

CHAPTER 11: GROUND CONDITIONS

Introduction

- 11.1 This chapter assesses the impact of the proposed development on ground conditions, including soils, geology, groundwater and contaminated land. In particular, it considers the potential effects of ground conditions (geology/geodiversity, ground instability, land contamination, agricultural soils and potential mineral sterilisation) both during construction and following completion.
- 11.2 The chapter describes the methods used to assess the impacts, the baseline conditions currently existing at the site and surroundings, the potential direct and indirect impacts of the development arising from ground instability and land contamination, the mitigation measures required to prevent, reduce, or offset the impacts and the residual impacts. It has been written by Abbeydale BEC Ltd.

Planning Policy Context

National Planning Policy

National Planning Policy Frameworkⁱ

- 11.3 The NPPF requires that contaminated sites proposed for redevelopment should not be capable of being classified as such under Part IIa of the Environmental Protection Act 1990 following appropriate remediation.
- 11.4 The NPPF also directs local authorities to encourage needed economic developments, providing the development is appropriate for its location in terms of pollution and contamination.

MPS1: Planning and Minerals

- 11.5 Minerals Policy Statement 1 (MPS 1) outlines the national approach to planning for minerals, taking into account the need to 'safeguard' and conserve mineral resources in accordance with the principles of sustainable development. It addresses, among other things, the issue of loss of access to mineral resources by development, a concept known as 'mineral sterilisation'.

Local Planning Policy

Staffordshire Moorlands Core Strategyⁱⁱ

- 11.6 The Staffordshire Moorlands Core Strategy Development Plan Document, produced in March 2014 provides strategic guidance on future developments and influences how and where the district council will develop.
- 11.7 The policies outlined in the report recommend the efficient use of resources by encouraging development on brownfield sites. It is consistent with the NPPF in that it encourages proposals that seek to remediate potentially contaminated sites. The policy notes that within Staffordshire Moorlands, settlements do exist that are suitable for re-use although they will have a historical legacy of contamination that will require remediation.
- 11.8 Wherever possible, development should ideally use existing buildings suitable for conversion, with new build structures seeking to minimise the impact on the

surrounding areas. Guidance relating to flood risk from the strategy is given in Chapter 12.

Churnet Valley Masterplan SPD ⁱⁱⁱ

- 11.9 The final version of the Churnet Valley Masterplan sustainability appraisal was published in March 2014 following consultation with multiple stakeholders. Eight character areas are identified with Moneystone Quarry identified as a key potential re-development sites within the area.
- 11.10 The plan indicates that a major positive effect will be achieved through the development of underused and contaminated sites. Although additional development may have potential negative impacts to the existing biodiversity the plan acknowledges the clear opportunity to create further biodiversity over time.
- 11.11 The main policies of relevance aim to 'reduce contamination, regenerate degraded environments and maintain soil resources and quality'. In addition there is a need to promote biodiversity, enhancing key habitats and species, whilst promoting an efficient use of resources.
- 11.12 Furthermore there are policies requiring a reduction in energy consumption and waste production.

Approach

Assessment Methodology

- 11.13 The baseline conditions, against which the likely environmental effects of the Proposed Development are assessed, have been determined through a review of desk based reports and searches. These are described in the *Baseline Conditions* section below that also identifies the receptors of relevance to the assessment.
- 11.14 The Study Area for the assessment comprises the application site as illustrated in Figure 1.1, together with a minimum 500m buffer zone. This buffer is based on guidance produced by the EA with respect to planning application consultations in the context of the location of licensed landfill sites and potential planning considerations regarding existing or potential mineral extraction sites.
- 11.15 The assessment of impacts in respect of ground instability, land contamination, soils and potential mineral sterilisation (collectively 'ground conditions') has been informed by consultation with the Environment Agency (EA), Staffordshire Moorlands District Council (SMDC) and Staffordshire County Council (SCC) as the relevant authorities.
- 11.16 The assessment takes into account the sensitivity of any affected receptors such as designated ecological sites such as SSSIs, humans and flora and fauna; and the magnitude of any potential impact based on its size, duration and probability. When these factors are combined a professional judgement on the significance of impacts can be made.

