Upton House
Market Street
Charlbury
Oxfordshire, OX7 3PJ
United Kingdom
tel +44 (0)1608 810374
fax +44 (0)1608 810093
e-mail info@gwp.uk.com
www.gwp.uk.com

BOW FARM STABILITY RISK ASSESSMENT TO SUPPORT A DEPOSIT OF WASTE FOR RECOVERY ENVIRONMENTAL PERMIT APPLICATION

For

MORETON C CULLIMORE (GRAVELS) LIMITED

November 2025

GWP Consultants LLP
Registered No. OC326183
Registered Office: Upton House, Market Street, Charlbury, Oxfordshire, OX7 3PJ, UK

Report Title: **Bow Farm Stability Risk Assessment to Support a Deposit of Waste for Recovery Environmental Permit Application**

Client: **Moreton C Cullimore (Gravels) Limited**

Job: BOWFEPR
Report Number: 251042
Version: v.01
Issue Status: Issued to Client
Prepared by: Edward Betteridge
Issue Date: 20th November 2025

Issue History:

Issue No	Date	Description	Admin Review	Technical Review	Approver
v.01	20.11.25	Issued to Client	CL	SJ	SJ

Approver Signature:

This document is based on GWP report template v.1.09 and Normal template v3.10 17/04/19

CONTENTS

TABLES

DRAWINGS

APPENDICES

BOW FARM STABILITY RISK ASSESSMENT TO SUPPORT A DEPOSIT OF WASTE FOR RECOVERY ENVIRONMENTAL PERMIT APPLICATION

1. INTRODUCTION

1.1 Report Context

The works approved by Planning Permission 19/000048/CM (Worcestershire County Council) and Planning Permission 19/0081/TWMAJM (Gloucestershire County Council) provide for, *inter alia*, site restoration using imported inert fill material at Bow Farm, Ripple, Worcestershire (the site).

Planning Permission 19/0081/TWMAJM was approved by Gloucestershire County Council through the successful appeal (Appeal Ref. APP/T1600/W/23/3324695) by the applicant following initial refusal of Planning Permission 19/0081/TWMAJM.

Completion of the approved site restoration scheme, involving the restoration of the mineral extraction areas requires 1.4Mm^3 (approximately 2.45Mt using a standard conversion factor of 1.75t/m^3) of imported inert fill material within Phases 1 to 9 of the excavation area in the main site area.

The approved site restoration scheme also provides for excavation and low-level restoration of Flexible Working Areas A and B in the west of the site. Flexible Working Areas A and B will only be excavated seasonally during non-high flow periods of the River Severn, located *c.* 25m to the west at its closest approach. Restoration of Flexible Working Areas A and B will be to wetlands and water features using only site derived mineral waste (silts and clays) and will have a final landform below pre-extraction ground levels. No imported inert fill material will be placed in Flexible Working Areas A and B.

An application is being made for a Bespoke Environmental Permit (use of waste in a deposit for recovery activity). The applicant is Moreton C Cullimore (Gravels) Limited.

The EPR Permit application is submitted on the basis that the permanent deposit of imported inert fill material within excavation area Phases 1 to 9 at the site to achieve the approved restoration scheme is a deposit for recovery activity and not a waste disposal activity.

To ensure that the recovered waste material is suitable for its intended use, the works will be managed by staff having the appropriate level of technical competence with relevant qualifications gained from one of the accepted industry schemes. Waste Acceptance Criteria inspection procedures will be in place to ensure that the inert fill material used in the works is as described on Waste Transfer Notes, is permitted by the Environmental Permit and is fit for purpose.

This report presents a Stability Risk Assessment (SRA) and has been prepared to support an EPR Permit application to provide for the permanent deposit of imported inert fill material at the site as a deposit for recovery activity to achieve the approved restoration landform.

A side slopes Artificial Geological Barrier (AGB) will be constructed on a phased basis within excavation area Phases 1 to 9 in order to provide protection to soil, groundwater and surface water at least equivalent to that resulting from an attenuation barrier/liner with a minimum thickness of 1.0m and a maximum permeability of 1 x 10^{-7} m/s.

1.2 Operator of the Proposed Development

Moreton C Cullimore (Gravels) Limited, Netherhills, Whitminster, Gloucestershire, GL2 7PD.

