I-70 TWIN TUNNELS WB WIDENING RISK ASSESSMENT AND PROJECT DELIVERY SELECTION

Colorado Department of Transportation
Innovative Contracting Advisory Committee

I-70 Twin Tunnels Project Delivery Selection Approach/Evaluation
October 24th, 2013 1pm to 4pm @ Region 1 HQ East and West Arterial Conference Rooms

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 (CMGC). 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 proposal (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.sd

- CMGC (Construction Manager/General Contracting) is a project delivery method in which the agency contracts separately with a designer and a contractor. The agency can perform design or contract with an engineering firm to provide a facility design. The agency selects a contractor to perform as a construction subject matter expert and advisor **during the design phase** on topics including construction, constructability,

construction estimating, risk assessment/mitigation, and construction phasing in the design phase. The significant characteristic of this delivery method is a contract between an agency and a contractor who will be at risk for the final cost and time of construction if the owner agency accepts a GMP (Guaranteed Maximum Price) proposal from the contractor. If the GMP is accepted, the contractor then serves as the general contractor during construction. If the owner agency rejects a GMP, the project may be advertised and the contractor who provided the CMGC services shall not be able to bid on the project.

- Construction industry/Contractor input into the design development and constructability of complex and innovative projects are the major reasons an agency would select the CMGC method. Unlike DBB, CMGC brings the builder into the design process at a stage where definitive input can have a positive impact on the project. CMGC 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 a DB procurement without industry input.

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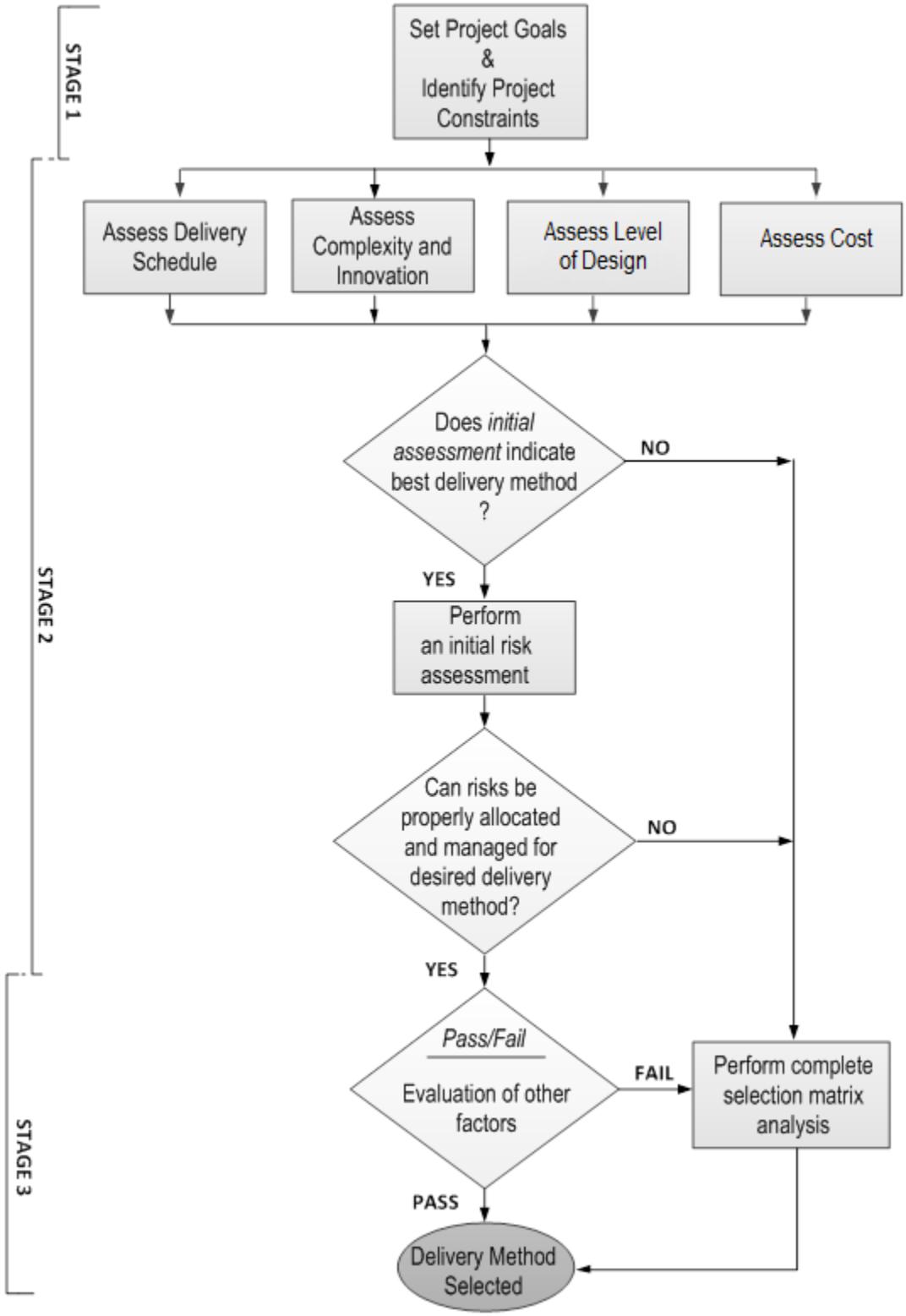
This document provides generic forms for use by CDOT staff. By using these forms, a brief project delivery selection report can be generated for each individual project. The process is divided into the following sections.

