

1. Introduction

The proposed project is to construct a new two-storey, steel framed museum storage facility for the regional authority to house recently bequeathed artefacts.

Some artefacts have specific technical storage requirements to ensure their preservation and will be housed in controlled environment storage areas (CESAs)

The facility will be constructed on a brown field site on the site of a former gas works which was demolished and remediated in 1972 and has remained vacant ever since. (See Appendix 1 for site plan)

Historical borehole records on ground conditions have been provided (Appendix 2)

The concept design is complete, and the regional authority requires the successful contractor to complete the design, apply for detailed planning permission and construct the building and external work on a design and build basis. They are not willing to consider qualified bids.

As the regional authority's project manager, I will prepare a report identifying the commercial, operational, and environmental risks that a contractor would have to consider and evaluate when designing and costing the substructure and other works below ground level.

I will also advise the client on a cost-effective procurement procedure that would reduce or eliminate disproportionate risk premiums that may be added at the tender stage by the tenderers.

2. Preamble

The authority has a £2 million grant to fund the project, no additional funds are available.

Due to the length of time since the demolition of the gas works it is assumed that demolition and remediation was not to current standards. It is unknown to what extent materials, services and contaminants remain in the ground.

The 'substructure' is taken to mean the building foundations. Other below ground works are the excavations for the substructure, lift pit, forklift access and loading bay.

The contractor will be appointed using the JCT Design and Build Contract 2016 (DB 2016)

Below ground works will commence in early Summer.

3. Task

The Risks that a contractor would have to consider and evaluate when designing and costing the facility substructure and other below ground works on a design and build basis are detailed below.

3.1 Environmental Risks

Environmental risks for this scenario are below. Risk levels in all registers in this report are assessed using the matrix in Appendix 3.

New Museum Storage Facility Environmental Risk Register – Substructure and Below Ground Works Date: 17/06/2023					
No	Hazard	Risk	Initial Risk Level	Mitigation Measures	Residual Risk Level
1,	Asbestos from gas works building and fly tipped waste.	Asbestos inhalation by site workers/visitors causing serious lung diseases.	Very High 15	Refurbishment and Demolition Survey conducted by a licensed consultant prior to works commencing as per The Control of Asbestos Regulations 2012.	Medium 5
		Project delay and additional costs caused by discovery of asbestos on site.		Any identified asbestos to be removed and disposed of by a specialist licensed consultant prior to works commencing.	
				Asbestos Action Plan distributed as per H&SE Code of Practice.	
2.	Residual hazardous materials such as heavy metals or arsenic from the gas works.	Inhalation, skin contact or ingestion of contaminants by site workers/visitors causing injury or disease.	High 12	Detailed site soil analysis conducted with samples sent for laboratory testing prior to works commencing.	Medium 4
		Project delay and additional costs caused by discovery of		Check the Contaminated Land Register for historic contamination.	

		hazardous materials on site.		Identified contaminants to be removed and disposed of by specialist licensed consultant prior to works commencing in accordance with Building Regulations 2010 Approved Document C: Site Preparation and Resistance to Contaminants and Moisture.	
3.	Changes in ground conditions since the historic borehole survey.	Substructure design and excavations based on incorrect assumptions, leading to costly design changes and programme delays. Disturbance of water table, requiring groundwater exclusion.	Very High 15	Comprehensive borehole survey conducted across the site to identify current ground conditions prior to design commencing.	Medium 5
4.	Remaining underground services from the gas works.	Burns, serious injury or deaths caused by fire or explosion due to ignition of escaping gas.	Very High 15	Comprehensive underground services survey conducted prior to other works commencing. Any identified services isolated prior to other works commencing.	Medium 5
5.	Disturbance of protected species on the site.	Project delay, suspension of works, disputes and prosecution as per the Wildlife and Countryside Act 1981. Detailed planning application may be rejected if due consideration not given.	Medium 6	Qualified ecologist commissioned to carry out a protected prior to submitting detailed planning application.	Low 3
6.	Removal of trees with tree protection orders (TPOs)	Up to £20,000 fine as per Part VIII of the Town and Country Planning Act 1990. Detailed planning application may be rejected if due consideration not given.	Medium 6	Check TPOs in the site area on local authority's tree map website prior to submitting detailed planning application.	Low 3
7.	Severe inclement weather during substructure construction	Delays to concrete curing and/or work stoppages due to safety risks in excavation areas.	High 12	Monitor forecasts and plan works accordingly,	Medium 4

