
Managing Access Challenges in Infrastructure Construction Projects

AUTHOR(S) ¹Sana Batarseh, PhD, ²Kenneth Sullivan, PhD, ³Rebecca Kassa, PhD,
⁴Brian Lines, PhD, ⁵Jake Smithwick, PhD

AFFILIATION(S) ¹Arizona State University, email: sbatars1@asu.edu
²Arizona State University, email: Kenneth.Sullivan@asu.edu
³Simplar Foundation, email: rebecca.kassa@simplar.com
⁴University of Kansas, email: brianlines@ku.edu
⁵University of North Carolina at Charlotte, email:
Jake.Smithwick@charlotte.edu

MANUSCRIPT TYPE Technical and Applied Research Paper

ABSTRACT

Access challenges are a recurring and often material source of disruption on infrastructure construction projects, particularly when right-of-way, utilities, environmental permits, third-party approvals, or corridor constraints remain unresolved at procurement. This paper presents a secondary qualitative synthesis of 27 semi-structured interviews with 48 professionals involved in U.S. transportation Design-Build and alternative delivery. The interviews represented 14 state departments of transportation and public- and private-sector experts. All 27 transcripts were reviewed for access-related content and organized into four categories: right-of-way and property access, utility conflicts and relocations, environmental and permitting constraints, and third-party or corridor limitations. The findings frame access as a project-delivery and contract-

administration risk rather than only a field-coordination problem. Although the categories differ in controllability, each requires investigation, disclosure, assigned responsibility, dated milestones, and integration with price and schedule commitments. Delivery-method suitability therefore depends in part on access maturity at final pricing. The paper contributes a delivery-selection logic, an access-risk control matrix, and contract-administration practices intended to improve risk visibility, schedule reliability, and dispute prevention. Numerical trends are retained as illustrative practitioner observations, not statistically generalizable estimates.

Keywords: access risk; infrastructure construction; right-of-way; utility coordination; Design-Build; Progressive Design-Build; CM/GC; contract administration

1 Purpose

The purpose of this study is to provide an applied framework for identifying, allocating, and managing access risk on public infrastructure and transportation projects. It examines how physical, legal, regulatory, and operational access affect procurement, pricing, scheduling, delivery selection, and contract administration. The study introduces access maturity, defined as the extent to which conditions have been investigated, documented, assigned to a controlling party, tied to dates, and incorporated into the contract and baseline schedule before final price commitment. The intended users are owners, construction managers, contractors, designers, utility coordinators, procurement professionals, schedulers, and legal or contract-administration teams.

2 Introduction

2.1 Background and Context

A notice to proceed does not by itself give a contractor the ability to perform planned work. The contractor must also have physical entry to the work area, legal possession or permission to use the property, regulatory authorization to perform the activity, and operational conditions that permit safe and productive construction. A project may therefore be under contract while critical work remains blocked by an unacquired parcel, an unrelocated utility, a pending environmental approval, a railroad agreement, business-access requirements, traffic restrictions, or inadequate staging and laydown space.

These constraints are especially consequential in transportation and public infrastructure because many controlling parties are outside the direct owner-contractor relationship. Property owners, utility companies, environmental agencies, railroads, municipalities, businesses, and the public can influence when and how construction proceeds. Federal right-of-way requirements, utility-coordination guidance, and environmental review procedures accordingly treat access-related activities as part of project development rather than as matters to be resolved only after award ([23 C.F.R. Part 710, 2026](#); [FHWA, 2022](#); [USDOT, 2024](#)).

2.2 Problem Statement or Research Gap

Access risks are often discussed in separate technical or administrative domains. Right-of-way teams manage property, utility teams manage relocations, environmental teams manage permits, procurement teams select a delivery method, and construction teams manage field sequencing. This separation can conceal the common project-delivery question: whether the owner can provide the access conditions assumed in the contractor's price and schedule. When access status is vague, responsibility is broadly transferred, or milestones are not tied to schedule logic, uncertainty may appear as bid contingency, delayed work, resequencing, productivity loss, change orders, or claims.

