C-470 Corridor Managed Tolled Express Lanes, Segment 1, Kipling to I-25
Risk Assessment and Project Delivery Selection

Colorado Department of Transportation
Innovative Contracting Advisory Committee
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Overview

This document provides a formal approach for CDOT highway project delivery selection. The document provides generic forms for use by CDOT staff and project team members. By using these forms, a brief project delivery selection report can be generated for each individual project. The primary objectives of this document are:

- Present a structured approach to assist CDOT in making project delivery decisions;
- Assist CDOT in determining if there is a dominant or obvious choice of project delivery methods; and
- Provide documentation of the project delivery decision in the form of a Project Delivery Decision Report.

Background

The project delivery method is the process by which a construction project is comprehensively designed and constructed including project scope definition, organization of designers, constructors and various consultants, sequencing of design and construction operations, execution of design and construction, and closeout and start-up. Thus, the different project delivery methods are distinguished by the manner in which contracts between the agency, designers and builders are formed and the technical relationships that evolve between each party inside those contracts. Currently, there are several types of project delivery systems available for publicly funded transportation projects in the Colorado. The most common systems are Design-Bid-Build (DBB), Design-Build (DB), and Construction Manager/General Contractor (CM/GC). No single project delivery method is appropriate for every project. Each project must be examined individually to determine how it aligns with the attributes of each available delivery method.

DBB is the traditional project delivery method in which an agency designs, or retains a designer to furnish complete design services, and then advertises and awards a separate construction contract based on the designer's completed construction documents. In DBB, the agency "owns" the details of design during construction and as a result, is responsible for the cost of any errors or omissions encountered in construction.

DB is a project delivery method in which the agency procures both design and construction services in the same contract from a single, legal entity referred to as the design-builder. The method typically uses Request for Qualifications (RFQ)/Request for Proposals (RFP) procedures rather than the DBB Invitation for Bids procedures. The design-builder controls the details of design and is responsible for the cost of any errors or omissions encountered in construction.

CM/GC is a project delivery method in which the agency contracts separately with a designer and a construction manager. The agency can perform design or contract with an engineering firm to provide a facility design. The agency selects a construction manager to perform construction management services and construction works. The significant characteristic of this

delivery method is a contract between an agency and a construction manager who will be at risk for the final cost and time of construction. Construction industry/Contractor input into the design development and constructability of complex and innovative projects are the major reasons an agency would select the CM/GC method. Unlike DBB, CM/GC brings the builder into the design process at a stage where definitive input can have a positive impact on the project. CM/GC is particularly valuable for new non-standard types of designs where it is difficult for the owner to develop the technical requirements that would be necessary for DB procurement without industry input.

Overview of the Project Delivery Selection Process

The process is shown in the form of a flow chart below. It consists of the following activities:

A. Describe the project and set the project goals.

B. Determine and review project dependent constraints.

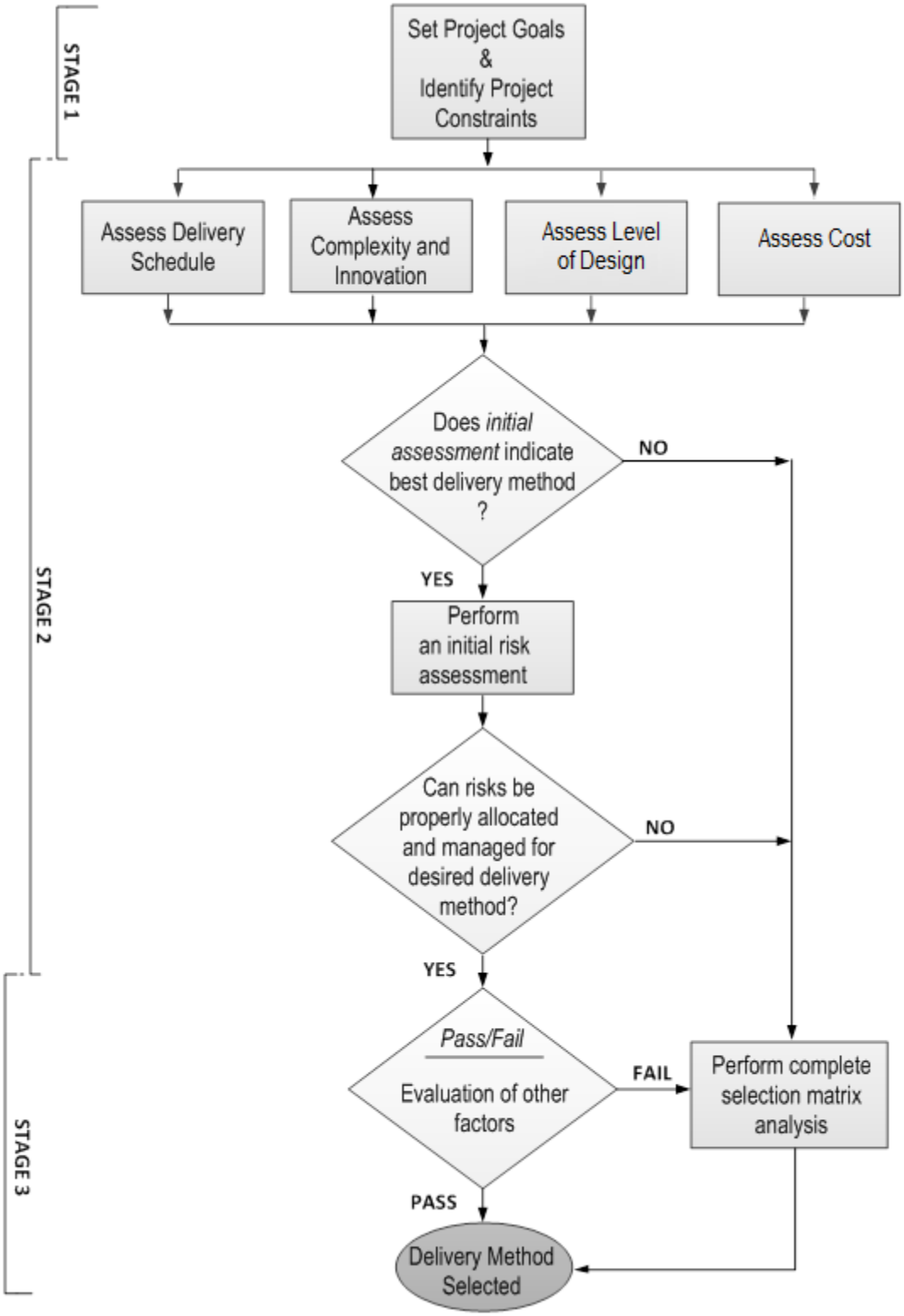
C. Assess the primary factors (these factors most often determine the selection).
   1. Delivery Schedule
   2. Complexity & Innovation
   3. Level of Design (at the time of the project delivery procurement)
   4. Cost

D. If the primary factors indicate there is a clear choice of the delivery method, then:
   5. Perform an initial risk assessment for the desired delivery method to ensure that risks can be properly allocated and managed, and

E. Perform a brief pass/fail analysis of the secondary factors to ensure that they are not relevant to the decision.
   6. Staff Experience/Availability (Owner)
   7. Level of Oversight and Control
   8. Competition and Contractor Experience

F. If steps B, C & D do not result in clear determination of the method of delivery then perform a more rigorous evaluation of all eight factors against the three potential methods of delivery (DBB, DB and CM/GC).