1.3 Agent who Completed this Report

GWP Consultants LLP, Upton House, Market Street, Charlbury, Oxfordshire, OX7 3PJ.

1.4 Outline of the Proposed Development

The works approved by Planning Permission 19/000048/CM (Worcestershire County Council) and Planning Permission 19/0081/TWMAJM (Gloucestershire County Council) provide for, *inter alia*, site restoration using imported inert fill material at Bow Farm, Ripple, Worcestershire.

Planning Permission 19/0081/TWMAJM was approved by Gloucestershire County Council through the successful appeal (Appeal Ref. APP/T1600/W/23/3324695) by the applicant following initial refusal of Planning Permission 19/0081/TWMAJM.

Completion of the approved site restoration scheme, involving the restoration of the mineral extraction areas requires 1.4Mm^3 (approximately 2.45Mt using a standard conversion factor of 1.75t/m^3) of imported inert fill material within Phases 1 to 9 of the excavation area in the north of the main site area as a deposit for recovery scheme.

An application is being made for a Bespoke Environmental Permit (use of waste in a deposit for recovery activity). The EPR Permit application is submitted on the basis that the permanent deposit of imported inert fill material within excavation area Phases 1 to 9 at the site to achieve the approved restoration scheme is a deposit for recovery activity and not a waste disposal activity.

Details of the site setting and development design are presented in the Environmental Setting and Site Design (ESSD) report prepared by GWP Consultants LLP (GWP Report No. 251039) which accompanies the EPR Permit application (Appendix Gii of the Permit application documentation) and which should be read in conjunction with this report.

2. SITE SETTING

2.1 Physical Setting

The application site is located at Bow Farm, Ripple, Worcestershire (National Grid Reference SO 87565 36504).

Drawing No. BOWFEPR2511-1 shows the site location and Drawing No. BOWFEPR2511-2 shows the different areas of the site, including the excavation area Phases 1 to 9 where imported inert fill material will be placed under the EPR Permit. Drawing No. BOWFEPR2511-3 shows the EPR Permit application area within the context of the site approved under the Planning Permissions.

The total site area covers *c.* 65ha, straddling the county boundary between Worcestershire and Gloucestershire. An area of *c.* 45ha of land has been approved for mineral extraction in the north and centre of the site (this is located entirely within Worcestershire). The approved mineral extraction areas are made up of excavation area Phases 1 to 9 (*c.* 30.9ha), Flexible Working Area A (*c.* 8.8ha) and Flexible Working Area B (*c.* 5.3ha). The processing plant and access route will be located in Gloucestershire (eastern part of the site).

A site plan is presented as Drawing No. BOWFEPR2511-4.

The Phases 1 to 9 excavation area in the main part of the site is located *c.* 500m south of the village of Ripple. The processing plant and main access road is located *c.* 300m south of the village of Puckrup and *c.* 900m southwest of the village of Twyning. The town of Tewkesbury is located *c.* 2.5km to the south of the site.

From a geomorphological terrain perspective, the site can be split into three areas:

- a flat low lying (<10mAOD) area south of Ripple Quarry Lake;
- a raised north-west south-east trending 300m wide, 1000m long ridge rising to 14mAOD, separated from the Ripple Quarry area by the Napps Local Wildlife Site (LWS) wetland area (a former osier bed); and
- a hill side slope rising to >30mAOD, above the River Severn valley, separated from the southern end of the raised ridge and floodplain by a small stream named the Ripple Brook.

The Ripple Brook valley has an elevation of 9-11mAOD adjacent to the site and divides the site in two.

The approved design and operation of the site reflects the three areas' different elevations and proximities to the River Severn (*c.* 25m to the west of the EPR Permit Application area and *c.* 400m west of the Phases 1 to 9 excavation area).

The north-south ridge in the centre of the site, approved under Planning, is where excavation area Phases 1 to 9 are situated. Phases 1 to 9 is the location for year-round sand and gravel extraction and is the area of the site where the imported inert fill material will be placed with restoration back to pre-extraction ground levels. The Phases 1 to 9 area of the site is the focus of the deposit for recovery Environmental Permit being applied for, as this is the part of the site where the imported inert fill material will be used to restore the site.

The elevated hill slope area in the east of the site will be the location for the processing plant, main site office and weighbridge, silt settlement lagoons associated with the processing plant/mineral washing and the site access road from the A38 in the east.

