TEN RECOMMENDATIONS FOR AVOIDING DISPUTES IN MULTI-CONTRACT UNDERGROUND CONSTRUCTION PROJECTS

N. A. Munfah

Gall Zeidler Consultants, New York, USA

ABSTRACT: Underground construction projects delivered through multiple, interrelated contracts are among the most dispute-prone undertakings in the construction industry. Subsurface uncertainty, fragmented scopes of work, complex physical and temporal interfaces, and cascading schedule dependencies frequently lead to claims that escalate into costly and time-consuming multi-party disputes. Drawing on relevant international practice and industry guidance, this paper presents ten integrated recommendations for avoiding disputes in multi-contract underground projects. These recommendations address geotechnical risk allocation, interface management, integrated scheduling, project delivery methods, change management, communication systems, leadership and governance, dispute avoidance mechanisms, risk management, and institutional learning. Each recommendation is examined in depth, highlighting its technical, contractual, and organizational implications. Together, the recommendations form a coherent framework for proactive dispute avoidance grounded in collaboration, transparency, and technically informed decision-making. While disputes cannot be entirely eliminated in underground construction, this paper demonstrates that their frequency, severity, and duration can be substantially reduced when these recommendations are implemented consistently and collectively across all project phases—from planning and design through construction and close-out.

1. INTRODUCTION

Underground construction plays a critical role in the delivery of modern infrastructure, including metro and rail systems, water and wastewater conveyance tunnels, hydropower facilities, underground roadways, and subsurface research installations. As urbanization intensifies and surface space becomes increasingly constrained, societies are turning more frequently to underground solutions to meet transportation, utility, and energy needs. These projects, however, are inherently complex due to geological uncertainty, constrained work environments, and the interaction between ground behaviour and construction methods.

To manage technical complexity, procurement risk, and market capacity, owners increasingly deliver underground programs through multiple contracts. Work may be divided by discipline (civil/structural, systems, architectural outfit), by geography (tunnels, stations, shafts), or by construction phase (early works, main works, systems installation). This approach allows owners to attract specialized contractors, phase funding commitments, and maintain flexibility. However, it also creates networks of interdependent contracts with numerous physical, temporal, technical, and organizational interfaces.

Recent examples of large-scale multi-contract underground projects include the LIRR Grand Central Madison Terminal in New York, the Crossrail project, in London, Copenhagen Metro, the Purple Line Extension in Los Angeles, Grand Paris Express, the Second Avenue Subway in New York, and several projects of Toronto Metro Expansion program. Each of these projects and many others was procured using multiple contracts based on geographical locations, types of work, and disciplines, creating numerous interconnected and interdependent contractual relationships.

Experience from major underground projects worldwide shows that many disputes do not arise from isolated contractual breaches, but from failures to manage these interfaces and interdependencies. Differing site condition claims, delay claims, scope responsibility disputes, and coordination failures frequently involve multiple parties and cannot be resolved effectively within the confines of a single bilateral contract. Instead, they evolve into multi-party disputes characterized by circular blame, inconsistent positions, and prolonged resolution processes that divert resources away from project delivery.

This paper synthesizes lessons learned from various projects, author's experience, and broader industry practice to propose ten practical recommendations for avoiding multi-contract disputes in underground projects. The emphasis is on dispute avoidance rather than dispute resolution, recognizing that proactive planning, governance, and collaboration are far more effective than reactive claims management after disputes have already crystallized.

2. CHARACTERISTICS OF MULTI-CONTRACT UNDERGROUND PROJECTS

2.1 INHERENT SOURCES OF DISPUTES

Disputes on underground projects typically originate from four closely related sources. The first and most pervasive source is differing subsurface conditions. No matter how extensive the site investigation program, actual ground conditions frequently deviate from expectations. Variations in rock mass quality, faulting, groundwater inflows, soil stratigraphy, and in-situ stresses often require changes in excavation methods, support systems, or permanent works design. When contracts do not clearly define how such variations are to be addressed, disputes are almost inevitable.

The second source of disputes lies in ambiguity regarding the roles, responsibilities, and risks of project participants. Underground projects involve intricate interactions between permanent works design, temporary works, and construction means and methods. Disagreements frequently arise over who bears responsibility for design adequacy, constructability, and compatibility with encountered ground conditions, particularly where performance-based and prescriptive specifications are mixed. These disagreements are exacerbated in multi-contract environments where responsibilities are fragmented across multiple entities.

Third, construction means and methods themselves are a frequent source of conflict. The behaviour of the ground is influenced by excavation techniques, sequencing, support installation, and groundwater control. When changes in means and methods are required to respond to actual conditions, disputes may arise over entitlement to additional time or compensation, especially if contracts do not adequately anticipate such changes.

Finally, disputes often stem from the contractual and commercial consequences of change. Underground projects evolve continuously during construction, yet many contracts are drafted as if conditions and designs will remain static. In multi-contract environments, changes affecting one contract can have cascading impacts on others, multiplying the potential for conflict and giving rise to complex, multi-party claims.

2.2 MULTI-PARTY COMPLEXITY AND INTERDEPENDENCE

Multi-contract underground projects create systems of intertwined multi-lateral contracts rather than isolated contractual relationships. Contractors may be contractually unrelated yet operationally interdependent. A delay or design change under one contract can directly affect the performance of another contractor, even where no contractual relationship exists between them. This interdependence complicates both project management and dispute resolution. Claims and defences must remain consistent across multiple contracts, limiting strategic options and increasing the risk of contradictory positions. Without coordinated management structures and dispute avoidance mechanisms, issues can quickly escalate into multi-party disputes that are costly, time-consuming, and damaging to project outcomes.

3. TEN RECOMMENDATIONS FOR AVOIDING MULTI-CONTRACT DISPUTES

3.1 RECOMMENDATION 1: CONDUCT COMPREHENSIVE GEOTECHNICAL INVESTIGATIONS AND ESTABLISH GEOTECHNICAL BASELINE REPORT

Underground construction is inherently uncertain due to subsurface conditions that cannot be fully known until excavation begins. Differing Site Conditions (DSC) claims are among the most common and costly sources of disputes in underground projects. A comprehensive geotechnical investigation program coupled with a well-drafted Geotechnical Baseline Report (GBR) is essential for managing these risks.

Key elements include conducting thorough subsurface investigations with borings, geophysical surveys, groundwater monitoring, and laboratory testing at sufficient density and depth. A Geotechnical Data Report (GDR) is usually prepared to present factual data from investigations without interpretation. The

GBR then establishes contractual baseline conditions for key geotechnical parameters, clearly allocating risk between the owner and the contractor. Clear DSC clauses should define what constitutes differing conditions and establishes payment mechanisms.