- Describe the project and set the project goals
- Determine and review project dependent constraints
- Assess the five primary factors (these factors most often determine the selection).
    1. Complexity & Innovation
    2. Initial Project Risk Assessment
    3. Delivery Schedule
    4. Cost
    5. Level of Design
- 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
- 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.

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.

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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: I-70 Twin Tunnels Westbound Widening
- ❒ Project Location and Limits: Interstate 70 between Mileposts 241.5 and 243.5. The project is located in the I-70 Corridor east of Idaho Springs at the Twin Tunnels Complex.
- ❒ Project Budget: The Estimated Design and Construction Budget for this project is $47.0 million.
- ❒ Project Est. Date: The Estimated Delivery Date for WB Package 2 is December 20th, 2014
- ❒ The Req. Date: The Required Delivery Date for the eastbound and westbound bores to be open to traffic is December 20th, 2014
- ❒ Project Corridor Interstate 70 West
- ❒ Project Funding: The Sources of Funding for this project are State, Federal, Local, and FASTER dollars.

- ❒ Major Features of Work include:
  - o Widening the west bound bore of the Twin Tunnels to a minimum of 54';
  - o Constructing permanent BMP facilities for water quality;
  - o Constructing transitions to the east bound lanes of I-70 to the west bound lanes east of the Twin Tunnels;
  - o Constructing transitions to the west bound lanes of I-70 to the east bound lanes west of the Twin Tunnels;
  - o Modifying the current eastbound detour to accommodate westbound traffic in the east bound tunnel bore;
  - o Employ and construct recommended mitigation for SWEEP, ALIVE, 106, and SCAP committees;
  - o Restore the frontage road, trailhead, and trail on CR314 after detour is no longer in use; and
  - o Construct trailhead and Clear Creek In-Stream Enhancements.