The low-lying area of Flexible Working Areas A and B, located *c.* 25m to the east of the River Severn at its closest approach, will only be excavated seasonally during non-high flow periods of the river. Restoration of Flexible Working Areas A and B will be to wetlands and water features using only site derived mineral waste (silts and clays) and will have a final landform below pre-extraction ground levels. No imported inert fill material will be placed in Flexible Working Areas A and B.

2.2 Geological Setting

The geological setting of the site has been determined based on a review of published information and historical and recent site investigation information.

The general geological setting of the site is shown in Sections 1.3 (Superficial geology) and 1.5 (Bedrock geology) of the Geo Insight report presented in Appendix 1b of the ESSD report which accompanies the EPR Permit application (Appendix Gii of the Permit application documentation).

Further details of the geological setting are provided in the ESSD report.

2.2.1 Bedrock Deposits

The solid geology underlying the site comprises the Triassic Branscombe Mudstone Formation of the Mercia Mudstone Group which consists of a sequence of red-brown mudstones and siltstones.

The Tewkesbury Fault crosses the site access road to the east of the processing plant area. The fault is therefore situated to the east of the Phases 1 to 9 excavation area of the EPR Permit application area. The Tewkesbury Fault has a north-south trend and juxtaposes limestone and shale of the younger Jurassic Rugby Limestone Member against the Branscombe Mudstone Formation.

2.2.2 Superficial Deposits

The bedrock mudstone is overlain by a series of stepped river Terrace Deposits of sand and gravel formed during the Pleistocene by the early River Severn system. The Terrace Deposits are believed to have formed in a braided river environment in which lateral variation from clay or silty channel fill to gravel islands can be expected. Erosion of the bedrock clay may lead to thickening of Terrace Deposits.

The Terrace Deposits collectively belong to the Severn Valley Formation. The youngest terrace deposit at Ripple is concealed beneath alluvial sediment of the modern River Severn.

The four lowest (youngest) of the River Severn terrace sand and gravel deposits are present on the site:

Kidderminster Station Member (BGS 4th Terrace of the River Severn)

The upper surface level is *c.* 32mAOD to 33mAOD and is found only at the eastern boundary of the full site area east of Ripple Brook. The terrace deposit comprises predominantly brown and red brown silty sand with pockets of fine and coarse gravel beneath a thin soil cover. The maximum proven thickness of this Member at the site is 4.7m, where reddish-brown silty sand with rare gravel is present.

Holt Heath Member (BGS 3rd Terrace or Main Terrace of the River Severn)

The Holt Heath Member underlies the level ground lying at *c.* 15mAOD to 17mAOD between the processing plant area and Puckrup Lane, to the east of the Phases 1 to 9 excavation area. A wedge-shaped remnant of this terrace also lies between the northern site boundary and Ripple Brook, extending north of the M50 as far as Ripple Village. It is evident that part of the terrace has been excavated in the past, possibly during construction of the M50 bridge in 1960.

Worcester Member (BGS 2nd Terrace of River Severn)

The Worcester Member is the main sand and gravel resource on the site within the Phases 1 to 9 excavation area and forms a prominent landform 3m to 4m above the floodplain. On the site, the front edge of the terrace forms a well-defined slope between the top of the terrace deposit at 12mAOD to 14mAOD and the floodplain at 9mAOD to 10mAOD. The terrace deposit appears to be continuous but thins to the edge of the site area against the rising bedrock mudstone adjacent to Bow Lane. A thickness of 5.5m of terrace deposit has been proven. The deposit is described as

medium dense, reddish-brown slightly clayey and occasionally pebbly fine to medium sand. The gravel and clay content varies but the terrace deposit is always predominantly sand.

Power House Member (BGS 1st Terrace of River Severn)

The current channel and floodplain of the River Severn are cut into the Power House Member, the youngest of the terrace gravel deposits of the Severn Valley Formation. The deposit is described as brown medium to fine grained sandy gravel. The deposit is entirely obscured by silty clay alluvium and overbank sediments. The maximum thickness of the sand and gravel deposit intersected on site was 3.3m. This is consistent with reported thickness from Ripple Quarry (adjacent to the north of the site) which reported an average thickness of 3.19m over the proposed extraction area with a maximum of 6.25m and minimum of 1.5m. Similar variation should be expected at Bow Farm.