Existing guidance addresses many individual components, but practitioners need a concise framework that integrates the access categories with delivery selection, risk allocation, and contract controls. Many access challenges are foreseeable enough to be investigated, assigned, disclosed, and monitored before construction begins. Some conditions remain genuine unknowns, but uncertainty should be made visible and managed rather than hidden in general contract language.

2.3 Research Questions

This paper addresses three applied research questions:

1. RQ1: What recurring access-risk categories most affect infrastructure construction delivery?
2. RQ2: How do common delivery methods influence the timing, visibility, pricing, and allocation of access risks?
3. RQ3: What contract-administration and coordination practices can reduce access-related disputes and improve schedule reliability?

3 Literature Review and Conceptual Background

3.1 Access as a Multi-Party Project-Delivery Risk

Research and guidance consistently position right-of-way, utilities, permits, and third-party requirements as preconstruction conditions with direct implications for construction readiness. Right-of-way acquisition can determine when projects are ready for letting and construction, and its duration is affected by parcel characteristics, relocation assistance, organizational practices, and external approvals ([Chung et al., 2022](#); [Abdelaty et al., 2023](#)). Federal regulations similarly connect right-of-way authorization, acquisition, certification, and construction progression ([23 C.F.R. Part 710, 2026](#); [FHWA, n.d.-b](#)).

Utility information presents a related but distinct challenge because records may be incomplete, locations may be inaccurate, and utility owners retain operational constraints and crew priorities. Subsurface Utility Engineering combines surveying, geophysics, engineering, and targeted exposure to improve the quality of utility information. Research has documented positive benefit-cost relationships for SUE, while transportation guidance emphasizes early coordination and equitable treatment of remaining uncertainty ([Jung, 2012](#); [FHWA, 2022](#); [Gransberg et al., 2017](#)). Environmental and third-party constraints add agency review periods, seasonal windows, public obligations, railroad requirements, and business-access commitments that may not be controlled by either the owner's construction staff or the contractor.

3.2 Access Maturity and Delivery-Method Selection

Delivery-method selection is a multi-criteria decision involving scope definition, schedule, complexity, risk, market conditions, and owner capability ([Molenaar et al., 2012](#); [Ahmed & El-Sayegh, 2021](#)). The timing of contractor involvement is particularly important when access information remains incomplete. Design-Bid-Build can provide clear competition when design and access conditions are mature, but contractor input arrives after design. Fixed-price Design-Build integrates design and construction, yet unresolved access risk may be priced as contingency or become a later dispute if transferred without sufficient baseline information. Progressive Design-Build and Construction Manager/General Contractor introduce contractor participation during design and can create time for investigation, phasing, validation, and negotiated risk treatment before final construction pricing ([Alleman & Tran, 2020, 2021](#); [Alameri & Esmaeili, 2023](#); [FHWA, 2023b](#)).

3.3 Risk Allocation and Contractual Control

The central risk-allocation principle is control. A contractor can manage labor, equipment, subcontractors, means and methods, and much of the construction sequence. It generally cannot control condemnation proceedings, another utility owner's workforce, an environmental agency's review period, or a railroad's approval. Research on transportation planning shows that delivery method influences how risks are identified and allocated, while FHWA Design-Build guidance recommends systematic risk identification and allocation rather than undifferentiated transfer ([Shabana et al., 2024](#); [FHWA, n.d.-a](#)). Effective controls include baseline information, responsibility matrices, access milestones, risk registers, utility agreements, allowances, validation periods, notice provisions, and defined schedule-relief procedures.

3.4 Study Contribution

This study treats access as one integrated project-delivery construct. It connects four recurring categories to access maturity, delivery selection, and contract administration. Rather than ranking delivery methods, it offers a decision logic for determining whether access is sufficiently defined for fixed price and schedule commitments and what controls are needed when it is not.

