

YORK POTASH LTD WOODSMITH MINE S73 APPLICATION

July 2017

Supplementary Environmental Statement
Volume 2 - Technical Assessments and Appendices
Lichfields



Woodsmith Mine Supplementary Environmental Statement

Technical Assessments and Appendices

Sirius Minerals Plc

July 2017

LICHFIELDS

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Appendices

Appendix 1: York Potash Environmental Statement (September 2014) and York Potash Supplementary Environmental Information (February 2015)

Appendix 2: York Potash Approved Development Site Boundary Plan

Appendix 3: Woodsmith Mine Site Plan

Appendix 4: Updated Plans Submitted as part of s73 Application

Appendix 5: Request for an EIA Scoping Opinion (15 May 2017)

Appendix 6: NYMNPA EIA Scoping Opinion (30 June 2017)

Appendix 7: Noise Model Input Data

Appendix 8: Phase 4 Noise and Vibration Management Plan

Appendix 9: LVIA – Updated Zones of Theoretical Visibility

Appendix 10: LVIA Photomontages

Appendix 11: Lighting Impact Assessment (June 2017) with associated plans and assumptions

Appendix 12: Hydrogeological Risk Assessment for s73 Development (June 2017)

Appendix 13: Microdrainage modelling

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1.0 Introduction

Purpose of the Document

- 1.1 This Supplementary Environmental Statement ('SES' (July 2017)) has been submitted on behalf of Sirius Minerals plc ('Sirius Minerals') and provides further environmental information to that presented in the York Potash Environmental Statement (September 2014) [Ref: 13.01], as updated by Supplementary Environmental Information (February 2015) [Ref: 13.02] (together 'the original ES')¹.
- 1.2 For ease of reference, a copy of the original ES is provided at Appendix 1. This SES should be read in conjunction with the original ES.
- 1.3 Sirius Minerals, under the subsidiary trading name of York Potash Ltd, is bringing forward the North Yorkshire Polyhalite Project. It is seeking minor material amendments to part of that Project; namely the approved form of development at the Woodsmith Mine site (formerly known as the Dove's Nest Farm site). The site is located near Sneatonthorpe within the administrative boundary of the North York Moors National Park Authority ('NYMNPA').
- 1.4 The SES accompanies an application pursuant to Section 73 ('s73') of the Town and Country Planning Act 1990 which seeks consent for the changes to the scheme. Due to the nature of the amendments, it has been agreed with NYMNPA that the application should report on any additional or different environmental impacts that have not been previously identified as part of the original EIA process
- 1.5 The purpose of this SES is to set out the conclusions of an additional Environmental Impact Assessment ('EIA') of the minor material amendments where Sirius Minerals considers that such information is required. Reference is also made to other non-material amendments to the scheme [Refs: 13.04-13.06] that have been agreed since the grant of planning permission by NYMNPA (Ref: NYM/2014/0676/MEIA). Sirius Minerals has undertaken a scoping process with NYMNPA to agree those matters requiring consideration; this process is described in Section 4.0 of this document.
- 1.6 The SES has been prepared pursuant to the Town and Country Planning (EIA) Regulations 2011 (as updated by the Town and Country Planning (EIA) (Amendment) Regulations 2015) [Ref: 13.03] ('the 2011 EIA Regulations').

Structure of the SES

- 1.7 The SES is structured as follows:-
- Section 2.0 explains the background and need for proposed minor material amendments to the approved development and the relationship of the changes to the wider North Yorkshire Polyhalite Project. It provides a description of the area affected by the proposed changes – namely the Woodsmith Mine site;
 - Section 3.0 describes the nature of the proposed minor material amendments;
 - Section 4.0 sets out details of the process of agreeing those matters to be considered as part of this SES (the EIA scoping process) and provides an overview of the main methodological approach and any relevant consultation undertaken in respect of the EIA;

¹ For the purposes of this SES, 'the original ES' refers generally to assessment work carried out in the ES (September 2014, as updated in February 2015). More specific reference to either the ES (September 2014) or to the Supplementary Environmental Information (February 2015) applies where particular regard to defined paragraph or page numbers is of relevance.

- Sections 5.0 to 8.0 set out the conclusions of the additional environmental assessment work conducted in respect of those matters relevant to the s73 application;
- Section 9.0 reviews whether additional cumulative impact may be relevant and require consideration as part of this SES;
- Section 10.0 summarises any additional mitigation or monitoring identified throughout this SES; and
- Section 11.0 provides an overall conclusion.

Availability of Document

- 1.8 A paper or electronic copy of the full SES can be obtained from:-
- Lichfields, 3rd Floor, 15 St Paul's Street, Leeds LS1 2JG
 - Tel: +44(0)113 397 1397
- 1.9 Reasonable copying and printing charges will be applied to the paper copy and a CD can be provided at a cost of £5.
- 1.10 Information on the s73 application and the SES can also be viewed at <http://www.northyorkmoors.org.uk/> or during the opening hours of the NYMNPA at the following address:-
- The Old Vicarage, Bondgate, Helmsley, North Yorkshire YO62 5BP
 - Tel: +44(0)1439 772700
- 1.11 All comments on the s73 application and this SES should be issued to the NYMNPA

2.0 **Background and Relationship to the Wider Project**

2.1 Planning permission for the North Yorkshire Polyhalite Project (ref: NYM/2014/0676/MEIA) was issued on 19 October 2015. This section provides contextual detail on the applicant, the site, the approved development and the relationship of the current modifications to the wider Project.

Sirius Minerals Plc

2.2 Sirius Minerals Plc is a listed company on the main market of the London Stock Exchange. The Company is focused on the development of its North Yorkshire Polyhalite Project in the UK and aims to be a world leading producer of multi-nutrient fertilizer. This involves the construction of a new state-of-the-art mine and associated mineral processing and port infrastructure to produce bulk volumes of POLY4 – the trademark name of the Company's polyhalite product.

2.3 Polyhalite is a naturally occurring mineral containing major plant nutrients – potassium, sulphur, magnesium and calcium. It is a valuable multi-nutrient fertiliser and its application by the farming industry, both within the UK and overseas, will assist in maintaining and improving crop yields and harvests.

2.4 The original planning application and this s73 application for the North Yorkshire Polyhalite Project are submitted under the Company's subsidiary trading name of York Potash Ltd.

The Site

2.5 The plan showing the approved development site boundary (Ref: YP-P2-CX-550 Rev 1) is attached at Appendix 2 to this SES. This defines the area of the North Yorkshire Polyhalite Project and is the area to which the s73 application relates. Notwithstanding this, the amendments to the development relate solely to the Woodsmith Mine site; Plan Ref: 653-AP-0002 Rev 2 (Appendix 3 to this SES).

2.6 For the purposes of this SES, reference to 'the Site' relates to the Woodsmith Mine site and reference to 'the wider Project Site' relates to the area contained within the overall development site boundary of the North Yorkshire Polyhalite Project.

2.7 Woodsmith Mine is located approximately 4km south of the outskirts of Whitby and wholly within the boundary of the North York Moors National park. The hamlets of Littlebeck and Sneatonthorpe are located approximately 1km to the west and 1km to the north east respectively from the site.

2.8 The site is bound as follows:-

- To the north by areas of farmland;
- To the east by the Haxby Plantation woodland; and
- To the south and west by the route of the B1416 (which runs from Whitby to the north to a junction with the A171 Robin Hood's Bay Road approximately 2km to the south east of Woodsmith).

2.9 The site was formerly used for farming and commercial forestry and benefits from mature woodland screening along the south, east and western boundaries. The highest points of the site are to the west and south, sloping gently downwards towards the east.

2.10 Existing vehicular access to the site is directly from the B1416 to the west and south.

- 2.11 Pursuant to the pre-commencement planning agreements and conditions attached to planning permission Ref: NYM/2014/0676/MEIA, preparatory works commenced at the site on 1 April 2017. These works include general site clearance and initial excavation around the Construction and Operational Platform; initial drainage works; the erection of the construction compound and haulage route; initial highways and drainage works; and erection of part of the perimeter fence. Development at the site officially commenced on 4 May 2017.

The Wider Approved Development

- 2.12 The development approved under application ref: NYM/2014/0676/MEIA comprises the following:-

“The winning and working of polyhalite by underground methods including the construction of a minehead at Dove's Nest Farm involving access, maintenance and ventilation shafts, the landforming of associated spoil, the construction of buildings, access roads, car parking and helicopter landing site, attenuation ponds, landscaping, restoration and aftercare and associated works. In addition, the construction of an underground tunnel between Doves Nest Farm and land at Wilton that links to the mine below ground, comprising 1 no. shaft at Doves Nest Farm, 3 no. intermediate access shaft sites, each with associated landforming of associated spoil, the construction of buildings, access roads and car parking, landscaping, restoration and aftercare, and the construction of a tunnel portal at Wilton comprising buildings, landforming of spoil and associated works at Dove's Nest Farm & Haxby Plantation, Sneatonthorpe (proposed minehead); underneath 252 sq km of the NYMNPA (winning & working of minerals); a corridor extending underground from the edge of the NP boundary to Wilton International Complex (mineral transport system); Lady Cross Plantation near Egton, Lockwood Beck Farm near Moorsholm, Tocketts Lythe, near Guisborough (intermediate shaft sites); site within the eastern limits of the Wilton International Complex, Teesside (tunnel portal).”

- 2.13 Following the grant of planning permission in October 2015, in December 2016, two non-material amendments to this scheme have been approved by the NYMNPA (under Section 96A of the Town and Country Planning Act 1990):

- 1 Ref: NYM/2016/0845/NM (December 2016): for the realignment of the main internal access road linking the approved Welfare Building complex and the mine-site and minor amendments to the Construction and Operational Platform levels (above Ordnance Datum ('AOD')) [Ref: 13.04]; and
- 2 NYM/2017/0255/NM (May 2017) to allow the temporary use of a) the shaft entrance without the right-turn lane and b) the farm entrance for a period of 10 weeks, or until the completion of the haul/welfare road, whichever is sooner [Ref: 13.05].

- 2.14 It is this scheme (i.e. the originally approved scheme incorporating both the s96A non material amendments) as detailed within the original ES that forms the baseline position against which the changes proposed as part of the s73 application will be assessed.

- 2.15 A third non-material amendment to the approved scheme is at the time of submission of this s73 application before the NYMNPA awaiting consideration. NYM/2017/0399/NM (June 2017) [Ref: 13.06] seeks permission to replace the previously approved grouting and cast concrete wall scheme for Woodsmith Mine with more localised diaphragm walls for the Men & Materials Shaft, Minerals Shaft and Mineral Transport System (MTS) Shaft to 60m below the below the Construction and Operational Platform level.

2.16 The changes proposed in this latest s96a submission are also incorporated in the s73 application and hence the implications arising from this minor change are fully assessed in this SES.

2.17 In addition to the above, information has been submitted pursuant to the requirements of several of the planning conditions attached to planning permission NYM/2014/0676/MEIA, seeking to part discharge various matters of detail associated with site preparation/enabling works. Where these matters have been approved and are relevant to a consideration of the changes included in the s73 application, they are identified in this SES.

Need for the Amendments to the Approved Development

2.18 Following the grant of planning permission, and the appointment of Contractors, more efficient construction techniques and other improvements have been identified that have resulted in the evolution of the scheme at Woodsmith Mine. These include:-

- 1 The redesign and adoption of an alternative construction approach to the foreshafts and use of diaphragm walls within the Men & Material and Minerals Shafts and associated changes to the building layouts to enable access and ventilation to be incorporated, removing the need for the Drift Portal and the -45m level road network;
- 2 The selection of a permanent solution for the winders at the site that can be installed at the outset and remove the need for temporary winders/temporary headframes during the construction period;
- 3 Revised Construction and Operational Platform levels and groundwater management, which removes the need for the previously approved grout curtain around the Construction and Operational Platform;
- 4 The reliance on a range of internal Shaft diameters to provide a greater level of flexibility during the construction phase;
- 5 The use of diaphragm wall construction for all shafts (i.e. below foreshafts) to 120 metres below ground (approximately 80m AOD);
- 6 Reconsideration of the location and layout of the water attenuation ponds within the site; and
- 7 Amendments to the internal road link (partly secured via the s96A consent identified at paragraph 2.6 above) to facilitate movement across the site.

2.19 The above matters give rise to the need to secure consent for minor material changes to the approved form of development at Woodsmith Mine, that is being sought via the s73 application.

Alternatives

2.20 The original ES (as issued in September 2014) [Ref: 13.01] included, at Chapter 2, a detailed summary of a range of alternative locations and designs considered in respect of the wider Project. The proposed changes considered in this SES have arisen as a direct result of the matters highlighted above. Whilst the detail of their final form and location within the Woodsmith Mine site have been the subject of iterative design and testing by the team, no additional alternatives have been studied by the applicant as part of the process of bringing forward the current minor amendments that require further consideration or identification within the SES.

Policy Considerations

2.21 Chapter 4 of the original ES included a summary of key policy and legislation of relevance to the development. A brief summary of any updates to that position is provided below as context to this SES.

Updated Policy

2.22 Since the grant of the original permission on 19 October 2015, no new national or local development plan policies have been adopted.

2.23 The NYMNP National Park Management Plan was subject to minor revisions in December 2016 [Ref: 13.09], but this does not include any material changes to the principles and policies set out in the 2012 Management Plan [Ref: 13.010] assessed as part of the original application.

2.24 The York, North Yorkshire and the East Riding Local Enterprise Partnership's ('LEP') Strategic Economic Plan (2016) [Ref: 13.07] was also updated in July 2016. However, the overall ambitions of the Plan, including delivering 21,900 new jobs and £1.4bn Gross Value Added ('GVA') growth within the LEP area by 2021, remain the same as those set out within the previously assessed March 2014 Plan [Ref: 13.08].

Emerging Policy

2.25 In accordance with paragraph 216 of the National Planning Policy Framework ('NPPF') [Ref: 13.011], decision-takers may also give weight to relevant policies in emerging plans according to the stage of preparation, number of outstanding objections and consistency with the NPPF.

2.26 Since the grant of permission, the NYMNP Local Plan has reached an early stage of the plan preparation process (First Steps, September 2016) [Ref: 13.012] but, due to its status, it does not include any draft/emerging policies of relevance to the s73 application.

2.27 The North Yorkshire, York and North York Moors Joint Minerals and Waste Plan (JMWP) is also under development and will be subject to Public Examination later in 2017 [Ref: 13.013]. Similarly, it also holds limited weight in decision making. Nevertheless, key emerging policies of relevance include:

- Policy M22: requires new proposals for the extraction of potash, salt or polyhalite/ renewed applications for the existing sites at Boulby Mine and Doves Nest Farm beyond their current planning permissions to be assessed against the criteria for major development set out in Policy D04. Proposals for new surface development and infrastructure/surface expansion within the existing sites which are not considered to be major development are to be permitted provided they meet the requirements of Policy D11 and Policy I02 and that no unacceptable impact would be caused to the special qualities of the National Park, its environment or residential or visitor amenity.
- Policy D04: requires proposals for major development in the National Park to be refused except in exceptional circumstances and where it can be demonstrated it is in the public interest. The demonstration of exceptional circumstances and public interest will require justification based upon: the need for the development, the impact of permitting/refusing it upon the local economy, whether the development could be located elsewhere and whether any detrimental effects can be moderated to a level which does not significantly compromise the reason for the designation. Where there are exceptional circumstances and the proposal is considered to be in the public interest, every effort to avoid/mitigate adverse effects.
- Policy D11: states that proposals for minerals and waste development will be permitted where it has been demonstrated that measures appropriate and proportionate to the scale

and nature of the development have been incorporated in its design, construction and operation in relation to: minimising greenhouse gas emissions, waste, water consumption and flood risk; generating/utilising renewable or low carbon energy where practicable; ensuring built or civil engineering elements meet a minimum 'Very Good' BREEAM (Building Research Establishment Environmental Assessment Method) or CEEQUAL standard as appropriate; implementing landscape planting comprising native species; mitigating the impacts arising from mining subsidence/land instability and dewatering activity.

- Policy IO2: states that development of ancillary minerals infrastructure at active minerals extraction sites will be permitted provided: the ancillary development produces a 'value added'/complementary product; the development would not have a significant additional adverse impact on local communities, businesses or the environment; and would not unacceptably increase the overall amount of road transport to or from the host site.

Implications of Updated Policy Issues

- 2.28 Taking into account the above, the policy context against which the proposed amendments should be assessed, remains largely unchanged to that described in the original ES, with the addition of the emerging JMWP [Ref: 13.013].
- 2.29 The principle consideration for the amended scheme, therefore, is the consistency of the revised scheme against the NPPF [Ref: 13.011] Major Development Test ('MDT') which remains the main planning policy consideration for assessing major development proposals in designated areas such as National Parks (Paragraph 116 of the NPPF):-
- "Planning permission should be refused for major developments in these designated areas except in exceptional circumstances and where it can be demonstrated they are in the public interest. Consideration of such applications should include an assessment of:-*
- the need for the development, including in terms of any national considerations, and the impact of permitting it, or refusing it, upon the local economy;*
 - the cost of, and scope for, developing elsewhere outside the designated area, or meeting the need for it in some other way; and*
 - any detrimental effect on the environment, including the landscape and recreational opportunities, and the extent to which that could be moderated."*
- 2.30 Other Policy considerations include the consistency of the amended scheme against the Development Plan and prevailing policy guidance in the NPPF [Ref: 13.011] and other documents that represent appropriate and noteworthy material considerations, as identified within Chapter 4 of the original ES [Ref: 13.01].
- 2.31 Detailed consideration of the relevance of the proposals that are the subject of the s73 application to planning policy is provided as part of the Planning Statement [Ref: 13.014] submitted alongside the application. In summary, the Statement concludes that the minor material amendments proposed will involve only very limited changes to the approved physical form of development at Woodsmith Mine. Changes are restricted to the minehead site only, and are predominantly associated with the use of alternative construction techniques that offer an efficient means of minehead development. The precise layout and scale of the buildings at the site are adjusted to allow for this new approach to construction, but the extent of physical changes will not materially affect the overall nature of the minehead built form at the site.
- 2.32 As stated above, the pre-eminent policy consideration (i.e. the MDT) is identical to that in 2015. The proposed amendments to the scheme do not influence the 'performance' of the development

against the requirements of the MDT, and hence the principles that supported a positive outcome for the original application remain. The amended scheme retains its status as a scheme of national importance, its contribution towards sustainable economic growth is substantial; and it continues to offer long-term positive economic benefits for the region.

- 2.33 It is therefore concluded that, in the context of the MDT, the exceptional circumstances that justified approval of the original application are unchanged and that there are no other changes in policy or circumstances that suggest an alternative outcome for the application is appropriate.

3.0 Description of Changes to the Development

Revised Plans

3.1 The purpose of the s73 application is to seek permission to amend various plans attached to planning permission NYM/2014/0676/MEIA (condition 5).

3.2 Appendix 4 to this SES includes copies of the amended plans identifying the changes to the Development and a schedule detailing which plans are being replaced or are no longer of relevance as a result of the s73 application. Table 3.1 identifies the new and replacement plans submitted as part of the s73 application and assessed as part of this SES.

Table 3.1 New and Replacement Plans submitted as part of s73 application

Plan Title	Reference Number
Proposed Site Plan and Block Plan	653-AP-0005 rev 4
Proposed Welfare Buildings Site Plan	653-AP-0006 rev 3
Proposed Mine Buildings Site Plan	653-AP-0007 rev 11
Proposed Hard Landscaping Plan	653-AP-0060 rev 4
Gatehouse – Proposed Plans, Sections and Elevations	653-AP-0032 rev 1
Mine Buildings 04 – Back-up Generator Plan, Section and Elevations	653-AP-0051 rev 5
Mine Building 05 – Intake Ventilation Shaft Plan, Section, Elevations	653-AP-0052 rev 5
Mine Building 06 – Substation Plan, Section and Elevations	653-AP-0053 rev 5
Mine Building 07 – Men and Material Shaft Winder Plan, Section and Elevations	653-AP-0054 rev 5
Mine Building 08 – Mineral Shaft Winder Plan, Section and Elevations	653-AP-0055 rev 6
Mine Building 09 – MTS Shaft Building Plan, Section and Elevations	653-AP-0056 rev 6
Mine Building Elevation Study	653-AP-0058 rev 4
Proposed Site Sections Sheet 01 and 02	653-AP-0008 rev 3 and 653-AP-0009 rev 14
MTS Scheme Operation Masterplan	YP-P2-CX-031 rev 12B
MTS Scheme Earthworks Strategy Construction Platforms	YP-P2-CX-033 rev 7B
Hours of Working	YP-P2-CX-080 rev 1B
Minehead Site Working Plan General Arrangement and Earthworks	YP-P2-CX-508 rev 9B
Minehead Site Working Plan Surface Water Drainage	YP-P2-CX-509 rev 2B
Minehead Site Working Plan – Lighting	YP-P2-CX-511 rev 1A
Proposed Minehead Existing Landscape Features	2309.MH01 rev 04
Proposed Minehead Removal of Existing Landscape Features	2309.MH02 rev 04
Proposed Minehead Restoration Proposals	2309.MH03 rev 07
Proposed Minehead Restoration Proposals – Cross Sections	2309.MH04 rev 06, 2309.MH05 rev 06 and 2309.MH06 rev 06
Proposed Mine and MTS Sub Surface Structures	1000 ENV DFS DWG 005 Rev 4

3.3 **The following previously approved plans are unchanged and remain of relevance to the s73 application:-**

Table 3.2 Previously Approved Plans which remain relevant (are unchanged as a result of the s73 application)

Plan Title	Reference Number
Mine and MTS Planning Boundary	Y5154-0102M-CJD1 rev 2
Site Location Plan	YP-P2-CX-550 rev 1
Existing Site Plan	653-AP-0002 rev 2
Existing Utilities and Borehole Locations	YP-P2-CX-510 rev 0
Miner's Welfare Facility - Proposed Floor and Roof Plans, Sections and Elevations	653-AP-0033 rev 0 and 653-AP-0034 rev 0
Miner's Welfare Facility - Elevation Study - Sheets 01 and 02	653-AP-0035 rev 0 and 653-AP-0036 rev 0
Existing Site Sections Sheets 01 and 02	653-AP-0003 rev 0 and 653-AP-0004 rev 0
Tree protection measures for works in highways at A171/B1416 right turn	2556.473.AIA.Whitby.YPL
Minehead Site Welfare Entrance General Arrangement	YP-P2-CX-043 Issue 0
[whilst not relevant to this s73 application, all plans relating to development at Lady Cross Plantation are also unchanged]	

3.4 **The following plans are submitted for illustrative purposes only and are considered in the SES where relevant:-**

Table 3.3 Plans provided for Illustrative Purposes only

Plan Title	Reference Number
MTS Scheme Earthworks Strategy Earthworks Bunds and Ponds	YP-P2-CX-032 rev 10B
Pyritic Mudstone Facilities and Temporary NHNI Waste Storage Facility	YP-P2-CX-036 rev 4B
Annual Progress Plan at Spring 2018	40-ARI-WS-71-CI-DR-1030 Rev B
Annual Progress Plan at Spring 2019	40-ARI-WS-71-CI-DR-1031 Rev B
Annual Progress Plan at Spring 2020	40-ARI-WS-71-CI-DR-1032 Rev B
Annual Progress Plan at Spring 2021	40-ARI-WS-71-CI-DR-1033 Rev B
Annual Progress Plan - Final Landforms	40-ARI-WS-71-CI-DR-1034 Rev B

Description of the Amendments to the Development

3.5 In summary, the amendments to the approved scheme comprise:-

- 1** Minehead Layout - Variations to the layout of buildings at the Minehead to include wider diameters for the Men & Materials and Minerals foreshafts. This variation replaces the need for the previously approved Drift mine access route, its associated on-site structures and the -45m level road network, as well as reducing the size requirement of the Intake Ventilation Equipment building;
- 2** Construction Methods and Sub-Surface Structures- Amendments to the construction methods associated with the above including the removal of two of the three 45m high temporary winding towers and revised groundwater management;
- 3** Shaft Diameters and Bunding – Adjustments to the shaft diameters and amendments to the non-screening bunding to the south of the main platform to accommodate the revised road layout and adjusted spoil quantities;

- 4 Water Attenuation – the relocation of the water attenuation ponds into the northern field, along with the addition of a Silt trap within the southern field;
- 5 Construction and Operational Platform Extension - an extension to the southern extent of the platform with a reduction in its width and the creation of access ramps; and
- 6 Internal Access Road – amendments to the route of the access road linking the approved Welfare Building to the Construction/Operational Platform location, and the associated relocation of the gatehouse.