3. CONCEPTUAL STABILITY SITE MODEL

Details of the components of the conceptual stability site model for the EPR Permit application area are presented in the following sub-sections, are summarised on Table 1, and are illustrated on Drawing No. BOWFEPR2511-8.

3.1 Basal Sub-Grade Model

The basal sub-grade will comprise the *in situ* underlying the Triassic Branscombe Mudstone Formation of the Mercia Mudstone Group.

3.2 Side slope Sub-Grade Model

The side slope sub-grade will comprise the perimeter slopes of the mineral excavation formed in the superficial Terrace Deposits of the River Severn.

3.3 Basal Artificial Geological Barrier Model

The Triassic Branscombe Mudstone Formation of the Mercia Mudstone Group underlying the site forms an adequate natural basal geological barrier. An engineered basal AGB will therefore not be constructed at the site.

3.4 Side Slope Artificial Geological Barrier Model

A side slopes AGB will be formed on a phased basis within excavation area Phases 1 to 9 using suitable indigenous clay material dug from the floor of the mineral excavation and/or site derived mineral waste (silts and clays).

The suitable material will be compacted in layers and brought up in lifts up to *c.* 7.5m high against the side slopes sub-grade formed in the superficial Terrace Deposits as the general placement of waste progresses.

Following the completion of each side slopes AGB lift, either imported inert waste material, or site derived mineral waste (silts and clays) will be graded against the compacted material in order to provide buttress support and to establish a stable platform for the placement and compaction of the next side slopes AGB lift. Excavated perimeter slopes in the superficial Terrace Deposits will have a maximum height of *c.* 7.5m and the maximum unsupported height of the side slopes AGB will be *c.* 3.75m. The side slopes AGB will have a minimum thickness of 1m and a permeability no greater than 1×10^{-7}m/s.

The side slopes AGB will be constructed in accordance with a Construction Quality Assurance Plan approved by the Environment Agency (EA). The Construction Quality Assurance Plan (GWP Report No. 250927) is provided as Appendix M of the EPR Permit application.

3.5 Inert Fill Mass Model

The site will receive imported inert fill material which will be placed within excavation area Phases 1 to 9.

The waste will be placed in layers *c.* 1m thick in lifts *c.* 3.75m thick. The maximum total thickness of waste will be *c.* 7.5m. Active advancing slopes in waste material will be formed no steeper than 1v : 1.5h. Temporary inter-phase slopes in waste material will be formed no steeper than 1v : 3h. An intermediate bench with a minimum width of 20m will be maintained between lifts. The final restoration surface of the waste mass in excavation area Phases 1 to 9 will be formed at gradients shallower than *c.* 1v : 20h.

No daily cover material will be placed.

3.6 Capping System Model

There will be no engineered capping system constructed as there will be no generation of gas or leachate. The inert fill material will be capped in a progressive manner with restoration soils following deposit for recovery.

Site restoration will be in accordance with the requirements of extant Planning Permissions 19/000048/CM (Worcestershire County Council) and 19/0081/TWMAJM (Gloucestershire County Council).

Approved restoration surface contours are shown on Drawing No. 2636-4-4-2-1 DR-0007 S4-P9 in Appendix 2 of the ESSD report which accompanies the EPR Permit application (Appendix Gii of the Permit application documentation).

4. STABILITY RISK ASSESSMENT

4.1 Risk Screening

A risk screening of the geotechnical issues relating to the stability and integrity of the components of the conceptual stability site model is presented in Table 1.

4.2 Modelling Approach and Software

Assessment of the geotechnical stability and integrity of the deposit for recovery development has principally involved the completion of a series of 2D limit equilibrium slope stability analyses.

Industry standard computer software (SLIDE – supplied by Rocscience Inc.) has been used to complete the slope stability analyses.

4.3 Geotechnical Parameters Selected for Analyses

Geotechnical parameters selected for analysis purposes are presented in Table 2.