The most serious environmental risks for the contractor in this scenario are presented by potential ground contamination. As remediations to the gas works site were carried out over fifty years ago, it is highly unlikely that current safety standards will have been observed. The ground on the site may therefore be contaminated with hazardous materials associated with the gas works

operations, building materials and services, including asbestos, lead and arsenic. As the site has been unoccupied it has also been subject to fly-tipping, which presents an additional contamination risk. Depending on the extent of the contamination, remediation works could be extensive and costly.

The ground contamination and condition risks can be largely mitigated by carrying out the appropriate ground investigations and surveys, however under design and build the contractor would not commission these until after the work is awarded. As the contract sum is fixed, this exposes them to a high level of risk at tender stage.

3.2 Commercial Risks

Commercial risks for this scenario are below.

New Museum Storage Facility Commercial Risk Register – Substructure and Below Ground Works				
Assessment Date: 17/06/23				
No.	Risk	Risk Rating	Mitigation Measures	Residual Risk
1.	Rise in costs of substructure materials (eg steel) post tender, minimising potential profit.	High 12	Use suppliers with established working relationship where possible. Work with Buying Manager and Cost Manager to ensure best possible prices, exploring scope for quantity discounts. Factor current material price stability into substructure design where possible. Place purchase orders as soon as possible following contract award.	Medium 9
2.	Energy price rises minimising potential profit.	High 12	Document and implement site energy efficiency measures.	Medium 9
3.	Labour shortage causing delays	Medium 9	Pre-qualification questionnaire to be completed by all sub-contractors prior to appointment to ensure they have appropriate resource.	Medium 6
4.	Supply chain issues with substructure materials	High 12	Factor current material availability into substructure design where possible. Appoint suppliers and place purchase orders as early as possible once requirements are confirmed	Medium 4
5.	Subcontractor insolvency	Very High 15	Due diligence on financial solvency prior to appointment Pre-qualification questionnaire as above	Medium 5
6.	Subcontractor price increases post-tender minimising potential profit	High 12	Use trusted subcontractors with established working relationship where possible. Work with cost manager & buying manager to ensure that package prices are realistic and meet all design requirements.	Medium 4

The commercial risks for the contractor in this scenario primarily relate to current economic conditions. Instability in energy and material prices poses a significant risk to the profitability of the project, as do potential labour shortages in the post-Brexit economy. These risks can be mitigated to an extent by procedural measures, established working relationships and due diligence, but the risks under a design and build contract remain significant as the contractor ultimately holds all the financial risk of any post-tender price fluctuations in an unpredictable economy.

3.3 Operational Risks

Operational risks are closely linked with commercial risks but some additional operational risks for this scenario are detailed below.

New Museum Storage Facility Operational Risk Register – Substructure and Below Ground Works				
Assessment Date: 17/06/23				
No.	Risk	Risk Rating	Mitigation Measures	Residual Risk
1.	Tender errors resulting in inadequate contract sum.	High 10	Appoint cost management personnel with successful experience on similar projects.	Medium 5
2.	Non-delivery of client requirements as per obligations in Clause 2.1 of DB 2016, resulting in dispute.	High 10	Ensure timely handover of all concept design and specification information from the regional authority. Prompt submission of RFIs. Close communication and regular progress reviews with the regional authority Project Manager.	Medium 5
3.	Poor project management performance – poor scheduling leading to delays and/or wasted materials	High 10	Appoint project management personnel with successful experience on similar projects.	Medium 5
4.	Delays due to accidents on site	Very High 15	Full health & safety risk assessment conducted prior to start on site and all actions implemented.	Medium 5
5.	Subcontractor failure	High 10	Ensure all subcontractors have subcontractor insurance. Use trusted subcontractors with established working relationship where possible	Medium 5

The operational risks to the contractor are primarily internal risks resulting from failure of people or process. For the most part these can be mitigated by the implementation of processes and procedures and careful consideration of internal work allocation.