3.6 Further detail on each amendment is set out below.

1. Minehead Layout

3.7 The s73 application seeks permission for the relocation, reorientation and amendment in size of the approved buildings at the Woodsmith mine site. The approved scheme includes a total floorspace of 12,276sq.m and the s73 scheme, a floorspace of 12,967sq.m, representing an overall net increase of 691 sq.m (less than 6%).

3.8 The changes, as set out in Table 3.4 below, can be described as follows:-

- the Men & Materials Shaft Winder building will be re-orientated and amended in shape to match the foreshaft requirements, removing the need for the 45m temporary headframe and reducing the building size;
- the Mineral Shaft Winder building will be re-orientated and will increase in size to accommodate the selected permanent winders and redesigned foreshaft, removing the need for the 45m temporary headframe;
- the Intake Ventilation Equipment building will be relocated closer to the Men & Materials Shaft Winder Building (to reduce power draw from the ventilation fans) and reduced in size, with Ventilation provided through the Men & Materials shaft;
- the MTS Shaft Building is increased in size to house an emergency winder; and
- the Backup Generator building will be reduced in size.

3.9 There are no changes to the substation and welfare building.

Table 3.4 Approved and revised building size

Building	Approved size (sq.m)	Proposed size (sq.m)	Difference (sq.m)
Men and Materials Shaft Winder Building	4,419	3,738	-681
Minerals Shaft Winder Building	1,642	4,231	2,589
Intake Ventilation Equipment Building	1,442	717	-725
MTS Shaft Building	449	640	191
Back-up Generator Building	1,024	341	-683
Substation Building	491	491	No change
Welfare Buildings	2,809	2,809	No change
Total	12,276	12,967	691

3.10 The maximum ridge heights for the revised buildings will be unchanged from the approved heights as follows:-

Table 3.5 Building heights as shown on the planning drawings and maximum ridge heights

Building	Approved Drawing Number	Max Ridge Height/m
Men and Materials Shaft Winder Building	653-AP-0054 Rev3	+212.8
Minerals Shaft Winder Building	653-AP-0055 Rev3	+212.8
Intake Ventilation Equipment Building	653-AP-0052 Rev3	+208.7
MTS Shaft Building	653-AP-0056 Rev4	+208.7
Back-up Generator Building	653-AP-0051 Rev3	+208.7

3.11 The assumed completion date of each of the buildings to allow permanent operations is as follows:-

Table 3.6 Assumed Timescales for Completion of Building/Availability for Operational Use

Name	Item	Date
Men and Materials Shaft Winder Building	Whole building	Spring 2019
Minerals Shaft Winder Building*	North and Central	Summer 2018
	South	Spring 2019
Intake Ventilation Equipment Building	Whole building	Spring 2021
MTS Shaft Building	Whole building	Spring 2021
Back-up Generator Building	Whole building	Spring 2021

Note: The North and Central parts of the Minerals Shaft Winder are 3,080 m² of the 4,231 m² building

3.12 In addition to the above, and for reasons described below, the approved Drift Tunnel and Portal structures are proposed to be removed. Staff will be transported to the Minehead via the realigned above ground road (realignment approved by an earlier s96a [Ref: 13.04] consent detailed in Section 2.0 of this SES) and access the mine via the Men & Materials Shaft building. This amendment also removes the requirement for the -45m level road network and the associated grouting and below ground structures.

2. Construction Methods and Sub-Surface Structures

3.13 The following changes to the construction methods are included as part of the s73 submission:-

- 1 utilisation of permanent winders and headframes for the Mineral Shaft Winder and Men & Materials Shaft Winder rather than using temporary headframes. The height of the temporary winders were limited to a ridge height of +212.5m AOD with an above ground height of 45m. Two of the three temporary headframes which had an identified adverse visual impact will not be needed. The third temporary winding tower at the MTS access shaft will be retained as per the approved scheme;
- 2 during the early part of construction, it will be necessary to use mobile D-wall rigs across the construction platform, with up to three rigs required (and two cranes per shaft/rig). The D-wall rigs are up to 26.2 metres high and are of a slender form;
- 3 Diaphragm wall construction for the three shafts (i.e. below foreshafts) is to be adopted to approximately 120 metres below ground (80m AOD);
- 4 the use of the permanent headframes at the outset means that an alternative means is required to allow access to the shafts as well as for spoil removal (all of which will need to occur below ground level during the entirety of the construction and operational phases). The new proposals therefore include the development of foreshafts above the Men & Materials Shaft (approximately 35m in diameter) and Minerals Shaft (approximately 32m in diameter). Spoil will be brought to the surface via lifting systems installed within the foreshafts. The Drift and bank level roads will not be constructed; and

- 5 the revised Construction and Operational Platform level and the use of Diaphragm walling (D-wall) techniques approved as part of a s96a application [Ref: 13.06] will localise the de-watering required around the Shaft areas to maintain the protection of the Special Area of Conservation (SAC).

3. Shaft Diameters and Bunding

- 3.14 Proposals include a reliance on a range of Shaft diameters for the Men and Materials, Minerals and MTS Shafts to allow for a greater level of flexibility during the construction phase. The approved internal diameters are 9.5m in width and the revised scheme proposes an internal diameter range of between 6.5m – 9.5m.
- 3.15 Adopting a range of shaft diameters impacts on volumes of spoil arising at Woodsmith Mine. Equally, changes detailed above also influence resulting spoil levels. It is estimated that adopting the diameters above, along with the wider s73 scheme changes will result in an overall decrease of spoil volumes of between 263,000-377,000m³ in comparison to the approved scheme, as shown in Table 3.4 below.

Table 3.7 Total spoil to be retained on-site (see exclusions in note below)

Area	As per Original ES (stated in SEI, Feb 2015)	s73 scheme: Maximum (9.5m Shafts)	s73 scheme Minimum (6.5m Shafts)
Basement and surface excavations for Shafts	66,816	12,000	12,000
Headframe Chambers / Foreshafts	21,058	101,400	101,400
Surface Preparation	249,556	95,600	95,600
Welfare Buildings and Associated Ponds	35,800	35,800	35,800
Ventilation Shafts	16,991	0	0
Minerals Shaft	105,978	86,370	44,565
Men & Materials Shaft	102,206	86,200	44,450
MTS Shaft	46,587	33,500	17,510
Pump and Cable Cubbies	6,790	3,400	3,400
45m level	24,201	0	0
360 Level	119,830	121,360	121,360
MTS Tunnel	233,516	265,900	265,900
Drift Portal and Tunnel	40,651	0	0
Total Unbulked	1,069,980	841,530	741,985
Bulking factor	1.15	1.15	1.15
Total	1,230,477	967,760	853,285

Note: Total Spoil figures exclude Hailite, Product/Non Product Grade Polyhailite and Non-hazardous low/high pollution material
Source: Arup

- 3.16 The updated spoil quantities have been incorporated into the s73 landscaping scheme, along with the revised road layout approved as part of a s96a application [Ref: 13.04] (Ref: NYM/2016/0845/NN, December 2016). This generates no material change in the layout and quantities of spoil in the approved screening bunds (namely Bunds A, B, F and G) which surround the Construction/Operational Platform. The non-screening Bund C is designed as a 'balancing area' to accommodate a range of spoil quantities. This results in a slight height differential of between 214 metres AOD and 214.5 metres AOD and differences in detailed bund form depending on the shaft diameters adopted.

- 3.17 The anticipated quantities of spoil are illustrated on Plan ref: YP-P2-CX-032- Rev 10B (Site General Arrangement Illustrative Earthworks Strategy Bunds and Ponds) and the overall layout of the spoil is highlighted Plan ref: YP-P2-CX-508 Rev 9B (Working Plan General Arrangement and Earthworks). Copies are provided at Appendix 4 of this SES.
- 3.18 As with the approved scheme, the 'Bund C' area will also accommodate temporary storage of spoil that will subsequently be relocated adjacent to the MTS shaft building, to complete the final bunding scheme in this area

4. Water Attenuation (Drainage Ponds)

- 3.19 The approved scheme shows two surface water attenuation ponds and a surface water wetland area that will be relocated further north within the site. The s73 application seeks approval for the relocation and amendment of the ponds to include three surface water ponds and a surface water wetland area, along with the addition of a narrow silt trap in the northern field. The relocation of the water attenuation ponds into a northern field removes the requirement to remove trees near Whinny Wood and the need to re-route a power line. In order to accommodate the revised location, the approved bridleway has also been re-routed around the ponds.

5. Construction/Operational Platform Extension

- 3.20 The approved scheme includes a single Platform level at between +199.64m and +201.18m AOD and the construction of a grout wall curtain along the west side of the Construction/Operational platform. Under a Section 96A application (Ref: NYM/2016/0845/NN, December 2016) [Ref: 13.04], a two tiered Construction and Operational Platform was approved for the northern extent of the Construction/Operational Platform at between +199.5m and +204m AOD. This removed the need for significant excavation and raised its elevation above the mean groundwater table, reducing the physical impact on the Moor Grit aquifer and Central Wet Heath/Mire area of the Ugglebarnby Moor SAC.
- 3.21 The levels of the southern extent of the Platform have now been finalised and are included as part of the s73 submission. The s73 submission also reduces the width of the Operational Platform area, although the requirement for a wider temporary Construction Platform remains during the construction phase, as per the approved s96A plans.
- 3.22 The increase in height of the Construction and Operational Platform has no implications for either the maximum AOD ridge height of the mine buildings or the MTS temporary winding tower that will both remain consistent with the approved building envelope.

6. Internal Access Road

- 3.23 Under a s96A application (December 2016) [Ref: 13.04], a revised road layout was approved to retain ease of access to the Construction and Operational Platform and to create a number of important highway efficiencies during construction. The s73 application extends this road to connect to the Construction/Operational Platform via a new ramp. The location of the Security Gatehouse has also been amended to reflect the revised position of the road.

Other Relevant Considerations

Phasing Plans

- 3.24 Condition 4 of the approved scheme (Ref: NYM/2014/0676/MEIA) enables the discharge of conditions for development at Woodsmith Mine to be considered on a phase by phase basis in accordance with the approved phasing plans (Ref. YP-P2-CX-500 – 206). However, taking into

account the difficulties in accurately predicting the progress of the project, it was agreed with the NYMNPA that the phasing approach could be broken down into key packages of work to better reflect on-site progress and priorities. To date, works proposed as part of the phasing submissions have included:-

- **Phase 1:** including off-site highways works;
- **Phase 2:** including general site clearance and preparation; construction of site roads and drainage works; the erection of the temporary construction welfare compound, car parking and perimeter fencing; and progression of the Construction Platform and spoil mounds;
- **Phase 3:** including erection of the Concrete Batching Plant; completion of the Construction Platform and platforms for the Construction Welfare Facility, Parking Area and Concrete Batching Plant; demolition of farm buildings; development of surface water drainage, drainage layer and temporary saline lagoon area; and establishment of construction welfare and security facilities; and
- **Phase 4:** includes the operation of the concrete batch plant, and bentonite/polymer plant, installation of concrete guide walls and Diaphragm wall construction.

3.25 Each revised phasing submission has been accompanied by a phasing Masterplan, detailing the specific elements to be included as part of the proposed package of works. This approach is expected to continue as future work packages are identified.

3.26 Hence the approved phasing plans are to be replaced with illustrative annual progress plans that both reflect submissions already made, thereby updating the original plans but also providing an enhanced understanding of future key packages of work, and how they interact.

3.27 It is also proposed that these annual progress plans become illustrative drawings rather than approved documents, to avoid the procedural need to formally amend drawings when amendments are made to the precise nature of construction activities planned for the site. The requirement remains to discharge the relevant phasing planning conditions and hence the NYMNPA retains control of on-site activities as appropriate, but the requirement for formal applications to adjust plan detail would be removed.

3.28 It is the case that the illustrative annual progress plans submitted with this s73 (Appendix 4) represent the anticipated programme of work at Woodsmith Mine going forward, and as such, this SES adopts the phasing as shown on these plans for assessment purposes.

Relevant Planning Conditions Proposed for Amendment

3.29 It is the purpose of the s73 application to vary the wording of a number of conditions of planning permission NYM/2014/0676/MEIA. Table 3.8 below summarises the reasons for the proposed amendments should the NYMNPA determine to grant consent for the s73 application.

Table 3.8 Summary of Planning Conditions Proposed to be Amended through the s73 Submission

Planning Condition in as per NYM/2014/0676/MEIA	Reasons for Proposed Change in s73 Application
Conditions which are directly referred to in the s73 application as requiring amendment	
Condition 5	Amendment to the drawing schedule to identify the approved and replacement plans showing the minor material amendments to the development
Other Conditions which may require amendment to 'tidy up' the permission	
Conditions 61 and 73	Amendment to drawing numbers to reflect the revised drawing schedule as well as the Glossary of Terms definition of permanent above ground structures

Planning Condition in as per NYM/2014/0676/MEIA	Reasons for Proposed Change in s73 Application
Condition 62	Amendment to drawing reference numbers to reflect the latest Basis of Design Report
Conditions 6, 44, 47, 51, 57 and 79	Reference to be made to the SES
Conditions 39 and 41	Reference to the 'ghost island' at the UGGLEBARNBY MOOR and shaft entrance to be removed as per a s96a application (May 2017) [Ref: 13.05]
Condition 45	Removal of references to the grout wall and replacement with reference to the revised groundwater management plan
Condition 4 and 94	Replacement of the reference to an approved phasing plan and replacement with annual progress plans

4.0 Scoping and Methodology

4.1 As stated in Chapter 1.0, this SES should be read in conjunction with the original ES (copy at Appendix 1).

Overall Assessment Methodology & Significance Criteria

4.2 For ease of interpretation and comparison, the methodology and the application of significance to any impacts identified in the course of undertaking the supplementary EIA remains unchanged from that undertaken for the original EIA of the wider project, as set out in Chapter 5 of the original ES (ES, September 2014) [Ref: 13.01]. The only exceptions to this occur where new or revised best practice guidance or legislation requires changes to the previous approach adopted or where consultees have requested variations to the previous approach. Where this is relevant, this is described in Sections 5.0 to 8.0 of this SES.

4.3 The original ES provided information on impacts arising during the construction, operational and decommissioning phases of development. As the proposed minor material amendments forming part of this s73 application apply to only the construction and operational phases of the development, no consideration has been given to decommissioning period as part of this SES. The conclusions and impacts identified in the original ES as it relates to the decommissioning period are considered to be unchanged.

Scoping

Request for an EIA Scoping Opinion (May 2017)

4.4 Section 5.5 of the original ES [Ref: 13.01] described the process of scoping the original EIA of the wider Project, which remains valid for this SES.

4.5 On 15 May 2017, a formal request for an EIA Scoping Opinion (see copy at Appendix 5 of this SES) was submitted to NYMNPA to establish and confirm those matters which need to be considered as part of this SES. The request made reference to Regulation 4 of the 2011 EIA Regulations [Ref: 13.03] which stresses the need to focus on those effects which are significant; other lesser effects need not be addressed as part of the EIA process. The scoping request also noted:-

- 1 That the starting point in scoping those matters requiring additional or supplementary examination is the original ES (September 2014) [Ref: 13.01] (as updated in February 2015) [Ref: 13.02] and the matters considered as part of that process; and
- 2 That whilst a s73 application is a new application for planning permission under the 2011 EIA Regulations that key planning conditions that ensure the implementation of any mitigation or monitoring measures identified in the original ES can be carried forward to any new permission relating to the s73 submission.

4.6 Against this background, the Scoping Request set out the view that the scope of the SES should include consideration of the following matters:-

- 1 Landscape and Visual Impact;
- 2 Geology and Hydrogeology;
- 3 Hydrology and Flood Risk; and
- 4 Noise and Vibration.

- 4.7 The submission of the EIA Scoping Request on 15 May 2017 preceded the coming into force of the Town and Country Planning (EIA) Regulations 2017 on 16 May 2017. In accordance with paragraph 76 of the 2017 EIA Regulations, which set out the relevant Revocation and Transitional Provisions, this means that the 2011 EIA Regulations [Ref: 13.03] continue to apply in relation to this SES.

EIA Scoping Opinion

- 4.8 On 30 June 2017, the NYMNPA issued its formal EIA Scoping Opinion (see Appendix 6 of this SES). The Scoping Opinion confirmed that the NYMNPA largely agreed with the view of Sirius Minerals regarding the proposed scope of the SES; it also highlighted a number of areas in which NYMNPA consider that specific detail or consideration should be given. Table 4.1 below provides a summary of how this SES response to the points identified in the Scoping Opinion.

Table 4.1 Summary of EIA Scoping Opinion (June 2017) and how it has been Addressed in the SES (July 2017)

Summary of Commentary in Scoping Opinion (June 2017) [See full text at Appendix 6]	Response on behalf of Sirius Minerals or where the information is provided in the SES (July 2017)
[Preamble noting the basis of submission of the scoping request and the development considered by NYMNPA in forming its Scoping Opinion]	Noted.
Consultation with relevant statutory bodies has taken place to inform this scoping opinion and, where appropriate, views received have informed its content	Noted. Where relevant to the assessments undertaken, this is considered in Chapters 5-9 of this SES and further detail of any additional discussions that have taken place is recorded.
Attention drawn to the requirements of Schedule 4 of the EIA Regulations (2011) and the need for the SES to be accompanied by any additional information relevant to the proposed development and to the environmental features likely to be significantly affected.	See Schedule 4.2 below which summarises where each requirement of Schedule 4 of the EIA Regulations 2011 [Ref: 13.03] has been addressed as part of this SES
General observations	
Need to ensure that, due to the scale, complexity and sensitivity (in locational and environmental terms) of the development originally permitted, and the need to ensure a rigorous approach to identification, assessment, and where necessary mitigation of any significant effects associated with the proposed amendments, that the SES is sufficiently comprehensive and presented with adequate clarity. Similarly, there is a need to address any implications arising from relevant changes to the environmental baseline and ensure clear signposting of any changes to effects identified in the SES.	Agreed. A thorough approach has been adopted in the scoping of matters to be addressed having regard to both relevant changes in the baseline (including those additional approvals granted under s96a [Refs: 13.04-13.06] as described in Chapter 2 of this SES). Other changes to the baseline considered in the original ES are described in 'Updated Baseline' provided within Chapters 5-9 of this SES. Concluding schedules are provided at the end of Chapters 5-9 and at the Conclusion of the SES (Chapters 11-12) to ensure that NYMNPA are fully informed on any anticipated changes to effects to those identified in the original ES.
Provide clear justification on the rationale for excluding any potentially relevant topics or matters which are not addressed, in order that the absence of significance can be clearly demonstrated.	Provided as part of the request for an EIA scoping opinion (May 2017, Appendix 5 of this SES). For clarity, and in response to this request, Table 4.2 below further summarises the key issues.
The SES should provide specific signposting to relevant conditions being amended, or elements of conditions, attached to the 2015 permission where they have informed the content of the SES	See Table 3.8 of this SES for a summary of planning conditions to be amended. The changes giving rise to the proposed amendments to wording of those conditions have been assessed as part of the SES.