Recognizing the unique risks of underground work, in 2019 FIDIC and the International Tunnelling and Underground Space Association (ITA-AITES) published the Conditions of Contract for Underground Works (the Emerald Book). This contract form specifically addresses risk allocation through mandatory geotechnical baselines, disclosure of all geological information, and tailored Unforeseeable Physical Conditions clauses.

The Channel Tunnel project provides a cautionary example (figure 1). The project encountered unforeseen geological conditions, particularly variations in the chalk marl and water ingress that exceeded predictions. These unforeseen conditions led to extensive claims for additional compensation and time extensions resulting not only in delaying the tunnelling contract but all subsequent contracts. The lack of a comprehensive geotechnical baseline at the contract stage contributed to protracted disputes requiring multiple arbitration proceedings. The project ultimately succeeded but was completed late and significantly over budget.

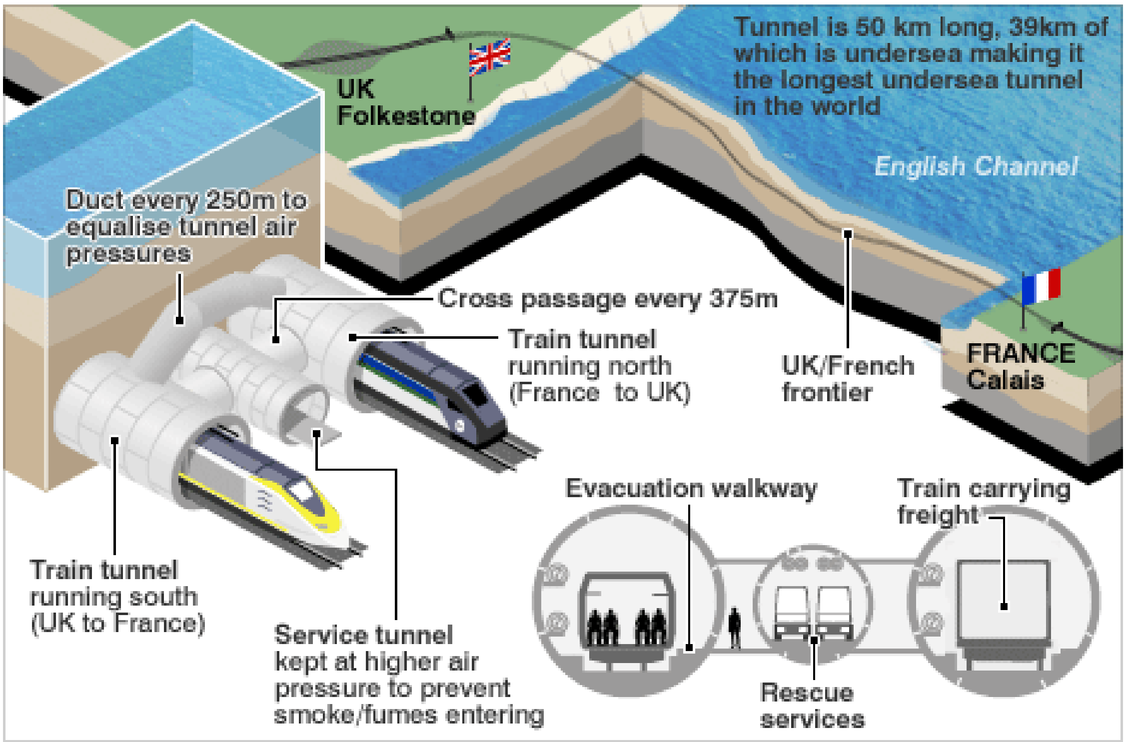


Figure 1 – Channel Tunnel 37.9 km (23.5 miles) under the English Channel

3.2 RECOMMENDATION 2: DEVELOP DETAILED INTERFACE MANAGEMENT PLANS

Interfaces represent the most common points of failure in multi-contract underground projects. Physical interfaces include tunnel connections, shafts, stations, and shared temporary works. Temporal interfaces involve sequencing and handover milestones. Technical interfaces encompass design criteria, tolerances, and performance requirements. Organizational interfaces define communication pathways and decision-making authority. A formal Interface Management Plan (IMP) should systematically identify all interfaces, assign responsibility for each, and establish processes for coordination and issue resolution. Key elements include defining physical interfaces with precise boundaries between work packages, handover points, and responsibility for temporary works and joint use areas. Temporal interfaces must establish work sequences between contractors, critical path dependencies, and notification requirements for delays. Technical interfaces specify design coordination requirements, quality standards at handover points, and acceptance procedures. Information interfaces define data exchange protocols, drawing deliverable schedules, and coordination meeting requirements. Interface Managers should be appointed with authority to resolve issues promptly.

On the Crossrail (Elizabeth Line) in London, despite excellent contract management using the British NEC3 Engineering and Construction Contract, a highly flexible collaborative contract promoting good project management, clear communication, and shared objectives among project participants, the project experienced significant interface challenges that contributed to delays and cost overruns. The project suffered from poor coordination between vertical contracts at individual station sites and horizontal contracts for railroad systems used across the railway. The lack of systematic coordination between contractors working on stations versus those installing railway-wide systems created numerous conflicts. Specifically, interface issues in shafts and portals housing signalling and communications cables led to lower than planned productivity. The complexity was compounded by three different signalling systems operating across the 110-kilometer route requiring extensive interface coordination. Figure 2 shows the route of Crossrail project.

