

TECHNICAL NOTE 001

DATE:	15 April 2025	CONFIDENTIALITY:	Confidential
SUBJECT:	Geotechnical and Proposed Restoration Stability		
PROJECT:	Ffos y Fran	AUTHOR:	K D Power
CHECKED:	A Hale	APPROVED:	R Grainger

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SUMMARY

The documents, reports and plans, provided on the planning portal with respect to the geotechnical aspects of the proposed restoration and the ongoing long-term stability of the tips and slopes at Ffos-y-Fran have been reviewed. The documents do not provide confidence that the tips and slopes will remain stable and will not pose an ongoing risk to residents of Merthyr Tydfil and a potential financial burden to Merthyr Tydfil County Borough Council and their successors.

INTRODUCTION

Merthyr Tydfil County Borough Council retained WSP UK Ltd to review and provide comment on the geotechnical and ground stability matters for a proposed change to the restoration proposals for the former Ffos-y-Fran Open Cast Coal Mine. The review has been undertaken on those documents lodged as part of the planning application; P/25/0037 - Variation of conditions 4 (Duration of Restoration), 6 (Approved Plans) and 50 (Restoration Strategy) of planning permission APP/U6925/A/10/2129921.

The following documents were reviewed

- Ffos-y-Fran Final Restoration Strategy 2025 Environmental Statement – Non-Technical Summary – January 2025.
- Ffos-y-Fran Restoration Strategy Environmental Statement (ES) ES Volume 1 – Technical Report, January 2025.
- ES Volume 3 Appendix 7A to 7J.

It is noted that no detailed geotechnical report has been submitted to support the planning application and the only details with respect to any geotechnical assessment or design is contained within Section 7 of the Ffos-y-Fran Restoration Strategy Environmental Statement.

SIGNIFICANT OBSERVATIONS

A review of the submitted documents gives rise to a number of significant observations, as set out below:

- It is noted that there are three overburden tips constructed during the mining operation, tips OB1, OB2 and OB3. The Environmental Statement (ES) indicates that these were initially assessed, for stability, in accordance with code and practices current at the time for temporary tips. These overburden tips are noted to contain glacial till, colliery spoil and sedimentary rock; mudstone, siltstone and sandstones, in addition, although not described, they are likely to include other materials including ironstone and seat-earths. No records have been supplied indicating the volumes or locations of where these materials were deposited within the overburden tips. Further, no records have been supplied indicating if any compaction has been applied to the materials within the tips. It is assumed that as these were constructed as temporary earthworks and that they were

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constructed by tracking the material into place, as they were temporary earthworks, rather than being compacted to any engineering specification.

- Tip OB1 failed in 2022 on its western side, the ES notes that this was due to the toe being excavated but no documentation is provided to support this and there appears, based upon the evidence supplied, to have been no further investigation into the failure. While the ES also states that further earthworks are required to ensure long-term stability, there are no records of any ground investigations being undertaken to inform stability analysis undertaken. Therefore, the stability analysis may not reflect the medium to long-term performance of tip OB1.
- The ES states with respect to the stability analysis of the north, east and south sides of tip OB1 that they will remain stable in the long-term based upon the fact that the design undertaken prior to them being tipped indicated them to be so. Furthermore, the ES provides factors of safety against failure for these slopes of between 1.19 and 1.23. Current British Standards, in place since 2004, do not adopt a lumped factor of safety approach, the now withdrawn *BS 6031: 1981 Code of Practice for Earthworks* did so. This, withdrawn standard, requires for permanent slopes a factor of safety of 1.3 to 1.4 for a first-time slide, although this is based upon a good standard of investigation and information being available. The factors of safety proposed appear from the information supplied to be based upon analysis undertaken by Miller Argent (South Wales) Ltd prior to the development of the open cast mine. The ES suggests the following:
 - That Tip OB1 was designed as a temporary tip.
 - That there are no records of how and where the various materials were placed within the tip.
 - That there are no records of the materials being compacted to any engineering specification.
 - That the factors of safety against slope instability are low compared with design standards.
- It is concluded that the medium to long-term stability of tip OB1 in the permanent situation cannot be relied upon and may represent a significant ongoing risk.
- With respect to tips OB2 and OB3, the ES notes that they have suffered small scale instabilities, but these are considered to have no significance, the basis of this statement is unclear. The ES states that they were constructed to the approved design, although this does appear to be designed for temporary tips. It further provides factors of safety for tips OB2 and OB3 of 1.18 to 1.26 and 1.18 to 1.35, respectively. As with OB1, no information has been provided as to the construction of the tips, no investigations have been undertaken to determine the structure of the geological materials and groundwater within the tip and provide geotechnical parameters for the materials. Given this and the low factors of safety, the medium and long-term stability of OB2 and OB3 must be questioned and the long term stability cannot be relied upon and may represent a significant ongoing risk.
- It is noted that the ES states on a number of occasions that the overburden tips have remained stable through the life of the opencast mine, even though failures of various sizes have been

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reported within the tips, and it is suggested that for this reason they can be considered stable in the long-term. This does not consider the ongoing long-term impact of climate change and the likely weathering of soils and rock within the tips, particularly as there are no records of the material being compacted to an engineering standard.