Table 2 – Geotechnical parameters selected for analyses

Material Type	Drained Cohesion [c' (kPA)]	Angle of Shearing Resistance (°)	Bulk Density (Mg/m^3)
Terrace Deposits (Side Slope Sub-grade)	0.5	40	1.8
Triassic Branscombe Mudstone Formation – Mercia Mudstone (Basal Sub-grade)	25	24	2.0
Artificial Geological Barrier (AGB) (Side Slope)	4	23	1.8
Waste Mass	4	23	1.8

4.4 Selection of Appropriate Factor of Safety

A benchmark minimum Factor of Safety (FoS) value of 1.30 has been adopted for the purpose of assessing the stability of the deposit for recovery development. It is considered that this benchmark value is appropriate given that:

- the geotechnical setting of the site is adequately defined;
- the geotechnical input parameters selected for analysis are known or have been conservatively estimated with reasonable confidence;

- the geotechnical stability and safety risks associated with the deposit for recovery development at the site are considered to be very low.

4.5 Stability Analyses

4.5.1 Basal Sub-Grade

No specific stability analyses have been deemed necessary. Relevant geotechnical issues are discussed below in Section 4.6.1.

4.5.2 Side Slopes Sub-Grade

No specific stability analyses have been deemed necessary. Relevant geotechnical issues are discussed below in Section 4.6.2.

4.5.3 Basal Artificial Geological Barrier

Not applicable. The Triassic Branscombe Mudstone Formation of the Mercia Mudstone Group underlying the site forms an adequate natural basal geological barrier. An engineered basal AGB will therefore not be constructed at the site.

4.5.4 Side Slopes Artificial Geological Barrier

See Appendix 1 and Section 4.6.3 below.

4.5.5 Waste Mass

See Appendix 2 and Section 4.6.4 below.

4.5.6 Capping

No specific stability analyses have been deemed necessary. Relevant geotechnical issues are discussed below in Section 4.6.5.

4.6 Stability Analyses Results

The following sub-sections summarise the results of the stability analyses performed and discuss relevant geotechnical issues associated with the various deposit for recovery components. Reference should be made as appropriate to the relevant Appendices for full details of the analyses performed and the associated results.

4.6.1 Basal Sub-Grade

- Basal sub-grade stability

  Based on evidence from geotechnical site inspection, site investigation borehole logs and published information relating to the lithological character of the Triassic Branscombe Mudstone Formation of the Mercia Mudstone Group, it is considered that no compressible material or cavities will be present beneath the site.

  Accordingly, it is considered that the stability and integrity of the basal sub-grade will not be compromised by compressibility or the presence of cavities.

- Basal heave

  The Triassic Branscombe Mudstone Formation of the Mercia Mudstone Group consists of a sequence of red-brown mudstones and siltstones, has low permeability, and does not transmit groundwater flow.

  There will be no groundwater pressures acting which have the potential to promote basal heave. Accordingly, it is considered that the stability and integrity of the basal sub-grade will not be compromised by basal heave.

  The surcharge weight provided by the placed inert fill material will negate the potential for any basal heave to occur associated with groundwater level rebound.

4.6.2 Side Slope Sub-Grade

- Compressibility

  Based on evidence from geotechnical site inspection, site investigation borehole logs and published information relating to the lithological character of the superficial Terrace Deposits, it is considered that no compressible material or cavities will be present in the excavated perimeter

slopes. Accordingly, it is considered that the stability and integrity of the excavated perimeter side slope sub-grade will not be compromised by compressibility or the presence of cavities.

- Slope stability

  Excavated perimeter slopes in the superficial Terrace Deposits will generally be formed at an overall design gradient of *c.* 1v : 1.5h. The maximum height of the excavated perimeter slopes will be *c.* 7.5m.

  Based on evidence from geotechnical site inspection, it is considered that the excavated slopes will remain adequately stable at the design gradient. Any minor face dressing or re-grading of the side slope sub-grade will be undertaken on a phased basis in advance of the construction of the side slope AGB.

  In accordance with the requirements of the Quarries Regulations 1999, the quarry operator is responsible for ensuring that the excavated faces are designed, constructed, operated and maintained so as to ensure that instability or movement which is likely to give rise to a risk to the health and safety of any person is avoided. Accordingly, it is considered that the stability and integrity of the side slope sub-grade will not be compromised by slope instability.