4 Methodology

4.1 Research Design

The study used a secondary, practice-oriented qualitative synthesis of the interview dataset developed for a broader doctoral study on the modernization of U.S. transportation Design-Build legislation and practice ([Batarseh, 2025](#)). The parent study used an embedded mixed-methods design that included documentary review, practitioner interviews, and AI-assisted legal analysis. The present paper used only the interview transcripts and supporting published guidance as evidence for the access-focused analysis. The statutory census and AI-assisted clause analysis were not treated as empirical findings in this paper.

4.2 Study Context and Sample

The parent study conducted 27 semi-structured interviews with 48 professionals between October 2024 and September 2025. Participants represented 14 state departments of transportation, including retired alternative-delivery managers; nine contractor and consultant interviewees; three experts from two independent cost-estimating firms; one FHWA policy specialist; and one insurance-industry representative. The sample provided experienced public- and private-sector perspectives on transportation Design-Build and related practices. All 27 interviews were reviewed for access-related content for this paper.

4.3 Data Sources and Collection

The dissertation reports that semi-structured interview guides were used to maintain consistency across roles while allowing follow-up questions about state and industry experience. Questions addressed statutory barriers, best practices, and third-party integration. Interviews lasted approximately 60-120 minutes, were conducted by video conference, and were transcribed verbatim ([Batarseh, 2025](#)). For the present analysis, the transcripts were the primary source. FHWA, eCFR, USDOT, NCHRP, and peer-reviewed studies were used to interpret the interview observations and assess consistency with established transportation practice.

4.4 Analytical Constructs

The unit of analysis was the access-related practitioner observation contained in an interview transcript. Project examples were treated as examples reported by participants, not as an independently audited project database. Access-related material was organized into four categories: (1) right-of-way and property access; (2) utility conflicts and relocations; (3) environmental and permitting constraints; and (4) third-party and corridor limitations. Delivery-method observations were organized around DBB, DB, PDB, and CM/GC or the related CMAR terminology used in some jurisdictions. Access maturity was assessed through five questions: Has the condition been investigated? Is its status documented? Is a controlling party assigned? Is a date or milestone established? Is the condition integrated into the procurement, contract, and schedule?

4.5 Data Analysis and Credibility

All 27 transcripts were reviewed for content related to access, utilities, right-of-way, permitting, third parties, staging, and corridor restrictions. Observations were organized into the four access categories and compared by the degree of control held by owners, contractors, and external parties. Delivery-method implications were synthesized by timing of contractor involvement, opportunity for investigation before final pricing, and owner capability. Recurring practices were then consolidated into the implementation tools presented in the findings. Interview-derived patterns were compared with federal regulations, FHWA and NCHRP guidance, and peer-reviewed research.

The numerical trends retained in [Section 5.3](#) were reported within the interviews. The transcript record used for this paper did not establish a common project denominator, standardized project size, uniform definition of schedule extension, or independent verification of the calculations. The values are therefore presented as illustrative practitioner-reported ranges and not as statistical estimates or causal comparisons.

5 Findings

5.1 Four Recurring Categories Differ in Controllability

The synthesis identified four recurring categories of access risk. Each can prevent planned work, but the responsible and controlling parties differ. Right-of-way and environmental approvals are often owner-led statutory obligations. Utilities may involve owner coordination but remain subject to the utility owner's assets, crews, outages, and

review procedures. Third-party and corridor limitations combine external approvals with operational constraints such as traffic, staging, business access, and limited work fronts. [Table 1](#) summarizes the categories and the controls needed to convert uncertainty into a manageable project condition.