- ❒ Major Schedule Milestones
  - o Goal Setting Meeting – October 24th, 2013
  - o Risk Assessment/Delivery Method Evaluation – October 24th, 2013
  - o Team Scoping Workshop – November 2013
  - o Preconstruction Phase – October 2013 to April 2014
  - o Construction Phases – February 2014 to December 2014
  - o Construction Package 1 NTP: February 1st, 2014
  - o Construction Package 2 NTP: March 1st, 2014

- West bound and east bound tunnels open to traffic – No later than December 20th, 2014

- The major project stakeholders are:
  - City of Idaho Springs
  - Traveling public (State and out of State)
  - CDOT
  - FHWA
  - SWEEP Committee
  - ALIVE Committee
  - 106 Committee
  - DRCOG
  - Summit, Jefferson, and Clear Creek Counties

- Major Challenges
  - Meeting project goals and objectives within the schedule, scope, and budget
  - Minimizing throw away work for future I-70 Realignment
  - Keeping PEIS/ROD, Corridor CSS, and Tunnel Visioning Commitments
  - Protecting Clear Creek, minimizing impacts to environmental resources
  - CDOT has limited experience with geotechnical tunnel work
  - Schedule and ROW risks

- Major Opportunities
  - Immediately Capitalize on Lessons Learned from the East Bound Bore
  - One-Season West Bound Widening
  - Less Impact to East Bound PPSL and Managed Lanes
  - Construction Cost Savings
  - Construction Cost Inflation Savings
  - Equipment is available and onsite now
  - Opens up option for west bound PPSL

- Main Identified Sources of Risk:

HIGH RISK - <75%

Construction and Constructability

- Construction Schedule Risk
- Tunnel Blasting Overbreak Risk
- Rock Cut Overbreak Risk
- Public Information and Public Relations Outreach

Design

- Design Schedule Risk
- ROW (Temporary and Permanent Easement Acquisition for Package 3)
- Traffic Demand Management (TDM) / Intelligent Traffic Systems (ITS)

Environmental Issues:

- Delay in review and/or approval of environmental documentation

MEDIUM RISK – 25 % < X < 75%

Design

- Design completion
- PS&E completion
- Administration costs (owner)

- Financing
- Insurance (OCIP or Contractor)
- Unable to reach CAP

Construction and Constructability

- Uncertainty in construction unit costs (e.g., earthwork – flooding impacts)
- Uncertainty in construction quantities (e.g., tunnels)
- Issues related to tunnel construction procedures (see also tunneling under Geotech)
- Issues related to other construction procedures
- Problems with or uncertainty in construction sequencing / staging / phasing / construction duration
- Maintenance of Traffic (MOT) / Work Zone Traffic Control (WZTC) Issues
- Labor for assumed plan if plan is adequate
- Proposed plan is not adequate
- Issues related to detours
- Difficult or multiple contractor interfaces – risk could change due to CMGC selection Contractor
- Uncertainty in structure demolition sequence and method
- Material, labor, and/or equipment procurement delays – risk could change due to CMGC selection Contractor
- Accidents/incidents during construction (traffic/collapse/slope failure/vandalism)
- Critical equipment failure
- Utility conflicts (anticipated or unanticipated)
- Work-window restrictions (e.g., fish windows, weather shut-down windows)
- Other third-party delays during construction

Design

- Earthwork
- Stormwater collection and treatment
- Additional aesthetics / context-sensitive solutions (CSS)
- Design deviations (e.g., design speeds, vertical clearances, turn radii)

Environmental

- Challenge to final decision document (e.g., resulting in delay in issuance of the final decision document).
- Delay in review and/or approval of environmental documentation
- Supplemental environmental documentation or Re-evaluation required that is time consuming
- Challenge to Early-Action Mitigation Plan (Wetlands, Floodplain/Habitat)
- Additional mitigation required, on- or off-site (e.g. solid waste disposal, wetlands, hazardous materials disposal)
- Unanticipated Section 106 issues (archaeological, cultural, or historical finds)
- Unanticipated 4(f) issues
- 4(f) issues different than anticipated – particularly those related to the CCC Greenway Plan.
- Difficulty in obtaining a Section 404 permit

External Influences (e.g., Political, Regulatory, Municipalities, Economic)

Difficulty obtaining other agency approvals/agreements (Municipalities)
Conflicts with other projects (Municipalities, Counties)
Coordination between multiple contractors on this project – risk could change due to CMGC selection Contractor
Political opposition
Funding shortfall (and related delay or increased financing cost)