Typically the entire selection process can be completed by the project team in a 4 hour workshop session, if team member have individually performed assessments before the workshop.



CDOT Project Delivery Selection Flowchart

The following forms and appendices are included to facilitate this process.

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Project description checklist

Provide information on the project that is using this tool. This includes size, type, funding, risks, complexities, etc. All information should be developed for the specific project.

Project Goals worksheet – including example project goals

A careful determination of the project goals is an instrumental first step of the process that will guide both the selection of the appropriate method of delivery as well as the specific delivery procurement process and implementation of the project.

Project Constraints worksheet (Go / No-Go Decisions)

Carefully review all possible constraints to the project. These constraints can potentially eliminate a project delivery method before the evaluation process begins.

Project Delivery Selection Matrix Summary

The Project Delivery Selection Matrix Summary summarizes the assessment of the eight Evaluation Factors for the three delivery methods. The form is qualitatively scored using the scoring provided in table 1 below.

Table 1 - Factor Evaluation Scoring Key

+ +	Most appropriate delivery method
+	Appropriate delivery method
–	Least appropriate delivery method
X	Fatal Flaw (discontinue evaluation of this method)
NA	Factor not applicable or not relevant to the selection

The form also includes a section for comments and conclusions. The completed Project Delivery Selection Matrix Summary should provide an executive summary of the key reasons for the selection of the method of delivery**.**

Workshop Blank Form

This form can be used by the project team for additional documentation of the process. In particular it can be used to elaborate on Evaluation Factor 4. “Initial Project Risk Assessment”.

Evaluation Factor Project Delivery Method Opportunity/Obstacle Summary

These forms are used to summarize the assessments by the project team of the opportunities and obstacles associated with each delivery method relative to each of the eight Evaluation Factors. The bottom of each form allows for a qualitative conclusion using the same notation as described above. Those conclusions then are transferred to the **Project Delivery Selection Matrix Summary.**

Appendix – Opportunity/Obstacle Checklists

These forms provide the project team with guidance concerning typical delivery method opportunities and obstacles associated with each of the eight Evaluation Factors. However, these checklist include general information and are not an all-inclusive checklist. Use the checklists as a supplement to developing project specific opportunities and obstacles.

Appendix – Initial Risk Assessment Guidance

Because of the unique nature of Evaluation Factor 4. "Initial Project Risk Assessment", the Appendix provides the project team with additional guidance for evaluation of that factor including: Typical CDOT Transportation Project Risks; a General Project Risks Checklist; and a Risk Opportunities/Obstacles Checklist.

Project Description Checklist

The following items should be considered in the project description as applicable. Other items can be added if they influence the project delivery decision. Relevant documents can be added as appendices.

Project Name: C-470 Corridor Managed Tolled Express Lanes, Segment 1, Kipling to I-25

Location: Region 1, Denver, C-470 from Kipling to I-25

Estimated Budget: $211,000,000 to $214,000,000

Estimated Project Delivery Period: January 2014 through December 2017

Required Delivery Date (if applicable): December 2017 (mandated by RAMP funding)

Sources of Project Funding: RAMP, tolling, local agency, CDOT/Federal

Project Corridor: C 470

Major Features of Work: Construction of one tolled express lane in each direction on C 470 between I 25 and Wadsworth / Platte Canyon; full reconstruction of existing pavement; construction of auxiliary lanes; improvement of ramps to current standards; realignment of substandard curves; safety and operational improvements, reconstruction of bridges; construction of water quality features; noise barriers; and, installation of ITS and tolling elements.

Major Schedule Milestones (assuming HPTE-financed project):
Right of Way Acquisition January 2014 – April 2015
Project Financing Determination January 2014 – September 2015
Design Build Procurement January 2014 – October 2015
Design Build Notice to Proceed October 2015
Project Completion December 2017

Major Project Stakeholders:

FHWA
CDOT
HPTE
Arapahoe County
Douglas County
Jefferson County
City of Centennial
City of Greenwood Village
City of Littleton
City of Lone Tree
Highlands Ranch Metropolitan District

Major Challenges (as applicable)

Right of Way: The project corridor is approximately 12 miles long. There are numerous right of way appraisals and acquisitions required. As with most projects, the right of way process will take place concurrently with final design.

Utilities: There are many utility concerns along the C 470 corridor. If the project is design bid build it will be necessary to have consultants do a majority of the utility identification, coordination and relocation work. If the project is design build, a large part of the utility work will take place during the procurement process, with the remainder done by the design build contractor/engineering team.

Environmental Approvals: An Environmental Assessment was done for C 470 from I 25 to Kipling in 2006. Douglas County has independently undertaken to complete a Revised Environmental Assessment and Finding of No Significant Impact in addition to development of FIR-level plans for the project. The revised EA is expected to be complete in June of 2014, the decision document in September of 2014. The preliminary design is expected to be complete in early 2014. All of these actions are in response to the need for an aggressive schedule and completion of several tasks concurrently.

During the Construction Phase: the major challenges are substantial completion of the construction by December 2017 to conform with RAMP requirements while ensuring a quality project built in a high-traffic corridor, in a manner that maximizes public and worker safety during construction.

Main Identified Sources of Risk

Construction:

- Schedule – optimization of safety, cost, quality of construction, minimization of disruptions to motorists and early completion to allow generation of tolling revenue
- Fluctuation in unit costs
- Quality assurance / quality control
- Financing
- Complex construction phasing
- Material, labor, equipment procurement delays
- Accidents during construction
- Public information requirements
- Unforeseen construction conditions and utility conflicts
- Unforeseen third-party delays

Design:

- Schedule – optimization of cost, coordination with completion of environmental process, quality assurance /quality control, right of way acquisition and utility coordination and relocations, and implementation of tolling infrastructure
- Control of consultant costs
- Decision on concrete versus asphalt
- Complexity of tolling ingress/egress, infrastructure and maximization of revenue

Environmental:

- Completion of and compliance with revised Environmental Assessment
- Water Quality implementation

- Changes to noise mitigation requirements
- Impacts on project cost from aesthetic treatments
- Stormwater management
- Unforeseen mitigation requirements

Coordination between local agencies, CDOT, design consultants and contractor:

- Difficulty obtaining agency approvals and agreements
- Conflicts with other construction projects
- Political considerations
- Funding shortfalls
- Funding delays
- Intergovernmental agreements

Project delivery and procurement:

- Construction market conditions
- Market economic cycles
- Interest and availability of qualified bidders
- Potential delays in procurement/advertisement/award process

Miscellaneous: As with every project, a source of risk is the quality assurance / quality control aspect during design and construction. In addition, on this project sources of funding are still being defined along with refinements to the project estimate. As a significant amount of the funding will depend on tolling revenue, traffic projections, tolling use, congestion modeling and financial aspects of bond ratings, investor perspectives, etc. are major sources of risk and constrain the amount of possible construction.