Table 1. Access-Risk Categories, Controllability, and Required Controls

Access category	Typical condition	Primary controller(s)	Common project effect	Required control before or during procurement
Right-of-way and property access	Parcels, easements, or temporary construction areas are not secured or available by the assumed date.	Owner/agency, property owner, courts or statutory process	Unavailable work areas, delayed mobilization, revised sequence, claim exposure	Parcel-level status, possession dates, easement limits, disclosure of unresolved acquisitions, and schedule-linked access milestones
Utility conflicts and relocations	Existing facilities conflict with excavation, structures, drainage, signals, or widening, and relocation is incomplete.	Utility owner with owner and designer coordination	Work stoppage, redesign, excavation delay, remobilization, productivity loss	SUE and baseline data, conflict matrix, relocation design and dates, reimbursement terms, outage windows, and delay treatment
Environmental and permitting constraints	Approvals or findings restrict when, where, or how work may occur.	Owner/agency and permitting or resource agency	Seasonal restriction, limited work window, mitigation, redesign, delayed approval	Permit and clearance status, known conditions, pending decisions, responsible party, and explicit schedule constraints
Third-party and corridor limitations	Railroads, municipalities, businesses, adjacent owners, traffic restrictions, staging limits, or laydown constraints affect operations.	Third party and owner; contractor for means and methods within disclosed limits	Approval delay, limited work fronts, traffic-control cost, business-access conflict, reduced productivity	Executed or tracked agreements, stakeholder commitments, staging assumptions, access-maintenance requirements, and escalation path

Note: The categories combine third-party property impacts and corridor restrictions because both depend on external approvals or operating conditions that extend beyond the direct owner-contractor relationship.

Across categories, early identification was necessary but not sufficient. A known utility conflict remained an active risk until it was designed, funded, scheduled, relocated, verified, and closed. A known parcel problem remained active until possession was established and connected to the construction sequence. The key finding for RQ1 is therefore that access risk is not simply the presence of a constraint. It is the gap between the access assumed by the project plan and the access that the controlling parties can actually provide.

5.2 Delivery Method Should Match Access Maturity

Interview observations and supporting guidance indicate that the suitability of a delivery method depends on the maturity of access conditions when price and schedule commitments are made. High access maturity supports methods in which the contractor can price a substantially defined package. Low maturity increases the value of early contractor involvement and phased validation, but only when the owner has authority, staffing, and negotiation discipline to manage the collaborative process.