3.4 Procurement Procedure

Given the limited project budget for the construction of the new facility, the regional authority is looking for a cost-effective procurement procedure which delivers cost certainty.

Under the design and build arrangement, contractors would usually be invited to tender based on the concept design and are appointed based on a fixed contract sum. Once appointed, the contractor would produce appoint sub-contractors, produce detailed designs, obtain detailed planning permission, and construct the project.

Design and build would provide a high level of cost certainty for the regional authority as once the contract is signed, opportunities to increase the contract sum are very limited so the burden of financial risk sits firmly with the contractor. A potential issue with using design and build is the technical design required in the controlled environment storage areas. The correct environment is critical to preserving the artefacts so entrusting the design to a non-specialist contractor could be a concern

A variation of the design and build arrangement is design and build with novation. Here, the architect and specialist museums design team that were in contract with the authority during the concept design phase could be contractually moved over (novated) to the contractor for the detailed design of the CESAs, ensuring the appropriate specialist input.

Despite the mitigation measures identified above, a design and build arrangement on this project leaves the contractor with considerable residual risk, particularly in relation to the potential land contamination, as they would be tendering without knowing the extent of contamination, or the extent or potential cost of the remediation works required. The contractor also remains at considerable risk from material and energy price fluctuations.

As the regional authority will not accept qualified bids, we could reasonably expect the contractor to build risk premiums into the contract sum via provisional sums as allowed for in DB 2016 Clause 3.11. to cover the worst-case scenario.

Given the project cost constraints, the regional authority wishes to reduce risk premiums as far as possible. This could be achieved by implementing a pre-construction services agreement (PCSA) via the JCT Standard PCSA Form, enabling the authority to employ contractor prior to the main contract award via a two-stage tender process. The first stage tenders the contractor's involvement in the project design, and the second their involvement in project construction.

A PCSA would enable the contractor to commission ground investigations and surveys to establish the extent of ground contamination and the remediation works required so known remediation costs could be included in the second stage tender, thus negating the need to build in risk premiums. This could potentially provide a cost saving for the regional authority as the actual cost of works may be less than the risk premium.

Regarding material and energy prices, the regional authority could look to include fluctuation provisions as per DB 2016 Clause 4.2.3. Provisions could be made to compensate the contractor an additional amount, should prices rise beyond a certain rate. Again, such provisions would potentially eliminate risk premiums provide overall cost savings.

4. Conclusion

This report has identified the commercial, operational, and environmental risks that a contractor would have to consider and evaluate when designing and costing the substructure and other works below ground level and carried out desktop risk assessments.

They key residual risks identified for the contractor are the potential ground contamination issues, and the fluctuating prices of energy and materials.

I would advise the regional authority that the most cost-effective procurement procedure for this project would be design and build, with novation of the specialist design team for the CESA design.

I would recommend incorporating a PCSA allowing for pre-construction tender site surveys and investigations, and fluctuation provisions to cover potential rises in steel and energy costs to reduce or eliminate disproportionate risk premiums at tender.

5. **Bibliography**

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6. References

Ref 1: Diagram adapted from <https://safetyculture.com/topics/risk-assessment/5x5-risk-matrix/>