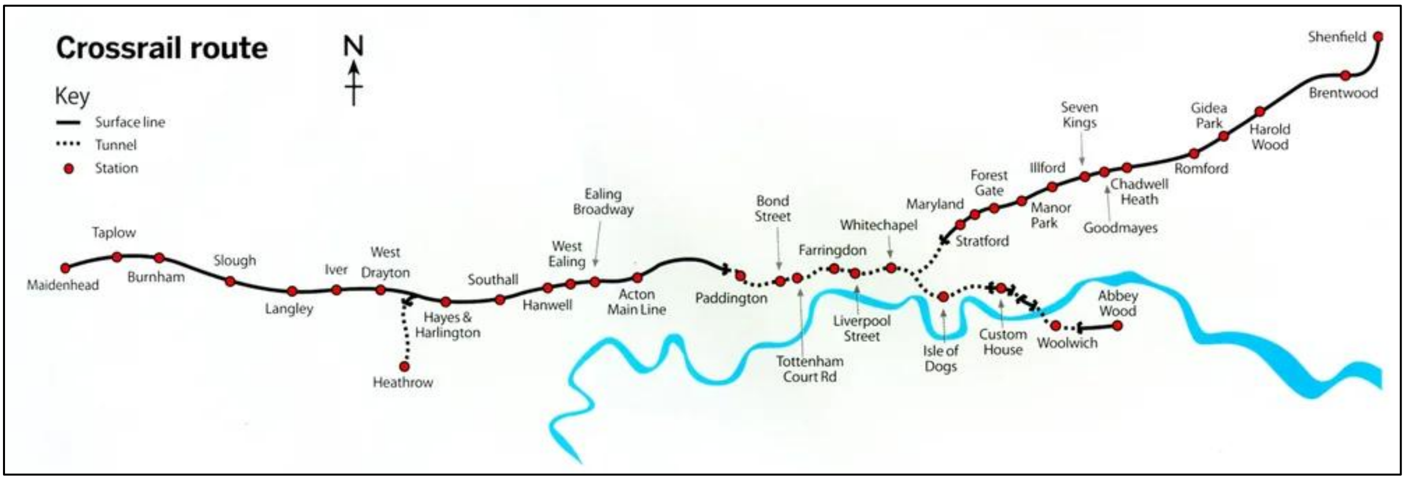


Figure 2 – Crossrail Route - London

Learning from Phase 1 challenges and Crossrail experiences, the Metropolitan Transportation Authority (MTA) in New York implemented enhanced interface management for Second Avenue Subway Phase 2. The project is being delivered through four tightly coordinated contracts with clear interface protocols: Contract 1 for utility relocations, Contract 2 for tunnel boring and station excavation, Contract 3 for station construction, and Contract 4 for railroad systems fit-out. Early utility relocation addresses underground infrastructure conflicts upfront, and close coordination between contracts is a stated cost-containment initiative. The project claimed that this approach and other improvements will save more than 1.3 billion dollars.

By proactively managing interfaces, project teams can prevent misunderstandings and coordination failures from escalating into disputes. Interface management is not a one-time exercise, but a continuous process that must be maintained throughout design and construction.

3.3 RECOMMENDATION 3: ESTABLISH INTEGRATED MASTER SCHEDULES WITH PROACTIVE COORDINATION

In multi-contract underground projects, the overall critical path often spans several contracts. An integrated master schedule is therefore essential. This schedule should identify interdependencies, interface milestones, shared access constraints, regulatory approvals, and key handover dates. Individual contractor schedules must be integrated into the master schedule. Schedule coordination requires active management throughout the project. Delays in one contract often cascade through dependent contracts, creating compounding impacts and disputes over responsibility.

The master schedule should be recognized contractually among all contracts and updated regularly. Short-term look-ahead schedules and early warning mechanisms enable proactive intervention when delays threaten interfacing activities. Without an integrated schedule, delay analysis becomes fragmented, increasing the likelihood of adversarial claims and inconsistent delay responsibility determinations. Regular schedule coordination meetings involving all affected contractors should review progress, update forecasts, and identify potential conflicts early. Protocols must establish procedures for notifying affected contractors of schedule changes and evaluating delay impacts across multiple contracts. Float management provisions should clarify ownership of schedule float and procedures for analysing concurrent delays.

The Gotthard Base Tunnel in Switzerland, the world longest and deepest rail tunnel at 57 kilometres, successfully implemented integrated schedule management across multiple delivery contracts over its 17-year construction period. Figure 3 shows the Gotthard Base Tunnel. To expedite construction, five access tunnels were built enabling simultaneous work at four different sites: Erstfeld, Amsteg, Sedrun, Faido, and Bodio. AlpTransit Gotthard, the owner, coordinated civil works across five main construction lots with different consortia, while another consortium installed railway infrastructure under a separate contract. More than 1000 technical interfaces were coordinated with each other on a regular basis. The project maintained strict adherence to the construction schedule, with handover points occurring on specified dates. Despite unforeseen geological conditions in the southern section, the project team successfully adjusted lot boundaries and implemented countermeasures to prevent delays. The project met precisely the specified date. This demonstrates that even for the world most complex tunnel project, rigorous integrated scheduling with proactive coordination can deliver on time despite unexpected challenges.