Significance Criteria

- 11.17 The classification of significance aids in the identification of the main environmental effects of the proposed development and what weight should be given to these effects. There is no statutory definition of what constitutes a significant effect and

guidance is of a generic nature. The significance criteria used in this report are set out below:

- Major Beneficial;
- Moderate Beneficial;
- Minor Beneficial;
- Negligible;
- Minor Adverse;
- Moderate Adverse; and,
- Major Adverse.

11.18 An explanation of each of level of significance used in the assessment is given below:-

- **Major** - Very large or large change in environmental conditions in a highly sensitive location or to a highly sensitive receptor. Effects, both adverse and beneficial, which are important considerations at a national to regional level because they contribute to achieving national / regional objectives, or, likely to result in exceedence of statutory objectives and/or breaches of legislation.
- **Moderate** - Intermediate change in environmental conditions. Effects that are likely to be important considerations at a district to local level because they contribute to achieving local objectives, or, may result in exceedence of local statutory objectives and/or breaches of legislation.
- **Minor** - Small change in environmental conditions. These effects may be raised as local issues but are unlikely to be of importance in the decision making process.
- **Negligible** - No discernible change in environmental conditions. An effect that is likely to have a negligible or neutral influence, irrespective of other effects.

Assumptions/Limitations

11.19 In practice, and given the role of judgement in the assessment process, there may be some variation between subject areas in the significance rating process. This may be as a result of limited information on the sensitivity of features and / or the complexity of interactions that require assessment in determining magnitude of change.

11.20 The baseline ground conditions reports were prepared as part of the initial assessment of data which was available when Moneystone Quarry was closed in December 2010. From the data received from the quarry the following Abbeydale BEC reports were produced and are appended:-

- 418040GR March 2011 Geotechnical and Hydrological Factual Report. **(Appendix 11.1)**
- 418040DS March 2011 Geotechnical and Hydrological Desk Study Report. **(Appendix 11.2)**
- 418040EA March 2011 Environmental Assessment Desk Study Report. **(Appendix 11.3)**
- 418040FR March 2011 Flood Risk Assessment Report. **(Appendix 12.1)**

11.21 These reports were prepared using the available information at the time and include in excess of 55 reports prepared for the quarry over the 50 years it operated. Additionally, site observation and other available information as recorded within the reports have been used to undertake the assessments made. Since these reports have been produced several additional reports have been located and used within our current assessment.

- 11.22 Subsequent to the quarry closure, monitoring of the quarry was initially carried out on a monthly basis, subsequently quarterly and records of the finding reported within Abbeydale BEC annual reports appended:-
- 418040MM January 2013 Annual Monitoring Report. **(Appendix 11.4)**
 - 418040let26 July 2014 Monitoring Report. **(Appendix 11.5)**
 - 418040MM/2 February 2015- Annual Monitoring Report **(Appendix 11.7)**
- 11.23 Many of the previous reports were prepared specifically for the quarrying issues at the time and do not necessarily hold information relevant to the proposed development. The information available has been used in good faith and mainly relate to areas which were subsequently quarried. No significant additional investigation has been undertaken, but with large areas of exposed rock limited additional investigation is being proposed at this stage.
- 11.24 The original baseline assessments were for all the land associated with the quarry. The current assessment, as presented in this chapter, is limited to the proposed development areas within the red line shown on Figure 1.1.