Funding delay
Intergovernmental agreements and jurisdiction

Geotechnical and Structural

- Poor ground/subsurface conditions
- Tunneling-specific issues
  - Uncertain or early design
  - Drill jumbo problems (e.g., operator issues / inexperience; machine procurement; machine maintenance; drive rate; other problems) – risk could change due to CMGC selection Contractor
  - Other construction problems
- Other general geotechnical risk
  - Unanticipated rockslide / rockfall
  - Permanent rockfall prevention design
  - Rock cut design

Permitting

- Difficulty obtaining permit approval (by permit type; e.g., 401, 404, NPDES, USCG, shoreline)
- Challenges to keep general contractor following permits

Project Delivery and Procurement

- Construction market conditions (cyclic market, and location within cycle at time of bid; number of viable bidders), including the potential for delay to the procurement process and/or re-bidding

Right-of-Way / Real Estate

- Other ROW issues
  - Reed property requiring redesign of package 3

Scope Issues Utility Issues

- Utility relocations to be completed by others (Utility companies, municipalities) are not completed on time
- Encounter unexpected utilities during construction
- Utility integration with project and/or utility betterments not as planned
- Cost sharing with utilities not as planned

LOW RISK - <25% - All others risks are either low or very low. These risks will be assessed during the design phase.

- ❒ Safety Issues
  - Rock Cuts cannot be cushion blasted. Cushion blasting could create continuous raveling and rock fall issues. Visual Challenges.

- ❒ Sustainable Design and Construction Requirements

Project Goals, Core Values, and Context Statement

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,1 but the report should include project-specific goals. These goals should remain consistent over the life of the project.

PROJECT PURPOSE AND CORE VALUES

The purpose of the Twin Tunnels project is to improve westbound highway safety, operations and travel time reliability in the Twin Tunnels area of the I-70 Mountain Corridor east of Idaho Springs.

Stakeholder Core Values
Safe travel for people and goods. **Safety** for emergency responders and maintenance workers. A s**afe** crossing for wildlife.
Mobility through safe and reliable transportation facilities.
A primary access and visual **gateway** to the Mountain Mineral Belt, historic Idaho Springs and Front Range communities.
Wildlife, wildlife habitat, migration routes and access to Clear Creek.
Clear Creek, as a clean, high-quality water resource, a recreational asset, an aquatic resource with sustainable fisheries' habitat, a drinking water source, and a defining natural feature of the corridor.
Tourist destinations and community facilities, including the Scott Lancaster Trail and Bridge, the waste-water treatment plant, the planned Clear Creek Greenway, the frontage road, and Clear Creek.
History as a defining element of Clear Creek County. Celebrating the cultural resources associated with mining and mining towns, and the first successful tunneling operation as part of the construction of I-70 west through Colorado's mountains.

PROJECT GOALS

1. SCHEDULE and BUDGET
    a. Meet the project schedule and budget to have west bound lanes fully operational from approximately mile post 242.3 west of the Twin Tunnels to mile post 242.83 at structure F-15-BR by December 20th, 2014 without sacrificing quality.

2. STAKEHOLDER INVOLVEMENT
    a. Provide meaningful stakeholder involvement as prescribed in the I-70 Mountain Corridor CSS.
    b. Facilitate and foster collaboration, communication, and partnerships among all members of the project team.

3. PUBLIC COMMUNICATION
    a. Provide accurate, meaningful, and timely communication.

4. SAFETY, MOBILITY, AND OPERATIONAL CHARACTERISTICS
    a. Improve safety, mobility, and operational characteristics in the project limits.

5. ENVIRONMENTAL
    a. Adhere to all environmental compliance requirements, including those documented in the Twin Tunnels westbound final decision document, permitting stipulations and I-70 Mountain Corridor PEIS/ROD commitments.
    b. Implement innovative methods for environmental stewardship and community supported enhancements within the project scope, schedule, and budget.