Safety Issues

This project is similar to most roadway design projects in the amount and quality of relevant safety issues. But, in addition, the C 470 corridor is one of the major transportation corridors in the metropolitan area, has a large amount of traffic, and has many complicating factors relating to interchanges, ramps, conflicting traffic movements, and decision points. As the construction project will be very large and complex, construction phasing along with the safety of motorists and construction workers presents an enormous challenge.

Sustainable Design and Construction Requirements

This project has no unique requirements concerning sustainable design or construction requirements other than that the construction involves tolling elements and infrastructure.

Project Goals

An understanding of project goals is essential to appropriate project delivery selection. Typically, the project goals can be defined in three to five items. Examples are provided below, but the report should include project-specific goals. These goals should remain consistent over the life of the project.

Project-Specific Goals

Schedule
- Minimize project delivery time
- Complete the project on schedule
- Accelerate start of project revenue

Cost
- Maximize the project scope and improvements within the project budget

Quality
- Provide a high-quality design and construction product

Functional
- Maximize the life-cycle performance of the project
- Maximize capacity and mobility improvements
- Minimize inconvenience to the traveling public during construction
- Maximize safety of workers and traveling public during construction

Project Constraints

There are potential aspects of a project that can eliminate the need to evaluate one or more of the possible project delivery methods. General constraints are provided, but it is critical to identify constraints that are project specific.

Constraints

- Source of Funding

  As this project contains two time-sensitive funding sources (RAMP funding and toll-generated revenue), it is extremely important to accelerate the project-delivery process. For this reason, design-build has been strongly favored during project development.

- Schedule constraints

  The primary schedule constraints are the completion of the Revised Environmental Assessment and Decision Document, completion of preliminary design, securing funding for tolling elements, and meeting the mandated completion of construction date of December 2017. All of these shift the emphasis of project delivery to accelerating the schedule of both design and construction.

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Project Delivery Selection Matrix Summary

Determine the factors that should be considered in the project delivery selection, discuss the opportunities and obstacles related to each factor, and document the discussion on the following pages. Then complete the summary below.

PROJECT DELIVERY METHOD OPPORTUNITY/OBSTACLE SUMMARY			
	DBB	**DB**	**CM/GC**
Primary Evaluation Factors			
1. Delivery Schedule	**X**	**+ +**	**X**
2. Project Complexity & Innovation	**+**	**+ +**	**+**
3. Level of Design	**++**	**+**	**+**
4. Cost	**+**	**+ +**	**–**
5. Perform Initial Risk Assessment	**–**	**+ +**	**–**
Secondary Evaluation Factors			
6. Staff Experience/Availability (Owner)	**Pass**	**Pass**	**Pass**
7.Level of Oversight and Control	**Pass**	**Pass**	**Pass**
8. Competition and Contractor Experience	**Pass**	**Pass**	**Pass**

+ +	Most appropriate delivery method
+	Appropriate delivery method
–	Least appropriate delivery method
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NA	Factor not applicable or not relevant to the selection

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Project Delivery Selection Matrix Summary Conclusions and Comments:

Delivery Schedule: Because a significant amount of planning, design and environmental analysis has already been done under the previous Environmental Assessment, the current Revision to that Environmental Assessment, and the FIR-level design undertaken by Douglass County, either Design Bid Build or Design Build are possible project delivery methods for the C-470 Corridor Managed Tolled Express Lanes, Segment 1, Kipling to I-25 project. But, the critical element on this project is the schedule. RAMP funding mandates substantial completion of construction by December 2017, and equally important, private investment in the tolling elements makes early completion and financial returns on investment extremely important. Design Build best supports the need for an accelerated schedule as construction proceeds in parallel with design. Construction Manager / General Contractor project delivery at this stage of project development would require an enormous change in direction of all ongoing elements of project development. As such, it has been eliminated from consideration.

Project Complexity and Innovation: This is a highly complex project. Design Build will allow maximum innovation by the contractor/designer team as selection of that team will depend on demonstration of innovation and proposed additional requested elements (AREs) and/or alternative technical concepts (ATCs).

Level of Design: As a factor in choosing between Design Bid Build and Design Build, the level of design plays less of a role. However, the advantage of Design Build is that final design will take place concurrently with construction rather than precede construction, thus shortening the schedule.

Cost: Considering cost, Design Build offers the advantage of competitive bidding on all elements of final design and construction by the proposing teams. The result will be the lowest cost for both final design and construction while providing the maximum scope, innovation, and quality of the design and construction.

Initial Risk Assessment: For a Design Build project, since the design build team controls the final design and construction, the risk is shifted to them for errors, omissions and construction problems. On this project it is intended that CDOT will have a consultant team separate from the design build team perform Quality Assurance rather than paying a substantially higher amount of money to the design build team to hire consultants for Quality Assurance. Doing so will reduce the cost of quality control while still assuring the overall quality of the design and construction, while minimizing CDOT's risk through the design build project delivery method.

1) Delivery Schedule

Delivery schedule is the overall project schedule from scoping through design, construction and opening to the public. Assess time considerations in getting the project started or funding dedicated and assess project completion importance.

DESIGN-BID-BUILD Requires time to perform sequential design and procurement, but if design time is available has the shortest procurement time after the design is complete.	
Opportunities	**Obstacles**
The amount of time needed to completely fund the project would allow for a thorough design process.	The scope of the project is determined by the available funding. On this project funding includes a TIFIA loan. The requirements to obtain this loan necessitate a long period of time for the process. The remaining time until the RAMP funding construction completion date is extremely limiting for time to construct.
A long design period allows more flexibility in considering alternate designs.	Uncertainty in unit costs for construction items over a long period of time complicates the accuracy of cost estimating, raising risk.
A long design period lowers risk in the right of way schedule and utility relocations.	
A long design period lowers the risk of complications in IGAs	

DESIGN-BUILD Can get project under construction before completing design. Parallel process of design and construction can accelerate project delivery schedule; however, procurement time can be lengthy due to the time necessary to develop an adequate RFP, evaluate proposals and provide for a fair, transparent selection process.	
Opportunities	**Obstacles**
The parallel process of design and construction maximizes efficiency in the final design and construction.	A lengthy procurement process creates more risk for contractor/designer teams with regard to market fluctuations, unit costs, and availability of local equipment and staff.
The time necessary to acquire funding for this project allows for a thorough procurement process.	
A lengthy procurement process allows more time for design-build teams to develop creative and innovative solutions for design and construction.	
Procurement would take place concurrently with completion of the NEPA process.	

CM/GC Quickly gets contractor under contract and under construction to meet funding obligations before completing design. Parallel process of development of contract requirements, design, procurements, and construction can accelerate project schedule. However, schedule can be slowed down by coordinating design-related issues between the CM and designer and by the process of reaching a reasonable Guaranteed Maximum Price (GMP).	
Opportunities	**Obstacles**
Parallel design and construction would accelerate project delivery schedule	The uncertainty in funding amounts and scope elements on this project works against the schedule and benefits of CM/GC. A GMP could not be defined for many months.
	The environmental process will not be complete for several months, construction cannot take place until then.
	Procurement of a CM/GC contractor would have to be delayed until more is known about funding and scope.