Baseline Conditions

Geology

- 11.25 Summarising the ground conditions given in report 418040DS, the site is shown on the Geological Survey maps to be underlain by the Rough Rock Sandstones of the uppermost unit of the Upper Carboniferous Millstone Grits. The Rough Rock Sandstone is fine to medium grained composed largely of quartz, weakly cemented with iron. However, it does contain beds and lenses of uncemented and poorly cemented weak sandstone. The sandstone has an onsite maximum thickness of 35m, with an average dip of 5 to 7 degrees and up to 12 degrees south – southwest. See **Figure 11.1 & Figure 11.2.**
- 11.26 Shale underlies the sandstone forming the base of most of the quarries. Coal Measures mudstone strata overlie the sandstone in the former production area and the lower ground to the south. Faulting affects the ground to the east of the quarried areas.
- 11.27 As discussed further in Chapter 12, although patterns have been altered by quarrying, both surface and groundwater within the sandstone generally flow to the south – southwest, to the River Churnet. South of the quarried areas streams are incised into the overlying mudstone with the underlying sandstone in parts outcropping in the stream beds.

Historic Quarrying Activity

- 11.28 Historically shallow quarrying occurred above the current quarries into the land to the south of Moneystone hamlet. Large scale quarrying started in the late 1950's in Quarry 1 (Q1) south of Eaves Lane. See **Figure 11.3.** The sides were generally near vertical with one or two benches and 30m deep. After quarrying they were infilled with tailings and acid liquor disposal.
- 11.29 Quarrying was then extended into Q2 north of Eaves Lane in the 1960's connecting by a tunnel under the lane. Quarrying and disposal of tailings then continued until the quarry's closure in 2010. In the intervening time up to 35m of sandstone was a removed and similar depth of tailings used to infill.

- 11.30 In 2001 a third quarry, Q3, was opened and quarried in the order of 45m deep to the west of Q1 and south of Eaves Lane, until December 2010. Inflowing groundwater was pumped from this quarry to the production area. Post 2010 the groundwater levels have risen to within a metre of the quarry outfall at 159m AOD. Outflow from the quarry via the outflow is currently anticipated during winter 2014-15.
- 11.31 The Quarry Production Area was located south of Q1 and continued operation until March 2011. Since then the surface structures have been removed and the area covered with site topsoil. Only the administration, workshop and laboratory buildings remain together with associated utility structures.
- 11.32 Since 2010 the quarry site has been managed in accordance with the restoration plan until March 2014 when Staffordshire County Council approved a Revised Restoration Plan for the site. In addition to the removal of the production area surface structures, a number of areas outside the current development proposals have been reprofiled and will be managed to conform with the revised restoration plan.
- 11.33 Within the development area the closure of the production plant in March 2011 resulted in acidic liquor no longer flowing into the west of Q1 (L4) and east of Q2 (L7). This has resulted in the tailing lagoons drying out and naturally vegetating over. Both lagoons have small, shallow areas of ponding water that remain.
- 11.34 The present conditions together with the Staffordshire County Council approved March 2014 Revised Restoration Plan forms the baseline to be considered as part of the EIA.
- 11.35 In the quarry area the sand resource has been exhausted. The only remaining sandstone has been left to support side slopes and Eaves Lane which would need to be diverted if the last remaining sandstone was to be removed. Although sandstone remains south of the quarries, it is concealed and previous attempts to extract shallowly concealed sandstone in the south of Q3 found it to be unviable. Therefore the extraction of sandstone below development areas south of the quarries will also be unviable.
- 11.36 The only remaining viable reserves are those to the north of Eaves Lane on the higher ground between Q2 and Whiston. A planning application to quarry this area has been made but the application was refused. No development in this North eastern area is being proposed.