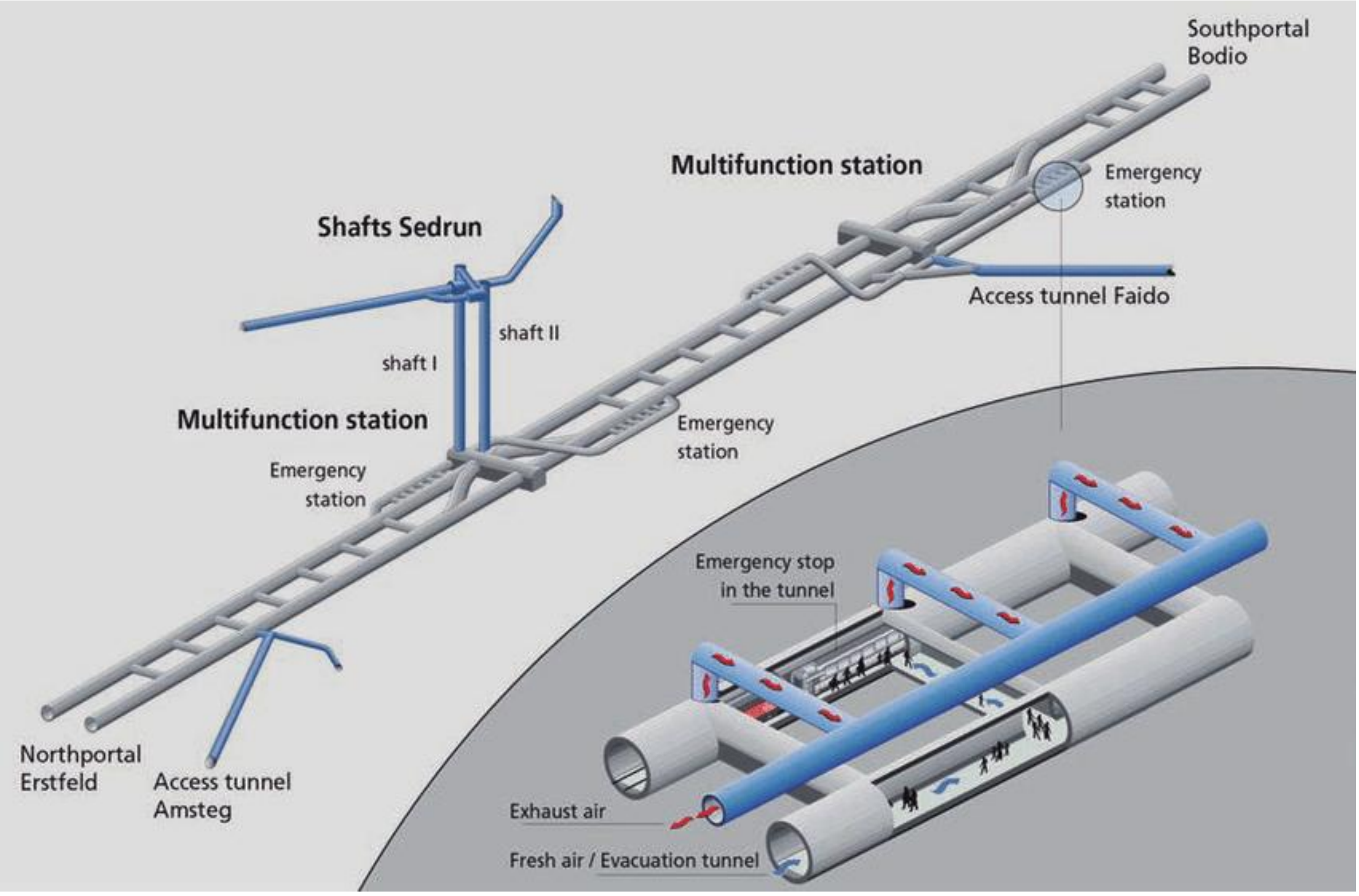


Figure 3 – Gothard Base Tunnel – 57km long in Switzerland

Conversely, as discussed above, the UK National Audit Office's 2019 review of Crossrail found that assumptions about achievable progress levels bore little resemblance to actual performance on critical contracts. Progress against handover schedules on critical contracts diverged from plan soon after each iteration. The report noted that Crossrail optimistic schedule assumptions contributed to the failure to meet the December 2018 opening date. The extension of the program schedule meant contractors remained mobilized longer than anticipated, increasing costs.

3.4 RECOMMENDATION 4: SELECT APPROPRIATE PROJECT DELIVERY METHODS WITH EARLY CONTRACTOR INVOLVEMENT

Traditional design-bid-build procurement with multiple separate contracts maximizes interface points and coordination complexity between the owner and the multiple contractors increasing interfacing risks on the owner. Alternative delivery methods that consolidate responsibility can significantly reduce multi-contract disputes by reducing the number of contractual boundaries.

Other Delivery method options include Design-Build, where a single entity is responsible for both design and construction, eliminating design-construction interface disputes. Construction Manager/General Contractor (CMGC) provides early contractor involvement during design phase allowing collaborative development of means and methods. Progressive Design-Build uses a phased approach where designer and contractor work collaboratively through design development and construction. Alliance Contracting has owner, designer, and contractors share project risks and rewards through joint decision-making and aligned incentives. Public-Private Partnerships (P3) have the private sector assume design, construction, and often financing and operations responsibility, internalizing many interface risks. These methods include Early Contractor Involvement (ECI) approaches which offer advantages for dispute avoidance. By involving contractors during design development, ECI fosters shared understanding of subsurface risks, constructability constraints, and realistic pricing. Although ECI does not eliminate all disputes, experience shows that it significantly reduces their frequency and severity by aligning expectations before construction begins.

Figure 4 - Copenhagen metro – Circle Line

The implementation of early Contractor Involvement had mixed results. ECI has been successful in regions like Northern Europe and Australia, where collaborative procurement models and strong trust between clients and contractors encourage early risk-sharing and joint problem-solving. In these contexts, involving contractors early helps improve constructability, minimize risks, reduce cost overruns, and accelerate delivery. However, ECI has been less effective in parts of the world where procurement systems remain highly rigid and adversarial, or where transparency and institutional capacity are weaker such as in the USA. In such environments, early involvement can be undermined by unclear roles, mistrust, or a focus on lowest-price bidding rather than long-term value.

The Copenhagen Metro Circle Line contract employed a progressive design build approach with target-price arrangement for its 15.5km automated metro and 17 stations. The contract with the CMT JV (Salini Impregilo, Samsung, Seli) included gainshare mechanisms that incentivized cost efficiency while maintaining quality. Despite challenging geology, urban setting, and numerous unforeseen conditions, the project settled commercially with limited disputes, attributed to the aligned incentive structure and early warning mechanisms built into the modified contract. Figure 4 shows Copenhagen Meto Circle Line. On the other hand, Maryland Purple Line (Tunnelled Sections) – Maryland Light rail project in the USA, the Contractor withdrew mid-project, citing inadequate risk allocation in PDB contract. The design significantly underestimated the scope including significant utility conflicts that were discovered during design progression, and procurement timeline did not allow adequate investigations. As a result, the contractor exited, the project suffered multi-year delay and a substantial cost increase.

The use of Alliance Contracting mechanism had mixed results. Alliance contracting is a collaborative project delivery method where the owner, contractors, and designers form a single integrated team that shares both risks and rewards through a pain/gain mechanism tied to a Target Outturn Cost (TOC). All parties operate under open-book accounting with unanimous decision-making, receiving reimbursement for direct costs plus overhead fees, while their profit margin varies based on actual performance against cost targets and key performance indicators (KPIs). The contract usually includes a "no-blame" clause prohibiting litigation between parties, shifting focus from "who pays for problems?" to "what's the best solution for the problem?"—with cost overruns or savings typically split 50/50 between the owner and non-owner participants. This structure incentivizes collective problem-solving rather than adversarial claims management, making it particularly effective for high-uncertainty projects like tunneling where geological conditions and technical challenges are difficult to predict. The alliance contracting has positive and negative outcomes.

The Clem Jones Tunnel (CLEM7) (figure 5) in Brisbane is a notable example of alliance contracting in underground construction. The alliance between RiverCity Motorway, Thiess John Holland JV, and Arup successfully delivered the 6.8 km twin-tube tunnel by overcoming significant geological and technical challenges without disputes or litigation. However, despite strong delivery performance, the project failed commercially when the owner entered insolvency in 2011 due to traffic volumes reaching only 25% of forecasts. The alliance absorbed around $800M in losses but still achieved high-quality, safe completion, likely avoiding even greater costs and claims under traditional contracting. The key lesson is that alliances are highly effective for managing technical complexity, but they cannot compensate for a fundamentally flawed business case, highlighting the difference between delivery success and overall project viability.

Courtesy of Sydney Herald

Figure 5 – Clem Jones Tunnel, Brisbane, Australia

A case of unsuccessful alliance-style collaboration contract that has struggled is the Melbourne Metro Tunnel Project. The project was delivered through a consortium model with many alliancing features (shared delivery teams and risk allocation), but cooperation weakened as the tunnel works encountered cost escalations, delays, and disputes over responsibility for overruns**.** By 2023–2024 the project required nearly $1 billion in additional government funding**,** and the total cost rose well beyond the original estimate, showing that the “shared pain/gain” principle was difficult to sustain under extreme pressure.