6. QUALITY
    a. Design and construct a quality project that is consistent with the overall vision and commitments approved by the PEIS.
    `

7. CONSTRUCTION
    a. Maintain mobility through the project during construction.
    b. Provide safe conditions for workers and the traveling public.

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: Limited and construction money is not guaranteed. If the construction price rises, the project and packages may not be funded.
- Schedule constraints: Schedule must be met.

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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**	**CMGC**
Primary Evaluation Factors			
1. Complexity and Innovation	+	-	+
2. Initial Project Risk Assessment	+	-	++
3. Schedule	-	X	++
4. Cost	+	N/A	+
5. Level of Design	+	X	++
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

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 of project delivery

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CONCLUSIONS AND COMMENTS:

On October 25, 2013, CDOT, the FHWA, and specialty units for Region 1 met and conducted a review for the Twin Tunnels WestboundWidening Project. Risks were identified, categorized, assessed, and listed. Design Bid Build, Design Build, and Construction Manager/General Contractor delivery methods were discussed in references to the goals and risks for the Twin Tunnels to determine the best project delivery method.

The merits of each delivery method were discussed and each method was evaluated under the five primary factors of Complexity & Innovation, Initial Project Risk Assessment, Delivery Schedule, Cost and , Level of Design. The secondary factors of Staff Experience/Availability(owner), Level of Oversight & Control, and Competition & Contractor Experience were also discussed and were given pass fail ratings by the project team.

RESULTS AND RECOMMENDATIONS

The Design-Build delivery method was eliminated during evaluation under the primary factors with regards to delivery schedule and level of design. The aggressive schedule of delivery and the NTP dates (February 1st, 2014 and March 1st, 2014) precluded CDOT from using Design-Build. The timeline for CDOT to define technical requirements and expectations through RFP development, gain acceptance of a quality program, and develop the Design-Build RFP proposal does not fit the current project schedule. The Design-Build procurement process takes four to six months minimum. CDOT does not have 30% design complete for the westbound widening to move forward with any Design-Build procurement. With two fatal flaws, Design-Build was eliminated as a delivery method.

The remaining Design-Bid-Build and CM/GC delivery methods were fully evaluated under the five primary factors. Each delivery method passed the three secondary measures.

Design-Bid-Build was evaluated as appropriate under method under the primary factors Complexity and Innovation, Initial Project Risk Assessment, Cost, and Level of Design. It was evaluated as not the appropriate delivery method under Schedule. This was due to the linear nature of DBB and the risk that if prices came in too high or too low, the procurement schedule would not allow the team to meet the project schedule. The need for a complete PS&E set at the time for bid was also a factor.

CM/GC was identified as most appropriate delivery method under the primary factors of Initial Risk Assessment, Schedule, and Level of Design. CMGC was evaluated to be an appropriate delivery method under the primary factors of Cost and Complexity & Innovation.

CM/GC was evaluated to have three most appropriates under the Primary Factors and all other Primary Factors were rated at least appropriate. Design-Bid-Build was evaluated to have four appropriate ranks and one least appropriate ranks under the Primary Factors.. Under the instructions and guidance of the I-70 Twin Tunnels WB Project Delivery Selection Approach Matrix, the Primary Factors show that CM/GC is the recommended delivery method for the Twin Tunnels WB Widening Project.