Contamination

- 11.37 Contaminated land is defined under the law through Part IIA of the Environmental Protection Act 1990, implemented through Section 57 of the Environment Act 1995. This supports a suitable for use based approach to the risk assessment of contaminated land. The evaluation is based upon an assessment of plausible linkages, referred to as the contamination – pathway – receptor model, based upon the current or proposed use of the site. The Conceptual Model, tables and sections **Figure 11.4** and **Figure 11.4** summarise the potential contamination present and actions proposed to be taken. See 418040EA report for a more detailed assessment (**Appendix 11.3**).
- 11.38 Prior to development further investigation to determine the actual levels of contamination present are proposed. Having carried out intrusive investigation and associated laboratory testing on samples obtained, a strategy to remediate areas found to be contaminated will be prepared for approval with Staffordshire Moorland

Contamination Officer. In the areas proposed for development the Conceptual Model indicates limited levels of contamination are anticipated. Of greatest concern are both acidic and alkaline levels of pH. Monitoring of pH in 2011 (**Appendix 11.4**) initially found inflows and the ponded water in several quarry areas to remain acidic (<4 pH). With time the acidity has reduced and recent readings (**Appendix 11.4**) indicate an average pH of around 6.5. Of particular concern are some persistently high pH levels where the residue of flumes in Q1E and Q2W remain. These will need to be treated as part of any development earthworks. There is also a potential risk from previously unidentified areas of high pH levels.

Hydrogeology

- 11.39 Following the cessation of pumping of Q3 in December 2010 the water level in Q3 has gradually risen. During this period water has been seen to seep from the higher north side of Q3 and pond in the base of the quarry. With increased ponding it was evident that during drier weather the level changes have reduced, indicating that increasing flows out of Q3 are occurring through the sandstone to the south. See **Figure 11.5**. With the current 2014 summer levels relatively static below the outflow this confirms previous predictions that both inflow and outflow of groundwater has equalised through the sides of Q3.
- 11.40 In the summer of 2014 earthworks were undertaken to cover over and grass the production area. All remaining concrete structures above finished ground level were broken out and crushed into a Type 1 road stone. The remaining stockpiles of sand and general spoil were then used to create an overall gradient of between 1:11 and 1:17 (v:h). A grass seed was then applied which has been slowly greening the area.
- 11.41 In Quarry 2 the area north of L7 lagoon was similarly re-levelled and grassed. Although the Q2 flume was levelled for most of its length, extending capping onto L7 continues not to be practical other than at the northern and eastern margins. The slopes were then left to naturally vegetate. Rock falls have occurred on several occasions on the western side of Q2 (L7) at several locations since 2014. As both the top and bottom of the faces have restricted access, no further assessment has been possible.
- 11.42 Acidity levels of ponds and the groundwater have been recorded on a quarterly basis as part of the ongoing monitoring. Although high and low pH are still being recorded the trend continues towards more neutral levels.
- 11.43 The quarries pre-groundwater level monitoring in the area of Q3 had indicated baseline water levels of 155m AOD and that the outfall installed into Stream A at 159m AOD would never be reached. However, in the spring of 2014 water levels in Q3 lake have continued to rise with the current expectation that lake levels will reach the overflow in the winter 2014-15. More detailed assessment of groundwater, drainage and flood risk is covered in Chapter 12.
- 11.44 With Q3 lake water levels now exceeding development levels the outfall will need to be reduced to 155 to 156m AOD by controlled outflow through Stream A. This is further explored in Chapter 12.

Stability

- 11.45 Detailed technical assessment has been carried out on the stability of the side slopes of Q3 for the desk study report **Appendix 11.2**. Following SCC agreement not to carry out earthworks remediation on Q3 at the present time, remediation at the development stage needs to be considered. The previous stability analysis has

shown that with the degradation of the quarry sides under the water line there are circumstances where the stability of the north side of Q3 could fail causing landslip into the lake.

- 11.46 There are also concerns that slickensided surfaces in the underlying shale could also impact on the north side of Q3. A more recently presented report prepared by MCG dated 19 August 2013 record the testing of the mass strength of the shale in the landbridge on the north side of Q3. However, the MCG report also records the weaker slickenside rock previously found to cause slippage on the north side of Q2E.