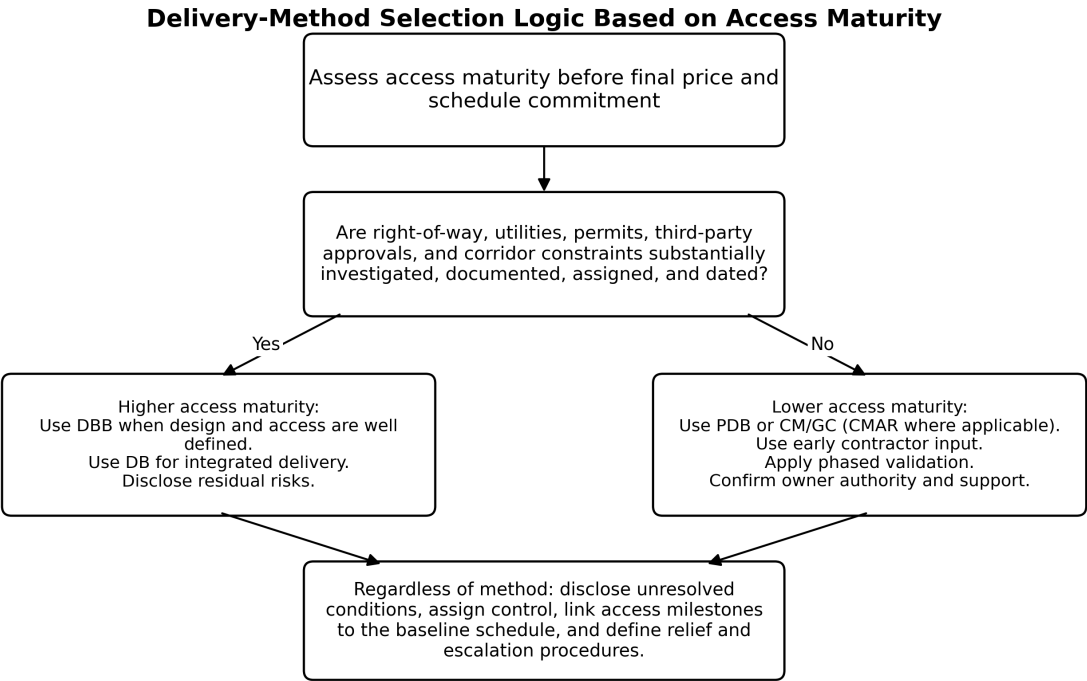


Figure 1. Delivery-method selection logic based on access maturity.

Source: Authors' analysis.

Table 2. Delivery-Method Implications for Access Risk

Delivery method	Access condition at final price	Principal advantage	Principal exposure or requirement
Design-Bid-Build (DBB)	Design, right-of-way, utilities, permits, and third-party conditions are substantially defined.	Familiar process and competitive pricing on a mature package.	Contractor involvement occurs after design; unresolved conditions may produce change orders, resequencing, or claims.
Design-Build (DB)	Scope and access conditions are reasonably defined, with residual risks disclosed and allocated.	Integrated design and construction can accelerate decisions and support innovation.	Fixed-price competition may produce contingency or disputes when access risk is transferred before adequate definition.
Progressive Design-Build (PDB)	Important access conditions remain unresolved and can be investigated during preconstruction before final price.	Collaborative design, validation, and risk treatment before construction price commitment.	Requires legal authority, owner capability, transparent cost development, and disciplined negotiation.
CM/GC or related CMAR	Scope and access strategy are evolving and owner seeks contractor input while retaining design influence.	Early constructability, phasing, sequencing, and pricing input.	Requires collaborative governance, independent cost review where used, and a defined path if price cannot be agreed.

Note: CM/GC is the FHWA transportation term. Some state laws use Construction Manager at Risk or Construction Manager/General Contractor terminology for related two-phase models.

The finding for RQ2 is conditional rather than hierarchical. DBB may be the strongest fit when access is mature, while DB may be appropriate when the owner can define and disclose the remaining conditions before fixed-price competition. PDB and CM/GC provide more opportunity to investigate utilities, develop phasing, evaluate temporary access, and negotiate residual risk before construction pricing. Early involvement does not eliminate access risk; it changes when the risk becomes visible and when the parties can decide how to avoid, mitigate, share, or retain it.

5.3 Practitioner-Reported Performance Patterns

Participants described material consequences when access conditions were unresolved at award or were not carried into schedule and contract controls. [Table 3](#) retains the numerical ranges and qualitative trends reported through the interviews. Because the source material did not provide a common denominator or consistent calculation method, the numerical values should be read as illustrative observations from experienced practitioners.

Table 3. Illustrative Trends Reported by Interview Participants

Observed issue	Practitioner-reported pattern	Interpretation and recommended control
Unresolved utilities and right-of-way	Participants described affected projects as experiencing approximately 20-40% schedule extensions when access constraints disrupted planned critical work.	Link parcel and relocation dates to the baseline schedule; identify the controlling party and define delay responsibility and relief.
Unresolved environmental findings	Participants reported major resequencing or redesign in more than 30% of the Design-Build projects they reviewed when key environmental constraints remained unresolved.	Disclose clearance and permit status before final price; show work windows and approval constraints in schedule logic.
Early contractor involvement	Participants associated PDB and CM/GC with greater opportunity to mitigate unresolved access through constructability, phasing, staging, and utility planning.	Use collaborative preconstruction when access maturity is low and owner authority and capability support phased validation.
Continuous stakeholder coordination	Participants repeatedly associated ongoing communication with better management of utilities, property, permits, and third-party approvals.	Use recurring coordination meetings, issue and decision logs, dated actions, and escalation procedures rather than one-time identification.