Summary of Commentary in Scoping Opinion (June 2017) [See full text at Appendix 6]	Response on behalf of Sirius Minerals or where the information is provided in the SES (July 2017)
Landscape and visual effects	
Need to assess revisions to bund height/configuration, which should be quantified so far as practicable. This should include effects arising from any changes in timing of bund formation resulting from the revised construction methodology, as this may also have consequential implications for landscape and/or visual impact during the earlier stages of development.	Noted. The range of bund heights are defined in Table 3.7 of this SES and shown on Plan Ref: YP-P2-CX-032 Rev 10B. See Chapter 6 for a consideration of the effects during the construction period which has regard to the revised construction methodology.
Should consider the 2 selected photomontages used in the original ES (photomontage 06, B1416 and photomontage 11, A171 Robin Hoods Bay Road) during both the construction and operational periods. Night-time perceptual effects should be considered due to the amendment of operational scheme lighting arrangements and removal of the drift access, particularly with regard to special qualities, including tranquillity and dark night skies.	Photomontages are provided for both viewpoints in both the construction and operational periods. Night-time views have also been taken into account as part of the assessment at Chapter 6 of this SES.
Further consideration should be given to whether grouping receptors geographically is an appropriate basis for the visual impact assessment once further assessment has been carried out.	Noted and agreed. See commentary in Chapter 6 of this SES which describes the approach taken.
With reference to Cumulative ZTV mapping at construction stage, the NYMNPA understands that a range of options are under consideration and the visual assessment should consider the worst case scenario.	The revised construction methodology now proposes up to six crawler cranes initially, followed by the provision of a single temporary winding tower to assist in sinking the MTS shaft. Chapter 6 of the SES provides an assessment of this scenario.
Geology and hydrogeology effects	
Reference to previous comments by Natural England regarding any longer term cumulative impacts on groundwater levels which may arise as a result of the presence of shaft platforms and other elements of the constructed development throughout the life of the mine. These should be assessed with regard to any changes in construction methodology and reflected in monitoring and mitigation proposals where necessary. The assessment needs to take into account the potential for any effects on any groundwater dependent ecological receptors, including the spring flush located within Ugglebarnby Moor to the west of the site.	See table 7.3 of this SES which reports on further discussions with Natural England and the Environment Agency. These confirm that temporary dewatering from perimeter wells around the construction platform should be acceptable, subject to setting an appropriate groundwater level monitoring strategy and Trigger Values.
Ecology, Hydrology and flood risk	
A 'standalone' section on ecology should be provided to increase clarity and ensure that interested parties are able to readily identify how effects on ecology have been considered and, where necessary, addressed through mitigation in the SES.	Now provided as Chapter 9 of this SES.

Summary of Commentary in Scoping Opinion (June 2017) [See full text at Appendix 6]	Response on behalf of Sirius Minerals or where the information is provided in the SES (July 2017)
With regard to local flood risk management, it is confirmed that no specific comments have been raised by North Yorkshire County Council in their capacity as lead local flood authority.	Noted
Noise and vibration	
The assessment should consider the noise and vibration impacts arising from the proposed use of d-walling rigs during the construction phase as these items of plant are likely to be associated with relatively high sound power levels and would be operated over 24 hour periods.	See Chapter 5.0 of this SES
Issues scoped out of the SES	
<i>Traffic and transport</i>	
The Highways Authority has confirmed that it is content that traffic and transport be scoped out of the proposed SES.	Noted
<i>Recreation and amenity</i>	
In addition to considering the effects on recreation and amenity as a result of changes to landscape and visual effects, there may be potential for effects arising from other sources or types of impact, particularly including any changes to levels of noise and vibration. Where these arise, these should be clearly distinguished in the SES.	Where relevant to the conclusions of the SES, consideration has been given, and is reported, in Chapter 6 (Landscape and Visual Effects)
<i>Effects on special qualities</i>	
It may be necessary to give more detailed consideration in the SES to impacts on other special qualities to those identified in the scoping request, or which arise from effects other than landscape and visual matters, or noise and vibration and to ensure that any such effects are clearly distinguished in the SES.	Noted. The assessment process has not identified any other effects on Special Qualities that require consideration as part of this SES other than those considered in Chapter 6 (Landscape and Visual Effects).
<i>Consideration of main alternatives</i>	
Whilst it is acknowledged that permission for the development being scoped is to be sought in the form of an application for material minor amendments to development already permitted, it would be helpful if it is clear, in the application and through the SES, how and why the proposed changes have been derived and, in particular, how the potential for any changed scale or nature of environmental effects has informed the identification of the proposed amendments.	Paragraph 2.20 of this SES considers Alternatives and confirms that no specific alternatives have been considered by Sirius Minerals. However, Chapter 2 of this SES describes the background to the emergence of the changes to the construction methodology and the reasons for the s73 application. The changes have emerged through an iterative process of environmental testing and review by the contractors bringing forward the minehead development at Woodsmith Mine. Chapters 5 to 9 describe, where relevant, how those topics considered to be of particular relevance to the proposed changes have informed the emergence of the development.

Structure of the SES

4.9 The SES comprises two documents:-

- 1 Woodsmith Mine SES - Non-Technical Summary (July 2017)
- 2 Woodsmith Mine SES (July 2017) comprising technical assessments and appendices

4.10 The SES, when read in conjunction with the original ES, contains all the relevant information required in Part 1 of Schedule 4 of the 2011 Regulations (as amended) [Ref: 13.03] which is necessary to assess the environmental effects of the development as proposed to be amended as a result of the s73 application and at least the information provided in Part II of Schedule 4. It has been undertaken with reference to best practice.

4.11 As requested in the Scoping Opinion, Table 4.2 summarises the location of information relevant to this SES and specified in Schedule 4 as being reasonably or at least required:-

Table 4.2 Schedule 4 of the 2011 EIA Regulations - Location of information in the SES (July 2017)

Requirements of Schedule 4 of the 2011 EIA Regulations [Ref: 13.03] for Inclusion in Environmental Statements		Location of Information in the SES (July 2017)
Part I		
1	Description of the development, including in particular: (a) a description of the physical characteristics of the whole development and the land use requirements during the construction and operational phases; (b) a description of the main characteristics of the production processes, for instance, nature and quantity of the materials used; (c) an estimate, by type and quantity, of expected residues and emissions (water, air and soil pollution, noise, vibration, light, heat, radiation, etc) resulting from the operation of the proposed development.	Chapters 3, 5 to 9
2	An outline of the main alternatives studied by the applicant or appellant and an indication of the main reasons for his choice taking into account the environmental effects.	See paragraph 2.20; Chapter 2 (for background to the scheme)
3	A description of the aspects of the environment likely to be significantly affected by the development including, in particular, population, fauna, flora, soil, water, air, climatic factors, material assets, including the architectural and archaeological heritage, landscape and the interrelationship between the above factors.	Chapters 5 to 10
4	A description of the likely significant effects of the development on the environment, which should cover the direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects of the development, resulting from: (a) the existence of the development; (b) the use of natural resources; (c) the emission of pollutants, the creation of nuisances and the elimination of waste, and the description by the applicant of the forecasting methods used to assess the effects on the environment.	Chapters 5 to 10
5	A description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment.	Chapters 5 to 11
6	A non-technical summary of the information provided under paragraphs 1 to 5 of this Part.	Bound separately
7	An indication of any difficulties (technical deficiencies or lack of know how)	Noted under

Requirements of Schedule 4 of the 2011 EIA Regulations [Ref: 13.03] for Inclusion in Environmental Statements		Location of Information in the SES (July 2017)
	encountered by the applicant in compiling the required information.	Chapters 5 to 9 under 'Limitations and Assumptions'
Part II		
1	A description of the development comprising information on the site, design and size of the development.	Chapter 3
2	A description of the measures envisaged in order to avoid, reduce and, if possible, remedy significant adverse effects.	Chapters 5 to 11
3	The data required to identify and assess the main effects which the development is likely to have on the environment.	Chapters 5 to 9
4	An outline of the main alternatives studied by the applicant or appellant and an indication of the main reasons for his choice, taking into account the environmental effects.	See paragraph 2.20; Chapter 2 (for background to the scheme)
5	A non-technical summary of the information provided under paragraphs 1 to 4.	Bound separately

Consultation

- 4.12 The proposed amendments to the development have been the subject of consultation with NYMNPA, the Environment Agency and Natural England. Feedback from consultation has fed into the form of the amendments proposed at the Minehead site and the process of supplementary EIA.
- 4.13 In addition, Sirius Minerals has been liaising with the NYMNPA on a regular monthly basis. This process has enabled the Applicants to ensure the s73 application satisfies the determining authority's information requirements, whilst providing clarity on the amendments and early review of draft design proposals.
- 4.14 Further topic by topic consideration as to how consultation has informed and assisted the process of supplementary EIA is reported under 'Consultation' in Chapters 5 to 9 of this SES.

Referencing Guide

- 4.15 In discussion with NYMNPA, a request was made for assistance in identifying relevant documentation previously submitted for those issues relevant to the s73 application. This is to assist the authority in its decision making by allowing ease of cross-referencing to earlier submissions so that any changes to effects can be quickly identified.
- 4.16 The applicant has responded to this request in several ways:-
- 1 Appendix 1 to this SES provides a complete copy of the ES (September 2014) [Ref: 13.01] and the SEI (February 2015) [Ref: 13.02]. With reference to the agreed scope of this SES, the following chapters of both the ES and the SEI are of relevance:-
 - a Chapter 8 – Noise and Vibration
 - b Chapter 11 – Ecological Impacts
 - c Chapter 12 – Landscape and Visual
 - d Chapter 14 – Geology and Hydrogeology
 - e Chapter 15 – Hydrology and Flood Risk

- 2** The Scoping Opinion (Appendix 6 to this SES) establishes a series of key issues relevant to the proposed s73 minor material amendments on which the NYMNPA have requested that assessment work should focus as part of this SES. To assist cross-referencing with these issues, a summary table is provided at the start of each technical chapter of this SES which identifies where consideration of each issue was also addressed in the ES (September 2014) or the SEI (February 2015) (See Tables 5.1, 6.1, 7.1, 8.1 and 9.1).
- 3** As specified in paragraph 2.14, the baseline position for the s73 application is assumed to be the approved North Yorkshire Polyhalite Project (ref: NYM/2014/0676/MEIA) as updated by several s96a submissions [Refs: 13.04-13.06] made throughout 2017. Where additional information has been provided as part of those submissions which may be relevant in understanding the updated baseline position, cross-referencing is also provided as part of Tables 5.1, 6.1, 7.1, 8.1 and 9.1 (e.g. updated ecological survey data).

5.0 Noise and Vibration

- 5.1 An assessment of noise and vibration was undertaken as part of the original ES (Chapter 8) [Ref: 13.01] to reflect refinements to the approved scheme at Woodsmith Mine.
- 5.2 Impacts were predicted to be Negligible and therefore not significant at the identified nearest residential dwellings.
- 5.3 This Chapter considers the potential for noise and vibration impacts associated with the s73 application following modifications to the design proposals.

Reference Guide

Table 5.1 Cross-referencing Guide Covering Consideration of issues relevant to Noise and Vibration

Issue Under Consideration	Reference Guide
Use of Winding Rigs during Construction	ES (September 2014) – paras 8.3.114 (page 249), 8.3.128 (page 251) and 8.5.9 (page 264)
Impact of noise on recreational users	ES (September 2014) – paras 12.6.51-12.6.59 (page 550-554), Table 12.33 (page 228); s96a ref NYM/2017/0399/NM – Phase 4 NVMP (40-RHD-WS-870-EN-PL-0017, May 2017); plus discharge of condition applications for Phase 2 NVMP (RHDHV 007 Rev 1, January 2017), Phase 3 NVMP (40-RHD-WS-70-EN-PL-0016, April 2017), Phase 4 NVMP (40-RHD-WS-870-EN-PL-0017, May 2017)
Methodological Approach	ES (September 2014) - Section 8.3 (page 228 onwards)
Summary of Overall Impacts	ES (September 2014) – Table 8.48 (page 311); SEI (February 2015) – Table 18.1 (page 220)

Updated Policy Context

- 5.4 No significant update has been identified to Legislation, Policy or Guidance since the original ES.

Updated Assessment Methodology & Significance Criteria

Assessment Methodology

- 5.5 The original ES (Part 2, Chapter 8, Noise and Vibration) [Ref: 13.01] and SEI [Ref: 13.02] modelled and assessed noise and vibration impacts in respect of all construction elements in accordance with British Standard (BS) 5228:2009+A1:2014 Code of Practice for Noise and vibration control on construction and open sites [Ref: 13.015] and also the Department for Communities and Local Government (DCLG) (2014) Planning Practice Guidance – Noise [Ref: 13.016].
- 5.6 Ground borne vibration assessments can be drawn from the empirical methods detailed in BS5228-2:2009+A1:2014; in the Transport and Road Research Laboratory Research Report (TRRL) 246: Traffic induced vibrations in buildings [Ref: 13.018]; and within the Transport Research Laboratory (TRL) Report 429 (2000): Ground borne vibration caused by mechanical construction works [Ref: 13.017].
- 5.7 Impacts were predicted at the identified nearest residential dwellings to Woodsmith Mine, being:
- NSR1 Parkdown Bungalow, approximately 180m from the nearest site boundary

- NSR2 Thornhill, approximately 467m from the nearest site boundary
- NSR3 Moorside Farm, approximately 489m from the nearest site boundary
- NSR4 Moor House Farm, approximately 445m from the nearest site boundary
- NSR5 Soulsgrave Farm, approximately 400m from the nearest site boundary

5.8 The assessment methodologies have not changed, and the approach adopted in the original ES (Part 2, Chapter 8) [Ref: 13.01] and 2015 SEI [Ref: 13.02] remains valid.

Significance Criteria

5.9 The Significance Criteria remain unchanged from the original ES, however the thresholds have been amended in light of the approved scheme.

5.10 In the original ES, since the construction activities are comparable to surface mineral extraction, thresholds were based on guidance as identified in para 5.5.

5.11 These noise limits were considered appropriate and subsequently formed a basis for conditions NYMNPA-20 and NYMNPA-21. These conditions establish construction noise limits for activities to be carried out for the approved scheme as:

- 55dB $L_{Aeq,1hr}$ for daytime (07:00 – 19:00);
- 65dB $L_{Aeq,1hr}$ for the demolition of buildings and erection of new structures;
- Up to 70dB $L_{Aeq,1hr}$ for temporary noisy operations to provide noise-reducing earth bunds and / or barriers; and
- 42dB $L_{Aeq,1hr}$ for evening and night-time (19:00 – 07:00).

5.12 In this s73 assessment, it is these conditioned noise limits (i.e. absolute limits rather than limits referenced to a baseline) that are used. These are consistent with Noise and Vibration Management Plans ('NVMP') submitted in respect of the approved scheme (see Table 5.1). Where the predicted noise level associated with the s73 scheme does not exceed the planning condition threshold at the identified receptors, this is interpreted as having no change in the significance of impact.

5.13 The original ES concluded that noise predictions indicate that the impact of all activities associated with the operational phase will be no more than Negligible at any of the surrounding residential receptors.

Consultation

5.14 The Scoping Report noted that the Drift Tunnel is removed from the site as part of the changes indicated in this s73 application. It set out that the proposed changes to the s73 scheme (outlined earlier in this document) are not anticipated to result in any noise and vibration impacts which are materially altered from those considered in the original ES.

5.15 Furthermore, mitigation measures specified by planning conditions NYMNPA-18-25 and NYMNPA-26-33 are proposed to be carried forward to ensure that the noise and vibration effects will not have a significant impact. These include the setting of noise limits for a range of activities, the production of noise and vibration, and blasting vibration, management plans, and noise and vibration monitoring.

5.16 Phase-specific mitigation measures to control noise and vibration will be set out in these management plans, based upon the specific construction methods and plant to be utilised within each construction phase and the prediction of noise levels at identified receptors.

- 5.17 The Scoping Opinion received from NYMNPA (Appendix 6 to this SES) stated that the proposed use of d-walling rigs during the construction phase could be of significance in terms of noise due to their sound power levels and 24-hour operation. It was therefore requested that impacts associated with this change to the construction methodology are addressed in the SES (paragraph 3.10 refers):

Para. 5.37 and 5.38 suggest that removal of the drift access arrangements and their replacement with direct surface transfer of personnel to the mine head buildings is likely to be the main change impacting on the noise climate. Whilst this may be the case at operational stage, it is considered that the proposed use of d-walling rigs during the construction phase could also be of significance in terms of their implications for noise and vibration, as these items of plant are likely to be associated with relatively high sound power levels and would be operated over 24 hour periods. It is important that noise and vibration impacts associated with this change and other proposed construction-stage changes are clearly addressed in the SES.” (Page 5, NYMNPA Scoping Response, June 2017).

Assumptions and Limitations

- 5.18 As above this assessment follows the methodology adopted in the original ES. For this SES, assumptions were:
- Noise level predictions were made using CadnaA noise modelling software using the environmental propagation methodology detailed in BS5228:2009+A1:2014.
 - Sound power levels of plant and equipment used during the construction phase were obtained from data sheets provided by the manufacturer, the EU Directive 2006/42/EC on machinery, or from BS5228:2009+A1:2014 (see detail in Appendix 7).
 - Stationary items of plant and equipment, such as generators, were modelled as point sources. Mobile plant were modelled as line sources operating within the anticipated areas of work for the relevant activity. On-times of plant and anticipated hours of working per day are based on information provided by the project team (see detail in Appendix 7).
 - Topographical data, including associated soil bunds, mounds or other acoustic screening to be constructed during Phase 4, were included in the CadnaA noise model based upon Drawing 40-ARI-WS-71-CI-DR-1030 – Illustrative Annual Progress Plans Spring 2018.
 - A conservative approach was adopted for the Spring 2018 scenario based on Maximum construction activity during the reference daytime, evening and night time periods.

Updated Baseline Conditions

- 5.19 Ongoing noise monitoring is being undertaken at boundary and receptor locations around Woodsmith Mine, in line with planning conditions governing the approved scheme, the s73 assessment does not consider there have been any alterations to baseline conditions within the site or the surrounding area. The assessment is carried out against planning condition noise limits.

Potential Impacts

Built-In Mitigation (or Mitigation assumed to be Built-in to future phases)

- 5.20 A range of noise mitigation measures were developed for the scheme during the preparation of the original ES, including acoustic screens along the western site boundary. The original principles underlying these measures remain relevant and have been incorporated from the outset in the s73 scheme design (see for example Drawing 40-ARI-WS-71-CI-DR-1030) (See

Appendix 4 to this SES). Furthermore, adoption of the measures required by planning condition on the approved scheme (eg NVMP) will further serve to ensure noise impacts remain at or below the levels assessed. Construction phase specific NVMPs, based on noise modelling to enable the prediction of noise levels at identified receptors, will specify measures similar to those in NVMPs submitted for the approved scheme (for example 40-RHD-WS-70-EN-PL-0017 [Ref: 13.019] submitted to discharge Condition NYMNPA-18 for the Phase 4 construction works) (see also Appendix 8 to this SES for copy of NVMP). Such measures would include, where necessary:-

- 1 Additional soundproofing or restrictions on the use of particularly noisy plant, for example the d-wall cutters and associated bentonite plant, during evening and night-time periods;
- 2 Restrictions on the use of concreting activities, batch plant or crane operations during evening or night-time; and
- 3 Enclosure/screening of batch plant and bentonite plant generators will be using temporary or semi-permanent acoustic screens.

During Construction (Noise)

- 5.21 In respect of the s73 application, a worst-case construction scenario is considered to be represented by the proposed activities and works detailed in the ‘Spring 2018’ indicative phase. This phase includes the operation of the d-walling equipment and associated plant (as specifically requested to be considered in the Scoping Opinion), as well as the concrete batching plant and bentonite plant, together with general construction and earthworks activity. Model inputs and assumptions are as set out above. It is therefore considered that an assessment of the ‘Spring 2018’ phase satisfies the need to consider the use of d-walling rigs and the other changes likely to impact on the noise climate during the construction phase.
- 5.22 A drift tunnel was proposed as part of the approved scheme but the noise and vibration impacts identified noted as associated with the initial tunnelling are avoided as the tunnel is no longer to be constructed.
- 5.23 The predicted results from the CadnaA noise model of the ‘Spring 2018’ indicative phase are below the thresholds provided in Conditions NYMNPA 20 and 21, as shown in Table 5.2.

Table 5.2 Calculated Noise Levels – 2018 Phase

Receptor Location	Maximum L _{Aeq,1hr} (dB)			
	Daytime (07:00 – 19:00)	Impact Significance	Evening and Night (19:00 – 07:00)	Impact Significance
Parkdown Bungalow	52.4	Negligible	39.0	Negligible
Thornhill	48.2	Negligible	40.0	Negligible
Moorside Farm	42.4	Negligible	32.2	Negligible
Moor House Farm	49.8	Negligible	40.1	Negligible
Soulsgrave Farm	49.8	Negligible	38.5	Negligible

- 5.24 Based on this modelling of the worst-case phase (incorporating d-walling activities within the proposed s73 amendments) it can be determined there are no changes in the significance of impact for each of the identified receptor locations for the worst-case daytime, evening and night time assessment periods for the assessed s73 scheme.

During Construction (Vibration)

- 5.25 A series of calculations were carried out based on typical construction activities, applying reasonable worst-case assumptions, in order to determine set-back distances at which critical

vibration levels may occur. These were presented in the ES, SEI and Table 5.3 reproduces the minimum set-back distances at which vibration levels of reportable significance are predicted to occur. A 66.6% certainty factor (i.e. an additional tolerance) was included in the relevant calculation methods in order to ensure a conservative approach.

Table 5.3 Predicted Distances at which Specific Vibration Levels Occur

Activity	Set-back Distance at which Vibration Level (PPV) occurs			
	0.3 mm/s	1.0 mm/s	10 mm/s	15 mm/s
Vibratory Compaction (Start-up)	166m*	65m	9m	6m
Vibratory Compaction (Steady State)	102m	44m	8m	6m
Vibratory Piling (Start-up)	154m*	56m	8m	6m
Vibratory Piling (Steady State)	75m	32m	6m	5m
Tunnelling	137m*	54m	9m*	7m*
HGV Movement on uneven Haul Route	277m	60m	3m	2m

Note (*): These predicted distances are outside the limitations of the calculations and are provided for information only

- 5.26 All identified sensitive receptors are at least 180m from the nearest site boundary, indicating that the only potential source of perceptible vibration at a sensitive receptor would be HGV movements. HGV movements for the s73 scheme will be maintained within levels conditioned for the approved scheme and the minimum distance between the primary haul route and any of the surrounding receptors is over 400m.
- 5.27 Applying the set-back distances shown above the s73 scheme, ground-borne vibration levels will be significantly lower than 0.3mm/s at all considered receptors, i.e. below levels which are considered to be just about perceptible in residential environments. It can therefore be determined there are no changes in the significance of impact for each of the identified receptor locations for the assessed s73 scheme.