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1) 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 and qualitative designs before procurement. Innovation provided by CDOT/Consultant expertise and through traditional owner directed processes such as VE studies, contractor bid alternatives, and post-bid VE.*	
Opportunities	**Obstacles**
Can use eb design as base design done and trained crew.	No contractor input to optimize costs.
Aids in consistency and maintainability	Innovations can add cost or time and restrain contractor's benefits
Save Design Costs and Schedule	Increased costs due to pricing risk.
DESIGN-BUILD *Incorporates design-builder into design process through best value selection and contractor proposed Alternate Technical Concepts (ATCs) – which are a cost oriented approach to providding complex and innovative designs. Requires that desired solutions to complex projects be well defined through contract requirements.*	
Opportunities	**Obstacles**
Early team integration	Design Consultant is already onboard and design is already finished.
Constructability and VE inherent in process	Some design solutions might be too innovative or unacceptable
	Schedule constraints precludes innovations
	Stipends would impact budget and time
	Some design solutions might be too innovative or unacceptable

CMGC *Allows independent selection of designer and contractor based on qualifications to jointly address complex innovative designs through three party collaboration of CDOT, designer and Contractor. Allows for a qualitative (non price oriented) design but requires agreement on GMP.*	
Opportunities	**Obstacles**
Can use eb design as base design done and trained crew.	Process depends on designer/CM relationship
Risk of innovation can be better defined, understood, shared, and minimized.	No contractual relationship between designer/CM
	If CAP negotiations fail, DBB option could impact.

Project Complexity & Innovation Summary

	DBB	DB	CMGC
1. Project Complexity & Innovation	+	-	+

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 of project delivery

Notes and Comments: .....
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2) 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 the risk discussion and checklists in the appendix.

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
• Environmental risk allocated to CDOT and mitigated before bid.	• Cannot fully mitigate geotech risk before contractor input is needed.
•	•
•	•
•	•
•	•

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
• Risk of Geotech now better known for Book 2 – CDOT Lessons Learned	• Won't have agreements in place for 3rd parties.
•	• DB Firms could price the risk of the environmental impacts
•	•
•	•

CMGC

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
• Geotech and rock cut risk can be shared or minimize through collaborative process.	•
• Define environmental risk better with Contractor and allocate.	•
• Contractor won't price in third party risk.	•
•	•

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Initial Risk Assessment Summary

	DBB	DB	CMGC
2. Initial Risk Assessment	+	-	++

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 of project delivery

Notes and Comments: .....

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3) 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
•	Low bid selection may lead to potential delays and other adverse outcomes.
•	Getting an ad set completed and through advertisement process could challenging -4-8 weeks
•	• No shortest procurement period for this project
•	•

DESIGN-BUILD

Can get project under construction (and meet funding obligations) before completing design. Parallel process of design and construction can accelerate project delivery schedule; however, procurement time can be lengthy due to the need for an accurate RFP.

Opportunities	Obstacles
• Ability to start construction before entire design, ROW, etc. is complete (i.e., phased design) •	• Time required to define technical requirements and expectations through RFP development can be intensive
•	• Request for proposal development and procurement can be intensive
•	• Time required to gain acceptance of quality program

CMGC

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, but schedule can be slowed down by CMGC design process and Guaranteed Maximum Price (GMP)negotiations and contracting.

Opportunities	Obstacles
• Ability to start construction before entire design, ROW, etc. is complete (i.e., phased design)	• Potential for not reaching CAP and substantially delaying schedule
• More efficient procurement of long-lead items	• GMP negotiation can delay the schedule
• Team involvement for schedule optimization •	•
• Continuous constructability review and VE	•
• Contractor input for phasing, constructability and traffic control may reduce overall schedule	•
•	•

•	•

Delivery Schedule Summary

	DBB	DB	CMGC
	-	X	++

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 of project delivery
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
Competitive bidding provides a low cost construction to a fully defined scope of work	Cost reductions due to contractor innovation and constructability is difficult to obtain
Least controversial	More potential of cost change orders due to owner design responsibility
•	•

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
• N/A	• N/A

CMGC

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
Owner/designer/contractor collaboration to reduce or share project risk can result in lowest project costs.	Non-competitive negotiated GMP introduces price risk
Cost will be known earlier when compared to DBB	Difficulty in GMP negotiation introduces some risk that GMP will not be successfully executed requiring aborting the CM/GC process.