Note: The percentages are interviewee-reported observations. They were not calculated from a standardized or independently audited project dataset and should not be interpreted as population estimates or causal effects of a delivery method.

5.4 **Responsibility, Documentation, and
Schedule Integration Are Core Controls**

The strongest recurring management principle was that access risk must be assigned to the party best positioned to control it, while the interfaces among parties must be documented. Owners generally lead property acquisition, public approvals, and disclosure of baseline conditions. Utility owners control their facilities, crews, standards, and outages. Contractors control means and methods, internal sequencing, labor, equipment, and subcontractor coordination within the access actually provided. Designers translate known conditions into constructible plans. Procurement and legal teams determine how these responsibilities appear in solicitation and contract documents.

Table 4. Access-Risk Control and Responsibility Matrix

Risk category	Owner/agency	Contractor or design-builder	External party	Required shared record
Right-of-way	Identify parcels; manage acquisition and disclosure; commit possession dates.	State access assumptions; sequence work to disclosed dates; document impacts.	Property owner, court, or relocation participant completes required action.	Parcel status register, possession milestone, easement map, notice and relief record.
Utilities	Provide baseline information; lead agreements and reimbursement where applicable.	Identify conflicts; coordinate design and means and methods; document delay.	Utility owner reviews, designs, approves outage, relocates, and verifies.	SUE data, utility conflict matrix, relocation schedule, agreement, escalation log.
Environmental/permit	Identify obtained and pending approvals; disclose restrictions and retained obligations.	Plan compliant means, methods, sequencing, submittals, and mitigation.	Resource or permitting agency reviews and decides.	Permit tracker, work-window constraints, approval activities, mitigation commitments.
Third-party/corridor	Coordinate agreements and public commitments; disclose operating constraints.	Develop staging, traffic, access-maintenance, and temporary-work plans.	Railroad, municipality, business, or adjacent owner provides review or approval.	Agreement log, stakeholder commitment register, schedule constraint, decision log.

Note: The matrix should be expanded into a living project register that also records status, responsible individual, required date, linked schedule activity, contract treatment, next action, escalation threshold, and closure evidence.

For RQ3, the key control is not communication alone but documented communication that changes the project record. Meetings should result in assigned actions, dates, decisions, and schedule updates. Utility agreements, right-of-way status reports, permit

trackers, issue logs, and third-party commitment registers create the evidence needed to manage the work and resolve entitlement if a constraint later causes delay.

6 Discussion

6.1 Interpretation of the Principal Findings

The findings reposition access as a threshold condition for performance. A contractor may have an executed contract, mobilized resources, and a technically sound work plan, yet remain unable to proceed because another party controls the required property, facility, approval, or operating window. Access is therefore simultaneously a technical condition, a schedule constraint, a procurement assumption, and a contractual obligation. Access maturity explains why the same delivery method can perform differently across projects. A fixed-price method is not inherently unsuitable for infrastructure work, but it becomes vulnerable when the owner requests price and schedule certainty before access conditions are sufficiently defined. Conversely, early contractor involvement is not inherently superior. Its value depends on whether the preconstruction process produces better information, specific decisions, transparent pricing, and enforceable commitments before the construction price is finalized.

6.2 Relationship to Prior Research and Practice

The results are consistent with prior research showing that right-of-way duration depends on management and external process factors, that SUE improves utility information, and that delivery selection should reflect project risk and owner capability ([Jung, 2012](#); [Molenaar et al., 2012](#); [Chung et al., 2022](#)). They also align with PDB research emphasizing early involvement, collaboration, and the need for capable owner governance ([Alleman & Tran, 2020, 2021](#); [Alameri & Esmaeili, 2023](#)). This study extends those streams by placing right-of-way, utility, environmental, and third-party constraints in one access-risk framework and connecting them directly to final price timing, schedule logic, and contract administration.