- The ES proposes that Backfill slope BF1 is re-engineered and provides limited stability analysis. It is noted that this analysis has been undertaken on a lumped factor of safety approach. This analysis does not appear to have been based upon any geotechnical investigation to provide information on the structure and physical characteristics of the materials within the slope or the groundwater regime. No information has been provided on the actual approach to the re-engineering of the slope or the source of the proposed compacted material within the toe, a critical element of the design. The soil strength parameters adopted for the “*general fill*” forming the side slope of BF1 and the compacted fill supporting the toe within the slope analysis are unrealistic and overly optimistic, therefore the medium to long-term stability of this slope cannot be relied upon.
- The proposed restoration includes the retention of parts of the open cast side walls; the stability of the exposed faces is discussed in terms of the stability analysis undertaken, prior to the mine being developed, by Miller Argent (South Wales) Ltd. There does not appear to have been any review of these results following on from the mining operations when a better understanding of the geology, its structure and the geotechnical parameters may have been attainable. The ES does discuss a number of ongoing risks and potential mitigation, but it does not address the overall stability, with respect to the southern side wall it notes that the original analysis identified small scale failures/features that were “*...only of possible significance as a safety consideration during the mining operational phase*”. If such features remain exposed, they will continue to represent an ongoing health and safety risk. With respect to the eastern sidewall, the ES reports various instabilities that occurred during the mining operations, including some large-scale spalling. It also states that “*rock gutters*” will be installed to mitigate the risk from rockfalls, while these are shown on a number of sketches the basis of size selection, where shown, is unclear and there is no evidence of any analysis or assessment being undertaken to determine the likely sizes, frequency or location of rockfalls. In addition, one of the sketches indicates that there is an abandoned adit within the face, it is not clear if this will be or has been treated to prevent collapse within the length that may have an impact upon the rock faces above.
- A scree slope developed below the east side wall during the mining operations as a result of large-scale spalling, based upon the documents it is proposed to retain the scree slope and possibly add further material. No apparent assessment of the stability of this slope has been undertaken to confirm the ongoing stability.
- The lagoons and water treatment areas constructed as part of the mining operations that are to remain are stated to have remained stable during the site operations and will continue to do so “*...in*

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perpetuity” providing they are not impacted by any engineering works; no evidence or justification to support this has been provided.

- The ES appears to dismiss the impact upon climate change, particularly on OB2 and OB3. Given the recent history of a number of tip failures across South Wales as a result of high rainfall events these appear to be an optimistic view, which is not likely to borne out in time.

CONCLUSIONS AND RECOMMENDATIONS

The submission does not adequately consider the stability of the proposed slopes and rockfaces for the proposed restoration scheme. There is insufficient evidence that a rigorous assessment of the soil parameters and groundwater regime has been undertaken. It is considered that based on the scheme proposals contained within documents submitted to support the planning application there will remain a significant risk of slope instability in the medium to long term.

Based upon the documents provided on the planning portal there is little evidence that the tips and slopes that will be left following restoration will be stable in the medium to long-term and they may continue to remain at risk of failure. With respect to the overburden tips, an almost total reliance has been placed upon work undertaken prior to the development of the mine and the overburden tips, their actual construction and the materials placed within them does not appear to have been considered.

The impact of the side wall faces that it is proposed to leave exposed does not appear to have been fully considered, particularly as it is acknowledged that further rockfalls may occur.

The stability of the scree slope below the east sidewall does not appear to have been considered.

The impact of climate change on the ongoing stability of the tips and slopes does not appear to have been considered, and in some cases the impacts have been dismissed with no supporting evidence.

Based upon the evidence in the documents supplied, from a geotechnical perspective, the proposed restoration does not appear to leave a site that will be stable in the long term.

In order to support the restoration plan, it is recommended that the works are supported by detailed geotechnical works, including but not limited to:

- Sufficient ground investigations of tips OB1, OB2 and OB3 to determine their make-up, their condition and to provide information on the geotechnical characteristics of the materials and groundwater within them. This should be used to develop a ground model to support medium and long-term stability analysis. This should also take into account the impacts of ongoing climate change.
- Ground investigation of backfill slope BF1 to determine its condition and to provide information on the geotechnical characteristics of the materials and groundwater within. This will allow the

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development of a more reflective ground model and allow realistic geotechnical parameters to be determined to adopt in slope stability analyses. Again, the impacts of climate change should be considered, particularly with respect to groundwater and surface water management.

- The exposed rock faces in the side slopes should be subject to more rigorous assessment and a better understanding of the risk of rockfall developed. This will allow a better understanding of the adequacy and acceptability of the mitigation measures to be made.
- The long-term impact of climate change should be considered for all elements of the proposed restoration.