*4.6.3 **Side Slope Artificial Geological Barrier*** (see Appendix 1)

- Side slope sub-grade stability

  See Section 4.6.2

- Side slope Artificial Geological Barrier slope stability

  Using the input parameters detailed in Appendix 1, a satisfactory minimum FoS value of 1.32 is indicated by the analysis results for slope failure involving the side slope AGB. Accordingly, it is considered that the stability and integrity of the side slope AGB within excavation area Phases 1 to 9 will not be compromised by slope instability.

*4.6.4 **Inert Fill Mass*** (see Appendix 2)

The fill material will be placed in layers *c.* 1m thick in 2 No. lifts *c.* 3.75m thick. The maximum total thickness of inert fill material will be *c.* 7.5m. Active advancing slopes in fill material will be formed no steeper than 1v : 1.5h.

Using the input parameters detailed in Appendix 2, a satisfactory minimum FoS value of 1.32 is indicated by the analysis results for circular slope failure involving the inert fill mass. Accordingly, it is considered that the stability and integrity of the inert fill mass will not be compromised by slope instability.

*4.6.5 **Capping***

- Slope stability

  Site restoration will be in accordance with the requirements of extant Planning Permissions 19/000048/CM (Worcestershire County Council) and 19/0081/TWMAJM (Gloucestershire County Council).

  Approved restoration surface contours are shown on Drawing No. 2636-4-4-2-1 DR-0007 S4-P9 in Appendix 2 of the ESSD report which accompanies the EPR Permit application (Appendix Gii of the Permit application documentation).

  Given the shallow restoration gradients, it is considered that the stability of the final restoration surface will not be compromised by slope instability.

- Deformation due to inert fill settlement

  No engineered low permeability capping system will be placed and therefore the potential for the integrity of such a system to be compromised by settlement of the inert fill mass does not exist.

  Given:

  - the character of the inert fill material which will be placed at the site (mainly clayey soil and stone);

- that site operational procedures, consistent with principles of best practice, will be employed to ensure that the inert fill material is placed in layers *c.* 1m thick and is adequately compacted

it is considered that the potential for settlement will be low (less than *c.* 2% of fill thickness). Re-grading of the restored surface will be undertaken if settlement results in the formation of localised shallow depressions. Whilst it is considered that such depressions would not adversely affect fill stability, they may cause localised ponding and therefore affect the afteruse of the site.

5. MONITORING

5.1 Basal Sub-Grade

The basal sub-grade will be inspected prior to the placement of site derived mineral waste (silts and clays) and imported inert fill material within excavation area Phases 1 to 9, in order to ensure that no compressible or unsuitable material is present, and that no ponded surface water is present.

5.2 Side Slope Sub-Grade

The side slope sub-grade will be inspected prior to the construction of the side slope AGB in order to ensure that no compressible or unsuitable material is present and that the sub-grade slopes exhibit adequate stability.

5.3 Side Slope Artificial Geological Barrier

Construction Quality Assurance procedures, consistent with a Construction Quality Assurance Plan approved by the EA and involving construction supervision and testing, will be adopted in order to ensure that the side slope AGB meets required specifications.

The Construction Quality Assurance Plan (GWP Report No. 250927) is provided as Appendix M of the EPR Permit application.

5.4 Inert Fill Mass

Placement of the inert fill material will be routinely monitored in order to ensure that the material is placed in layers *c.* 1m thick and is adequately compacted and that inert fill slopes are formed at appropriate gradients and remain stable.

5.5 Capping

A topographic survey of the restored surface will be undertaken at intervals in accordance with the requirements of the EPR Permit in order to monitor inert fill settlement.

6. ADDITIONAL ANALYSIS – EXCAVATION IMPACT ON M50 EMBANKMENT

As part of the requirements of Planning Permission 19/000048/CM (Worcestershire County Council), Pre-Commencement Condition 13 stipulated that a geotechnical stability assessment was required for the excavation of Phases 1 to 9 at the Bow Farm site, with particular reference to the M50 embankment which passes to the north of the site. The closest approach to the M50 is on the eastern side of the northern margin of Phase 1 where the crest of the excavation will be 20m from the curtilage of the motorway.

The *Bow Farm Excavation Impact on M50 Embankment* report (GWP Report No. 241009) has been prepared separately to discharge Condition 13 of Planning Permission Number 19/000048/CM (Worcestershire County Council) but is included as Appendix 3 of this report to support this Stability Risk Assessment.

