QTS Project Wind

Geotechnical Risk Register

QTS

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Principal author

Signed by: e.forbes

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X

Checked by

Signed by: Chris Lazenby

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X

Verified by

Signed by: Kevin McGee

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Introduction

1.0 Introduction

The Geotechnical Risk Register in Section 2.0 of this report identifies the key geotechnical risks specific to the enabling works package, and summarises what actions are required to mitigate or inform these risks. The risk register is to be updated at regular intervals during the project to reflect project development and actions taken to mitigate risks.

Table 1-1, Table 1-2 and Table 1-3 outline the methodology considering the severity (S), likelihood (L) and risk (R) classifications used in this assessment.

1	**Minor**	Minor damage or loss (no human injury), time and cost implications.
2	**Moderate**	Moderate damage or loss (slight injury or illness), time and cost implications.
3	**Serious**	Substantial damage or loss (serious injury or illness), time and cost implications.
4	**Major**	Major damage or loss (fatal injury), time and cost implications.
5	**Catastrophic**	Catastrophic loss or damage (multiple fatalities), time and cost implications.

Table 1-1: Potential Severity of Risk (S)

Likelihood (L)		**Severity (S)**				
		1	**2**	**3**	**4**	**5**
		Minor	**Moderate**	**Serious**	**Major**	**Catastrophic**
1	**Extremely Unlikely**	1	2	3	4	5
2	**Unlikely**	2	4	6	8	10
3	**Likely**	3	6	9	12	15
4	**Extremely Likely**	4	8	12	16	20
5	**Almost Certain**	5	10	15	20	25

Table 1-2: Likelihood (L) and Severity (S) Risk Matrix

Risk	**Discussion**
High (20-25)	High likelihood of the identified risk being realised and / or in the event the identified risk is realised, the impact on cost or programme is likely to be significant with either major delays / costs probable. Normal contingency sums very unlikely to be sufficient to cover the risks during construction/operation.
Moderate (9-19)	Moderate likelihood of the identified risk being realised and / or in the event the identified risk is realised, the impact on cost or programme is likely to be significant with further consideration and assessment required. It is unlikely that normal contingency sums would be sufficient to cover the risk during construction/operation.
Low (1-8)	Low likelihood of the identified risk being realised and / or in the event the identified risk is realised, the overall impact on cost or programme is likely to be low and would typically be manageable within normal contingency sums with only a low risk of contingency sums being exceeded during construction/operation.

Table 1-3: Risk Classification (R)

2.0 Geotechnical Risk Register

Item	Description of Risk / Hazard	Consequence	Pre-Mitigation			Mitigation	Post Mitigation		
			L	S	R		L	S	R
1	Soft, weak, loose and / or compressible soils	Structural damage to building due to a limit state failure (ultimate or serviceability) of foundations, floor slabs or other infrastructure. Unsuitable subgrade for earthworks to commence or a significant volume of soft / compressible soils may impact the volume of soils available to reuse as general / engineered fill below structures.	4	4	16	Undertake site wide enabling works in accordance with a suitable earthworks specification to improve the material directly impacting the foundation, floor slab and infrastructure solutions (where relevant). Removal of any soft or loose materials during the earthworks in accordance with a suitable Earthworks Specification.	1	4	4
2	Aggressive ground conditions to buried concrete	Damage to buried concrete which may impact the structural integrity of buildings and infrastructure.	5	3	15	Design concrete in accordance with the design classification as presented in the Cundall Ground Conditions Summary Report (NCL1-DCZZ-XXX-UG-RP-B-00-01).	1	3	3
3	Elevated sulphate content leading to expansion in soils susceptible to expansion (such as burnt shale and PFA)	Elevated sulphate concentrations in soils may lead to swelling and structural damage to foundations and floor slabs.	3	3	9	PFA may demonstrate expansive soil properties when mixed with cement. If cement / lime stabilisation is adopted, the Contractor shall ensure that the stabilisation design will consider the risk of PFA swelling as part of the design. The earthworks shall be undertaken in accordance with a suitable Earthworks Specification, which will include for appropriate testing on material during the earthworks.	1	3	3
4	Previously unidentified ground conditions	Soft or compressible ground conditions leading to potential structural damage of foundations, ground bearing floor slabs (where adopted) or other infrastructure due to limit state failure (ultimate or serviceability). Potential shortfall of suitable material to complete earthworks will require importation of fill, which may impact programme and costs.	3	4	12	Unexpected ground conditions encountered shall be reported to the Engineer so suitable mitigation measures can be implemented.	2	4	8

Item	Description of Risk / Hazard	Consequence	Pre-Mitigation			Mitigation	Post Mitigation		
			L	S	R		L	S	R
5	Below ground obstructions	Presence of below ground obstructions may impact the proposed foundation layout or service corridor routes, subsequently resulting in design changes. Impact to programme and cost if previously unidentified below ground obstructions are encountered.	5	2	10	Earthworks strategy includes information on the known ground obstructions, but this is not considered to be exhaustive. If previously unidentified concrete structures are identified during enabling works, these shall be surveyed, and the information made available to the Client / Engineer. The strategy provides details where obstructions should be removed and where they can remain in situ. However, as scheme design progresses, any obstructions that remain in situ (such as the relict piles) must be considered within design.	1	2	2
6	Perched water / shallow groundwater	Impact to earthworks programme and cost. Potential dewatering requirement for enabling works or for temporary excavations for deep service corridors.	5	2	10	Shallow water (<1mbgl) is anticipated within Made Ground soils and shallow Till deposits across the site. Reference should be made to Cundall Remediation and Earthworks Strategy for further information. Appropriate temporary works construction drainage strategy to control groundwater will be required to be produced by the Contractor to allow for earthworks to have limited interaction with shallow water.	1	2	2
7	Inability to achieve design assumptions.	If the geotechnical parameters assumed during the design process cannot be replicated or achieved by the proposed earthworks, this may lead to structural damage of the buildings or infrastructure due to limit state failure (ultimate or serviceability) of foundations, ground bearing floor slabs (if adopted) or other infrastructure.	2	4	8	Ensure the earthworks are undertaken in accordance with an approved Earthworks Specification and verified by a geotechnical engineer.	2	4	8