European underground projects increasingly utilize alternative delivery method combined with standardized FIDIC contract terms, particularly the Emerald Book for underground works. This consolidates design-construction responsibility while providing uniform risk allocation frameworks. In contrast, procurement of underground construction projects in North America attempted using alternative delivery with collaborative approach with limited success.

The traditional design-bid-build contract creates more interface points and often leading to changed-conditions claims. Collaborative alternative delivery methods work well for underground projects when sophisticated owners with experienced leadership use it along with adequate preparation time and balanced risk allocation. It fails when used as a cost or risk transfer mechanism or when political pressures override technical requirements.

3.5 RECOMMENDATION 5: IMPLEMENT ROBUST CHANGE MANAGEMENT SYSTEMS

Changes are inevitable in complex underground projects due to unforeseen conditions, design evolution, and scope modifications. In multi-contract environments, changes in one contract often ripple through related contracts. Poor change management leads to disputes over change order pricing, time extensions, and impacts on other contractors.

Figure 6 - Construction of Tyson Corner Tunnel, part of the Silver Line in Washington

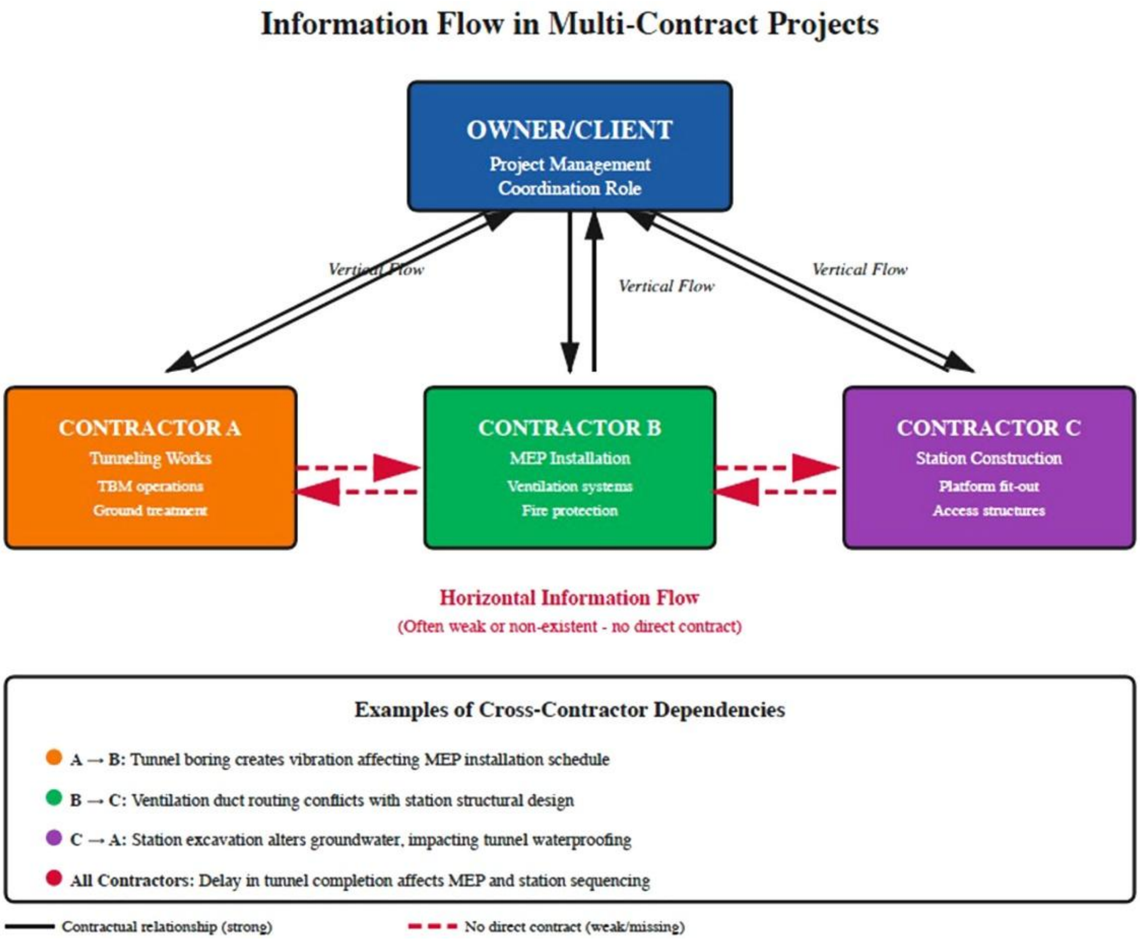
Key elements include establishing formal change management procedures with clear authority levels, pricing methodologies, and approval workflows documented in contracts. Real-time documentation systems should allow contractors to record changed conditions with photos, measurements, and contemporaneous notes before evidence disappears. Procedures must evaluate change impacts across multiple contracts, including downstream effects on schedule and costs for other contractors. Change contingency budgets should be adequate for the project complexity and uncertainty level. Early change order pricing procedures should prevent accumulation of unresolved changes.

A success story is Washington DC, USA Silver Line contract; it implemented a five-tier change classification system with pre-negotiated unit prices for over 200 potential common change items, eliminating 60% of pricing disputes before they occurred. When major undocumented fiber optic and electrical utilities were discovered during tunnel construction, the robust process enabled 21-day resolution from discovery to approve change, compared to a typical 90+ day disputes—preventing work stoppage and cascading delays. A bi-weekly Change Control Board with defined approval authorities processed 1,200+ changes over 5 years with a 98.5% settlement rate and zero change-related litigation, delivering the project on-time in July 2014 despite $180M in total variations (12% of base contract). Pre-agreed unit prices and immediate joint investigation protocols transformed potentially adversarial differing site conditions into collaborative 3-week resolutions, saving significant costs, avoiding delays, and eliminating litigations.

3.6 RECOMMENDATION 6: ESTABLISH CLEAR COMMUNICATION PROTOCOLS AND CENTRALIZED INFORMATION MANAGEMENT

Poor communication is among the most common causes of construction disputes generally and multi-party disputes particularly. In multi-contract projects, information must flow not only vertically between owner and contractors, but horizontally between contractors who may have no direct contractual relationship but could be impacted. Lack of communication infrastructure creates blind spots where critical information fails to reach those who need it. Figure 7 provides basic illustration of communication protocol in multi-contract projects.