Delivery Schedule Summary

	DBB	DB	CM/GC
1. Delivery Schedule	x	+ +	x

Notes and Comments:

2) Project Complexity & Innovation

Project complexity and innovation is the potential applicability of new designs or processes to resolve complex technical issues.

DESIGN-BID-BUILD Allows CDOT to fully resolve complex design issues and qualitatively evaluate designs before procurement of the general contractor. Innovation is provided by CDOT/Consultant expertise and through traditional owner directed processes such as VE studies and contractor bid alternatives.	
Opportunities	**Obstacles**
DBB clearly allows most control of design, therefore allowing thorough analysis of alternate designs and innovative concepts.	The complexity and magnitude of the project present a severe challenge to construct in the limited amount of time available due to RAMP requirements to complete work by December 2017. Although this is a schedule issue, it is clearly complicated by the complexity of the project.

FIR-level design is substantially complete, resolving many preliminary problems and preliminarily defining scope and right of way requirements, allowing more efficient consideration of new designs and processes.	Design with oversight and control by CDOT is more likely to utilize tried and successful designs and processes, lowering the likelihood of innovation.
The magnitude of the project allows elements of the design to be treated separately which could allow experimental designs and construction processes to be compared to other designs on the same project.	

DESIGN-BUILD Incorporates design-builder input into design process through best value selection and contractor proposed Alternate Technical Concepts (ATCs) – which are a cost oriented approach to providing complex and innovative designs. Requires that desired solutions to complex projects be well defined through contract requirements.	
Opportunities	**Obstacles**
As final design, construction phasing and construction methods are developed by the design-build team in a competition to win the award of the project, innovation and value are maximized.	Final design by a design-build team removes certainty of the control and quality of design and increases risk depending on the effectiveness of the QA/QC process implemented.
ATCs proposed by the design/build candidates maximize the amount of scope for the available funding and are normally based on innovation in design and in construction methods.	

CM/GC Allows independent selection of designer and contractor based on qualifications and other factors to jointly address complex innovative designs through three party collaboration of CDOT, designer and Contractor. Allows for a qualitative (nonprice oriented) design but requires agreement on GMP.	
Opportunities	**Obstacles**
Selection of the CM/CG team is based on qualifications of proposers and ideally results in innovative designs and construction methods.	Lack of a clearly-defined scope and budget hampers definition of a GMP. That would limit opportunities to adequately develop innovative designs and construction methods
Collaboration between CDOT and design/contractor results in maximum potential for innovation.	

Project Complexity & Innovation Summary

	DBB	DB	CM/GC
2. Project Complexity & Innovation	+	+ +	+

Notes and Comments:

3) Level of Design

Level of design is the percentage of design completion at the time of the project delivery procurement

DESIGN-BID-BUILD 100% design by CDOT, with CDOT having complete control over the design.	
Opportunities	**Obstacles**
The design would be complete before selection of a contractor, maximizing control by CDOT and minimizing risk to CDOT.	

DESIGN-BUILD Design advanced by CDOT to the level necessary to precisely define contract requirements and properly allocate risk (typically 30% or less).	
Opportunities	**Obstacles**
A considerable effort to consider design optimization has taken place by the design-build team in order to be awarded the project.	The preliminary design given to the design-build team is only at a 30% level, increasing risk of unforeseen problems and delays.
The design-build team is given maximum opportunity to optimize the design to maximize scope and minimize cost.	

CM/GC Can utilize a lower level of design prior to procurement of the CM/GC and then joint collaboration of CDOT, designer, and CM/GC in the further development of the design. Iterative nature of design process risks extending the project schedule.	
Opportunities	**Obstacles**
A lower level of design is required to successfully implement CM/GC.	Efficiency of transitioning to a CM/GC design this far along in the project development process is an obstacle.

The CM/GC team is given maximum opportunity to optimize the design and the construction methods and phasing.	The project development and design has proceeded for a long period of time with a large group of stakeholders and participants. Potential CM/GC contractors would be presented with a significant challenge in coming up to speed with the project in a way that would make CM/GC more attractive than other project delivery methods.

Level of Design Summary

	DBB	DB	CM/GC
3. Level of Design	++	+	+

Notes and Comments:

4) Cost

Project cost is the financial process related to meeting budget restrictions, early and precise cost estimation, and control of project costs.

DESIGN-BID-BUILD Competitive bidding provides a low cost construction for a fully defined scope of work. Costs accuracy limited until design is completed. More likelihood of cost change orders due to contractor having no design responsibility.	
Opportunities	**Obstacles**
Competition between contractors in bidding limits construction cost.	The final estimate is not available until time of advertisement, increasing risk of exceeding the project budget because of unforeseen market conditions.
Completion of design before procurement (advertisement) allows the most accurate cost estimating.	Design-build costs for final engineering tend to be lower than traditional design-bid-build costs for final design by a consultant.
	If consultants are used for design and/or construction management, costs can be significantly higher than utilizing in-house staff.

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DESIGN-BUILD Designer-builder collaboration and ATCs can provide a cost-efficient response to project goals. Costs are determined with design-build proposal, early in design process. Allows a variable scope bid to match a fixed budget. Poor risk allocation can result in high contingencies.	
Opportunities	**Obstacles**
Design-build bids are based on optimizing costs versus scope, while best responding to project goals.	Uncertainty resulting from incomplete design and the complexity and scale of this project increases risk to the design-build team which results in higher costs for the project.
ATCs provide maximum scope for minimum cost.	
Competition between potential design build teams results in the lowest cost for the project.	
Costs are defined early in the project development process reducing risk of budget overruns.	

CM/GC CDOT/designer/contractor collaboration to reduce risk pricing can provide a low cost project however non-competitive negotiated GMP introduces price risk. Good flexibility to design to a budget.	
Opportunities	**Obstacles**
Shared risk between CDOT and the CM/GC team minimizes risk to any single party, theoretically minimizing the cost of the project.	As stated earlier, inability to define the GMP early in the process presents a "moving target" to the CM/GC team and minimizes the desirability of this project delivery method.
Optimization of the design by CDOT, the designer, and contractor minimizes the cost of the project.	

Cost Summary

	DBB	**DB**	**CM/GC**
4. Cost	**+**	**+ +**	**–**

Notes and Comments:

5) Initial Risk Assessment

Risk is an uncertain event or condition that, if it occurs, has a negative effect on a project's objectives. Risk allocation is the assignment of unknown events or conditions to the party that can best manage them. An initial assessment of project risks is important to ensure the selection of the delivery method that can properly address them. An approach that focuses on a fair allocation of risk will be most successful. Refer to risk discussion and checklists in appendix B.