6.3 Alternative Explanations and Contextual Factors

Project size, statutory authority, market capacity, owner staffing, geography, utility density, environmental sensitivity, and third-party interfaces can influence access difficulty and delivery performance. CMAR and CM/GC terminology also varies by

jurisdiction. The framework is therefore a screening and control tool, not a rule that automatically assigns a delivery method whenever access is unresolved.

7 Implications

7.1 Practical and Industry Implications

Owners should perform an access-maturity assessment before selecting the delivery method and before requesting final price and schedule commitments. At minimum, the assessment should address parcel possession, utility information and relocation responsibility, permit and clearance status, third-party agreements, staging, traffic, business access, and other corridor restrictions. Conditions that remain unresolved should be disclosed specifically rather than described as generally ongoing.

Procurement and contract documents should connect access information across the project. The same parcel, relocation, permit, or approval should appear consistently in the risk register, responsibility matrix, solicitation, contract clauses, and baseline schedule. Retained owner risks and contractor-controlled obligations should be distinguished. Where no party fully controls timing, the team should consider allowances, contingency pools, validation periods, shared-risk mechanisms, or defined relief events instead of broad transfer.

During execution, access milestones should be managed as schedule activities or constraints. Each item should have a controlling party, required date, predecessor and successor logic, current status, next action, escalation threshold, and closure evidence. This converts access coordination from an informal conversation into a measurable project-control process.

7.2 Research and Theoretical Implications

Access maturity provides a basis for future measurement. A standardized index could assess investigation quality, documentation, control assignment, date certainty, contract treatment, and schedule integration. It could support comparisons among projects and delivery methods while separating underlying access conditions from the nominal method selected.

8 Limitations and Future Research

This paper is a secondary analysis of interviews originally conducted for a broader study of Design-Build legislation and practice. Access was not the sole purpose of the parent interview protocol. The sample consisted of experienced experts and was not designed to be statistically representative of all states, agencies, firms, or project types. The unit of analysis was practitioner observation, and project examples were not independently audited. In particular, the reported 20-40% schedule-extension range and the more-than-30% redesign or resequencing observation lack a common denominator, standardized definitions, and a uniform calculation method. They should be interpreted only as illustrative practitioner-reported outcomes. The analysis also does not establish that a delivery method caused better or worse performance.

Future research should assemble project-level data with consistent definitions of access constraint, planned duration, critical-path impact, concurrency, and cost effect. Studies could compare DBB, DB, PDB, and CM/GC after controlling for project complexity and access maturity; validate an access-maturity index; test the effectiveness of responsibility matrices and schedule-linked registers; and examine how state law, utility rights, and environmental processes change the allocation of control.

9 Conclusion

Access challenges are recurring project-delivery risks. Right-of-way, utilities, environmental approvals, and third-party or corridor constraints determine whether the contractor can perform planned work. Many can be investigated, assigned, disclosed, dated, and monitored before construction, although genuine unknowns remain.

Delivery method should be matched to access maturity at price and schedule commitment. Mature conditions may support DBB or DB; lower maturity may justify PDB or CM/GC when the owner can manage collaborative preconstruction and transparent price development. Regardless of method, a living register, clear control assignment, schedule logic, and defined notice, relief, and escalation procedures improve the team's ability to manage uncertainty before it becomes a dispute.

