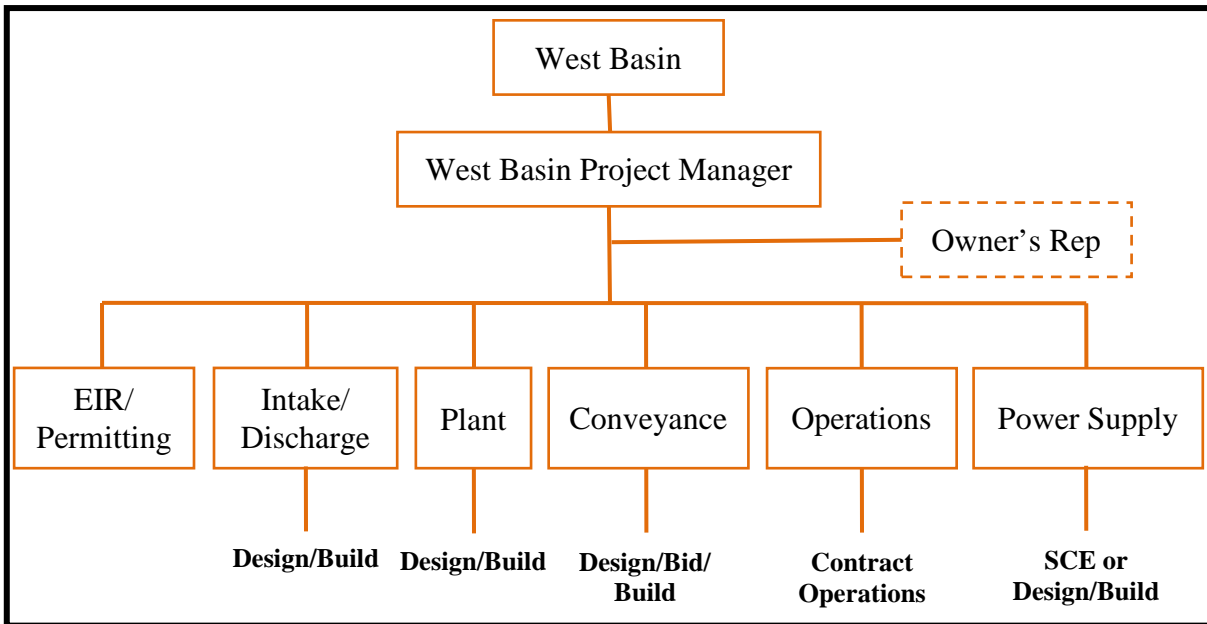
7. Conclusions

7.1. Conclusions

The OWDPMP project can be broken down into three distinct components: the Intake/Discharge Structure, the Desalination Plant, and the Conveyance System. Among these components, the Desalination Plant and the Conveyance System components can be clearly defined by West Basin and a descriptive method of procurement is warranted, and preferred by West Basin. For these two components, a traditional DBB, or descriptive specified DB method, are appropriate. West Basin identified these two methods as ones to be considered further. The Conveyance System requirements would need to be closely specified from the outset in order to satisfactorily integrate into the local distribution system. With more risk associated to the intake/discharge structures, and the industry proprietary solutions associated with this component, a procurement method with performance based requirements may be considered. DBO should also be included in the preferred delivery options as it presents the unique advantage of incorporating long term operational considerations into design and construction.

The use of multiple contracts would however bring its own risks associated with the overlapping and interconnecting components. Careful consideration to the management of such a hybrid delivery model will need to be undertaken, developed and implemented. Based on the assessment provided within this TM, the hybrid organization might look like the Program Delivery Model shown below in **Figure 7-1**.

Figure 7-1: Example Program Delivery Model



Within this type of Program Delivery Model that includes a hybrid set of delivery methods and contracts, additional development and coordination is often recommended and provided by an Owner’s Representative. In general, this support can help to define and drive the program, in addition to providing significant coordination between the major components.

An overall schedule for the Program Master Plan that takes into account use of the hybrid delivery model described above is included in Appendix A.