DESIGN-BID-BUILD Risk allocation for design-bid-build best is understood by the industry, but requires that most design-related risks and third party risks be resolved prior to procurement to avoid costly contractor contingency pricing and change orders and claims.	
Opportunities	**Obstacles**
Completion of the design before procurement eliminates a majority of unknowns and thereby potentially minimizes the risk.	On this project the highest risk is not meeting the deadline of construction completion by December 2017. Design-bid-build maximizes this risk by allowing the shortest amount of time for construction.
The industry most often works on design-bid-build projects. The process is thoroughly understood and operations have been optimized.	Swelling or unsuitable subgrade material. This risk exists for all project delivery methods.
	Uncertainty in actual funding for the project. If projections do not meet expectations, the ability to scale back the project quickly and adjust the environmental clearance is difficult under design-bid-build.

DESIGN-BUILD Provides opportunity to properly allocate risks to the party best able to manage them, but requires risks allocated to design-builder to be well defined to minimize contractor contingency pricing of risks.	
Opportunities	**Obstacles**
Two R1 design-build projects are currently in progress, allowing for coordination between teams, usage of common elements of the procurement documents, and application of lessons learned, thus lowering risk and expense to CDOT.	Risks are not completely known by design-build team and are incorporated into the price bid for the design and construction work.
By optimizing the schedule, this project delivery offers the best opportunity to respond to the particular constraints of this project.	Additional risk to CDOT is incurred by potential defects in the design-build QA/QC process.
Uncertainty in actual funding for the project. If projections do not meet expectations, the ability to scale back the project quickly and adjust the environmental clearance is more easily accommodated under design-bid-build.	Swelling or unsuitable subgrade material. This risk exists for all project delivery methods.

CM/GC Provides opportunity for CDOT, designer, and contractor to collectively identify and minimize project risks, and allocate risk to appropriate party. Has potential to minimize contractor contingency pricing of risk, but can lose the element of competition in pricing.	
Opportunities	**Obstacles**
Collaboration between CDOT and the CM/GC ideally minimize risk to any single party.	Not having a clearly defined scope or budget, and therefore a definite GMP at the outset of the project significantly reduces the desirability of CM/GC as a delivery method on this project by increases the risk of not meeting the schedule imposed by RAMP funding.
Uncertainty in actual funding for the project. If projections do not meet expectations, the ability to scale back the project quickly and adjust the environmental clearance is more easily accommodated under cm/gc.	Swelling or unsuitable subgrade material. This risk exists for all project delivery methods.

Initial Risk Assessment Summary

	DBB	DB	CM/GC
5. Initial Risk Assessment	–	+ +	–

Notes and Comments:

6) Staff Experience/Availability

Owner staff experience and availability as it relates to the project delivery methods in question.

DESIGN-BID-BUILD Technical and management resources necessary to perform the design and plan development. Resource needs can be more spread out.	
Opportunities	**Obstacles**
Staff experience and availability are adequate.	

DESIGN-BUILD Technical and management resources and expertise necessary to develop the RFQ and RFP and administrate the procurement. Concurrent need for both design and construction resources to oversee the implementation.

Opportunities	Obstacles
Staff experience and availability are adequate.	

CM/GC Strong, committed CDOT project management resources are important for success of the CM/GC process. Resource needs are similar to DBB except CDOT must coordinate CM's input with the project designer and be prepared for GMP negotiations.	
Opportunities	**Obstacles**
Staff availability is adequate.	Staff experience is limited.

Staff Experience/Availability Summary

	DBB	DB	CM/GC
6. Staff Experience/ Availability	+	+	+

Notes and Comments:

7) Level of Oversight and Control

Level of oversight involves the amount of agency staff required to monitor the design or construction, and amount of agency control over the delivery process

DESIGN-BID-BUILD Full control over a linear design and construction process.	
Opportunities	**Obstacles**
CDOT's level of oversight and control of the delivery process is maximized during design and construction.	In-house staff may be unavailable for design and/or construction management.
Consultants can be used to complete design and construction management if in-house staff are not available.	

DESIGN-BUILD Less control over the design (design desires must be written into the RFP contract requirements). Generally less control over the construction process (design-builder often has QA responsibilities).	
Opportunities	**Obstacles**
The number of staff required is similar to Design Bid Build, but the amount of work required to complete design is less.	CDOT has less control in modifying design elements during final design as they must be specified in the RFP documents.
The design-build team can provide whatever staff is required to design and construct the project.	Level of CDOT control over QA/QC depends on the methods implemented by the design-build team.

CM/GC Most control by CDOT over both the design, and construction, and control over a collaborative owner/designer/contractor project team	
Opportunities	**Obstacles**
CDOT has more control of the design and construction than with design build.	CDOT has less control of the design and construction than with design-bid-build.

Level of Oversight and Control Summary

	DBB	DB	CM/GC
7. Level of Oversight and Control	+ +	+	+

Notes and Comments:

8) Competition and Contractor Experience

Competition and availability refers to the level of competition, experience and availability in the market place and its capacity for the project.

DESIGN-BID-BUILD High level of competition, but GC selection is based solely on low price. High level of marketplace experience.	
Opportunities	**Obstacles**
Competition is optimized for construction contractor selection.	As the contractor is selected by the lowest bid without regard to ability and previous work, quality of construction may suffer.
If design is done by a consultant, competition is included in the design process.	
Design-bid-build is by far the most common project delivery method. Everyone has the most experience with this method.	

DESIGN-BUILD Allows for a balance of price and non-price factors in the selection process. Medium level of marketplace experience.	
Opportunities	Obstacles
Competition is included in the design and construction process	Less contractor experience than with design-bid-build
More experience for CDOT and designer/contractor teams than CM/GC	

CM/GC Allows for the selection of the single most qualified contractor, but GMP can limit price competition. Low level of marketplace experience.	
Opportunities	Obstacles
Selection of CM/GC team is based on qualifications and competition between proposing teams.	This project delivery method has the least experience for CDOT and designer/contractor teams

Competition and Contractor Experience Summary

	DBB	DB	CM/GC
8. Competition and Contractor Experience	+	+ +	+

Notes and Comments:

C-470 Corridor Managed Tolled Express Lanes, Segment 1, Kipling to I-25
Risk Assessment and Project Delivery Selection

APPENDIX

Opportunity and Obstacle Checklists

(With Project Risk Assessment Discussion and Checklists)

1) Delivery Schedule Checklist

DESIGN-BID-BUILD	
Opportunities	Obstacles
❒ Schedule is more predictable and more manageable ❒ Milestones can be easier to define ❒ Projects can more easily be "shelved" ❒ Shortest procurement period ❒ Elements of design can be advanced prior to permitting, construction, etc. ❒ Time to communicate/discuss design with stakeholders	❒ Requires time to perform a linear design-bid-construction process ❒ Design and construction schedules can be unrealistic due to lack industry input ❒ Errors in design lead to change orders and schedule delays ❒ Low bid selection may lead to potential delays and other adverse outcomes.