Item	Description of Risk / Hazard	Consequence	Pre-Mitigation			Mitigation	Post Mitigation		
			L	S	R		L	S	R
8	Presence of unknown ground services	Impact on earthworks, programme and cost. Impact on foundation design if services cannot be diverted. Injury to site personnel if a below ground service is struck.	4	4	16	Consultation with regulators will be completed as part of the scheme design and locations will be provided. Presence of below ground services will need to be considered as part of earthworks programme. Diversions, if required, shall be undertaken prior to commencement of earthworks. Principal Contractor will be required to undertake service clearance and consultation with regulators prior to the enabling works commencement.	1	4	4
9	Slope instability	Deep excavations near existing infrastructure to be retained may impact the extent of earthworks feasible and lead to foundation / floor slab failure.	3	4	12	Assessment of the stability of deep excavations (where required) shall be undertaken prior to construction by the Contractor as part of a temporary works assessment.	1	4	4
10	Heave of natural ground and cohesive made ground following excavation and removal of large stockpiles	Damage to ground floor slabs (if adopted) and foundations due to heave occurring in soils where the ground has been exposed to heavier loads (i.e. due to stockpiling).	3	3	9	Heave potential of cohesive made ground and / or Till shall be assessed as part of the next design phase to inform the suitability of a ground bearing floor slab (if adopted) and impact on piles.	1	3	3
11	Hazardous ground gas	Elevated concentrations of hazardous ground gases and / or depleted oxygen concentrations may lead to explosion and / or asphyxiation of site end users.	4	5	20	The site is currently classified as a gassing characteristic situation 2, requiring the installation and verification of ground gas protection measures in accordance with BS8485 and CIRIA C665.	1	5	5
12	Presence of unexploded ordnance	Risk to life and damage to plant/property if an unexploded ordnance is disturbed during construction.	3	5	15	Current risk classification identified is classed as 'Moderate Risk'. Mitigation measures provided within the Detailed UXO Risk Assessment should be adhered to during any intrusive works, this includes an operational UXO emergency response plan, UXO safety and awareness briefings and an on-call engineer are required.	1	5	5

Item	Description of Risk / Hazard	Consequence	Pre-Mitigation			Mitigation	Post Mitigation		
			L	S	R		L	S	R
13	Contaminated ground	Risk to human health and / or controlled waters during the temporary and / or permanent works	5	3	15	Remediation requirements with respect to contaminated ground are provided within the Cundall Remediation and Earthworks Strategy (NCL1-DCZZ-XXX-UG-RP-B-00-11) and should be adhered to.	1	3	3
14	Previously unidentified contamination	Risk to human health and / or controlled waters during the temporary and / or permanent works	4	4	16	If previously unidentified contamination is identified during enabling works, the Engineer, Client and Local Authority shall be consulted, and appropriate mitigation measures will be adopted.	2	4	8
15	Invasive species contaminated soils	Disturbance of invasive species may be non-compliant with environmental legislations and could result in prosecution. Presence of invasive species will require treatment (if it is required to be disturbed), which could impact cost and programme of earthworks.	5	2	10	The location of contaminated soils associated with the removal of invasive species is shown on the Below Ground Features plan and further information is included within Cundall Remediation and Earthworks Strategy. Contractor shall consider disturbance of these soils within their Risk Assessment and Method Statement and	1	2	2
16	Data discrepancies contained within topographical survey used for earthworks volume assessment	Inaccuracies within earthworks volumes leading to requirement for either increased disposal or increased import of fill, resulting in programme and cost impacts	4	3	12	Additional topographical surveys may be required once preparatory works have been carried out such as tree clearance.	2	3	6
17	Frost heave of PFA	Damage to roads, ground floor slabs and foundations due to heave occurring in PFA which has been placed within 450mm of the structure.	4	3	12	PFA should not be placed within 450mm of any below ground structures, floor slabs or roads. Contractor to manage the reuse of PFA on site and follow a suitable earthworks specification.	2	2	4

Table 2-1: Geotechnical Risk Register

Development Layout Impact

The above risks are based on the existing ground investigation information and the current design drawing NCL1-DCZZ-STE-XX-SK-A-01-13_LC Master Plan_720MW dated 04/03/2025. The description of risk and subsequent mitigations are based fundamentally on the proposed earthworks in relation to the proposed development and these may not be applicable if the layouts or proposed construction methodology changes. If the proposed development is updated as the scheme design progresses, the risks and subsequent mitigations should be reviewed as the identified mitigation measures may no longer be suitable to manage the risks in a revised context.

Cundall Johnston & Partners LLP
One Carter Lane London EC4V 5ER
Tel:+44 (0)20 7438 1600
Asia Australia Europe MENA UK and Ireland
www.cundall.com

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