10 References

- Abdelaty, A., Park, H., Jeong, H. D., & Gransberg, D. D. (2023). Barriers and recommendations for right-of-way acquisition process. *Journal of Legal Affairs and Dispute Resolution in Engineering and Construction*, 15(2), 04523006. <https://doi.org/10.1061/JLADAH.LADR-907>
- Ahmed, S., & El-Sayegh, S. (2021). Critical review of the evolution of project delivery methods in the construction industry. *Buildings*, 11(1), 11. <https://doi.org/10.3390/buildings11010011>
- Alameri, R., & Esmacili, B. (2023). Progressive design-build delivery method: Assessment of project performance. *International Journal of Construction Education and Research*, 19(1), 22-41. <https://doi.org/10.1080/15578771.2021.1950242>
- Alleman, D., & Tran, D. (2020). Challenges of implementing progressive design-build in highway construction projects. *Journal of Legal Affairs and Dispute Resolution in Engineering and Construction*, 12(1), 04519036. [https://doi.org/10.1061/\(ASCE\)LA.1943-4170.0000327](https://doi.org/10.1061/(ASCE)LA.1943-4170.0000327)
- Alleman, D., & Tran, D. (2021). Exploring a progressive design-build best-value delivery method in highway construction. *Journal of Legal Affairs and Dispute Resolution in Engineering and Construction*, 13(1), 05020018. [https://doi.org/10.1061/\(ASCE\)LA.1943-4170.0000443](https://doi.org/10.1061/(ASCE)LA.1943-4170.0000443)
- Batarseh, S. (2025). An approach to adjusting Design Build for the modern construction industry [Doctoral dissertation, Arizona State University].
- Chung, F., Baek, M., & Ashuri, B. (2022). Improving the management practices for right-of-way acquisition process. *Journal of Legal Affairs and Dispute Resolution in Engineering and Construction*, 14(1), 04521038. [https://doi.org/10.1061/\(ASCE\)LA.1943-4170.0000511](https://doi.org/10.1061/(ASCE)LA.1943-4170.0000511)
- Code of Federal Regulations. (2026). 23 C.F.R. Part 710: Right-of-way and real estate. Electronic Code of Federal Regulations. <https://www.ecfr.gov/current/title-23/chapter-I/subchapter-H/part-710>
- Federal Highway Administration. (n.d.-a). Current design-build practices for transportation projects: Risk allocation. U.S. Department of Transportation. <https://www.fhwa.dot.gov/construction/contracts/pubs/dbpractice/10.cfm>
- Federal Highway Administration. (n.d.-b). Preparing the PS&E: Right-of-way coordination and certification requirements. U.S. Department of Transportation. <https://highways.dot.gov/fed-aid-essentials/videos/project-development/preparing-pse-right-way-coordination-and>
- Federal Highway Administration. (2022). Subsurface utility engineering. U.S. Department of Transportation. <https://www.fhwa.dot.gov/programadmin/sueindex.cfm>

- Federal Highway Administration. (2023a). Design-build project delivery. U.S. Department of Transportation. <https://www.fhwa.dot.gov/construction/cqit/desbuild.cfm>
- Federal Highway Administration. (2023b). Construction Manager/General Contractor project delivery. U.S. Department of Transportation. <https://www.fhwa.dot.gov/construction/cqit/cm.cfm>
- Gransberg, D., Pittenger, D., & Chambers, G. (2017). Utility coordination using alternative contracting methods (NCHRP Project 20-07, Task 373). National Cooperative Highway Research Program. [https://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP20-07\(373\)_ACM-Utility-Coordination-Guide.pdf](https://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP20-07(373)_ACM-Utility-Coordination-Guide.pdf)
- Jung, Y. J. (2012). Evaluation of subsurface utility engineering for highway projects: Benefit-cost analysis. *Tunnelling and Underground Space Technology*, 27(1), 111-122. <https://doi.org/10.1016/j.tust.2011.08.002>
- Molenaar, K. R., Harper, C., & Tran, D. (2012). Guidebook for selecting project delivery methods and alternative contracting strategies: Technical memorandum no. 1. Transportation Pooled Fund Program Study TPF-5(260). <https://pooledfund.org/Document/Download?id=3772>
- Shabana, O., Gad, G. M., & Minchin, R. E. (2024). Impact of project delivery methods on risk allocation during the planning phase of transportation projects. *Journal of Legal Affairs and Dispute Resolution in Engineering and Construction*, 16(4), 04524019. <https://doi.org/10.1061/JLADAH.LADR-1109>
- U.S. Department of Transportation. (2024). NEPA. <https://www.transportation.gov/transportation-policy/nepa>