March 2014 Revised Restoration Plan

- 11.47 The March 2014 Revised Restoration Plan requires limited changes to the ground conditions as given in the baseline conditions described above. The most significant change is to the former Production Plant the area which is outside the currently proposed development area.
- 11.48 As part of recent earthworks undertaken, re-direction of surface water from Q1E and Q1W into Q3 has been undertaken. This is discussed in more detail within Chapter 12.
- 11.49 Around Q1 and Q2 many of the vertical quarry side slopes remain exposed with several failures recorded in **Appendices 11.4** and **11.5** since 2010. No strategy to protect them is required within the March 2014 revised restoration plan. However, with the potential of increased open access, measures to protect the quarry faces or ways of limiting access to the slopes will need to be considered. Similarly, although no restrictions to access the tunnel between Q1 and Q2 has been agreed, restricted access regular monitoring or improvements of its stability will need to be considered. A Tunnel Stability Assessment Report (Abbeydale BEC, June 2016)_ is provided as part of the planning application re-submission.
- 11.50 As part of the March 2014 Revised Restoration Plan no proposals to limit access onto the uncapped L4 and L7 lagoons is required. As part of the current maintenance of the quarry running sand signs are maintained around the lagoons and access to site is limited. However, no requirements post the maintenance period are currently in place.

Potential Impacts

- 11.51 This section details the potential impacts on the ground conditions. The impact assessment has been based on the impact to the baseline assuming full implementation of the Revised Restoration Plan.

Construction

Soils

- 11.52 The construction works can lead to the compaction and displacement of soils. If left unmanaged this can result in increased surface water runoff (see Chapter 12) and the trackout of soils beyond the site boundary by construction vehicles. Trackout can lead to loss of soils from a site and the silting up of watercourses or sewers when tracked out soils are washed away during rainfall. The potential for trackout is limited by the presence of the existing access road within the site, on which the majority of potential trackout soils would be deposited. Furthermore, the nearest watercourses are to the south of the site, which is remote from the access point

and any potential trackout. The limited sensitivity notwithstanding, there is the potential for trackout to act as a nuisance locally, which could result in a **minor adverse** impact.

Hydrology

- 11.53 As part of the Quarry works a temporary outfall was placed close to the crest of the quarry at 159m AOD. As seen during recent monitoring visits water seepage has increased at the head of Stream A and some minor instability of the incised stream valley slopes have occurred in the Coal Measures mudstone above the water bearing sandstone. With time the artificially formed lake in Q3 will breach through the short section of ground between and allow the lake to naturally reduce in level. Outflows from the lake into the stream and through the SSSI could damage existing habitats in the valley floor. The SSSI is considered to be of high sensitivity and the potential magnitude of the event is low to medium. If unmitigated, a sudden outflow could result in a **moderate adverse** impact on the SSSI.
- 11.54 In addition to the risk of overflow from general overflow of the lake, there is a potentially more significant risk associated with a landslide on the northern side of Q3. In the event that a substantial landslide occurred, a substantial volume of water could be directed downstream through the SSSI in a short space of time. This would be an impact of large magnitude which could result in a **major adverse** impact on the SSSI.
- 11.55 Building foundations, plinths and hardstandings will be formed through the pouring of concrete. Without controls on this process, concrete spillages could potentially result in pollutants coming into contact with surface water features on the site. This could result in a **minor adverse** impact.

Risks to Health

- 11.56 As part of the approved restoration strategy the existing Q1E (L4) and Q2W (L7) tailing lagoons have remained un-capped. The dangers of the running sand conditions within these lagoons remains a concern to people and larger animals alike as the crust increasingly outwardly appears to harden, yet is not strong enough to maintain their weight.

Stability

- 11.57 The slope on the northern side of Q3, as described in the baseline section of this report, are potentially unstable and will require addressing as part of the development. Accordingly, in the absence of any mitigation there is a potential risk of injury to site workers associated with landslips that could result in a **moderate adverse** impact.