Key elements include implementing centralized project information management systems (common data environments) accessible to all project participants with appropriate permissions. Regular coordination meetings should occur at multiple levels: executive steering committees, project management meetings, technical coordination sessions, and field-level logistics meetings. Formal communication protocols must define notification requirements, response timeframes, and escalation procedures for issues requiring higher-level resolution. Contractual obligations should require contractors to share relevant information with third-party contractors and attend coordination meetings.



Examples of Cross-Contractor Dependencies

- **A → B:** Tunnel boring creates vibration affecting MEP installation schedule
- **B → C:** Ventilation duct routing conflicts with station structural design
- **C → A:** Station excavation alters groundwater, impacting tunnel waterproofing
- **All Contractors:** Delay in tunnel completion affects MEP and station sequencing

Figure 7 – Information Flow in Multi-Contract projects

The use of Building Information Modelling (BIM) and digital collaboration platforms further enhances coordination among contractors by visualizing interfaces and construction sequences. Transparent information flow reduces misunderstandings and fosters trust among project participants.

Sydney Metro West exemplifies excellent coordination across a staged, multi-contract delivery approach. For the Eastern Tunnelling Package, a team of 100 staff members across three countries and four time zones collaborated on detailed design, demonstrating that modern communication tools and rigorous coordination protocols enable effective management of geographically dispersed teams.

3.7 RECOMMENDATION 7: APPOINT EXPERIENCED PROGRAM LEADERSHIP AND STAFF IN UNDERGROUND CONSTRUCTION

Underground construction requires specialized technical knowledge and experience that differs significantly from surface construction. Project leadership lacking underground expertise may make poor decisions about contract packaging, baseline establishment, change management, and dispute resolution that increase conflict probability. Multi-contract coordination adds another layer of complexity requiring strong organizational and interpersonal skills.

Fundamentally it includes appointing project directors and managers with demonstrated experience in underground construction and multi-contract project delivery. Project leadership capabilities should cover underground technical expertise, underground construction methods, contract administration, and risk management. Owners should consider engaging program managers or delivery partners with specific underground and multi-contract expertise to supplement its staff capabilities. Continuity of key personnel from planning through construction and closeout preserves institutional knowledge and relationships. Training and knowledge transfer for less experienced staff working under experienced leadership builds organizational capability.

For the Gateway Program in New York, The Gateway Development Commission (GDC) is a joint, bi-state public authority established by New York and New Jersey to oversee and deliver the Gateway Program which aims to modernize and expand the 10-mile (16km) Northeast Corridor rail line between Newark, New Jersey, and New York Penn Station. The GDC serves as the lead agency for major projects including the $16.1 billion Hudson Tunnel working with partners including Amtrak, NJ TRANSIT, and the Port Authority of New York and New Jersey. Supporting GDC and providing tunnelling expertise, GDC retained a Project Delivery Partner, a tri-venture of Parsons-Mace-Arcadis to oversee the design and the construction of the program providing the technical capabilities that GDC lacks. The project is advancing successfully on schedule and budget. Figure 8 shows the Hudson Tunnel as part of Gateway Program.

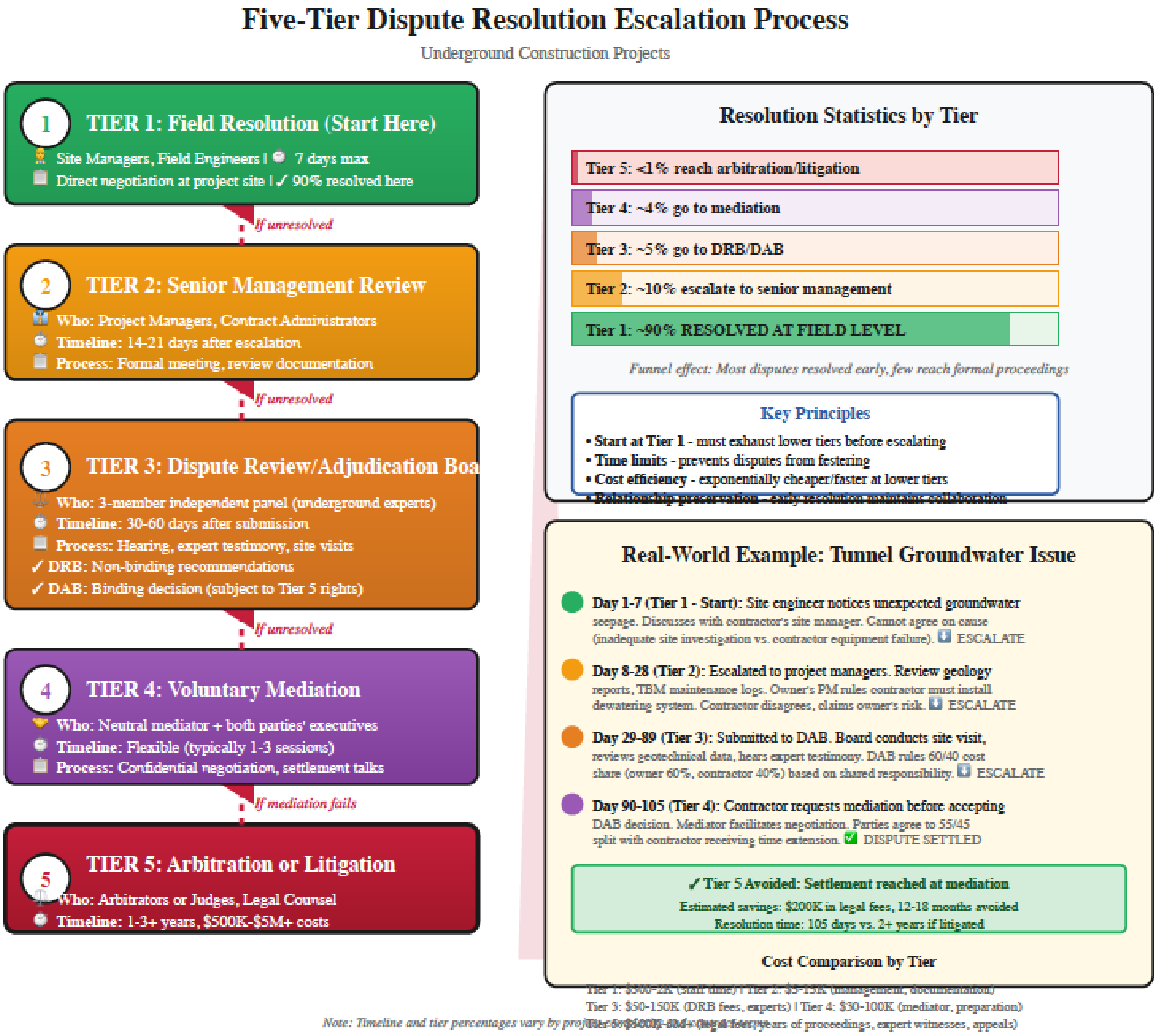
Figure 8 – Hudson Tunnel as part of the Gateway Program

Construction supervision of a tunnelling project is rarely a routine job and unconventional decisions involving high responsibility and judgment may be called for. Supervision teams need multi-disciplinary qualifications covering geology, rock and soil mechanics, tunnelling technology, structural capabilities, occupational safety, environmental aspects, contract administration, and for TBM projects, mechanical engineering expertise. Many disputes arise when construction supervision teams lack the technical depth to recognize significant deviations from expected conditions or to evaluate contractor proposals.