DESIGN-BUILD	
Opportunities	Obstacles
❒ Potential to accelerate schedule through parallel design-build process ❒ Shifting schedule risk to DB team ❒ Encumbers construction funds more quickly ❒ Industry input into design and schedule ❒ Fewer chances for disputes between agency and design-builders ❒ More efficient procurement of long-lead items ❒ Ability to start construction before entire design, ROW, etc. is complete (i.e., phased design) ❒ Allows innovation in resource loading and scheduling by DB team	❒ Request for proposal development and procurement can be intensive ❒ Undefined events or conditions found after procurement, but during design can impact schedule and cost ❒ Time required to define technical requirements and expectations through RFP development can be intensive ❒ Time required to gain acceptance of quality program ❒ Requires agency and stakeholder commitments to an expeditious review of design

CM/GC	
Opportunities	Obstacles
❒ Ability to start construction before entire design, ROW, etc. is complete (i.e., phased design) ❒ More efficient procurement of long-lead items ❒ Early identification and resolution of design and construction issues (e.g., utility, ROW, and earthwork) ❒ Can provide a shorter procurement schedule than DB ❒ Team involvement for schedule optimization ❒ Continuous constructability review and VE ❒ Maintenance of Traffic improves with contractor inputs ❒ Contractor input for phasing, constructability and traffic control may reduce overall schedule	❒ Potential for not reaching GMP and substantially delaying schedule ❒ GMP negotiation can delay the schedule ❒ Designer-contractor-agency disagreements can add delays ❒ Strong agency management is required to control schedule

2) Project Complexity & Innovation Checklist

DESIGN-BID-BUILD	
Opportunities	Obstacles
❒ CDOT can have more control of design of complex projects ❒ CDOT& consultant expertise can select innovation independently of contractor abilities ❒ Opportunities for value engineering studies during design, more time for design solutions ❒ Aids in consistency and maintainability ❒ Full control in selection of design expertise ❒ Complex design can be resolved and competitively bid	❒ ❒ Innovations can add cost or time and restrain contractor's benefits ❒ No contractor input to optimize costs ❒ Limited flexibility for integrated design and construction solutions (limited to constructability) ❒ Difficult to assess construction time and cost due to innovation

DESIGN-BUILD	
Opportunities	Obstacles
❒ Designer and contractor collaborate to optimize means and methods and enhance innovation ❒ Opportunity for innovation through draft RFP, best value and ATC processes ❒ Can use best-value procurement to select design-builder with best qualifications ❒ Constructability and VE inherent in process ❒ Early team integration ❒ Sole point of responsibility	❒ Requires desired solutions to complex designs to be well defined through technical requirements (difficult to do) ❒ Qualitative designs are difficult to define (example. aesthetics) ❒ Risk of time or cost constraints on designer inhibiting innovation ❒ Some design solutions might be too innovative or unacceptable ❒ Quality assurance for innovative processes are difficult to define in RFP

CM/GC	
Opportunities	Obstacles
❒ Highly innovative process through 3 party collaboration ❒ Allows for owner control of a designer/contractor process for developing innovative solutions ❒ Allows for an independent selection of the best qualified designer and best qualified contractor ❒ VE inherent in process and enhanced constructability ❒ Risk of innovation can be better defined and minimized and allocated ❒ Can take to market for bidding as contingency	❒ Process depends on designer/CM relationship ❒ No contractual relationship between designer/CM ❒ Innovations can add cost or time ❒ Scope additions can be difficult to manage ❒ Preconstruction services fees for contractor involvement ❒ Cost competitiveness – single source negotiated GMP

3) Level of Design Checklist

DESIGN-BID-BUILD	
Opportunities	Obstacles
❒ 100% design by owner ❒ Agency has complete control over the design (can be beneficial when there is one specific solution for a project) ❒ Project/scope can be developed through design ❒ The scope of the project is well defined through complete plans and contract documents ❒ Well-known process to the industry	❒ Owner design errors can result in a higher number of change orders, claims, etc. ❒ Minimizes competitive innovation opportunities ❒ Can reduce the level of constructability since the contractor is not bought into the project until after the design is complete

DESIGN-BUILD	
Opportunities	Obstacles
❒ Design advanced by the owner to level necessary to precisely define the contract requirements and properly allocate risk ❒ Does not require much design to be completed before awarding project to the design-builder (between ~ 10% - 30% complete) ❒ Contractor involvement in early design, which improves constructability and innovation ❒ Plans do not have to be as detailed because the design-builder is bought into the project early in the process and will accept design responsibility	❒ Must have very clear definitions and requirements in the RFP because it is the basis for the contract ❒ If design is too far advanced it will limit the advantages of design-build ❒ Potential for lacking or missing scope definition if RFP not carefully developed ❒ Over utilizing performance specifications to enhance innovation can risk quality through reduced technical requirements ❒ Less agency control over the design ❒ Can create project less standardized designs across agency as a whole

CM/GC	
Opportunities	Obstacles
❒ Can utilize a lower level of design prior to selecting a contractor then collaboratively advance design with owner, designer and contractor ❒ Contractor involvement in early design improves constructability ❒ CDOT controls design ❒ Design can be used for DBB if the price is not successfully negotiated. ❒ Design can be responsive to risk minimization	❒ Teaming and communicating concerning design can cause disputes ❒ Three party process can slow progression of design ❒ If design is too far advanced it will limit the advantages of CMGC or could require design backtracking

4) Cost Checklist

DESIGN-BID-BUILD	
Opportunities	Obstacles
❒ Competitive bidding provides a low cost construction to a fully defined scope of work ❒ Increase certainty about cost estimates ❒ Construction costs are contractually set before construction begins	❒ Cost accuracy is limited until design is completed ❒ Construction costs are not locked in until design is 100% complete. ❒ Cost reductions due to contractor innovation and constructability is difficult to obtain ❒ More potential of cost change orders due to owner design responsibility

DESIGN-BUILD	
Opportunities	Obstacles
❒ Contractor input into design should moderate cost ❒ Design-builder collaboration and ATCs can provide a cost-efficient response to project goals ❒ Costs are contractually set early in design process with design-build proposal ❒ Allows a variable scope bid to match a fixed budget ❒ Potential lower average cost growth ❒ Funding can be obligated in a very short timeframe	❒ Risks related to design-build, lump sum cost without 100% design complete, can compromise financial success of the project.

CM/GC	
Opportunities	Obstacles
❒ Owner/designer/contractor collaboration to reduce project risk can result in lowest project costs. ❒ Early contractor involvement can result in cost savings through VE and constructability ❒ Cost will be known earlier when compared to DBB ❒ Integrated design/construction process can provide a cost efficient strategies to project goals ❒ Can provide a cost efficient response to the project goals	❒ Non-competitive negotiated GMP introduces price risk ❒ Difficulty in GMP negotiation introduces some risk that GMP will not be successfully executed requiring aborting the CM/GC process. ❒ Paying for contractors involvement in the design phase may increase total cost

5) Initial Risk Assessment

Three sets of risk assessment checklists are provided to assist in an initial risk assessment relative to the selection of the delivery method:

A. Typical CDOT Transportation Project Risks
B. General Project Risks Checklist
C. Opportunities/Obstacles Checklist (relative to each delivery method)

It is important to recognize that the initial risk assessment is to only ensure the selected delivery method can properly address the project risks. A more detailed level of risk assessment should be performed concurrently with the development of the procurement documents to ensure that project risks are properly allocated, managed, and minimized through the procurement and implementation of the project.

A. TYPICAL CDOT TRANSPORTATION PROJECT RISKS

Following is a list of project risks that are frequently encountered on CDOT transportation projects and a discussion on how the risks are resolved through the different delivery methods.