Groundwater

- 11.58 In the construction of the majority of lodges only the footing pads of the lodges causes the ground to be disturbed so having a **negligible** impact on groundwater. Where piling is required, potentially around the northern side of Q3, potential impacts to groundwater would also be of **negligible** significance as this area is above the level of the water table and the number of lodges where this would be required is relatively low.

Minerals

- 11.59 With development only being proposed in existing exhausted quarried areas a **negligible** impact to mineral sterilisation will result.

Completed Development

Risks to Health

- 11.60 The older vertical rock slopes from time to time collapse and could cause a danger to the unformed visitor. Although the potential for such an impact is low, the receptor is of high sensitivity and this therefore represents a potentially **moderate adverse** impact.

Hydrology

- 11.61 Having provided a controlled reduction in lake levels to 155m - 156m during the construction period, the risk of uncontrolled reduction and the consequences to the SSSI and stream and river beyond is significantly reduced. However, if no further management of water levels was carried out through the operation of the leisure park, levels could rise, reinstating the risk of overtopping to the SSSI. Therefore, without long term management of lake levels there is a potential **minor to moderate adverse** impact on the SSSI.
- 11.62 The increase in impermeable surfaces as a result of the development has the potential to increase surface water runoff to watercourses. This is discussed further in Chapter 12 but, left unchecked, could result in a **minor adverse** impact on local watercourses. This is based on a relatively modest amount of hard surfacing due to the nature of lodge construction, the potential for existing lagoons to retain flows on-site and the moderate sensitivity of the receiving watercourses.

Mitigation

Construction

Soils

- 11.63 To limit concerns about off-site disturbance earthworks will be designed to minimise the amount of general soils and rock material that are imported to or exported from site. Consideration has also been given to reduce, where possible, the distance materials are being transported around site. Construction of access tracks will aim to use unbound surfaces of site won material so providing a very limited requirement for imported materials.
- 11.64 Where construction requires the movement of soils, these would be treated in accordance with the Environment Agency Pollution Prevention Guidelines (PPG1), Defra's Code of Practice on Sustainable Soils and the MAFF Good Practice Guide for Handling Soils by Machine (2000).

Hydrology

- 11.65 It is proposed that there will be a controlled reduction in the water level of the Q3 lake to 155-156m AOD to reduce the potential for uncontrolled overflows of water into the stream and the SSSI. It is also proposed to construct a 171m AOD platform along the west, north and east side of Q3, which will improve the stability of the north side of the quarry, the longer stability of the rock face and Eaves Lane behind

and will limit the risk of sudden outflows of lake water into Stream A due to slope failures.

- 11.66 Having provided a controlled reduction in lake levels during construction the levels will be monitored and controlled throughout the operation of the leisure park both for controlling the flow of water to the SSSI and also to facilitate different leisure uses around the fringe of the lake. Through this action the consequences to the SSSI and stream and river beyond, is significantly reduced and will ensure that flows are maintained at a level suitable to maintain and enhance the integrity of the SSSI.
- 11.67 Lagoons L4 and L7 will be capped as part of the proposals. This will ensure that the acidic tailing will be protected from surface water run-off so neutralising the pH of surface water downstream of the lagoons. This represents a potentially significant improvement from the existing conditions that would persist in the absence of the development.
- 11.68 Modifications proposed to the flow and gradient of surface water across the development area reduction in peak run-off can be achieved so significantly reducing peak flow downstream can be achieved.

Risks to Health

- 11.69 As stated above, as part of the proposed development, stockpiled material will be used to cap lagoons L7 and L4. This will ensure that the existing risks associated with the lagoons will be removed to make the site safe for visitors and wildlife.
- 11.70 During the operation of the leisure park, a mixture of protection and reinforcement of slopes and better control of access will be developed and maintained to provide ensure that the risks to human health from collapse of slopes is minimised.