During Operation (Noise and vibration)

- 5.28 Negligible noise and vibration impacts were predicted during the operational phase in the original ES. The Drift Tunnel is removed from the site as part of the changes indicated in this s73 application, but operational vehicle movements associated with the proposed access road will remain within limits agreed for the approved scheme. The frequency of operational movements will be below those during the construction phase (negligible effect) and will only involve minibus-type vehicles). As such there will not be a material effect on the noise climate and impacts at identified receptors will be negligible at worse. Other operational changes associated with the s73 scheme are also not considered to be significant and therefore the same conclusions as stated in the original ES apply.
- 5.29 The predicted noise levels from the operational phase stated in the SEI [Ref: 13.02] are reproduced in Table 5.4 for information.

Table 5.4 Calculated Noise Levels – Operational Phase

Receptor Location	Cumulative Operational Noise Level (dB)			
	Daytime (07:00 – 19:00)	Impact Significance	Evening and Night (19:00 – 07:00)	Impact Significance
Parkdown Bungalow	32	Negligible	25	Negligible
Thornhill	28	Negligible	24	Negligible
Moorside Farm	32	Negligible	25	Negligible
Moor House Farm	31	Negligible	23	Negligible

Receptor Location	Cumulative Operational Noise Level (dB)			
	Daytime (07:00 – 19:00)	Impact Significance	Evening and Night (19:00 – 07:00)	Impact Significance
Soulsgrave Farm	34	Negligible	26	Negligible

- 5.30 Based on the available information the proposed changes to the scheme covered by the s73 scheme are not anticipated to result in any noise and vibration impacts which are materially different to those considered in the original ES.

Additional Mitigation Measures

- 5.31 No further specific mitigation has been identified as necessary as a result of the s73 scheme during either the construction or operational periods.

Updated Residual Impacts

- 5.32 The residual impacts of the consented scheme, outlined in the original ES, remain appropriate and would be unchanged by the scheme changes proposed during both the construction and operational periods.

Summary & Conclusions

- 5.33 Based on the predicted results from the CadnaA noise modelling of the worst-case phase of the s73 scheme, and consideration of vibration effects, there are no changes in the significance of impact for any of the identified receptor locations compared with the approved scheme (see Table 5.5).

Table 5.5 Comparison of Noise and Vibration Impacts for Approved and s73 Scheme

	Approved scheme Maximum impact for all phases	s73 scheme Maximum impact (2018 phase)
Construction Phase		
NSR1	Negligible	Negligible
NSR2	Negligible	Negligible
NSR3	Negligible	Negligible
NSR4	Negligible	Negligible
NSR5	Negligible	Negligible
Operational Phase		
NSR1	Negligible	Negligible
NSR2	Negligible	Negligible
NSR3	Negligible	Negligible
NSR4	Negligible	Negligible
NSR5	Negligible	Negligible

6.0

Landscape and Visual Impact

6.1

A landscape and visual impact assessment (LVIA) was included as part of the original ES [Refs: 13.01-13.02]. This assessment has been prepared to identify possible changes in landscape and visual impact between the approved development and the S73 scheme.

Reference Guide

Table 6.1 Cross-referencing Guide Covering Consideration of issues relevant to Landscape and Visual Impact

Issue Under Consideration	Reference Guide
Bund heights	ES (September 2014) - para 12.5.44 (page 525)
Winding Towers (during construction)	ES (September 2014) – Section 12.3 (pages 483-484); Section 12.5 (pages 519-525); Section 12.6 (pages 530-554); paras 12.11.2, 4, 5 and 7 (pages 572-573) SEI (February 2015) – Para 12.1.5 (Page 158); Para 12.1.13 (Page 159); Para 12.2.7 & 12.2.8 (Page 162); Para 12.2.12 & 12.2.13 (Page 163); Para 12.2.16 (Page 163); Para 12.2.19 (Page 164); Para 12.5.1 (Page 166)
Night-time views (during construction and operation)	ES (September 2014)- para 12.4.67 (page 497); para 12.4.143 (page 515); para 12.11.6 (page 573); Appendix 12.6 SEI (February 2015) – para 12.2.8 (page 162)
Consideration of Viewpoint 06 (B1416)	ES (September 2014) - para 12.4.127 ((page 512); table 12.17 (page 542); para 12.6.33 (page 544); table 12.26 (page 553); para 12.6.59 (page 554); table 12.33 (page 563); table 12.36 (page 565); para 12.8.8 (page 567) SEI (February 2015) – para 12.1.8 (page 160); para 12.2.15 (page 163)
Consideration of Viewpoint 11 (A171 Robin Hoods Bay Road)	ES (September 2014) - para 12.3.28 (page 487); para 12.4.97-98 (page 506); para 12.4.103 (page 507); para 12.4.129 (page 512); para 12.6.12 (page 533); para 12.6.53 (page 551); table 12.26 (page 553); para 12.6.59 (page 554); table 12.36 (page 565) SEI (February 2015) - Para 12.1.14 (Page 159); Para 12.1.18 (Page 160); Para 12.2.7 (Page 162); Para 12.2.11 (Page 163); Para 12.3.1 (Page 166)
Effect on Special Qualities: Tranquillity and Dark Night Skies	ES (September 2014) - para 12.2.4 & 12.2.9 (page 478); para 12.4.65 - 12.4.67 (page 497); para 12.4.84 (page 502); para 12.4.143 (page 515); table 12.13 (page 534); table 12.31 (page 559); para 12.8.7 (page 567); table 12.39 (page 569); para 12.11.6 (page 573) SEI (February 2015) - Table 17.1 (Page 210); Para 17.2.3 & 17.2.6 (Page 212); Para 17.2.24 (Page 215); Para 17.4.2 (Page 217); Para 17.4.5 (Page 217)
Impact of landscape and visual changes on recreational users	ES (September 2014) - para 12.6.51 - 12.6.55 (page 551-552); table 12.24 (page 552); table 12.35 (page 564)
Contribution of SuDS to landscape and views	ES (September 2014) - para 12.5.22 (page 520) ;table 12.5 (page 524) SEI (February 2015) – para 12.2.1 (page 161)
Explanation of grouping of receptors for assessment purposes	ES (September 2014) - para 12.3.11 (page 484); para 12.3.17 (page 485)
Methodological Approach	ES (September 2014) - para 12.3 (pages 482- 487)

Issue Under Consideration	Reference Guide
	SEI (February 2015) – para 12.1.1 (page 157)
Summary of Overall Impacts	ES (September 2014) - para 12.11 (pages 572-573) SEI (February 2015) – table 18.1 (page 220)

Updated Policy Context

- 6.2 No significant changes have been identified in the national or local policy context for landscape and visual matters since preparation of the original ES. The implications of the S73 scheme to planning policy remain as identified in the ES (September 2014) (Part 2 Chapter 12 Section 1.9) [Ref: 13.01].

Updated Assessment Methodology & Significance Criteria

Assessment Methodology

- 6.3 For consistency, and to allow ready comparison with previous findings, the methodology used in the preparation of this assessment and supporting information, including Zone of Theoretical Visibility (ZTV) mapping and photomontages remains the same as set out in the original ES. This includes:-
- Guidelines for Landscape and Visual Impact Assessment, Third Edition, Landscape Institute and Institute of Environmental Management and Assessment, 2013 [Ref: 13.020], as adapted by Estell Warren Ltd and set out at Part 2 Appendix 12.1 of the ES (September 2014);
 - ZTV mapping prepared in accordance with Part 2 Chapter 12 (12.3.11 to 12.3.17) of the ES (September 2014) [Ref: 13.01];
 - Photomontages updated in accordance with Part 2 Chapter 12 (12.3.22 to 12.3.24) of the ES (September 2014) [Ref: 13.01]; and
 - The assessment is based on updated scheme drawings (Appendix 4 to this SES).
- 6.4 For ZTV mapping the aim of this assessment is to identify whether there is a significant difference between the visual envelopes of the S73 scheme and the approved scheme at construction and operational stages. Where a significant difference in the height or extent of S73 features has been identified compared to the approved scheme, updated ZTV maps (see Appendix 9 to this SES) have been prepared to show the comparative extent of ZTV associated with S73 and approved schemes. Where no significant difference between the height or extent of features occurs between the two schemes (for example for operational stage buildings, due to the similarity of building heights and positions) the approved scheme ZTV mapping has not been updated and may be used to identify ZTV for the relevant S73 scheme features. Cumulative ZTV mapping has been updated to show the difference in extent of influence arising from tall structures during the construction stage and is reported in Chapter 10 of this SES.
- 6.5 To aid understanding of landscape character and visual changes arising from the S73 scheme updated photomontages (see Appendix 10 of this SES) have been prepared from the two worst case viewpoint locations identified in the original ES:-
- Photomontage 06 (B1416) at the north west corner of the site, to illustrate effects within close range views; and
 - Photomontage 11 (A171 Robin Hood's Bay Road), lying in an open, elevated position east of the site with panoramic distant views across the whole extent of the site and showing the site in its wider landscape context.

- 6.6 This approach has been agreed with the NYMNPA as part of the Scoping response (Appendix 6 to this SES).
- 6.7 The photomontages have been updated to show the scheme at the following stages of construction and operation:-
- Construction platform complete, three D-wall rigs active, with screening to the north and east as provided by the temporary bunds shown on the Phase 3 masterplan;
 - Construction platform at Spring 2019, showing Mineral Shaft Winder and Men & Materials Shaft Winder buildings and MTS shaft temporary winding tower in place, with northern and eastern mounding remaining. This approach has been taken on the basis that the limited arisings from the shaft basements would not provide significant screening during the initial period of the construction stage.
 - The above stages of the construction period are considered to represent the ‘worst case’ construction condition for assessment purposes, showing the maximum levels of construction activity before permanent eastern screen bunding begins;
 - Year 1 of the operational stage, with mounds complete but no plant growth being shown; and
 - Year 15 of the operational stage, with planting shown at 5m height above ground level.
- 6.8 The base ground level for Photomontage 06 was previously established using a hand-held GPS device. The start of works on site has allowed this level to be verified by site survey resulting in the level being amended from 209m AOD to 208.53m AOD. This revised level has been used to produce the updated photomontage.
- 6.9 Updated scheme design drawings used in the preparation of this assessment comprise the following:
- 2309.MH01 Revision 04, Existing Landscape Features;
 - 2309.MH02 Revision 04, Removal of Existing Landscape Features;
 - 2309.MH03 Revision 07, Restoration Proposals;
 - 2309.MH04 Revision 06, Cross Sections (1:2500 scale);
 - 2309.MH05 Revision 06, Cross Sections (1:500 scale); and
 - 2309.MH06 Revision 06, Cross Sections (1:500 scale).

Significance Criteria

- 6.10 The significance criteria adopted in this assessment remain the same as used in the original ES. Moderate, moderate/ major and major landscape and visual impacts are considered to be likely significant environmental impacts in terms of EIA Regulations [Ref: 13.03].

Consultation

- 6.11 This assessment has taken on board comments made in the scoping responses (Appendix 6 to this SES) received from the NYMNPA and Natural England, including:-
- The assessment should take account of changes to screening bunds resulting from change to spoil volumes and construction methodology, including impacts arising from changes in the timing of bund formation;
 - The assessment should identify potential changes in night time perceptual effects due to the amendment of operational scheme lighting and removal of the drift access, including impacts arising due to changes in screen bunding south of the shaft platform;

- Impact on specific receptors should be included depending on the outcome of the initial assessment of impact on receptor groups, to ensure that appropriate consideration is given to any specific impacts on individual receptors and to allow more targeted mitigation to be developed if necessary; and
- Construction stage cumulative ZTV mapping should take account of possible impacts arising from the use of D-wall rigs. The SES should also address the potential worst case impact of up to six crawler cranes being in place during D-wall activities.

6.12 The NYMNPAs scoping response (Appendix 6) raises the question of whether D-wall rigs would be in place at the same time as the MTS shaft temporary winding tower. It is confirmed that this would not occur.

Assumptions and Limitations

6.13 Assumptions and limitation used during the preparation of this assessment remain the same as set out in the 2014 ES (Part 2 Chapter 12, 12.3.25 to 12.3.26) [Ref: 13.01].

Updated Baseline Conditions

6.14 Given the short timescale between this assessment and previous assessments baseline conditions within the site and the surrounding area are assumed to remain as previously identified in Part 2, Chapter 12, Section 1.4 of the 2014 ES [Ref: 13.01].

Potential Impacts

Built In Mitigation

6.15 A range of landscape and visual mitigation measures was developed for the scheme during the preparation of the original ES. The original principles underlying these measures remain relevant and have been incorporated from the outset in the S73 scheme design. Key LVIA mitigation measures incorporated into the S73 scheme are as set out below.

During Construction

6.16 The following mitigation measures have been built into the S73 scheme construction design:-

- Where possible, the existing woodland and plantation framework of the site has been retained to provide visual screening of construction operations. A key change from the approved scheme is the retention of mature coniferous plantation at Whinny Wood on the eastern edge of the site;
- Temporary topsoil and subsoil storage mounds would be sown to grass after being formed, to reduce the amount of visible bare soils across the site and provide localised screening of construction works (see Bund A below);
- Bund A, forming part of the northern screening bund, would be formed at the outset of the construction stage to screen close range views from the B1416 to the north west of the site to ground level construction activities and shaft top buildings and would be retained and remodelled as part of the permanent site landform;
- The eastern screening mound would be formed progressively from north to south during the construction period, gradually screening ground level construction activity. Completed areas of mounding would be sown to grass and planted at the first horticulturally sound opportunity after soils have been placed, to keep the amount of bare soils and spoil visible within the site to a minimum;

- Temporary structures and cabins within the construction site would be painted in neutral colours, reflecting the wooded backdrop to the construction site within open views from moorland areas to the east; and
- Construction lighting would be kept to the minimum necessary for safe working practice, to reduce glare and light spillage within the surrounding dark landscape.

During Operation

6.17 Mitigation measures built into the scheme design to reduce landscape and visual impact during the operational stage are as follows:

- Retention of existing woodland and plantation cover where possible, to provide immediate screening and lend a sense of maturity to the restored site;
- Construction of landform mounding to screen operational buildings and surface activities within the site and sympathetically reflect the wider topographical character of the Ugglebarnby Moor ridge;
- Restriction of building ridge heights to agreed maximum levels, developed in conjunction with screen mounding heights;
- Amendment of the eastern screening mound to ensure the screening of vehicles using the internal site access road and to minimise the potential for glare or light spill from vehicles using the internal road at night;
- Retention of existing woodland planting belts and provision of additional woodland and scrub planting across the Bund C area to screen potential winter night time views to the internal site road from the B1416, whether Bund C is constructed or not;
- Provision of the minimum level of lighting across the site to meet safe operational working practice and minimise impact on dark skies and tranquillity special qualities;
- Establishment of replacement and new native wetland, grassland, scrub and woodland habitats to ensure sympathetic integration of the operational site into its landscape setting and to achieve linkage of existing habitats and woodland cover across the Ugglebarnby Moor ridge; and
- Establishment and guidance of habitat development through a Landscape and Ecological Management Plan to ensure that landscape and biodiversity objectives for the operational site are achieved.

Impact During Construction

Construction Changes Potentially Affecting LVIA

6.18 A revised construction annual progress sequence is shown on Arup figures 40-ARI-WS-71-CI-DR-1030 to 1034 (Appendix 4), as shown in Section 3.0.

6.19 Proposed construction stage changes that could affect landscape and visual matters include:-

- Raising the shaft construction platform and an associated slower construction of the eastern and northern screening mounds;
- Use of D-wall rigs and up to six crawler cranes for the construction and excavation of foreshafts during the early part of the construction stage;
- Replacement of the temporary winding towers at the Mineral and Men & Materials Shafts with early construction of operational shaft top buildings (ahead of the eastern screening mound being formed);

- Moving the northern bank of SuDS ponds into an open field immediately north of the approved location (in Whinny Wood); and
- Other minor amendments to the construction site layout and equipment types which may also be visible (albeit they are not expected to result in noticeable change when compared to the approved scheme).

- 6.20 The 45m high temporary winder headgear at the MTS shaft would be retained as per the approved scheme and temporary lighting during the construction period would remain as previously assessed.
- 6.21 The proposed D-wall rigs reach up to 26.2m above ground level and would be set on platform levels up to 203.7m AOD. This compares to service and production shaft 45m high temporary winding towers set on a platform level of 200.7m AOD for the approved scheme. The D-wall rigs are also mobile and are relatively slender and transparent (at distance) compared to the solid mass of the enclosed temporary winding tower structures. Tall cranes would be used during D-walling and for the excavation of the foreshafts, as would occur with the approved scheme.
- 6.22 Within the approved scheme, the Mineral and Men & Materials Shaft temporary winding towers would have been in place for a period of 38-47 months. For the S73 scheme, up to three D-wall rigs would be operating over a period of approximately 12 months, following on from completion of the Construction Platform works.
- 6.23 After completion of D-wall works the rigs would be removed from site and the 45m temporary winding tower would be constructed at the MTS shaft. Cranes would also be used across the Construction Platform, as assessed for the approved scheme. For the greater part of the construction period the key change, in relation to tall structures and between the S73 and approved schemes, would therefore be a reduction in the number of 45m temporary winding towers from three to one.
- 6.24 Following construction of the diaphragm walls and excavation of the foreshafts, the permanent shaft top buildings and winders would be constructed at the Mineral and Men & Materials Shafts and used for hauling excavated shaft arisings to surface. These arisings (along with MTS arisings) would then be used to form screen mounding, firstly to the north and east of the Construction Platform, then east of the internal site road and finally in the Bund C area to the south of the Construction Platform. Within the approved scheme eastern and northern screen mounds would be constructed gradually over a period of approximately 3-4 years from the start of construction. Shaft top buildings would then have been constructed behind the screening bunds. For the S73 scheme, it is expected to take a similar period of time to construct the northern and eastern screening mounds. The S73 scheme would therefore result in the permanent Mineral Shaft Winder Building and the Men & Materials Shaft Winder Building being visible during their construction and for a period of 2-3 years until the northern and eastern screen mounds are completed.
- 6.25 Updated construction phase ZTV mapping has been prepared to compare the extent of the visual envelopes for D-wall rigs and the single temporary MTS winding tower against the three temporary winding towers associated with the approved scheme. The comparative visual envelopes have been overlaid on landscape receptors and visual receptors using with and without woodland models to identify potential worst case envelopes.
- 6.26 S73 scheme mound and building heights at the construction stage do not exceed those that were used to prepare 2015 SEI report [Ref: 13.02] ZTV mapping for mounds and ground level activity. On this basis the ZTV for revised construction stage mounds, buildings and ground level activity would remain the same as identified in the 2015 SEI [Ref: 13.02]. (for reference

these figures are 2307.MH ZTV LCA 03 rev 01, 2307.MH ZTV LCA 04 rev 01, 2307.MH ZTV VR 03 rev 01 and 2307.MH ZTV VR 04 rev 01).

Physical Impacts

- 6.27 The physical construction footprint of the S73 scheme would remain broadly the same as the approved scheme. The following scheme amendments would result in changes to previously identified physical impacts at the construction stage:-
- The northern bank of SuDS ponds has been moved to an adjoining pastoral field. Under the approved scheme this field was to be used for temporary spoil storage before being returned to agricultural use. The loss of the field and permanent replacement with SuDS ponds and associated habitat would represent a new permanent physical landscape change;
 - Under the approved scheme, the majority of Whinny Wood was to be felled to accommodate the northern SuDS ponds; the whole of Whinny Wood would now be retained as part of the S73 scheme; and
 - A small section of Haxby Plantation, at the western edge of the plantation near the site entrance, would now be retained a part of the S73 scheme.

- 6.28 Table 6.2 compares the extents of existing landscape features to be removed at the construction stage for the approved and S73 schemes:

Table 6.2 Removal of Existing Landscape Features

Feature to be removed at construction stage	Quantity (Approved Scheme)	Quantity (S73 Scheme)
Broadleaved woodland	1.7ha	1.7ha
Conifer plantation	11.3ha	11.1ha
Gappy and/or grown out hedgerows with trees	1450 linear metres	1450 linear metres
Agricultural land (currently in pastoral use)	27ha	30.8ha
Rough grassland with young trees/ scrub, including open windthrow areas within Haxby Plantation	4.1ha	5.1 ha
Area disturbed as part of earlier borehole drilling operations (stone platforms, earth banks)	3.7ha	3.7ha
Total area removed	47.8ha	47.8ha

- 6.29 The overall increase in area to be removed has increased from the 2014 ES figures [Ref: 13.01] shown above but remains the same as the extent of landscape that would be removed for the approved 2015 SEI [Ref: 13.02] scheme.
- 6.30 The identified difference in physical impact between approved and S73 schemes is not considered significant and would not alter the previously identified level of impact on the Coast and Coastal Hinterland (4b) Whitby – Cloughton LCA, which would remain **Minor adverse**.

Landscape Character Impacts

- 6.31 The following new ZTV figures have been prepared to inform comparison of the extent of visibility of approved scheme and S73 scheme tall structures (winding towers and D-wall rigs) against landscape receptors:-
- Figure 2354.MH ZTV LCA01 – approved temporary winding towers compared against proposed D-wall rigs, without woodlands;

- Figure 2354.MH ZTV LCA02 – approved temporary winding towers compared against proposed D-wall rigs, with woodlands;
- Figure 2354.MH ZTV LCA03 – approved temporary winding towers compared against the single MTS temporary winding tower, without woodlands;
- Figure 2354.MH ZTV LCA04 – approved temporary winding towers compared against the single MTS temporary winding tower, with woodlands;

6.32 The extent of influence of S73 construction stage mounds, buildings and ground level activity on landscape receptors would remain the same as identified in the 2015 SEI report (for reference these figures are 2307.MH ZTV LCA 03 rev 01 and 2307.MH ZTV LCA 04 rev 01).