A.1: Site Conditions and Investigations How unknown site conditions are resolved. For additional information on site conditions, refer to 23 CFR 635.109(a) at the following link: http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=91468e48c87a547c3497a5c19d640172&rgn=div5&view=text&node=23:1.0.1.7.23&idno=23#23:1.0.1.7.23.1.1.9)

DESIGN-BID-BUILD

Site condition risks are generally best identified and mitigated during the design process prior to procurement to minimize the potential for change orders and claims when the schedule allows.

DESIGN-BUILD

Certain site condition responsibilities can be allocated to the design-builder provided they are well defined and associated third party approval processes are well defined. Caution should be used as unreasonable allocation of site condition risk will result in high contingencies during bidding. CDOT should perform site investigations in advance of procurement to define conditions and avoid duplication of effort by proposers. At a minimum CDOT should perform the following investigations:

1) Basic design surveys
2) Hazardous materials investigations to characterize the nature of soil and groundwater contamination
3) Geotechnical baseline report to allow design-builders to perform proposal design without extensive additional geotechnical investigations

CM/GC

CDOT, the designer, and the contractor can collectively assess site condition risks, identify the need to perform site investigations in order to reduce risks, and properly allocate risk prior to GMP.

A.2: Utilities

DESIGN-BID-BUILD

Utility risks are best allocated to CDOT, and mostly addressed prior to procurement to minimize potential for claims when the schedule allows.

DESIGN-BUILD

Utilities responsibilities need to be clearly defined in contract requirements, and appropriately allocated to both design-builder and CDOT:

Private utilities (major electrical, gas, communication transmission facilities): Need to define coordination and schedule risks as they are difficult for design-builder to price. Best to have utilities agreements before procurement. Note – by state regulation private utilities have schedule liability in design-build projects, but they need to be made aware of their responsibilities.

Public Utilities: Design and construction risks can be allocated to the design-builder, if properly incorporated into the contract requirements.

CM/GC

Can utilize a lower level of design prior to contracting and joint collaboration of CDOT, designer, and contractor in the further development of the design.

A.3: Railroads (if applicable)

DESIGN-BID-BUILD

Railroad risks are best resolved prior to procurement and relocation designs included in the project requirements when the schedule allows.

DESIGN-BUILD

Railroad coordination and schedule risks should be well understood to be properly allocated and are often best assumed by CDOT. Railroad design risks can be allocated to the designer if well defined. Best to obtain an agreement with railroad defining responsibilities prior to procurement

CM/GC

Railroad impacts and processes can be resolved collaboratively by CDOT, designer, and contractor. A lengthy resolution process can delay the GMP negotiations.

A.4: Drainage/Water Quality Best Management Practices (construction and permanent)

Both drainage and water quality often involve third party coordination that needs to be carefully assessed with regard to risk allocation. Water quality in particular is not currently well defined, complicating the development of technical requirements for projects.

Important questions to assess:

1) Do criteria exist for compatibility with third party offsite system (such as an OSP (Outfall System Plan))?
2) Is there an existing cross-drainage undersized by CDOT Criteria?
3) Can water quality requirements be precisely defined? Is right-of-way adequate?

DESIGN-BID-BUILD

Drainage and water quality risks are best designed prior to procurement to minimize potential for claims when the schedule allows.

DESIGN-BUILD

Generally, CDOT is in the best position to manage the risks associated with third party approvals regarding compatibility with offsite systems, and should pursue agreements to define requirements for the design-builder.

CM/GC

CDOT, the designer, and the contractor can collectively assess drainage risks and coordination and approval requirements, and minimize and define requirements and allocate risks prior to GMP.

A.5: Environmental: Meeting environmental document commitments, (noise, 4(f) and historic, wetlands, endangered species, etc.)

DESIGN-BID-BUILD

Risk is best mitigated through design prior to procurement when the schedule allows.

DESIGN-BUILD

Certain environmental approvals and processes that can be fully defined can be allocated to the design-builder. Agreements or MOUs with approval agencies prior to procurement is best to minimize risks.

CM/GC

Environmental risks and responsibilities can be collectively identified, minimized, and allocated by CDOT, the designer, and the contractor prior to GMP

A.6: Third Party Involvement: Timeliness and impact of third party involvement (funding partners, adjacent municipalities, adjacent property owners, project stakeholders, FHWA, PUC)

DESIGN-BID-BUILD
Third party risk is best mitigated through design process prior to procurement to minimize potential for change orders and claims when the schedule allows.

DESIGN-BUILD
Third party approvals and processes that can be fully defined can be allocated to the design-builder. Agreements or MOUs with approval agencies prior to procurement is best to minimize risks.

CM/GC
Third party approvals can be resolved collaboratively by CDOT, designer, and contractor.

B. GENERAL PROJECT RISK CHECKLIST (items to consider when assessing risk)

Environmental Risks	External Risks
❒ Delay in review of environmental documentation ❒ Challenge in appropriate environmental documentation ❒ Defined and non-defined hazardous waste ❒ Environmental regulation changes ❒ Environmental impact statement (EIS) required ❒ NEPA/ 404 Merger Process required ❒ Environmental analysis on new alignments required	❒ Stakeholders request late changes ❒ Influential stakeholders request additional needs to serve their own commercial purposes ❒ Local communities pose objections ❒ Community relations ❒ Conformance with regulations/guidelines/ design criteria ❒ Intergovernmental agreements and jurisdiction
Third-Party Risks	**Geotechnical and Hazmat Risks**
❒ Unforeseen delays due to utility owner and third-party ❒ Encounter unexpected utilities during construction ❒ Cost sharing with utilities not as planned ❒ Utility integration with project not as planned ❒ Third-party delays during construction ❒ Coordination with other projects ❒ Coordination with other government agencies	❒ Unexpected geotechnical issues ❒ Surveys late and/or in error ❒ Hazardous waste site analysis incomplete or in error ❒ Inadequate geotechnical investigations ❒ Adverse groundwater conditions ❒ Other general geotechnical risks
Right-of-Way/ Real Estate Risks	**Design Risks**
❒ Railroad involvement ❒ Objections to ROW appraisal take more time and/or money ❒ Excessive relocation or demolition ❒ Acquisition ROW problems ❒ Difficult or additional condemnation ❒ Accelerating pace of development in project corridor ❒ Additional ROW purchase due to alignment change	❒ Design is incomplete/ Design exceptions ❒ Scope definition is poor or incomplete ❒ Project purpose and need are poorly defined ❒ Communication breakdown with project team ❒ Pressure to delivery project on an accelerated schedule ❒ Constructability of design issues ❒ Project complexity (scope, schedule, objectives, cost, and deliverables are not clearly understood)

Organizational Risks	Construction Risks
❒ Inexperienced staff assigned ❒ Losing critical staff at crucial point of the project ❒ Functional units not available or overloaded ❒ No control over staff priorities ❒ Lack of coordination/ communication ❒ Local agency issues ❒ Internal red tape causes delay getting approvals, decisions ❒ Too many projects/ new priority project inserted into program	❒ Pressure to delivery project on an accelerated schedule. ❒ Inaccurate contract time estimates ❒ Construction QC/QA issues ❒ Unclear contract documents ❒ Problem with construction sequencing/ staging/ phasing ❒ Maintenance of Traffic/ Work Zone Traffic Control