Stability

- 11.71 As part of any development a revised stability analysis of the Q3 slopes and land bridge will be required together with a strategy to maintain the stability of the existing Q3 side slopes. This will be achieved by placing material against the weak sandstone identified in the lower western face of the quarry now located below the level of the lake. This would ensure that the slope is stable and that the risk of landslip and potential injury is avoided, which would be a significant improvement on the existing conditions.

Groundwater

- 11.72 All works will be conducted in accordance with current legislation and standards including EA Pollution Prevention Guidance (PPG) documents that provide important information on a range of relevant environmental issues. In particular PPG5 (2007), 'Works and maintenance near water' and PPG6 (2012), 'Working at construction and demolition sites', provide information on protecting the water environment from pollution caused during construction operations.
- 11.73 Fuels and chemicals would be stored in accordance with the Control of Pollution (Oil Storage) Regulations in either double skin tanks, or within appropriately sized bunds (i.e. a capacity of not less than 110% of the largest tank, or largest combined volume of connected tanks located within the bunded area).
- 11.74 Storage containers would be inspected regularly for leaks or damage. Cement, concrete, other chemicals and materials would be stored securely. Prior to

construction an emergency response would be set up to deal with incidents of construction spillages.

11.75 Concrete will be batched on site within the designated area. The appropriate classification of concrete for the environmental conditions will be used in order to avoid the potential for leaching.

11.76 Surface water run-off arising from working areas of the site will be directed to existing lagoons to allow suspended sediment to settle, and prevent any contamination due to spillages entering the local drainage system.

Residual Impacts

11.77 Table 11.1, below, summarises the potential impacts identified earlier in this report, the mitigation measures described in the preceding section and the residual impact once these mitigation measures have been implemented.

Table 11.1: Summary of Mitigation and Residual Impacts

Impact Category	Potential Impact	Mitigation	Residual Impact
Construction			
Soils	Trackout	Soils to be treated in accordance with best practice and movement of soils to be kept to a minimum.	Negligible
Hydrology	Overflow from Q3 lake to SSSI	Reduction of lake levels and improving slope stability	Negligible
	Runoff from tailing lagoons to watercourses	Capping of tailing lagoons	Moderate beneficial
	Risk of contamination from concrete pouring	The use of designated concrete batching areas	Negligible
Risks to Health	Risks to people and animals from existing lagoons	Capping of existing tailings	Major Beneficial
Stability	Risk of landslip affecting humans	Improvements to slope stability	Major Beneficial
Groundwater	Contamination from site processes and materials storage	Compliance with best practices on-site and direction of surface water to existing lagoons to remove suspended sediment.	Negligible
Minerals	Sterilisation of mineral deposits	None required	Negligible
Operation			
Risks to Health	Risk of slope collapse affecting visitors	Control of access and monitoring slope stability	Negligible
Hydrology	Impact of flows from Q3 through the SSSI	Ongoing control of outflow during operation of the leisure park.	Minor Beneficial

Conclusions

11.78 The reports undertaken to date including Appendix 11.1 to Appendix 11.6 identify potential risks associated with the ground conditions when developing and operating the site. Also the current risks of leaving the site, over an extended period, without further development.

11.79 In the quarry area the sand resource has been exhausted. The leisure park, where practical, makes use of the remaining features of the quarry and reduces the risk of slope collapse and peak run-off flows down the streams flowing from the site. As

part of the development ground profile changes are to be kept to a minimum so that existing natural vegetation and habitat can be retained and encourage to naturally re-generate into developed areas.

ⁱ Department for Communities and Local Government (2012) *National Planning Policy Framework*, DCLG, London.

ⁱⁱ Staffordshire Moorlands District Council (2014) A Local Plan for the future of Staffordshire Moorlands: Core Strategy Development Plan. SMDC.

ⁱⁱⁱ Staffordshire Moorlands District Council (2014) Final Churnet Valley Masterplan: Sustainability Appraisal. SMDC