6.33 Photomontage View 06A (B1416) has been updated from the approved scheme Photomontage View 06 to illustrate S73 scheme construction stage impacts at close range from the Moorland (1b) Central and Eastern Moors Landscape Character Area (LCA) to the north west of the site. Comparison of the approved scheme Photomontage 06 and the S73 Photomontage 06A during the construction stage shows that large scale intrusive elements, including foreground screen mounding and tall vertical structures (temporary winding towers, generator stacks and cranes for the approved scheme, D-wall rigs, generator stacks and cranes followed by a single temporary winding tower and cranes for the S73 scheme) replace the existing character of open agricultural fields with a distant wooded backdrop. Within Photomontage 06A the MTS shaft temporary winding tower is slightly out of view and is obscured by an existing electricity supply pole. Moving slightly south from the viewpoint the MTS temporary winding tower would be fully visible. For both schemes these new intrusive elements are of a similar scale and extent, with tall elements clearly breaking the skyline and drawing attention. For the S73 scheme proposed mounding and tall elements would be intervisible with the Moorland (1b) LCA at Ugglebarnby Moor in the west, resulting in **major adverse** impact across close range areas of the LCA, as for the approved scheme.

6.34 Photomontage View 11A (A171 Robin Hood's Bay Road) has been updated from the approved scheme Photomontage View 11 to illustrate S73 scheme construction stage impacts within views across the most open and elevated intervisible Moorland (1b) Central and Eastern Moors LCA to the east of the site. For both schemes the existing agricultural and wooded character of the site would change during the construction period to one of unnatural temporary landforms, temporary buildings, vehicle activity at ground level and tall structures that break the Ugglebarnby Moor ridge skyline. The scale and appearance of site construction activity, as a whole, during the D-wall stage, would be similar to that of the approved scheme, and would remain a disruptive influence on landscape character across the open moorland areas to the east of the site. At the single MTS winding tower stage of construction, the S73 scheme would again result in a similar disruptive influence on open moorland character as identified for the approved scheme, with the single winding tower remaining a prominent feature against the distant skyline. Overall the S73 scheme would give rise to moderate major adverse impact on the open Moorland (1b) LCA to the east of the site, as for the approved scheme.

6.35 In terms of initial screening provided by the eastern bund the approved scheme would provide marginally better enclosure of ground level activity. Within the overall context of construction activity at the site, however, this is not a significant difference and would not influence the magnitude of impact. For both schemes the eastern screening bund would be constructed from north to south, gradually enclosing ground level activity and buildings as construction progresses. The approved scheme phasing plans indicate that the approved scheme eastern bund would be partially built and restored (lower slopes) between months 6-25 after commencement of construction, and would be complete by month 51. For the S73 scheme the northern half of the eastern bund would be built and restored by Spring 2020 (approximately 30

months after the start of construction) with all bunds complete by Spring 2022. For both approved and S73 scheme the final part of the eastern bund, adjoining the Drill Platform near the MTS shaft, would not be built and restored until the last stages of construction. Overall, the differences in timing of construction of the eastern bund would not materially alter the screening of construction stage activity or the perceived scale and contrast of construction activity from intervisible areas to the east.

- 6.36 For the S73 scheme the Mineral and Men & Materials Shafts winder buildings would be completed early (by Spring 2019) and would be on view from areas to the east for most of the construction phase until the eastern bund is completed (see Photomontage 11A). Comparison of the approved scheme Photomontage 11 and the S73 scheme Photomontage 11A shows that the broad, low forms of the shaft top buildings would be less prominent within the landscape than the additional two temporary winding towers associated with the approved scheme. Construction work on the shaft top buildings would be visible for the S73 scheme but would have been screened in the approved scheme. This impact would be offset by the more visible construction activity that would have been involved in building and dismantling the two additional winding towers for the approved scheme. The change from using two additional winding towers to use of permanent shaft top buildings during the construction phase would provide a slight benefit when compared to the approved scheme but this would not be sufficient to alter impact thresholds identified for the approved scheme due to the overall level of disturbance associated with construction activity.
- 6.37 Inspection of new ZTV mapping (Figures 2354.MH ZTV LCA01 and 2354.MH ZTV LCA02) indicates that the broad extent of intervisibility between proposed D-wall rigs and surrounding LCA's is very similar to that identified for the approved scheme temporary winding towers. Whilst the D-wall rigs and cranes are less solid structures than the temporary winding towers, and could therefore be expected to have a lesser influence on wider landscape character, they are mobile, with the potential to draw attention through movement across the Construction Platform. Overall, it is considered that, subject to local context and degree of visibility, D-wall rigs and cranes used during the early part of the construction period would be perceived as intrusive features within the 0-3km zone and as perceptible features within the 3-6km zone around the Minehead. This would result in adverse landscape character impacts over a similar geographical area to those identified for the approved scheme temporary winding towers, but at a slightly reduced level of impact. It should be noted that a similar level of impact would have occurred during the pre-temporary winder tower period of the approved scheme, where tall cranes would have been used during the excavation of foreshafts.
- 6.38 Figures 2354.MH ZTV LCA03 and 2354.MH ZTV LCA04 demonstrate that the S73 scheme single temporary winding tower at the MTS shaft and the three temporary winding towers of the approved scheme would have a similar extent and distribution of intervisibility across the wider landscape. Whilst the reduction from three to one temporary winding tower would represent a lesser skyline disturbance, the single temporary MTS shaft tower would remain a disruptive feature within the landscape, drawing attention within an open landscape in a similar manner to that which would have occurred with three towers. On this basis, it is predicted that the adverse impact of the single MTS shaft temporary winding tower on landscape character, through the majority of the construction period, would be very similar to that identified for the approved scheme.
- 6.39 In terms of ground level activities, a comparison of approved and S73 scheme photomontages from View 11 indicates that, where intervisibility occurs, the overall scale of disruption resulting from construction activity would be very similar between the two schemes. The illustrative annual progress plans demonstrate that the key mitigation principle of constructing the eastern bund progressively from north to south would be retained. The main difference between the

schemes results from the earlier construction of shaft top buildings, with these being on view from the second year of the construction period in the S73 scheme. Within the wider context of construction activity across the site and the presence of tall structures, the static forms of shaft top buildings would not present an additional or noticeable level of adverse impact compared to the whole scene.

- 6.40 On balance, it is predicted that where full construction activity is visible (i.e. D-wall rigs with ground level activity, or the remaining MTS shaft temporary winding tower with shaft winder buildings and ground level activity), a similar adverse impact on landscape character would occur when compared to the approved scheme, due to the overall level of construction activity at the site. The visual presence of a single MTS shaft temporary winding tower would remain a disruptive influence within the landscape when compared to the presence of three temporary winding towers, resulting in a similar level of adverse impact on wider landscape character as identified for the approved scheme.
- 6.41 Based on the above, for LCAs that are intervisible with S73 scheme construction stage activities, likely significant impacts are predicted to remain the same as identified for the approved scheme and are summarised below:-
- Coast and Coastal Hinterland (4b) Whitby-Cloughton – **moderate adverse** generally with **moderate major adverse** local to the site;
 - Moorland (1b) Central and Eastern Moors – Ugglebarnby Moor, local to the site, **major adverse**; moorland areas east of the site, **moderate major adverse**;

Visual Impacts

- 6.42 The following new ZTV figures have been prepared to inform a comparison of the extent of visibility of approved scheme and S73 scheme tall structures against landscape receptors:-
- Figure 2354.MH ZTV VR01 – approved temporary winding towers compared against proposed D-wall rigs, without woodlands;
 - Figure 2354.MH ZTV VR02 – approved temporary winding towers compared against proposed D-wall rigs, with woodlands;
 - Figure 2354.MH ZTV VR03 – approved temporary winding towers compared against the single MTS temporary winding tower, without woodlands; and
 - Figure 2354.MH ZTV VR04 – approved temporary winding towers compared against the single MTS temporary winding tower, with woodlands.
- 6.43 From an inspection of the above ZTV mapping it is concluded that the extent of visual influence resulting from the S73 scheme tall construction structures and the range of visual receptors likely to be affected by tall structures is very similar to that of the approved scheme.
- 6.44 The extent of influence of the revised construction stage mounds, buildings and ground level activity on visual receptors would remain the same as identified in the 2015 SEI report (for reference these figures are 2307.MH ZTV VR 03 rev 01 and 2307.MH ZTV VR 04 rev 01).
- 6.45 Photomontage View 06A (B1416) has been prepared to illustrate the S73 scheme construction stage effects within close range views from the B1416 and adjoining public rights of way to the immediate north west of the site. An analysis of the changes between the approved scheme and S73 scheme impacts within the photomontage is provided at paragraph 6.33 above.
- 6.46 Photomontage View 11A (A171 Robin Hood's Bay Road) has been prepared to illustrate the S73 scheme construction stage effects within views from public rights of way, roads, access land and cultural heritage receptors that are set within the open and elevated moorland landscape to the

east of the site at Normanby Hill Top/ Latter Gate Hills/ Graystone Hills. An analysis of the changes between the approved scheme and S73 scheme impacts within the photomontage is provided at paragraph 6.34 to 6.36 above.

- 6.47 For visual receptors including users of the B1416 road, public rights of way and open access land at Ugglebarnby Moor to the immediate north west of the site Photomontage View 06A demonstrates that construction stage visual impact arising from the S73 scheme would remain similar to that identified for the approved scheme, resulting in **major adverse** and **moderate major adverse** worst case impacts close to the site.
- 6.48 To the immediate north of the site impact at the closest residential property, Parkdown, would remain **minor moderate adverse** from the house and **major adverse** from the garden, as identified for the approved scheme. Views of ground level activity and tall structures associated with the S73 scheme would remain visible.
- 6.49 To the north west and north of the site, upper sections of tall structures associated with the S73 scheme would remain visible against the skyline within distant filtered views from settlements (including Sneatonthorpe, Sneaton and Sleights), outlying properties, roads and public rights of way resulting in **minor moderate adverse** and **minor adverse** impacts as identified for the approved scheme.
- 6.50 To the north east and east of the site, a range of views would be possible to the S73 scheme, including filtered views to the upper sections of tall structures within lower lying wooded areas, open close-range views of tall structures close to the eastern edge of the site and open, panoramic views of the whole construction site and full extent of tall structures across open moorland areas around Graystone Hills (see Photomontage View 11A). S73 scheme changes to the construction site layout, early construction of shaft top buildings and reduction from three to one temporary winding tower would not change the overall scale or contrast of visible construction activity within available views when compared to the approved scheme. Impacts would gradually decrease as the eastern screening mound is progressively constructed from north to south. Worst case impact on visual receptors including settlements (Stainsacre, Low Hawsker and High Hawsker), individual residential properties, users of public rights of way and recreational routes (including the Coast to Coast Walk, National Cycle Route 1, Moor to Sea Cycle Route 2 and Cinder Track), roads, access land and cultural heritage sites would range from **moderate adverse** to **moderate major adverse**, as identified for the approved scheme.
- 6.51 Across open moorland areas to the south of the site, at Sneaton Low Moor and Low Moor, views would be possible to the upper sections of tall structures and to construction vehicle movements on the B1416, as for the approved scheme. Worst case impact on visual receptors including users of public rights of way and recreational routes (including the Coast to coast Walk and Moor to Coast Cycle Route 9), roads and access land would range from **moderate adverse** to **moderate major adverse**, as identified for the approved scheme.
- 6.52 To the west of the site, views of tall structures associated with the S73 scheme would be possible above the intervening wooded ridge of Ugglebarnby Moor from the western flank of Littlebeck Valley and the rising moorland flank of Sneaton High Moor and Goathland Moor beyond. Worst case impact on visual receptors including users of public rights of way and recreational routes (including the Coast to Coast Walk), access land, roads, visitors to the Blue Bank car park panoramic viewpoint and occupants of residential properties would be **moderate adverse**, as identified for the approved scheme.
- 6.53 In addition to the above, the range of lesser impacts, ranging from **minor adverse** to **minor moderate adverse** identified for the approved scheme would also occur with the S73 scheme.

Night Time Impacts

- 6.54 The Construction Platform would be operated 24 hours per day and would give rise to the same range of potential light sources as previously identified for the approved scheme. The night time context and setting for construction activities also remains the same as identified for the approved scheme. Construction stage lighting impact would therefore remain **moderate adverse**, as identified for the approved scheme.

Impacts on Special Qualities

- 6.55 The broad extent of intervisibility and impact levels associated with ground level construction activities and temporary tall structures associated with the S73 scheme would remain very similar to those identified for the approved scheme. Likely significant impacts on the special qualities of the North York Moors National Park, within the environs of the site, are predicted to remain as identified for the approved scheme:-

- Wide sweeps of open heather moorland: distinctive dales, valley and inland headlands – **major adverse**;
- Long imprint of human activity: a wealth of archaeology from prehistory to the 20th Century – **moderate adverse**;
- A rich and diverse countryside for recreation; an extensive network of public paths and tracks – **major adverse**;
- Tranquillity; dark skies at night and clear unpolluted air – **moderate adverse**; and
- A place of artistic scientific and literary inspiration; a heritage of authors, artists, scientists and explorers – **moderate major adverse** (Coast to Coast Walk).

Impacts during Operation

Operational Changes Potentially Affecting LVIA

- 6.56 Proposed operational stage changes with the potential to result in changes to landscape and visual impact include the following:-
- Raising of the Operational Platform;
 - Amendment of shaft top building positions and sizes;
 - Amendment of the Operational Platform lighting scheme;
 - Relocation of the northern SuDS ponds and retention of Whinny Wood;
 - Removal of the drift access, resulting in vehicles moving on the site road between the welfare facility and Operational Platform area, with potential impacts arising from moving vehicles and vehicle headlights;
 - Amendment of the entrance arrangement to the welfare facility, with relocated gatehouse and split road;
 - Amendment of final site contours to accommodate the new internal site road alignment and revised spoil quantities; and
 - Minor amendments to planting and seeding proposals to reflect the revised site layout.
- 6.57 In designing the new Operational Platform level and shaft top buildings, the vertical relationship between building ridge height and the height of the approved northern and eastern screening mounds has been retained. On this basis, the ZTV for revised operational stage buildings would remain the same as identified in the original ES.

- 6.58 Revised spoil quantities would remain similar to those of the approved scheme, enabling the eastern and northern screen mounds around the shaft top area to be constructed to approved scheme heights. To the south of the shaft platform and east of the revised internal access road, new mounds would be formed to a similar scale and height as for the approved scheme. As envisaged for the approved scheme the Bund C area, south of the shaft platform, would be used as a balancing area for spoil. Based on current spoil production figures Bund C would be reduced in height from 218.5m AOD to a maximum of 214.5m AOD. Depending on spoil generation, however, Bund C may be further reduced in height or may not be required at all.
- 6.59 The relocated northern SuDS ponds would be hidden from external views with no resulting intervisibility with surrounding landscape character areas or visual receptors. The retention of Whinny Wood and loss of the agricultural field occupied by the relocated SuDS ponds would represent new permanent changes to the landscape character and fabric of the site.
- 6.60 The revised lighting scheme for the site is shown on Arup drawing YP-P2-CX-511. Proposed lighting levels and fittings are designed to provide safe levels of lighting whilst minimising impact on the dark skies setting, as for the approved scheme.

Physical Impacts

- 6.61 The physical footprint of the S73 operational scheme would be broadly similar to the approved operational scheme. Minor physical landscape changes associated with the S73 operational scheme include the following:-
- Retention of all mature coniferous plantation at Whinny Wood;
 - Permanent loss of the agricultural field to the immediate north of Whinny Wood and replacement with the relocated northern SuDS ponds including associated grassland, wetland and woodland habitats;
 - Retention of a small area of mature coniferous woodland in Haxby Plantation near the site entrance;
 - Minor changes to swales, ponds and access tracks across the site; and
 - Minor changes to the proposed site landform and associated landscape proposals, to accommodate the proposed site layout changes.
- 6.62 The change in extent of landscape features within the operational site, between approved and S73 schemes, is set out in Table 6.3:

Table 6.3 Habitats to be Created at Site Restoration

Habitat to be added at restoration stage	Quantity (Approved Scheme)	Quantity (S73 Scheme)
Broadleaved native species woodland	9.6ha	13.8ha
Open scrub with grassland	16.1ha	16.2ha
Acid grassland	11.2ha	15.8ha
Wetland (SuDS retention ponds and wildlife ponds)	2.1ha	1.8ha
Total area of habitat to be created	39ha	47.6ha

- 6.63 Compared to the overall scale of the site and the approved scheme, none of the above changes are significant enough to alter the previously identified Year 1 operational impact on the physical landscape of the Coast and Coastal Hinterland (4b) Whitby-Cloughton LCA, which would remain **minor adverse**. The habitat content and layout of the S73 scheme is very similar to that of the approved scheme and would deliver the same long term **minor**

beneficial impact on the Coast and Coastal Hinterland (4b) Whitby-Cloughton LCA by Year 15 of the operational stage.

Landscape Character Impacts

- 6.64 The extent of influence of S73 operational stage buildings on landscape receptors would remain the same as identified in the 2014 ES (for reference these figures are 2307.MH ZTV LCA 05, 2307.MH ZTV LCA 06, and 2307.MH ZTV LCA 07) [Ref: 13.01].
- 6.65 The physical extent and juxtaposition of landscape and built elements within the site has not changed significantly between approved and S73 schemes. Building changes would occur within the limits of the approved scheme shaft top area. Impact on the landscape character of the site itself and the broader landscape character area within which the site lies would remain as identified for the approved scheme:-
- Coast and Coastal Hinterland (4b) Whitby-Cloughton LCA – **minor adverse** at Year 1, **minor beneficial** at Year 15.
- 6.66 With the retention of the approved scheme shaft top screening mounds, landscape proposals and the relationship to building heights, the external appearance and intervisibility of the S73 scheme with surrounding landscape character areas would remain the same as that of the approved scheme. S73 scheme changes to building sizes and locations would not materially affect wider landscape character, due to buildings remaining hidden behind screening mounds and planting.
- 6.67 The potential for increased adverse operational landscape character affects due to visibility of vehicles moving overland within the site rather than through the Drift has been mitigated through amended mounding and planting to the east of the internal road to screen internal site movements from external views. The appearance and character of the amended mounds south of the shaft platform is broadly similar to the approved scheme, and would not exceed approved scheme heights. Landscape proposals have been amended to suit the revised mound shapes, reflect the design principles established in the approved scheme and would have a similar appearance in external views.
- 6.68 Photomontage View 06A (B1416) has been updated from the approved scheme Photomontage View 06 to illustrate potential operational scheme impacts within very close range views to the north west of the site. As for the approved scheme, the existing scene of open fields and wooded backdrop with distant skylines beyond would be replaced initially with grassed screen mounding followed by scrub and woodland cover in the longer term, reflecting the enclosed, wooded nature of the B1416 further to the south. The timing of final mound formation and scrub development would be different between the two schemes. For the approved scheme, the final mound shape would be formed at the outset of the construction stage and scrub planting would be well established by Year 1. For the S73 scheme an initial temporary mound would be formed and then reshaped in Spring 2021. Photomontage 06A has been prepared to show a worst case situation of grass cover only on the S73 mound at Year 1, on the basis that scrub planting would not contribute significantly within the first year of planting. At Year 1 the approved scheme impact at this location would be **neutral**, based on the established scrubby mound being in keeping with adjoining landscape character, whilst that of the S73 scheme would be **minor adverse**, due to a lack of scrub planting development. By Year 15 scrub planting would be well developed for both schemes, resulting in **neutral** impact.
- 6.69 Photomontage View 11A (A171 Robin Hood's Bay Road) has been updated from the approved scheme Photomontage View 11 to illustrate potential amended operational scheme impacts across the most open and elevated intervisible landscape character areas to the east of the site. For both schemes, at Year 1 screening mounds would be visible as new man-made forms in the

landscape but would blend relatively well into the wooded, gently undulating Ugglebarnby Moor ridge and the undulating horizon beyond. Shaft top buildings remain partially visible at Year 1, for both schemes, but would subsequently be fully screened by mitigation planting (refer to Year 15 views). For both schemes the internal site access road, between welfare facility and shaft top, would be fully screened by mounding and planting. The partial removal of Whinny Wood forms a contrasting, gappy feature at Year 1 of the approved scheme. This impact is avoided with the S73 scheme. Amendment of the height of Bund C, to the south of the Operational Platform, is difficult to distinguish between the two schemes and does not constitute a significant change. Similarly, further possible reduction of Bund C to a lower height or to existing ground levels would not form a significant change within the overall scene. By Year 15 proposed mounding and planting, for both schemes, achieves the design aim of sympathetically blending the operational site into the wider Ugglebarnby Moor ridge and forming a connecting wooded area across the ridge. At Year 1 the S73 scheme would result in **minor moderate adverse** impact on the Moorland (1b) LCA due to the ‘new’ appearance of screening bunds and initial visibility of buildings, as identified for the approved scheme. By operational Year 15 both schemes would result in **minor moderate beneficial** impact on the Moorland (1b) LCA due to an increase in woodland cover and visual connectivity across the Ugglebarnby Moor ridge.

- 6.70 With the exception of the localised change from **neutral** to **minor adverse** at the immediate north west corner of the site impact on surrounding landscape character areas at the operational stage of the S73 scheme is predicted to remain the same as identified for the approved scheme:-
- Moorland (1b) Central and Eastern Moors LCA, from **minor adverse** (previously **neutral**) to **minor moderate adverse** at Year 1, from **neutral** to **minor moderate beneficial** at Year 15; and
 - **Neutral** across other North York Moors National Park LCAs, Scarborough Borough Council LCAs and the North Yorkshire and Cleveland heritage Coast.