Fig 1: Site plan adapted from CIOB drawing pack

Figs 2 & 3: Historical borehole diagrams adapted from CIOB scenario

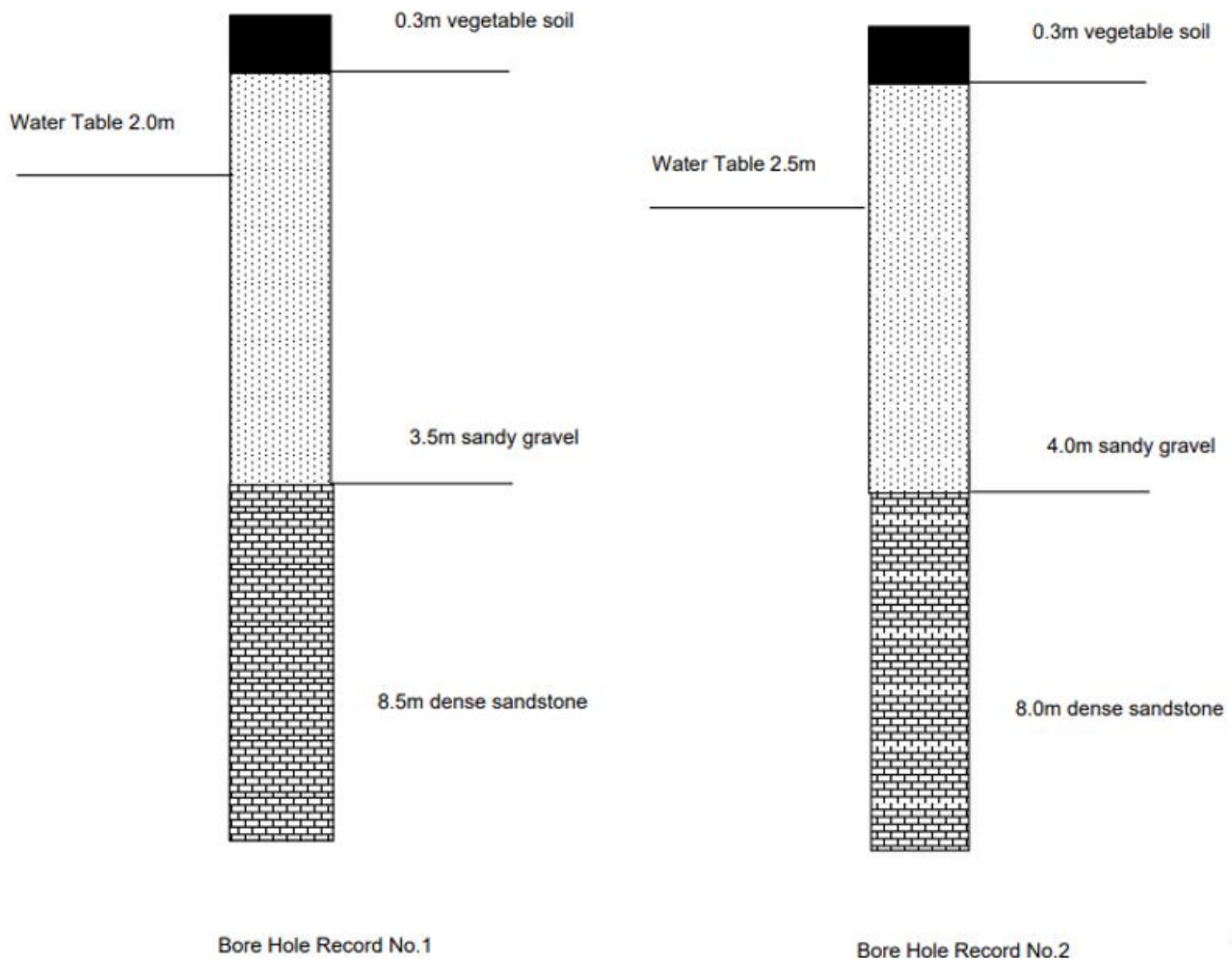
7. Appendices

7.1 Appendix 1: Site Plan



Figure 1

7.2 Appendix 2: Historical Borehole Records



Figures 2 & 3

7.3 Appendix 3: Risk matrix

	Impact How severe would the outcomes be if the risk occurred?				
	Insignificant 1	Minor 2	Significant 3	Major 4	Severe 5
5 Almost Certain	Medium 5	High 10	Very high 15	Extreme 20	Extreme 25
4 Likely	Medium 4	Medium 8	High 12	Very high 16	Extreme 20
3 Moderate	Low 3	Medium 6	Medium 9	High 12	Very high 15
2 Unlikely	Very low 2	Low 4	Medium 6	Medium 8	High 10
1 Rare	Very low 1	Very low 2	Low 3	Medium 4	Medium 5