3.8 RECOMMENDATION 8: IMPLEMENT TIERED DISPUTE AVOIDANCE AND RESOLUTION MECHANISMS

Despite best efforts at dispute avoidance, conflicts will arise in complex underground projects. The key is resolving them quickly at the lowest organizational level before they escalate into formal disputes requiring litigation or arbitration. Tiered dispute resolution procedures provide multiple opportunities for resolution, with progressively formal mechanisms if earlier steps fail.

Key elements include Tier 1 field resolution requiring site management to attempt resolution at the field level within short timeframes such as 7 days. Tier 2 senior management review escalates unresolved issues to senior project management for resolution within defined periods such as 14-21 days. Tier 3 uses a Dispute Review Board (DRB) or in Europe the Dispute Adjudication Board (DAB), an independent three-member panel with underground construction expertise providing non-binding recommendations (DRB) or binding decisions (DAB) subject to final arbitration or litigation rights. Tier 4 is voluntary mediation allowing parties to negotiate settlement with assistance of a neutral mediator before formal proceedings. Tier 5 is final binding resolution through arbitration or court proceedings only after exhausting earlier tiers. See figure 9.



Five-Tier Dispute Resolution Escalation Process

Underground Construction Projects

Funnel effect: Most disputes resolved early, few reach formal proceedings

Key Principles

- **Start at Tier 1** - must exhaust lower tiers before escalating
- **Time limits** - prevents disputes from festering
- **Cost efficiency** - exponentially cheaper/faster at lower tiers
- **Relationship preservation** - early resolution maintains collaboration

Real-World Example: Tunnel Groundwater Issue

● **Day 1-7 (Tier 1 - Start):** Site engineer notices unexpected groundwater seepage. Discusses with contractor's site manager. Cannot agree on cause (inadequate site investigation vs. contractor equipment failure). ⬇ ESCALATE

● **Day 8-28 (Tier 2):** Escalated to project managers. Review geology reports, TBM maintenance logs. Owner's PM rules contractor must install dewatering system. Contractor disagrees, claims owner's risk. ⬇ ESCALATE

● **Day 29-89 (Tier 3):** Submitted to DAB. Board conducts site visit, reviews geotechnical data, hears expert testimony. DAB rules 60/40 cost share (owner 60%, contractor 40%) based on shared responsibility. ⬇ ESCALATE

● **Day 90-105 (Tier 4):** Contractor requests mediation before accepting DAB decision. Mediator facilitates negotiation. Parties agree to 55/45 split with contractor receiving time extension. ✅ DISPUTE SETTLED

✓ Tier 5 Avoided: Settlement reached at mediation

Estimated savings: $200K in legal fees, 12-18 months avoided

Resolution time: 105 days vs. 2+ years if litigated

Cost Comparison by Tier

Tier 1: $500-2K (staff time) | Tier 2: $5-15K (management, documentation)

Tier 3: $50-150K (DRB fees, experts) | Tier 4: $30-100K (mediator, preparation)

Tier 5: $500K-$5M+ (legal fees, years of proceedings, expert witnesses, appeals)

Note: Timeline and tier percentages vary by proj

Figure 9 – Tiered Dispute Resolution

Standing DRBs are usually appointed at project start and conduct regular meetings with project participants and site visits throughout construction, maintaining familiarity with project details and building relationships with parties. This enables them to provide informed, rapid recommendations when disputes arise. Ad hoc DRBs are assembled only when disputes occur, requiring extensive familiarization before they can be effective. For multi-contract underground projects with inherent dispute risk, standing DRBs are strongly preferred despite higher cost.

Many successful underground projects credit DRBs with preventing disputes from escalating. The independent analysis a DRB provides can prevent deadlock in disputes that would otherwise have paralyzing effects on the work. DRB recommendations, while non-binding, carry significant weight given the members expertise and project familiarity, and parties frequently accept them rather than pursuing costly arbitration. The FIDIC Emerald Book includes provisions for standing DABs as the primary dispute resolution mechanism.

3.9 RECOMMENDATION 9: DEVELOP COMPREHENSIVE RISK MANAGEMENT PLANS AND RISK REGISTERS

Underground projects face numerous uncertainties including geotechnical conditions, groundwater, existing utilities, adjacent structures, environmental requirements, commercial risks, and third-party interfacing. In multi-contract projects, risks may affect multiple contractors simultaneously or cascade through dependent contracts. Systematic risk identification, analysis, allocation, and management is essential.

Developing comprehensive risk registers during planning identifying potential risks, probability of occurrence, consequences, preliminary allocation, and potential mitigation measures should be developed. Risks should be mitigated during design, and any residual risks should be allocated to the party best able to manage them: ground risk often to owner through GBR, construction means and methods to contractor, design risks to designer, force majeure shared. Risk allocation must be clear in contracts with specific mechanisms for addressing allocated risks such as Differing Site Condition (DSC) clauses for ground risk and time extension procedures for delays. Adequate contingency budgets should be maintained for owner-allocated risks. Regular risk reviews should update likelihood and impact assessments as project progresses. Risk mitigation strategies should be implemented for high-priority risks, including additional investigation, design modifications, insurance, or contractual protections. Project wide risk register should be developed and shared with all contractors and should be updated on a regular basis.