Visual Impacts

- 6.71 The extent of influence of S73 operational stage buildings on visual receptors would remain the same as identified in the 2014 ES (for reference these figures are 2307.MH ZTV VR 05, 2307.MH ZTV VR 06 and 2307.MH ZTV VR 07) [Ref: 13.01].
- 6.72 Photomontage View 06A (B1416) has been prepared to illustrate S73 scheme operational stage effects within close range views from the B1416 and adjoining public rights of way to the immediate north west of the site. An analysis of the changes between the approved scheme and S73 scheme impacts within the photomontage is provided at paragraph 6.70 above.
- 6.73 Photomontage View 11A (A171 Robin Hood’s Bay Road) has been prepared to illustrate S73 scheme operational stage effects within views from public right of way, roads, access land and cultural heritage receptors that are set within the open and elevated moorland landscape to the east of the site. An analysis of the changes between the approved scheme and S73 scheme impacts within the photomontage is provided at paragraph 6.71 above.
- 6.74 The S73 scheme operational stage landform would be primarily seen from visual receptors to the east of the site and at the immediate north west corner of the site, with effects as analysed for Photomontage Views 06A and 11A, as described above. Retained mature woodland cover at Haxby Plantation and the Belt Plantations would enclose most views of the site from the south and west. Within distant views from elevated moorland areas west of the site shaft top building roofs would be partially visible above intervening mounds. Close range views of the restored site landform would be possible from Parkdown, to the north of the site. At Year 1 of the operational stage. Habitats on the restoration landform would be in varying stages of development, from newly seeded, to recently planted and more established planting, with restoration having

occurred progressively through the construction period. By Year 15 of the operational stage, woodland and scrub habitats would be well developed, would soften the visual appearance of screen bunding and would help to visually integrate the site into its wider landscape setting. Operational stage impacts for the S73 scheme would therefore remain the same as previously identified for the approved scheme, with the exception of Year 1 impacts on close range receptors at the north west corner of the site, as follows:

- In views from rights of way, access land and road receptors at the immediate north west corner of the site the S73 scheme would result in Year 1 **minor adverse** impact reducing to **neutral** impact by Year 15, compared to Year 1 **neutral** impact for the approved scheme;
- At Parkdown, Year 1 impact within views from the garden would be **minor moderate adverse**, reducing to **neutral** by Year 15;
- In views from visual receptors to the east of the site including occupants of settlements, users of public rights of way recreational routes, roads, access land and visitors to cultural heritage sites **minor moderate adverse** and **minor adverse impact** would occur at Year 1, changing to **minor moderate beneficial** and **minor beneficial** by Year 15, due to enhancement of the wooded character of the UGGLEBARNBY MOOR ridge; and
- In views from public rights of way and access land receptors to the west of the site impact at Year 1 would be **negligible adverse** reducing to **neutral** by Year 15.

6.75 In summary, visual impact during the operational stage of the S73 scheme would remain the same as identified for the approved scheme, with the exception of a change from **neutral** to **minor adverse** at Year 1 for landscape and visual receptors to the immediate north west corner of the site. No likely significant impacts would occur.

Night Time Impacts

6.76 An updated operational stage lighting impact assessment has been prepared for the S73 scheme at Appendix 11.

6.77 The potential for increased visibility of headlights associated with vehicles moving along the road generated by the removal of the Drift Portal and Tunnel has been mitigated through revised screen mounding and planting. This has been designed to contain potential sources of direct glare from vehicle headlights along the internal site access road and within the Operational Platform area. In terms of potential views from the B1416 to the internal site access road, existing woodland and younger planting along the section of road adjacent to Bund C is considered to be sufficiently dense to restrict summer and winter views into the site. Section C-C on figure 2309.MH05 shows that Bund C at 214.5m AOD height would provide landform enclosure and screening of the internal site road in views from the west. Should Bund C be further reduced in height or not constructed the combination of existing roadside planting and proposed woodland and scrub planting across the Bund C area would be sufficient to screen year round night time views towards the site from the B1416. In addition, the revised lighting arrangement for the Operational Platform has been designed to minimise the potential for glare and light spill impacts within a dark skies setting.

6.78 The updated lighting impact assessment has identified that, at Year 1 of the operational scheme, **negligible adverse** impact would arise from direct visibility of lighting due to light intrusion and luminaire intensity. As mitigation planting develops it is predicted that these negligible adverse levels of impact would gradually reduce. In terms of sky glow, **minor adverse** impact is predicted to arise at Year 1. Given the dark skies setting it is predicted that **minor adverse** impact, arising from sky glow, would remain throughout the operational life of the mine, as identified for the approved scheme.

Impacts on Special Qualities

- 6.79 The broad extent of intervisibility and impact levels associated with the S73 operational scheme would remain very similar to those identified for the approved scheme. As the scheme moves into the operational stage, the likely significant impacts on special qualities identified at the construction stage would reduce, as identified for the approved scheme:-
- Wide sweeps of open heather moorland: distinctive dales, valley and inland headlands – **minor adverse** at Year 1 changing to **minor beneficial** at year 15;
 - Long imprint of human activity: a wealth of archaeology from prehistory to the 20th Century – **neutral at Year 1 and Year 15**;
 - A rich and diverse countryside for recreation; an extensive network of public paths and tracks – **minor adverse** at Year 1 changing to **minor beneficial** at Year 15;
 - Tranquillity; dark skies at night and clear unpolluted air – **minor adverse** at Year 1 and Year 15; and
 - A place of artistic scientific and literary inspiration; a heritage of authors, artists, scientists and explorers – **minor adverse** at Year 1 changing to minor beneficial at year 15 (Coast to Coast Walk).
- 6.80 **Minor adverse** impact on the Tranquillity; dark skies special quality would remain throughout the operational period due to residual sky glow effects, as identified for the approved scheme.

Mitigation Measures

- 6.81 No additional mitigation measures are required as a result of the s73 submission during the construction, operational or decommissioning phases.

Updated Residual Impacts

- 6.82 LVIA mitigation measures have been built into the S73 scheme from the outset and have been taken into account when assessing impacts. On the basis that no further mitigation measures are possible or proposed the residual impacts will be identical to those identified earlier in this chapter.

Summary & Conclusions

- 6.83 The S73 scheme contains minor changes at the construction and operational stages of the project. These changes include amendment of the construction process, amendment of the construction layout and features, including early construction of some permanent buildings and amendment of the permanent site landform, the operational road and building layout and restoration measures. This supplementary environmental information has been prepared to assess possible changes to landscape and visual impact identified in the 2014 ES and 2015 SEI.
- 6.84 Updated ZTV mapping and photomontages have been used to assess whether the S73 scheme would result in different degrees or extents of landscape and visual impact when compared to the approved scheme. This assessment has identified that the S73 scheme would give rise to similar construction, operational and decommissioning degrees and extents of impact as identified for the approved scheme and would not exceed those impacts. The change from using three temporary winding towers to use of a single MTS shaft temporary winding tower would result in a decrease in the number of visible tall structures, although cranes would still be present across the site for the full construction period. Likely significant landscape and visual

impacts, ranging from **moderate adverse**, **moderate major adverse** and **major adverse** would occur during the S73 scheme construction period, as identified for the approved scheme.

- 6.85 At the operational stage, the S73 scheme would result in the same levels of impact as identified for the approved scheme for most landscape and visual receptors, with initial adverse impacts arising from visibility of new mounds and residual visibility of buildings. As mitigation planting develops these impacts would reduce and change to beneficial impacts over the long term. At the north west corner of the site the S73 scheme would result in **minor adverse** impact at Year 1 compared to **neutral** impact for the approved scheme. This would reduce to **neutral** impact by Year 15.
- 6.86 The S73 scheme would affect the same range of special qualities of the National Park as identified for the approved scheme and would result in the same degree of impact at the construction and operational stages. Residual **minor adverse** impact on the Tranquillity; dark skies special quality would remain throughout the operational stage due to sky glow effects, as identified for the approved scheme.
- 6.87 Cumulative construction stage landscape and visual impacts arising from the S73 scheme would remain the same as for the approved scheme in both degree and extent. No adverse cumulative impact would arise from the operational stage of the project, with **minor beneficial** cumulative impact occurring over the long term as restoration habitats develop.
- 6.88 Restoration proposals have been adapted to the S73 scheme and reflect the previously agreed principles of screening operational buildings and activity within the site, creating a variety of native wetland, grassland, scrub and woodland habitats across the site and delivering sufficient broadleaved woodland cover to link existing wooded habitats across the Ugglebarnby Moor ridge, on which the site is set. Revised restoration proposals would remain effective in assimilating the Minehead site into the National Park during the operational stage
- 6.89 In summary, the worst case impacts generated by the approved and S73 schemes are presented in Table 6.4 below:-

Table 6.4 Summary comparison of the landscape and visual impacts of the approved and S73 schemes

	Approved scheme	S73 scheme
Construction Phase		
Physical impacts	minor adverse	minor adverse
Landscape character impacts	moderate adverse, moderate major adverse and major adverse	moderate adverse, moderate major adverse and major adverse
Visual impacts	moderate adverse, moderate major adverse and major adverse	moderate adverse, moderate major adverse and major adverse
Night time impacts	moderate adverse	moderate adverse
Impacts on special qualities	moderate adverse, moderate major adverse and major adverse	moderate adverse, moderate major adverse and major adverse
Cumulative impacts	major adverse (locally), minor adverse (more distant areas)	major adverse (locally), minor adverse (more distant areas)
Operational Phase		
Physical impacts	minor adverse at Year 1 changing to minor beneficial by Year 15	minor adverse at Year 1 changing to minor beneficial by Year 15
Landscape character impacts	minor moderate adverse at Year 1 changing to minor moderate beneficial by Year 15	minor moderate adverse at Year 1 changing to minor moderate beneficial by Year 15
Visual impacts	minor moderate adverse at Year 1	minor moderate adverse at Year 1

	Approved scheme	S73 scheme
	changing to minor moderate beneficial by Year 15	changing to minor moderate beneficial by Year 15
Night time impacts	minor adverse (sky glow)	minor adverse (sky glow)
Impacts on special qualities	minor adverse (sky glow impact on Tranquillity; dark skies SQ)	minor adverse (sky glow impact on Tranquillity; dark skies SQ)
Cumulative impacts	neutral at Year 1, minor beneficial by Year 15	neutral at Year 1, minor beneficial by Year 15

7.0 Geology and Hydrogeology

- 7.1 This chapter of the SES considers whether the amendments to the development that form the basis of the s73 application will give rise to different impacts in respect of geology and hydrogeology to those identified in the original ES [Ref: 13.01].
- 7.2 The assessment considers the potential for direct impacts on groundwater quality and resources and, indirect impacts on dependant features such as habitats or water supplies. The potential for related land quality impacts is also considered. This chapter should be read in conjunction with Chapter 8 – Hydrology and Flood Risk – of the original ES that are inter-related to the consideration of impacts reported in this chapter.
- 7.3 This chapter should also be read in conjunction with the Hydrogeological Risk Assessment for the Section 73 Works at Woodsmith Mine, North Yorkshire [Ref: 13.028] which is provided at Appendix 12 of this SES.

Reference Guide

Table 7.1 Cross-referencing Guide Covering Consideration of issues relevant to Geology and Hydrogeology

Issue Under Consideration	Reference Guide
Impacts on groundwater dependent ecological receptors	ES (September 2014) - Table 14.7 (Page 625); Para 14.4.28 & 14.4.29 (Page 637); Para 14.4.82 (Page 648); Para 14.4.97 & 14.4.98 (Page 650); Table 14.16 (Page 652); Table 14.17 (Page 661); Table 14.18 (page 663); Table 14.19 (Page 666); Para 14.5.51 (Page 667); Para 14.6.3 & 14.6.4 (Page 669) ;Table 14.21 (Page 670); Para 14.6.12 (Page 671) s96a ref NYM/2017/0399/NM – Phase 4 Hydrogeological Risk Assessment (40-FWS-WS-70-WM-RA-0004 Rev 2, May 2017); plus discharge of condition applications for Phase 2 HRA (1433DevOR27 Rev 3, January 2017), Phase 3 HRA (HRA40-FWS-WS-70-PL-0005 Rev 5, April 2017), Phase 4 HRA (40-FWS-WS-70-WM-RA-0004 Rev 2, May 2017)
Longer term impact on groundwater levels due to presence of below ground structures	ES (September 2014) - Para 14.5.11 & Para 14.5.13 (Page 654); Para 14.5.14 & 14.5.15 (Page 655); Para 14.5.39 (Page 659); Para 14.5.43 (Page 659); Para 14.5.51 & 14.5.54 (Page 667); Table 14.20 (Page 668); Para 14.6.3 - 14.6.8 (Page 669); Table 14.21 (Page 670); Para 14.6.10 (Page 670); Para 14.6.12 (Page 671); Table 14.22 (Page 673); Table 14.23 (Page 677)
Characterisation of surface water bodies	ES (September 2014) -Table 14.7 (Page 625)
Hydrogeological modelling conclusions	ES (September 2014) – 14.3.27 (Page 629) s96a ref NYM/2017/0399/NM – HRA (40-FWS-WS-70-WM-RA-0004 Rev 2, May 2017); plus discharge of condition applications for Phase 2 HRA (1433DevOR27 Rev 3, January 2017), Phase 3 HRA (HRA40-FWS-WS-70-PL-0005 Rev 5, April 2017), Phase 4 HRA (40-FWS-WS-70-WM-RA-0004 Rev 2, May 2017)
Methodological Approach	ES (September 2014) - Para 14.3 (Page 619-631) s96a ref NYM/2017/0399/NM – HRA (40-FWS-WS-70-WM-RA-0004 Rev 2, May 2017); plus discharge of condition applications for Phase 2 HRA (1433DevOR27 Rev 3, January

Issue Under Consideration	Reference Guide
	2017), Phase 3 HRA (HRA40-FWS-WS-70-PL-0005 Rev 5, April 2017), Phase 4 HRA (40-FWS-WS-70-WM-RA-0004 Rev 2, May 2017)
Summary of Overall Impacts	ES (September 2014) - Table 14.22 (Page 673); Table 14.23 (Page 677); Table 14.24 (Page 681)

Updated Policy Context

- 7.4 There is no significant updated Legislation, Policy or Guidance relating to Geology and Hydrogeology to that reported in the original ES (Chapter 14) [Ref: 13.01].

Updated Assessment Methodology & Significance Criteria

Assessment Methodology

- 7.5 The assessment methodology is predominantly unchanged from the original ES, as detailed in the Hydrogeological Risk Assessment (Chapter 14 of the original ES) [Ref: 13.028].

Significance Criteria

- 7.6 The Significance Criteria are predominantly unchanged from that in the original ES [Ref: 13.01], with exceptions summarised below and detailed in table 7.1 which relate to:-
- an amendment to the characterisation of conservation and wildlife sites to be dependent on the hydrogeology; and
 - an amendment to the characterisation of surface water bodies to include a dependence on their Water Framework classification.

Table 7.2 Sensitivity of hydrogeological receptors

Sensitivity	Groundwater Receptor Characteristics	Receptor Examples
Very High	has very limited or no capacity to accommodate physical or chemical changes supports internationally important ecological, amenity or landscape features	licensed public water supply or major industrial abstractions (e.g. SPZ 1/2) licensed/unlicensed abstractions and springs providing potable water supply, for which there is no alternative source (e.g. mains water) designated SAC, SPA, or Ramsar site with fauna or flora that are hydrogeologically supported from groundwaters within rock aquifers surface water bodies supporting the above
High	has limited capacity to accommodate physical or chemical changes supports nationally important ecological amenity or landscape features	designated 'Principal Aquifer' licensed/unlicensed abstractions and springs providing potable water supply, for which an alternative source (e.g. mains water) is available SSSI, NNR with fauna or flora that are hydrogeologically supported from groundwaters within rock aquifers surface water bodies supporting the above
Medium	has limited capacity to accommodate physical or chemical changes supports regionally important	designated 'Secondary A (or Undifferentiated) Aquifer' regionally important wildlife sites with fauna or flora that are hydrogeologically supported from groundwaters within rock aquifers

Sensitivity	Groundwater Receptor Characteristics	Receptor Examples
	ecological, amenity or landscape features	non-potable licensed abstractions surface water bodies supporting the above or classified as Good under Water Framework Directive.
Low	has moderate capacity to accommodate physical or chemical changes supports locally important ecological, amenity or landscape features	non-potable unlicensed abstractions local wildlife sites (LNR, SNCI, RIGS), country parks with flora hydrogeologically supported from groundwaters within rock aquifers designated SAC, SPA, or Ramsar site with fauna or flora that are not hydrogeologically supported from groundwaters within rock aquifers surface water bodies supporting the above or classified as Moderate under Water Framework Directive.
Very Low	generally tolerant of and can accommodate physical or chemical changes supports no features of significant ecological, amenity or landscape value	designated 'Secondary B Aquifer' or 'Unproductive Strata' surface waters with no important, dependent receptors SSSI, NNR with fauna or flora that are not hydrogeologically supported from groundwaters within rock aquifers

Consultation

7.7

With respect to the current Section 73 submission, and the ongoing Phases 2 to 4 construction works of the development, a number of meetings have been held with the Environment Agency and Natural England. The key points and consultee responses are summarised in Table 7.2

Table 7.3 Consultee Responses

Context	Consultee	Comment
Submission made on the Woodsmith Mine extended baseline monitoring [Ref: 13.01]	Environment Agency	Environment Agency requested clarification for monitoring presented for Moorside Farm Spring. The extended baseline report was agreed by the EA as acceptable.
A meeting was held to discuss the extended hydrogeological baseline monitoring and the preliminary results of hydrogeological modelling of the Phase 2 Site Preparatory Works at Woodsmith Mine. December 2017 [Ref: 13.024]	Environment Agency	FWS presented the findings to extended baseline monitoring and preliminary results of the groundwater modelling of the Phase 2 Site preparatory Works. The extended baseline monitoring highlighted a greater magnitude in seasonal variation than previously allowed for in 2014 Hydrogeological Risk Assessment. The Environment Agency confirmed its general agreement to the findings of the modelling, the proposals for the Construction and Operational Phase Ground and Surface Water Monitoring and the reasoning justifying that by raising the construction platform above the water table in the Moor Grit there was no requirement at this stage to construct the grout wall or pressure relief drain.

Context	Consultee	Comment
<p>Separate meetings were held with the Environment Agency & Natural England held to discuss the Phase 2 Pre-commencement hydrogeological baseline monitoring and the preliminary results of hydrogeological modelling temporary dewatering proposals to facilitate diaphragm walling and shaft basement construction 3m and 8m below Construction and operational platform level within the Phase 3 Construction works at Woodsmith Mine. February 2017</p>	<p>Environment Agency and Natural England</p>	<p>The Environment Agency and Natural England confirmed their general agreement to the key sensitive hydrogeological receptors of concern to groundwater lowering caused by these works as the hydrogeologically supported Spring Flush area and Moorside and Soulsgrave farm springs.</p> <p>The Environment Agency and Natural England confirmed their agreement that, based on the preliminary modelling, temporary dewatering from perimeter wells around the construction platform should be acceptable, subject to setting an appropriate groundwater level monitoring strategy and Trigger Values.</p>
<p>Meeting held with Environment Agency to discuss Environment Agency's comments on the Phase 3 Hydrogeological Modelling, Risk Assessment and Monitoring / Remedial Action Plan. May 2017 [Ref: 13.029]</p>	<p>Environment Agency</p>	<p>The Environment Agency confirmed its general agreement to the findings of the modelling and hydrogeological risk assessment.</p> <p>The Environment Agency advised that approval of the construction and operation of the non-hazardous non inert extractive materials management facility would have to be undertaken as part of the Environmental Permit submission.</p> <p>The Environment Agency requested that turbidity monitoring should be included in the construction monitoring of Moorside and Soulsgrave farm springs.</p>
<p>Conference call with Environment Agency to discuss approach to Hydrogeological Risk Assessment for the Section 73 amendment submissions. June 2017 [Ref: 13.028]</p>	<p>Environment Agency</p>	<p>The Environment Agency confirmed its agreement to the approach proposed for the hydrogeological risk assessments, in terms of providing a comparison of the principal changes to the scheme design, the hydrogeological mitigation measures proposed and a qualitative risk assessment of the resultant changes to the hydrogeological impacts on the Construction, Operational and decommissioned phases of the development.</p> <p>The Environment Agency agreed that hydrogeological modelling to confirm detailed design of hydrogeological mitigation measures could then be submitted as part of the phased submissions to discharge planning conditions.</p> <p>The Environment Agency confirmed that for future hydrogeological risk assessments cumulative impacts of the works and their long term effects should be addressed by the modelling.</p>

Context	Consultee	Comment
Meeting with the NYMNP and Natural England to discuss Phase 4 Hydrogeological Modelling. July 2017	NYMNP and Natural England	Natural England confirmed that it was satisfied with the approach to modelling adopted within Phase 4. It was agreed that now the broader scheme has been established for the surface mine development all future hydrogeological risk assessment and modelling will consider and incorporate the cumulative and long term impacts of the final scheme development.

- 7.8 As part of the above discussions, it has also been agreed that further matrix based qualitative hydrogeological risk assessments and quantitative modelling are not required as part of this SES. Rather, future hydrogeological submissions to discharge planning conditions in association with the wider development will include modelling data as appropriate to each individual phase of works and taking due consideration of preceding completed works.
- 7.9 In addition, detailed Steady State and Transient modelling of the temporary and cumulative construction phase impacts of the amended overall scheme design will be undertaken to finalise the surface water catchment area and geometry of the recharge trench around the western boundary of the southwestern NHNI facility. This modelling will be undertaken to reflect each individual construction phase of works, taking due consideration of the preceding completed works and the proposed works over the construction period.
- 7.10 Finally, detailed pollution modelling of the final footprint of the NHNI facilities will be undertaken as part of the Environmental Permit application, to confirm the detailed design of the encapsulation and groundwater control measures and to demonstrate the pollution impact of these waste storage facilities.