The results of the analysis show that the excavation within the Phases 1 to 9 excavation area will have no impact on the M50 Motorway embankment. The excavation faces should remain stable and not cause any movement outside the site boundary.

In a letter to Worcestershire County Council dated 20th December 2024, National Highways raised no objections to the Discharge of Condition 13 of Planning Permission Number 19/000048/CM following the submission of the *Bow Farm Excavation Impact on M50 Embankment* report (GWP Report No. 241009). Discharge of Condition 13 was subsequently permitted by Worcestershire County Council on 2nd June 2025 through Condition discharge application 24/000035/DIS.

7. SUMMARY AND CONCLUSIONS

This report presents a Stability Risk Assessment and has been prepared to support an EPR Permit application to provide for the permanent deposit of imported inert fill material within the excavation area Phases 1 to 9 at the site as a deposit for recovery activity to achieve the approved restoration landform.

Completion of the approved site restoration scheme, involving the restoration of the mineral extraction areas requires 1.4Mm^3 (approximately 2.45Mt using a standard conversion factor of 1.75t/m^3) of imported inert fill material within Phases 1 to 9 of the excavation area in the main site area.

The EPR Permit application is submitted on the basis that the permanent deposit of imported inert fill material within excavation area Phases 1 to 9 to achieve the approved restoration scheme is a deposit for recovery activity and not a waste disposal activity.

Notwithstanding, a side slope AGB will be constructed on a phased basis within excavation area Phases 1 to 9 in order to provide sufficient attenuation between the source and the receptor (the underlying Triassic Branscombe Mudstone Formation of the Mercia Mudstone provides an adequate natural basal AGB) as would be required in order to ensure compliance with the Landfill Directive in circumstances where an inert landfill waste disposal activity was being applied for.

The side slope AGB will be constructed on a phased basis in order to provide protection to soil, groundwater and surface water at least equivalent to that resulting from an attenuation barrier/liner with a minimum thickness of 1.0m and a maximum permeability of 1 x 10^{-7} m/s.

It is considered that the geotechnical setting of the site is adequately defined and that the geotechnical stability and safety risks associated with the development are very low.

The geotechnical stability and integrity of the components of the conceptual stability site model have been assessed and it is considered that adequate Factor of Safety values will be obtained during site development and following completion.

GWP CONSULTANTS
NOVEMBER 2025

Table 1 – Risk screening of the components of the conceptual stability site model

Deposit for recovery component	Geotechnical issue	Classification of geotechnical issue	Justification		
			Is stability/integrity of component at significant risk?	Principal reason(s)	Supporting analyses
Basal sub-grade	Compressibility of sub-grade	Simple	No	No compressible material in basal sub-grade	See Section 4.6.1
	Cavities in sub-grade	Simple	No	No cavities in basal sub-grade	See Section 4.6.1
	Basal heave	Simple	No	No groundwater pressures acting to promote basal heave	See Section 4.6.1
Side slope sub-grade	Compressibility of sub-grade	Simple	No	No compressible material in side slope sub-grade	See Section 4.6.2
	Cavities in sub-grade	Simple	No	No cavities in side slope sub-grade	See Section 4.6.2
	Slope stability	Simple	No	Adequate stability of side slope sub-grade	See Section 4.6.2
Side slope artificial geological barrier	Compressibility and slope stability of side slope sub-grade	Simple	No	No compressible material in side slope sub-grade and adequate stability of side slope sub-grade	See Section 4.6.3
	Cavities in sub-grade	Simple	No	No cavities in side slope sub-grade	See Section 4.6.3
	Slope stability	Simple	No	Shallow gradient slope in adequately strong side slope artificial geological barrier material	See Section 4.6.3
Inert fill mass	Stability of inert fill mass	Simple	No	Shallow gradient slope in adequately strong imported inert fill material	See Section 4.6.4
Capping system	Slope stability	Simple	No	Shallow gradient restored surface	See Section 4.6.5
	Deformation due to inert fill settlement	Simple	No	No engineered capping system - limited inert fill settlement	See Section 4.6.5

APPENDIX 1

Stability analyses – side slopes Artificial Geological Barrier

APPENDIX 2

Stability analyses – inert fill mass

APPENDIX 3

Bow Farm Excavation Impact on M50 Embankment report **(GWP Report No. 241009)**