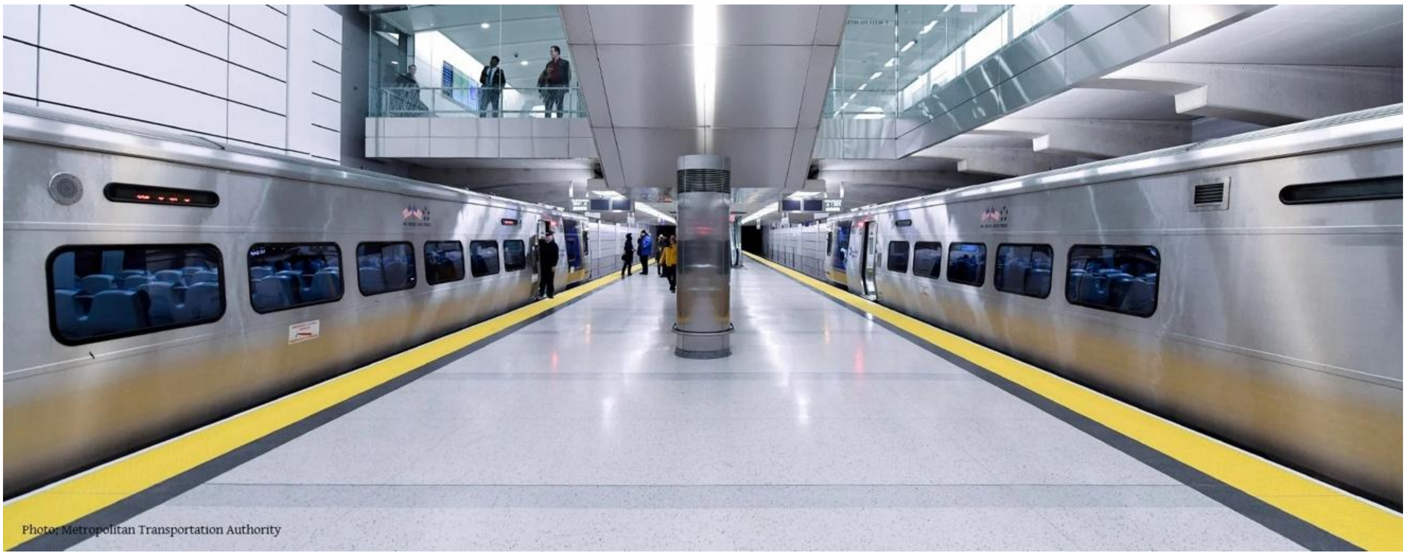


Photo: Metropolitan Transportation Authority

Figure 10 – Grand Central Madison

The East Side Access project in New York used an integrated risk management system that combined risks from the owner and over 12 contractors totalling 1,050 risks into a single unified framework with agreed allocation rules and standing coordination committees. This approach proved beneficial during major crises, such as discovering a critical water tunnel far from its mapped location and managing unexpected settlement at Grand Central Terminal, allowing rapid collaborative redesign and mitigation instead of years of litigation. The system resolved over 2400 conflicts, reduced formal claims by 78%, and shortened issue resolution from years to about 45 days, generating estimated savings of more than $650M. However, the project still faced significant delays and overruns, showing that integrated risk management improves crisis response and collaboration but cannot fully overcome deeper poor planning or governance failures. It transforms how multi-contract projects respond to inevitable challenges by replacing litigation with collaboration and enabling continuation of work that might otherwise collapse into adversarial paralysis. Figure 10 shows the completed Grand Central Madison station.

Several case studies describe projects where risk registers were developed during design but not maintained during construction, or where contractors were not required to develop complementary risk registers. The lack of systematic risk management contributed to disputes and claims during construction. Modern best practice in underground contracts recognizes that attempting to transfer all ground risk to contractors through broad disclaimers leads to inflated bid prices as contractors add premiums for unknowable risks, or to disputes and claims when contractors encounter conditions worse than any reasonable interpretation would support. Instead, equitable risk sharing through GBRs, with clear compensation mechanisms for conditions outside baseline parameters, produces more realistic pricing and fewer disputes.

3.10 RECOMMENDATION 10: CAPTURE LESSONS LEARNED AND PROMOTE CONTINUOUS IMPROVEMENT

Dispute avoidance requires institutional learning. Regular project reviews during construction, plus comprehensive post-project evaluations, provide opportunities to identify both successful practices and areas needing improvement for future projects.

Key elements include conducting periodic lessons-learned reviews at major project milestones such as completion of each tunnel drive, station construction, or contract package. Successful practices should be documented including effective contract strategies, dispute resolution techniques, and coordination mechanisms that worked well. Disputes and claims that occurred should be analysed, identifying root causes and preventive measures that could have avoided or mitigated. Comprehensive post-project reports should summarize lessons learned, including both technical, management, and contractual aspects. Lessons learned should be shared broadly through industry organizations, conferences, and publications to benefit the wider underground construction community. They should be applied to subsequent project phases or future projects, demonstrating continuous improvement.

The NY MTA explicitly states that Phase 2 of the Second Avenue Subway incorporates lessons learned from Phase 1 to deliver the project better, faster, and cheaper. Specific improvements include addressing utility relocation requirements upfront to reduce risk of unexpected costs or delays, early real estate acquisition to avoid conflicts during construction, adoption of best-value selection process design-build contracts, close coordination between contracts, reduction in station size and back-of-house space, and reuse of existing tunnel segments. It is estimated that these initiatives would save more than 1.3 billion dollars.

Owners with sustained underground construction programs, such as major transit agencies, develop institutional knowledge over successive projects that reduces disputes. However, organizations with infrequent underground projects often reinvent the wheel, repeating mistakes made on previous projects because knowledge was not retained. In these cases, it is important that these organizations to gain knowledge from other sister organizations in its implementation of underground projects.

4. INTEGRATED APPLICATION OF THE RECOMMENDATIONS

The ten recommendations presented in this paper are interdependent and mutually reinforcing. Implemented in isolation, each recommendation can reduce certain categories of risk; implemented together, they create a coherent governance and delivery framework that addresses the technical, contractual, and organizational roots of multi-contract disputes.

Comprehensive geotechnical investigations and well-drafted GBRs establish a common factual and contractual foundation upon which all other project decisions are based. Interface management plans and integrated master schedules then translate that foundation into coordinated execution, ensuring that physical works, sequencing, and information flows align across contracts. Appropriate project delivery methods, particularly those incorporating early contractor involvement, provide the collaborative environment necessary for these tools to function effectively in practice.

Robust change management, communication protocols, and centralized information systems enable the project team to respond constructively to inevitable change rather than treating it as an exception or failure. Experienced leadership and tiered dispute avoidance mechanisms provide governance structures that support timely decision-making and prevent disagreements from escalating. Finally, formal risk management processes and continuous learning ensure that both emerging and residual risks are addressed proactively and that lessons learned are captured for future projects.

5. CONCLUSIONS

Multi-contract underground projects will remain essential for delivering critical infrastructure in dense urban environments and challenging geological settings. While disputes cannot be entirely eliminated, their frequency and impact can be significantly reduced through proactive, integrated management. The ten recommendations outlined in this paper reflect current best practice derived from industry experience and authoritative research. Ultimately, successful dispute avoidance depends on a cultural commitment to collaboration, transparency, and shared project objectives.

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Nasri Munfah
Gall Zeidler Consultants, USA
nmunfah@gzconsultants.com