Assumptions and Limitations

- 7.11 No hydrogeological modelling has been undertaken specifically as part of this submission; however, reference has been made to modelling undertaken in support of the Phase 2, 3 and 4 submissions to discharge hydrogeologically related planning conditions. As agreed with the Environment Agency, matrix based quantitative modelling will be undertaken in respect of the S73 amendments during the detailed design stage and submitted in support of construction phase documents prepared to discharge the hydrogeologically related planning conditions.

Updated Baseline Conditions

- 7.12 No significant changes in the understanding of the hydrogeology or aquifer units below the Woodsmith minesite has been derived from the results of the extended monitoring regime, since the issue of the original baseline report [Ref: 13.027]. This additional data has, however, identified minor increases in the range of seasonal groundwater level fluctuations determined for the superficial deposits, Moor Grit, Scarborough, Cloughton and Saltwick aquifers.
- 7.13 The additional baseline monitoring has enabled re-evaluation of the spring data for Ugglebarnby Moor Spring (SP01) discharge in the Southern Dry Heath area of Ugglebarnby Moor SAC. That re-analysis has determined that the likely source of the groundwater, providing baseflow to that spring issue, is from a mixture of the Moor Grit and the superficial deposits rather than Scarborough Formation, as previously reported [Ref: 13.027]. It has also been determined that groundwater flow from this spring is not sustained throughout the year and that this spring does run dry during periods of sustained low rainfall in the spring, summer and autumn periods.

- 7.14 From the extended baseline monitoring period, it has become evident that the spring flows from Moorside Farm Spring (MF2) are persistent during low groundwater levels within the Moor Grit, although diminished by approximately half. During these low flow rate conditions, the inflow from MF2 to the water supply tank can fall below the usage rate of this water supply, such that no overflow from the tank occurs at MF1.
- 7.15 It has also been determined that the groundwater flow from Dove's Nest Farm Spring (DNS(1)) is not sustained throughout the year and runs dry for long periods of time in all seasons with no flow recorded from the spring between June 2014 to March 2016.
- 7.16 The extended baseline data and additional surface water flow data has also identified that groundwater spring discharges within the minesite and in the Special Area of Conservation ('SAC') do not provide any significant contribution to surface water flow volumes within Sneaton Thorpe Beck or Little Beck.
- 7.17 To reflect the amended methodology for evaluating sensitivity of receptors (Table 7.2 of this SES), the Receptor Sensitivity specific to the Woodsmith Mine has been updated below as Table 7.4:-

Table 7.4 Receptor Sensitivity

Type	Receptor	Sensitivity
Sensitive Aquifers	Moor Grit Member	Medium
	Scarborough Formation	Medium
	Cloughton Formation	Medium
	Saltwick Formation	Medium
	Sherwood Sandstone Group	Very Low
	Brotherton Formation	Very Low
Base Flow Springs	Doves Nest Farm Spring (DNS1)	Very Low
	Ugglebarnby Moor Spring (SP01)	Very Low
	Springs Northwest of Ugglebarnby Moor (SP02, SP03)	Very Low
	Springs North of Woodsmith Mine (SP04)	Very Low
	Springs North of Woodsmith Mine (KHF)	Very Low
Spring Water Supplies	Moorside Farm Spring (MF2)	High
	Soulsgrave Farm Spring (SF2)	High
	Newton House Farm Spring (NHF1)	High
Groundwater Abstractions	Sneaton Low Moor Caravan Park	High
Ecological Receptors	Ugglebarnby Moor Northern Dry Heath Area	Low
	Ugglebarnby Moor Central Wet Heath Area	Low
	Ugglebarnby Moor Southern Dry Heath Area	Low
	Ugglebarnby Moor Southern Spring Flush	Very High
	Sneaton Low Moor Dry Heath Area	Low
Surface Waters	Sneaton Thorpe Beck	Low
	Little Beck	Medium

Potential Impacts

Built in Mitigation

During Construction

7.18 The s73 development is considered to present no significant adverse hydrogeological impacts on the environment.

7.19 As such, the following mitigation measures currently allowed for in the construction phase for the development, as detailed in Section 8 of the Hydrogeological Risk Assessment Report, and revised to reflect the amended development design, are considered appropriate [Ref: 13.028].

- The raised two tiered Construction and operational platform will include a basal geological or enhanced geological clay liner of 0.5m minimum thickness to separate construction surface waters from groundwater within the Moor Grit aquifer.
- Diaphragm walling will be used for all foreshaft and shaft construction works, within the Ravenscar Formation, instead of grouting and temporary dewatering.
- Localised temporary dewatering will be carried out to maintain trench stability during diaphragm walling and to enable dry construction of shallow substructures within the Moor Grit aquifer. These temporary works will be adopted instead of grouting and temporary dewatering, as included in the approved scheme.
- Grout curtains, with a maximum permeability of 1×10^{-9} m/s, will be adopted for all shaft excavations in permeable strata below the Whitby Mudstone. Dewatering from these excavations will be minimised to a maximum of 36 m³/day.
- A 1m basal engineered clay liner and a cover layer comprising GCL and Geofin drainage layer within the 1-2m thick engineered cap over the south western NHNI facility and incorporation a Geofin drainage layer and a 1-2m soil cover layer over the eastern NHNI facility.
- A recharge trench will be constructed around the western perimeter of the south western NHNI extractive materials management facility to discharge surface waters, collected within the geofin drainage layer installed in the soil cover over this Permanent Waste Management Facility, into the Moor Grit aquifer.
- Groundwater drains will be installed in the superficial deposits at the location of Dove's Nest spring and in an area to the north of this spring to collect and control groundwater discharge beneath the eastern toe slope area to the landscape mounds.
- Construction phase fresh, sulphatic and saline groundwaters will be treated within an onsite facility prior to either discharge to an onsite deep reinjection well, into the Sherwood Sandstone, or tankered offsite to an offsite waste water disposal facility.

During Operation

7.20 The proposed modified design to the operational condition for the mine surface development presents no significant adverse hydrogeological impacts on the environment.

7.21 As such, the following mitigation measures currently allowed for in the operational phase of development, as detailed in Section 8 of the Hydrogeological Risk Assessment Report [Ref: 13.022], and revised to reflect the amended development design, are considered appropriate [Ref: 13.028].

- The groundwater drainage blanket collecting spring issues beneath the north-eastern NHNI facility and groundwater drains in the cut slopes to the Welfare Facility will be operated in

accordance with a Groundwater Management Plan and a Remedial Action Plan (agreed pursuant to planning condition 89 of the planning permission for implementing urgent and corrective actions.

- The recharge trench around the western perimeter of the southwestern NHNI facility and the engineered capping system above all the NHNI extractive materials management facilities will be managed and operated in accordance with a Groundwater Management Plan and a Remedial Action Plan for implementing urgent and corrective actions.
- Groundwater dewatered during the Operational Phase of the minesite from the shafts and from the Minerals Transport System is to be managed as non-domestic waste water that will be piped through the Minerals Transport System Tunnel to a treatment and discharge facility at the Wilton Site. It is intended that the Deep Groundwater Discharge Well will not be used for regular discharge of non-domestic waste water generated by the works during the operational period, although it will be maintained to accommodate for temporary discharges, should this prove necessary.

During Decommissioning

7.22 The proposed modified design to the decommissioned condition for the mine surface development presents no significant adverse hydrogeological impacts on the environment.

7.23 As such, the following mitigation measures currently allowed for in the decommissioned state of development, as detailed in Section 8 of the Hydrogeological Risk Assessment Report [Ref: 13.022], and revised to reflect the amended development design, are considered appropriate [Ref: 13.028].

- The groundwater drainage blanket and piped system that collects Dove's Nest spring discharge and any other surface spring issues encountered beneath the proposed NHNI facilities will be retained in-situ, providing permanent underdrainage to the spring line.
- All shafts and associated chambers will be capped, plugged and backfilled in a manner to maintain the long term structural and the geotechnical stability of the site and the wider environment. The design of these works will ensure the hydrogeological conditions in the surface Secondary A Aquifers in the Ravenscar Group are maintained in their current condition and are isolated from the sulphatic and saline groundwater below the Whitby Mudstone. In addition, groundwater ingress and migration into the shafts from the Non Secondary B and Principal Aquifers below the Whitby Mudstone, in particular those present in the Sherwood Sandstone and Brotherton Limestone, will be isolated by means of plugging the shafts and backfilling. This will be designed to prevent any continued water ingress or flow in the shafts and groundwater ingress or flow into or through the mine workings at depth.

7.24 The Deep Groundwater Discharge Well will be grouted up and sealed, with all head works removed.

During Construction

Ecosystems

7.25 The Spring Flush area is identified to be the only hydrogeologically supported terrestrial ecosystem within Ugglebarnby SAC [Ref: 13.024]. This Spring Flush ecosystem is of very high sensitivity to any reduction in groundwater levels. The magnitude of physical impact at the receptor from the s73 development design is considered to be unchanged from that identified in the original ES [Ref: 13.01] and remains as very low [Ref: 13.028]. The proposed amended

development is therefore determined to present a negligible hydrogeological impact to the Spring Flush ecosystem [Ref: 13.028].

- 7.26 The proposed design amendments present no adverse chemical impact on the sensitive ecosystems adjacent to the site.

Spring Discharges

- 7.27 The Moorside Farm Spring discharge in the southern Ugglebarnby Moor SAC and Soulsgrave Farm Spring discharge to the southeast of the mine are of high sensitivity to reductions in groundwater levels in the Moor Grit and Scarborough aquifers, respectively. The magnitude of physical impacts at these receptors from the modified development design are considered to be unchanged from that identified for the approved scheme [Ref: 13.022] and remain as very low. The s73 development is therefore determined to present a negligible impact to these spring discharges [Ref: 13.028].
- 7.28 The Moorside Farm and Soulsgrave Farm spring discharges are of very high sensitivity to any reduction in groundwater quality in the Moor Grit or Scarborough aquifers. The magnitude of chemical impacts at these receptors from the s73 development site design is considered to be unchanged from that identified in the original ES [Ref: 13.022] and remains as very low. The proposed modified development is therefore determined to present a negligible impact on these spring discharges [Ref: 13.028].

Aquifers down Hydraulic Gradient of the NHNI Waste Facilities

- 7.29 The Moor Grit, Scarborough and Cloughton aquifers down hydraulic gradient of the NHNI extractive materials management facilities are of moderate sensitivity to changes in groundwater levels. The magnitude of physical impact at these receptors from the s73 mine surface development site design is considered to be unchanged from that identified for the approved scheme [Ref: 13.022] and, as such, the s73 scheme is determined to present a negligible physical impact to down gradient aquifers [Ref: 13.028].
- 7.30 The Moor Grit, Scarborough and Cloughton aquifers that will receive leachate egress through the plan areas of the NHNI extractive materials management facilities are of moderate sensitivity to reductions in groundwater quality. The magnitude of chemical impact at the receptor from the amended development design is considered to be unchanged from that identified in the approved scheme [Ref: 13.022] and remains as very low. The proposed amended development is, therefore, determined to present a negligible impact to groundwater quality in these Secondary A aquifers [Ref: 13.028].

During Operation

- 7.31 No significant adverse hydrogeological impacts are anticipated on the environment.

Additional Mitigation Measures

- 7.32 No additional mitigation measures are required as a result of the changes included in the s73 application during either the construction or operational periods.

Updated Residual Impacts

During Construction

- 7.33 The residual impacts of the proposed changes to the scheme will result in:-

- Slightly reduced groundwater levels within the Moor Grit to the west of the minesite in the non-hydrogeological supported northern Dry Heath and the Central Wet Heath areas of Ugglebarnby Moor SAC.
- Slightly reduced groundwater levels within the Scarborough and Cloughton Formation to the east of the shaft platform.

During Operation

7.34 The residual impacts of the proposed changes to the scheme will result in:-

- Slightly reduced groundwater levels within the Moor Grit to the west of the minesite in the non-hydrogeological supported northern Dry Heath and the Central Wet Heath areas of Ugglebarnby Moor SAC.
- Slightly reduced groundwater levels within the Scarborough and Cloughton Formation to the east of the shaft platform.

Summary & Conclusions

7.35 Since approval of the original planning permission, design amendments have been made to the Construction Platform, substructures, shafts and to the volume and surface arrangement of the Non-Hazardous Non-Inert Waste Facilities.

7.36 Based on the findings of this supplementary qualitative risk assessment, the amended mine development is determined to present a negligible adverse physical and chemical impact on all of the key sensitive hydrogeological receptors, including the Ugglebarnby Moor SAC ecological systems, the Moorside and Soulsgrave farm springs and the Secondary A Aquifers underlying and adjacent to the site.

7.37 Detailed quantitative modelling of groundwater levels and spring flow rates will be undertaken to finalise the design of the perimeter recharge trench to the southwestern NHNI facility and quantitative modelling will be carried to finalise design of the basal liner and capping system to these facilities. The results of this modelling will be presented in supporting construction phase documents for the discharge to hydrogeological planning conditions and to the Environmental Permit application.

7.38 By adopting the mitigation measures included for in the approved scheme, it is concluded that the modified development design will present no significant additional adverse hydrogeological risks to the environment during its construction, operation or long term post decommissioned phases. As such, no additional mitigation measures are warranted.

7.39 In summary, the residual impacts generated by the approved and S73 schemes are presented in Table 7.5 below:-

Table 7.5 Summary comparison of the geological and hydrogeological impacts of the approved and S73 schemes

	Approved scheme	S73 scheme
Construction Phase		
Physical impacts	Negligible to Minor	Negligible
Chemical impacts	Negligible to Minor	Negligible
Cumulative impacts	Minor	Negligible
Operational Phase		
Physical impacts	Negligible to Minor	Negligible
Chemical impacts	Negligible to Minor	Negligible
Cumulative impacts	Minor	Negligible

8.0 Hydrology and Flood Risk

8.1 This chapter of the SES considers whether the changes to the approved form of development that are the subject of the s73 application give rise to additional or different environmental effects to those identified in original ES (Chapter 15) [Ref: 13.01] in respect of hydrology and flood risk. In particular, consideration is given to the relocation of previously approved surface water attenuation ponds which include three ponds and a wetland area in an area in the north of the Woodsmith mine site. The location of the new ponds is shown on plans provided at Appendix 4 of this SES (area defined throughout this chapter as ‘the northern field’).

Reference Guide

Table 8.1 Cross-referencing Guide Covering Consideration of issues relevant to Hydrology and Flood Risk

Issue Under Consideration	Reference Guide
Assessment of on-site drainage features	ES (September 2014) – Para 15.7.5 (Page 709); Para 15.7.7 (Page 710); Para 15.7.10 (Page 711); Para 15.7.13 (Page 712); Para 15.7.20 (Page 713) SEI (February 2015) - Para 15.3.3 (Page 188); Para 15.3.4 & 15.4.2 (Page 189); Para 15.4.7 & 15.6.3 (Page 190) Discharge of condition applications for Phase 2 Surface Water Drainage Scheme (REP-P10-DNF-CD-001SWDDoC 60 and 79 161221 Rev 1), Phase 3 Surface Water Drainage Scheme (40-ARI-WS-71-PA-RP-1050), Phase 4 Surface Water Drainage Scheme (40-ARI-WS-71-PA-RP-1053)
Flood storage	ES (September 2014) - Table 15.1 (Page 692) Discharge of condition applications for Phase 2 Surface Water Drainage Scheme (REP-P10-DNF-CD-001SWDDoC 60 and 79 161221 Rev 1), Phase 3 Surface Water Drainage Scheme (40-ARI-WS-71-PA-RP-1050), Phase 4 Surface Water Drainage Scheme (40-ARI-WS-71-PA-RP-1053)
Surface water flows from site drainage and treated sewage	ES (September 2014) – Table 15.13 (Page 722) SEI (February 2015) – Para 15.4.7 (Page 190); Para 15.6.2 (Page 190); Table 18.1 (Page 220); Para 15.7.3 (Page 191)
Impacts from treated sewage	ES (September 2014) – Para 15.7.49 - 15.7.58 (Page 718- 720); Table 15.13 (Page 722) SEI (February 2015) - Para 15.6.2 (Page 190)
Methodological Approach	ES (September 2014) - Para 15.5 (Page 702 – 706)
Summary of Overall Impacts	ES (September 2014) – Table 15.13 (page 722) SEI (February 2015) - Para 15.7 (Page 191); Table 18.1 (Page 220)

Updated Policy Context

8.2 No significant update has been identified to Legislation, Policy or Guidance relating to Hydrology and Flood Risk since the submission of the original ES.

Updated Assessment Methodology & Significance Criteria

Assessment Methodology

8.3 The assessment methodology is unchanged from the original ES.

Significance Criteria

- 8.4 The Significance Criteria is unchanged from the original ES.

Consultation

- 8.5 Consultation has been undertaken in respect of the submission of information to secure consent for details of land drainage associated with phases 2 and 3 of the development of the Woodsmith Mine site. This has included discussions with North Yorkshire County Council to agree the following details in respect of the development (see earlier consideration of these applications at Chapter 2 of this SES):-

- Phase 2 – including the relocation of one of the ponds and an outfall to the northern field
- Phase 3 – including the relation of three ponds, wetland and outfall to the northern field

Assumptions and Limitations

- 8.6 Most of the catchments considered in the original ES are largely unchanged and hence it is unnecessary to consider these further as part of this SES. However, there have been changes to the catchment within which the ponds have moved (which includes the northern field). This catchment has therefore been assessed and is reported further below.

Updated Baseline Conditions

- 8.7 The amendments do not affect the baseline hydrology and surface water flood risk information previously provided in the original ES. The surface water drainage strategy that has formed the basis of design for the site is not affected by the amendments; however the layout and positioning of drainage features such as swales, filter drains, attenuation ponds, wetlands and outfalls will be affected by the amendments.
- 8.8 The approved scheme showed two surface water attenuation ponds and a surface water wetland area that will be relocated into a field further north within the site to include three ponds and a wetland area. The relocation of the ponds and wetland removes the requirement to fell trees near Whinny Wood and the need to re-route a power line.

Potential Impacts

Built in Mitigation

- 8.9 The space available in the northern field, and the greater depth of excavation possible, means that the total storage volume provided in the attenuation ponds has increased from 7,400m³ in the approved scheme to 9,900m³ for the proposed ponds.

During Construction

- 8.10 Site investigations have shown clay to a depth of approximately 4m, and a groundwater level at approximately 3m depth at the location of the proposed ponds. The groundwater level at the ponds in the approved scheme was close to ground surface, meaning that the ponds would have been predominantly above the existing ground level, impounded by raised embankments. In the new proposed location, the ponds can be excavated into the landscape to a greater depth. This will ease construction and help to blend them into the surrounding landscape. The greater depth means that the volume of storage available will be greater for the same pond footprint.

During Operation

- 8.11 The proposed ponds are closer to, and discharge to, a larger tributary of Sneaton Thorpe Beck than the approved scheme, providing a closer match to the current hydrological regime.
- 8.12 The proposed surface water drainage layout is shown on the revised general arrangement drawing YP-P2-CX-509 (Appendix 4 to this SES).
- 8.13 To demonstrate compliance with the design criteria for the proposed changes to the ponds, calculations have been updated to show that there is sufficient storage to attenuate the runoff to the greenfield runoff rates for storm events up to the 1 in 100 year plus climate change:
- The total area draining to the ponds: 8.95 ha
 - The greenfield runoff rate: 6.5 l/s/ha
 - The allowable rate of runoff: $8.95 \times 6.5 = 58.2$ l/s
- 8.14 The 1 in 100 year + 30% climate change storm events were applied to the network in Microdrainage. The following table shows the volume of storage in the ponds during the critical duration events.

Table 8.2 Volume of storage in the ponds during the critical duration events

	Storage volume to be constructed (m ³)	Storage volume used in the critical storm event (m ³)	Spare volume (m ³)	Outlet orifice diameter (mm).
Pond 1	3700	3188	512	238
Pond 2	3700	3234	466	179
Pond 3	2500	2254	246	155

- 8.15 During the critical duration event the maximum flow rate discharging from the wetland to Sneaton Thorpe Beck is 57.9 l/s which is less than the greenfield runoff rate of 58.2 l/s.
- 8.16 Appendix 13 contains outputs from the Microdrainage model demonstrating compliance with the design criteria above.

Additional Mitigation Measures

- 8.17 No additional mitigation measures are considered necessary as a result of the minor material amendments to the development that forms the basis of the s73 application. This applies to both the construction and operational periods.

Updated Residual Impacts

- 8.18 The residual effects arising from the s73 form of development are the same as those identified in the assessment of impacts provided at paras 8.9-8.16 above. The additional volume provided in the attenuation ponds provides a greater level of protection from flood risk. The additional volume provided in the attenuation ponds reduces the risk of sediment entering the watercourse downstream (however the impact remains negligible). These residual effects are relevant to both the construction and operational periods.

Summary & Conclusions

- 8.19 The key mitigation measures and residual impacts in Table 15.13 of the ES (September 2014) [Ref: 13.01] remain unchanged except for the impacts related to treated sewage which are no longer applicable.

- 8.20 The calculations demonstrate that the revised location and layout of the surface water attenuation ponds and wetland in the northern field complies with the design criteria such that the ponds have more than the required capacity to store the critical duration 1 in 100 year plus climate change storm event and that the runoff rate is less than the greenfield runoff rate. These calculations demonstrate that the proposed layout does not increase the flood risk at the site or elsewhere. The additional storage volume provides a greater level of protection from flood risk and from sediment entering the watercourse downstream.
- 8.21 In summary, the impacts generated by the approved and revised scheme are presented in Table 8.3 below:-

Table 8.3 Summary comparison of the hydrological and flood risk impacts of the approved and S73 schemes

	Approved scheme	S73 scheme
Construction Phase		
Increased sediment supply	Negligible	Negligible
Direct disturbance of surface water courses	Negligible	Negligible
Accidental release of fuels, oils, lubricants and construction materials	Negligible	Negligible
Operational Phase		
Increased surface water flows from site drainage and treated sewage	Minor adverse	No Impact
Discharge of treated sewage effluent	Minor adverse	No Impact
Decreased spring flows	Negligible	Negligible
Increased sediment supply	Negligible	Negligible
Direct disturbance of surface water courses	Negligible	Negligible
Accidental release of fuels, oils, lubricants and construction materials	Negligible	Negligible

9.0 Ecology

- 9.1 An Ecological Impact Assessment (EcIA) was included as part of the original ES [Ref: 13.01]. This SES chapter has been prepared to identify possible changes to impacts on ecological receptors between the approved development and the S73 scheme.
- 9.2 The issues considered here are inter-related with those in Chapter 6.0 Landscape and Visual Impact, Chapter 7.0 Geology and Hydrogeology and Chapter 8.0 Hydrology and Flood Risk.