• Warrants a best value approach instead of low bid approach	

Cost Summary

	DBB	DB	CMGC
4. Cost	+	N/A	+

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 of project delivery

Notes and Comments: .....
.....
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5) 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**
Well-known process to the industry	Rock cut design requires designer –contractor collaboration
Agency has complete control over the design (can be beneficial when there is one specific solution for a project)	Change of site conditions could be a challenge to handle in the field
	Overbreak hard to design around
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**
•	• 0 Design

CMGC *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. Iterative nature of design process risks extending the project schedule.*	
Opportunities	**Obstacles**
• Rock cut design requires designer –contractor collaboration	•
• Can utilize a lower level of design prior to selecting a contractor then collaboratively advance design with owner, designer and contractor	•
• Design can be responsive to risk minimization • Contractor involvement in early design improves constructability • CDOT controls design	•

Level of Design Summary

	DBB	DB	CMGC
5. Level of Design	+	X	++

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 of project delivery
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**

•	

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**
•	•

CMGC *Strong, committed CDOT project management resources are important for success of the CMGC process.*	
Opportunities	**Obstacles**
•	•

Availability Summary

	DBB	DB	CMGC
6. Staff Experience/ Availability			

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 of project delivery

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**

•	•

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**
•	•

CMGC *Most control by CDOT over both the design, and construction, and control over a collaborative owner/designer/contractor project team*	
Opportunities	**Obstacles**
•	•

Level of Oversight and Control Summary

	DBB	DB	CMGC
7. Level of Oversight and Control			

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 of project delivery

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 limited ability to choose based on qualifications. High level of marketplace experience*	
Opportunities	**Obstacles**
•	•

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DESIGN-BUILD *Allows for a balance of qualifications and price in the selection process. Medium level of marketplace experience*	
Opportunities	**Obstacles**
•	•

CMGC *Allows for the selection of the single most qualified contractor, but GMP can limit price competition. Low level of marketplace experience*	
Opportunities	**Obstacles**
•	•

Competition and Contractor Experience Summary

	DBB	DB	CMGC
8. Competition and Contractor Experience			

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 of project delivery

Notes and Comments: .....
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.....
.....

APPENDIX

Opportunity and Obstacle Checklists

(With Project Risk Assessment Discussion and Checklists)

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THIS WAS USED FOR EVALUATION PURPOSES ONLY. SEE RISK LIST ABOVE FOR MORE INFORMATION:

1) Project Complexity & Innovation

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	❒ Increased costs due to pricing of risk ❒ 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 ❒ ATC process fosters cost based innovation but not necessarily innovation to improve quality ❒ Quality assurance for innovative processes are difficult to define in RFP

CMGC	
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 ❒ Limited competition in design after designer is selected

2) 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)

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

CMGC

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.

CMGC

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

CMGC

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.

CMGC

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.

CMGC
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.

CMGC
Third party approvals can be resolved collaboratively by CDOT, designer, and contractor.

3) Delivery Schedule

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)	❒ Request for proposal development and procurement can be lengthy ❒ 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 lengthy ❒ Time required to gain acceptance of quality program ❒ Requires agency and stakeholder commitments to an expeditious review of design

CMGC

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	❒ Potential for not reaching GMP and substantially delaying schedule ❒ GMP negotiation can delay the schedule ❒ Schedule-driven goals may drive up cost ❒ Designer-contractor-agency disagreements can add delays ❒ Strong agency management is required to control schedule

4) Cost

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	❒ Risks related to design-build, lump sum cost without 100% design complete, can compromise financial success of the project.

CMGC	
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 CMGC process. ❒ Paying for contractors involvement in the design phase may increase total cost

5) Level of Design

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 ❒ 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

CMGC	
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

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B. GENERAL PROJECT RICK 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. 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

CMGC	
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 CMGC 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 CMGC ❒ 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

DESIGN-BID-BUILD	
Opportunities	**Obstacles**
❒ Agency 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.)

CMGC	
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

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

CMGC	
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 CMGC ❒ 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

CMGC	
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