C. RISK OPPORTUNITIES/OBSTACLES CHECKLIST (relative to each delivery method)

DESIGN-BID-BUILD	
Opportunities	**Obstacles**
❒ Risks managed separately through design, bid, build is expected easier ❒ Risk allocation is most widely understood/used ❒ Opportunity to avoid or mitigate risk through complete design ❒ Risks related to environmental, railroads, and third party involvement are best resolved prior to procurement ❒ Utilities and ROW best allocated to CDOT and mostly addressed prior to procurement to minimize potential for claim ❒ Project can be shelved while resolving risks	❒ Owner accepts risks associated with project complexity (the inability of designer to be all-knowing about construction) and project unknowns ❒ Low-bid related risks ❒ Potential for misplaced risk through prescriptive specifications ❒ Innovative risk allocation is difficult to obtain ❒ Limited industry input in contract risk allocation ❒ Change order risks can be greater ❒ Contractor may avoid risks

DESIGN-BUILD	
Opportunities	**Obstacles**
❒ Performance specifications can allow for alternative risk allocations to the design builder ❒ Risk-reward structure can be better defined ❒ Innovative opportunities to allocate risks to different parties (e.g., schedule, means and methods, phasing) ❒ Opportunity for industry review of risk allocation (draft RFP, ATC processes) ❒ Avoid low-bid risk in procurement ❒ Contractor will help identify risks related to environmental, railroads, ROW, and utilities ❒ Designers and contractors can work toward innovative solutions to, or avoidance of, unknowns	❒ Need a detailed project scope, description etc., for the RFP to get accurate/comprehensive responses to the RFP (Increased RFP costs may limit bidders) ❒ Limited time to resolve risks ❒ Additional risks allocated to designers for errors and omissions, claims for change orders ❒ Unknowns and associated risks need to be carefully allocated through a well-defined scope and contract ❒ Risks associated with agreements when design is not completed ❒ Poorly defined risks are expensive ❒ Contractor may avoid risks or drive consultant to decrease cost at risk to quality

CM/GC	
Opportunities	Obstacles
❒ Contractor can have a better understanding of the unknown conditions as design progresses ❒ Innovative opportunities to allocate risks to different parties (e.g., schedule, means and methods, phasing) ❒ Opportunities to manage costs risks through CM/GC involvement ❒ Contractor will help identify and manage risk ❒ Agency still has considerable involvement with third parties to deal with risks ❒ Avoids low-bid risk in procurement ❒ More flexibility and innovation available to deal with unknowns early in design process	❒ Lack of motivation to manage small quantity costs ❒ Increase costs for non-proposal items ❒ Disagreement among Designer-Contractor-Owner can put the process at risk ❒ If GMP cannot be reached, additional low-bid risks appear ❒ Limited to risk capabilities of CM/GC ❒ Designer-contractor-agency disagreements can add delays ❒ Strong agency management is required to negotiate/optimize risks ❒ Discovery of unknown conditions can drive up GMP, which can be compounded in phased construction

6) Staff Experience/Availability Checklist

DESIGN-BID-BUILD	
Opportunities	Obstacles
❒ Agency, contractors and consultants have high level of experience with the traditional system ❒ Designers can be more interchangeable between projects	❒ Can require a high level of agency staffing of technical resources ❒ Staff's responsibilities are spread out over a longer design period ❒ Can require staff to have full breadth of technical expertise

DESIGN-BUILD	
Opportunities	Obstacles
❒ Less agency staff required due to the sole source nature of DB ❒ Opportunity to grow agency staff by learning a new process	❒ Limitation of availability of staff with skills, knowledge and personality to manage DB projects ❒ Existing staff may need additional training to address their changing roles ❒ Need to "mass" agency management and technical resources at critical points in process (i.e., RFP development, design reviews, etc.)

CM/GC	
Opportunities	Obstacles
❒ Agency can improve efficiencies by having more project managers on staff rather than specialized experts ❒ Smaller number of technical staff required through use of consultant designer	❒ Strong committed owner project management is important to success ❒ Limitation of availability of staff with skills, knowledge and personality to manage CMGC projects ❒ Existing staff may need additional training to address their changing roles ❒ Agency must learn how to negotiate GMP projects

7) Level of Oversight and Control Checklist

DESIGN-BID-BUILD	
Opportunities	Obstacles
❒ Full owner control over a linear design and construction process ❒ Oversight roles are well understood ❒ Contract documents are typically completed in a single package before construction begins ❒ Multiple checking points through three linear phases: design-bid-build ❒ Maximum control over design	❒ Requires a high-level of oversight ❒ Increased likelihood of claims due to owner design responsibility ❒ Limited control over an integrated design/construction process

DESIGN-BUILD	
Opportunities	Obstacles
❒ A single entity responsibility during project design and construction ❒ Continuous execution of design and build ❒ Getting input from construction to enhance constructability and innovation ❒ Overall project planning and scheduling is established by one entity	❒ Can require high level of design oversight ❒ Can require high level of quality assurance oversight ❒ Limitation on staff with DB oversight experience ❒ Less owner control over design ❒ Control over design relies on proper development of technical requirements

CM/GC	
Opportunities	Obstacles
❒ Preconstruction services are provided by the construction manager ❒ Getting input from construction to enhance constructability and innovation ❒ Provides owner control over an integrated design/construction process	❒ Agency must have experienced staff to oversee the CM/GC ❒ Higher level of cost oversight required

8) **Competition and Contractor Experience**

DESIGN-BID-BUILD	
Opportunities	Obstacles
❒ Promotes high level of competition in the marketplace ❒ Opens construction to all reasonably qualified bidders ❒ Transparency and fairness ❒ Reduced chance of corruption and collusion ❒ Contractors are familiar with DBB process	❒ Risks associated with selecting the low bid (the best contractor is not necessary selected) ❒ No contractor input into the process ❒ Limited ability to select contractor based on qualifications

DESIGN-BUILD	
Opportunities	Obstacles
❒ Allows for a balance of qualifications and cost in design-builder procurement ❒ Two-phase process can promote strong teaming to obtain "Best Value" ❒ Increased opportunity for innovation possibilities due to the diverse project team	❒ Need for DB qualifications can limit competition ❒ Lack of competition with past experience with the project delivery method ❒ Reliant on DB team selected for the project ❒ The gap between owner experience and contractor experience with delivery method can create conflict

CM/GC	
Opportunities	Obstacles
❒ Allows for qualifications based contractor procurement ❒ Agency has control over an independent selection of best qualified designer and contractor ❒ Contractor is part of the project team early on, creating a project "team" ❒ Increased opportunity for innovation due to the diversity of the project team	❒ Currently there is not a large pool of contractors with experience in CMGC, which will reduce the competition and availability ❒ Working with only one contractor to develop GMP can limit price competition ❒ Requires a strong project manager from the agency ❒ Teamwork and communication among the project team