Reference Guide

Table 9.1 Cross-referencing Guide Covering Consideration of issues relevant to Ecology

Issue Under Consideration	Reference Guide
Protected Species Surveys	ES (September 2014) - Para 11.5 (Pages 453 – 463) SEI (February 2015) - Para 11.2.8 - 11.3.4 (Pages 151 – 155) Discharge of condition applications for Phase 2 Protected Species Management Plan (December 2016) (RHDHV0002_ReptilesPSMP_Phase 2 Reptiles_PSMP_Phase 2 Rev 2; RHDHV0005_Bats_PSMP_Phase 2 Rev 2 (final); RHDHV0003_Badgers_PSMP_Phase 2 Rev 2; RHDHV0004_Birds_PSMP_Phase 2 Rev 2); Phase 3 Protected Species Management Plans (May 2017) (40-RHD-WS-70-EN-PL-0010; 40-RHD-WS-70-EN-PL-0011; 40-RHD-WS-70-EN-PL-0012; 40-RHD-WS-70-EN-PL-0013); Phase 4 Protected Species Management Plans (June 2017) (40-RHD-WS-70-EN-PL-0018 Phase 4 Reptiles PSMP; 40-RHD-WS-70-EN-PL-00019 Phase 4 Badger PSMP; 40-RHD-WS-70-EN-PL-0020 Phase 4 Birds PSMP and 40-RHD-WS-70-EN-PL-0021 Phase 4 Bat PSMP)
Dewatering Strategy/Groundwater levels	ES (September 2014) - Para 14.3.18 (Page 627); Para 14.6.12 (Page 671) s96a ref NYM/2017/0399/NM – Phase 4 Hydrogeological Risk Assessment (40-FWS-WS-70-WM-RA-0004 Rev 2, May 2017); plus discharge of condition applications for Phase 3 HRA (HRA40-FWS-WS-70-PL-0005 Rev 5, April 2017), Phase 4 HRA (40-FWS-WS-70-WM-RA-0004 Rev 2, May 2017)
Methodological Approach	ES (September 2014) - Para 11.3 (Page 445-448)
Summary of Overall Impacts	ES (September 2014) - Table 11.12 (Page 471); Para 11.10 (Page 470) SEI (February 2015) - Para 11.6 (Page 156); Table 18.1 (Page 220)

Updated Policy Context

- 9.3 No significant update has been identified to Legislation, Policy or Guidance relating to ecology since the original ES.

Updated Assessment Methodology & Significance Criteria

Assessment Methodology

- 9.4 The EcIA methodology used in the preparation of the original ES has been updated. The latest guidance is the *Guidelines for Ecological Impact Assessment in the United Kingdom and*

Ireland: Terrestrial, Freshwater and Coastal (Chartered Institute of Ecology and Environmental Management (CIEEM), 2016) [Ref: 13.030].

- 9.5 Although the EcIA guidance has been updated, the fundamental approach to EcIA has not changed, therefore the approach described in the ES (September 2014) (Part 2 Chapter 11, Section 11.3) and the SEI (February 2015) remains valid.

Significance Criteria

- 9.6 The Significance Criteria remain unchanged from the original ES.

Consultation

- 9.7 With respect to the current Section 73 submission, and ongoing construction works of the consented development, consultation with Natural England, Environment Agency and the NYMNPA has been undertaken with respect to the dewatering strategy and associated potential hydrogeological impacts. Additional groundwater monitoring has also been undertaken as reported in the Groundwater Management Plan (e.g. 40-FWS-WS-70-WM-PL-0010, submitted to discharge Condition NYMNPA-47 for the Phase 4 construction works).
- 9.8 Agreement from Natural England was also obtained for the scope and methodologies for additional protected species surveys as reported in the Phase 4 Protected Species Management Plans (PSMPs) (40-RHD-WS-70-EN-PL-0018 Phase 4 Reptiles PSMP; 40-RHD-WS-70-EN-PL-00019 Phase 4 Badger PSMP; 40-RHD-WS-70-EN-PL-0020 Phase 4 Birds PSMP and 40-RHD-WS-70-EN-PL-0021 Phase 4 Bat PSMP) which were submitted to discharge Condition NYMNPA-52 for the Phase 4 construction works.

Assumptions and Limitations

Assumptions and limitations pertinent to the preparation of this chapter remain the same as those set out in the original ES.

Updated Baseline Conditions

- 9.9 Additional protected species (i.e. badger, bat, bird) surveys have been undertaken between 2015 and 2016 (see Table 9.1 for titles and dates of surveys submitted for consideration to the NYMNPA and copies at Appendix 14 of this SES²). These have confirmed the site conditions remain unchanged to that previously recorded in the original ES, and have supported the partial discharge of the ecology-related planning conditions of the consented scheme.
- 9.10 The S73 amendments do not alter the baseline conditions within the site or the surrounding area.

Potential Impacts

Built-in Mitigation

- 9.11 A range of ecological mitigation measures were developed for the scheme during the preparation of the original ES. The original principles underlying these measures remain relevant and have been incorporated from the outset in the S73 scheme design as part of an iterative design process.

² Note – for copies of the confidential badger survey information, please liaise with the applicant – details provided in Chapter 1 of this SES

9.12 Furthermore, the current planning conditions relating to ecology (as outlined in Paragraph 9.7-8 above), would continue to address the management and control of ecological receptors.

During Construction

9.13 The changes covered by this document would not result in any ecological impacts which are materially different to those identified in the original ES. There are no changes to the site boundary at Woodsmith Mine and therefore no additional ecological receptors would be affected beyond those considered in the original ES.

9.14 The approved scheme was granted with a number of planning conditions to ensure that the conclusions drawn in the original ES were achieved. The planning conditions relevant to ecology included the following:

- Implementation of a hydrogeological risk assessment (including monitoring and remedial action plan) (NYMNPA-46 and related conditions);
- Protected Species Management Plans (PSMPs) for bats (including a bat roost destruction licence), reptiles, birds and badgers (NYMNPA-52);
- Breeding bird surveys (focussing on snipe, curlew and nightjar in areas around the site boundary including Haxby Plantation and Ugglebarnby Moor) (NYMNPA53 and NYMNPA-54); and
- Implementation of a Landscape and Ecological Management Plan (NYMNPA-57).

9.15 Discussions with Natural England and the Environment Agency with respect to the dewatering strategy and associated potential hydrogeological impacts have been undertaken, as has additional groundwater monitoring. Although the S73 scheme will result in slightly reduced groundwater levels, these impacts are within areas where the species have been confirmed to not be groundwater-dependent. Furthermore, the results of the groundwater monitoring to date have shown that there is a low degree of impact around the consented scheme, with no impact on the spring flush habitat around Lousy Lane. Therefore, there are currently no predicted impacts on groundwater-dependent species. Refer to Chapter 7 of this SES (Geology and Hydrogeology) for further information.

9.16 Through the adherence to the PSMPs, in combination with the original principles incorporated within the design, impacts on protected species are avoided. Further details in respect of protected species are provided in the relevant PSMPs submitted to partially discharge planning conditions applied to the consented scheme.

During Operation

9.17 There would be no material change to the positive ecological impacts identified in the original ES.

9.18 The additional volume provided in the attenuation ponds further reduces the risk of sediment entering the watercourse, and thereby avoids potential impacts to populations of brown trout, salmon or pearl mussel, which are known to be present downstream from the site. Refer to Chapter 8 of this SES (Hydrology and Flood Risk) for further information.

Additional Mitigation Measures

9.19 No additional mitigation measures are required as a result of the proposed s73 changes to the development. This conclusion applies to both the construction and operational periods.

Updated Residual Impacts

- 9.20 The residual impacts during construction and operation summarised in Table 11.12 of the ES (September 2014) remain appropriate and would be unchanged by the scheme changes proposed.

Summary & Conclusions

- 9.21 The S73 scheme contains minor changes at the construction and operational stages of the project. These changes include amendment of the construction process, amendment of the construction layout and features, including early construction of some permanent buildings and amendment of the permanent site landform, the operational road and building layout and restoration measures. The changes covered by this document will not result in any ecological impacts which are materially different to those covered in the original ES. There are no changes to the site boundary at Woodsmith Mine and therefore there will be no additional ecological receptors affected beyond those considered in the original ES.
- 9.22 Restoration proposals would still be implemented (as outlined in Chapter 6.0 Landscape and Visual Impact of this SES), which would result in the creation of a range of habitats appropriate to the area and its immediate surrounds.
- 9.23 In summary, a comparison of the worst case impacts generated by the approved and S73 schemes are presented in Table 9.2 below:

Table 9.2 Summary comparison of the ecological impacts of the approved and S73 schemes

	Approved scheme	S73 scheme
Construction Phase		
Impact on non-statutory sites	No impact	No impact
Impact on habitats	Moderate adverse	Moderate adverse
Impact on birds	Moderate adverse	Moderate adverse
Impact on bats	Moderate adverse	Moderate adverse
Impact on reptiles	Negligible	Negligible
Impacts on otter, water vole, dormice, aquatic and terrestrial invertebrates	No impact	No impact
Operational Phase		
Impact on non-statutory sites	No impact	No impact
Impact on habitats	Moderate beneficial	Moderate beneficial
Impact on birds	Moderate beneficial	Moderate beneficial
Impact on bats	Moderate beneficial	Moderate beneficial
Impact on reptiles	Minor beneficial	Minor beneficial
Impacts on otter, water vole, dormice, aquatic and terrestrial invertebrates	No impact	No impact

10.0 Updated Cumulative Assessment

10.1 In accordance with Town and Country Planning (EIA) Regulations 2011 (as updated) [Ref: 13.03], consideration has been given to any direct and indirect cumulative impacts arising from the interrelationships between different impacts arising from the development now proposed when considered alongside any other developments in the area surrounding the site. The objective is to identify whether combined impacts from the development or impacts from several developments, and which individually might be insignificant could, when considered together, cause a further significant direct or indirect and cumulative impact requiring mitigation.

10.2 A cumulative assessment is made of consideration of two types of possible impacts:-

- 1 Synergistic – the combined effect of different type of impacts attributable to the proposed development ('direct impacts') in respect of a particular receptor; and
- 2 Cumulative – these arise from the combined effect of the proposed development with committed development schemes that, individually, may be insignificant, but when combined with other impacts, may be significant.

10.3 In respect of the s73 application, it is noted that the minor material amendments do not give rise to any significantly altered impacts to those previously identified in the original ES. It is therefore reasonable to conclude that the likelihood of additional or different synergistic impacts to those identified in the original ES is unlikely. No further consideration has therefore been given to this type of impact as part of this SES.

10.4 However, consideration has been given to other cumulative effects should the amended development be considered alongside other plans or projects in the surrounding area.

10.5 A cumulative assessment was undertaken as part of the original ES [Part 5, Ref: 13.01]. The scope of the assessment, and range of plans and projects considered, was identified as a result of an initial sieving exercise. This resulted in the identification of 175 individual projects and plans that formed the basis of the cumulative assessment. It is relevant, however, that this schedule had regard to the overall site boundary for the Wider Project and the significant majority of the projects and plans identified had no relationship to the Woodsmith Mine site.

10.6 The cumulative assessment concluded that the impacts arising when the development was considered alongside other plans and projects did not represent a change from the levels of significance predicted for those same impacts when assessed individually within the ES (i.e. no significant cumulative impacts were considered likely to arise).

10.7 In the preparation of this SES, a further review of planning records available to the applicant on the website of NYMNPAs has been carried out adopting identical sieving assumptions to that identified in the original ES. This identified no further schemes requiring consideration as part of the SES as it relates to the Woodsmith Mine site. The conclusions of this sieving process were confirmed as part of the EIA scoping process undertaken in relation to the s73 development.

10.8 As a result of this review, no further assessment of the potential for cumulative impacts has been carried out in respect of noise and vibration, geology and hydrogeology, hydrology and flood risk and ecology. For completeness, however, previous cumulative visualisations included in the original ES have been updated as part of the LVIA in this SES to have regard to whether the changes arising from the s73 application could affect landscape or visual impacts (particularly in long range views). These photomontages are provided at Appendix 10 and a summary of the conclusions are set out below.

Updated Assessment of LVIA Cumulative Impacts during Construction

- 10.9 Updated construction stage cumulative ZTV mapping, using 'without' and with' woodland terrain models, has been prepared as follows:
- 1 2354.CU01 and 2354.CU02 compare the approved scheme winding towers cumulative visual envelope with that of the S73 scheme D-wall rigs at the Minehead site; and
 - 2 2354.CU03 and 2354.CU04 compare the approved scheme cumulative winding towers visual envelope with that of the S73 scheme single temporary winding tower at the MTS shaft.
- 10.10 The cumulative visual envelope for D-wall rigs would not arise during the period when temporary winding towers would be present at the MTS sites, but has been presented to indicate the wider potential influence of D-wall rig activity within the National Park. The D-wall rig cumulative visual envelope should be treated with caution, however. Due to the relatively slender nature of the D-wall machines and their latticework construction it is predicted that D-wall rigs would not form prominent features within the wider landscape at viewing distances beyond the 3-6km zone. Crawler cranes used at the D-walling stage are taller than the D-wall rigs. Again, however, these machines are relatively slender and made of latticework construction, indicating that they would not be perceived as prominent features beyond the 3-6km zone.
- 10.11 During the part of the construction period when the single temporary MTS winding tower is in place the cumulative visual envelope resulting from the S73 scheme would be very similar to that of the approved scheme. The reduction from three to one temporary winding towers would not significantly decrease the sense of intrusion caused by tall structures during the construction period, with the single winding tower remaining a prominent man-made skyline feature within an open landscape. Cumulative construction impacts on the North York Moors National Park would therefore remain major adverse across areas local to the Woodsmith Mine site and the intermediate shaft sites, decreasing to minor adverse across areas more distant from these sites. Other cumulative and sequential landscape and visual impacts during the construction stage would remain as set out in Part 5 Chapter 22 of the 2014 ES.

Updated Assessment of LVIA Cumulative Impacts during Operation

- 10.12 Adverse cumulative impact on landscape and visual resources is not predicted to arise during the operational stage, due to the limited extent of scheme effects, the distance between the operational sites and the lack of intervisibility between the sites, as for the approved scheme. Over the long term, minor beneficial cumulative landscape character impacts are predicted to arise as a result of the contribution of the restored Woodsmith site to acid grassland, scrub and woodland habitats to the landscape fabric of the National Park.

Conclusions

- 10.13 The assessment has demonstrated that there are no changes to the likely cumulative impacts arising as a result of the development forming part of the s73 application and no additional mitigation measures are considered necessary.

11.0 Conclusions

- 11.1 This SES has been submitted on behalf of Sirius Minerals and provides further environmental information to that presented in the York Potash ES (September 2014) [Ref: 13.01], as updated by the SEI (February 2015) [Ref: 13.02]. The document considers whether any additional or different environmental impacts that have not been previously identified as part of the original EIA process may arise in association with a series of minor material amendments to the approved form of development at the Woodsmith Mine site. The minor material amendments are the subject of a s73 planning application and this SES provides necessary information to assist the NYMNPAs in its consideration of that application.
- 11.2 Following the grant of planning permission, and the appointment of Contractors, more efficient construction techniques and other improvements have been identified that have resulted in the evolution of the scheme at Woodsmith Mine and this has given rise to the minor material amendments to the form of development. The changes have been captured on a series of amended plans and the s73 application seeks permission to move forward in compliance with those plans through the amendment to the wording of condition 5 on the original planning permission for the North Yorkshire Polyhalite Project. Changes may also be necessary to other conditions including nos 6, 39, 41, 44, 45, 47, 51, 57, 61, 62, 66, 73, 79 and 94.
- 11.3 The amended proposals for the Woodsmith Mine site have emerged from an iterative process of environmental assessment and refinement. Ongoing consultation and review of key issues arising as various submissions are made to discharge planning conditions associated with the development have also fed into this process. To that extent, measures to mitigate any impacts which may arise from the amended development have been largely 'built in' to the form of development now proposed or are capable of being carried forward by the retention of various planning conditions attached to the original planning permission for the development.
- 11.4 As a result of this, there are largely no anticipated changes to the overall impacts identified in the original ES as a result of the amended scheme. The only exception is the reduction in anticipated impact arising during the operational period in respect of surface water flows from site drainage and treated sewage and the discharge of treated sewage effluent. Changes to the development include the relocation of previously approved surface water attenuation ponds and a wetland area. The resultant impact reduces from minor adverse (as reported in the original ES) to no impact when the amended scheme is considered.
- 11.5 No additional mitigation measures are specifically identified as a result of the EIA reported in this SES.

12.0

Abbreviations

General

- SES - Supplementary Environmental Statement
- Sirius Minerals – Sirius Minerals plc
- ES – Environmental Statement
- NYMNPAA - North York Moors National Park Authority
- s73 - Section 73 of the Town and Country Planning Act 1990
- EIA – Environmental Impact Assessment
- s96A - Section 96A of the Town and Country Planning Act 1990
- AOD - above Ordnance Datum
- MTS - Mineral Transport System
- LEP - Local Enterprise Partnership
- GVA - Gross Value Added
- NPPF - National Planning Policy Framework
- JMWP - Joint Minerals and Waste Plan
- BREEAM - Building Research Establishment Environmental Assessment Method
- CEEQUAL – Civil Engineering Environmental Quality Assessment and Award Scheme
- MDT - Major Development Test
- D-walling – Diaphragm walling
- SAC - Special Area of Conservation

Noise and Vibration

- NSR –Noise Sensitive Receptor

Landscape and Visual Impact Assessment

- ZTV – Zone of Theoretical Visibility
- LCA – Landscape Character Area
- SuDS – Sustainable drainage systems
- LVIA – Landscape and visual impact assessment

Geology and Hydrogeology

- NHNI - Non Hazardous Non Inert
- GCL - Geosynthetic Clay Liner

Hydrology and flood Risk

- NYCC - North Yorkshire County Council

Ecology

- EcIA – Ecological Impact Assessment

- **PSMP – Protected Species Management Plan**

13.0

References

General

- 1 York Potash Environmental Statement (Royal HaskoningDHV, September 2014) [see also Appendix 1 to this SES]
- 2 York Potash Supplementary Environmental Information (Royal HaskoningDHV, February 2015) [see also Appendix 1 to this SES]
- 3 Town and Country Planning EIA Regulations 2011 (as updated by the Town and Country Planning EIA Regulations 2015)
- 4 Application ref: NYM/2016/0845/NM under s96a (December 2016) for the realignment of the main internal access road linking the approved Welfare Building complex and the mine-site and minor amendments to the Construction and Operational Platform levels
- 5 Application ref: NYM/2017/0255/NM under s96a (May 2017) to allow the temporary use of (a) the shaft entrance without the right-turn land and (b) the farm entrance for a period of 10 weeks, or until the completion of the haul/welfare road
- 6 Application ref: NYM/2017/0399/NM under s96a (June 2017) to replace the previously approved grouting and cast concrete wall scheme with more localised diaphragm walls for the Men and Materials shaft, Minerals shaft and Mineral Transport System shaft
- 7 Strategic Economic Plan Update (The York, North Yorkshire and East Riding Enterprise Partnership, 2016)
- 8 Strategic Economic Plan (The York, North Yorkshire and East Riding Enterprise Partnership, March 2014)
- 9 National Park Management Plan – Amendment Sheet (North York Moors National Park Authority, December 2016)
- 10 National Park Management Plan (North York Moors National Park Authority, June 2012)
- 11 National Planning Policy Framework (Department of Communities and Local Government, March 2012)
- 12 Local Plan – First Steps (North York Moors National Park Authority, September 2016)
- 13 Draft North Yorkshire, York and North York Moors Joint Minerals and Waste Plan (North Yorkshire County Council, York City Council and the North York Moors National Park Authority, November 2016)
- 14 York Potash Planning Statement (Nathaniel Lichfield and Partners [now Lichfields], September 2014)

Noise and Vibration

- 15 British Standards Institution (2014) British Standard BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise (BSI, London)
- 16 Planning Practice Guidance (Department of Communities and Local Government, March 2014)
- 17 Hiller, DM and Crabb GI, (2000). Ground borne vibrations caused by mechanised construction works. Highways Agency, Transport Research Laboratory, TRL report 429
- 18 Watts, GR (1990). Traffic induced vibrations in building. Department for Transport, Transport and Road Research Laboratory Research Report (TRRL), Research Report 246

- 19** Phase 4 – Woodsmith Mine Noise and Vibration Management Plan Ref: 40-RHD-WS-70-EN-PL-0017 (Royal HaskoningDHV, May 2017)

Landscape and Visual Impact Assessment

- 20** Guidelines for Landscape and Visual Impact Assessment, Third Edition, Landscape Institute and Institute of Environmental Management and Assessment, 2013

Geology and Hydrogeology

- 21** FWS Consultants Ltd, 2016. Hydrogeological Baseline Report for the Doves Nest Farm Minesite, North Yorkshire 2012 to 2016. Report 1975OR01.
- 22** FWS Consultants Ltd, September 2014. Hydrogeological Risk Assessment of the Minesite Development at Dove's Nest Site, North Yorkshire. Report 1433MineOR24E.
- 23** FWS Consultants Ltd, Preliminary Quantitative Hydrogeological Risk Assessment of Pollution Impact from Permanent Waste Management Facilities, Report 1433MineOR29, September 2014.
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