INDEPENDENT TECHNICAL ENGINEER PHASE 2 DUE DILIGENCE REPORT ON THE NORTH YORKSHIRE POLYHALITE PROJECT, UK

PREPARED FOR SIRIUS MINERALS PLC AND THE LENDERS' GROUP

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1 EXECUTIVE SUMMARY

BACKGROUND

Roscoe Postle Associates UK Ltd. (RPA) was retained by Sirius Minerals PLC (Sirius or the Company) in September 2017, to act as Independent Technical Consultant (ITC) on behalf of senior lenders and credit providers (collectively, the Lenders), to carry out a technical due diligence review of the Sirius-owned North Yorkshire Polyhalite Project (the Project), located in North Yorkshire, UK.

A Definitive Feasibility Study (DFS) for the Project was compiled by Bechtel Ltd. (Bechtel) for Sirius and published in 2016. Since the time of the DFS, considerable further engineering of the various Project facilities has been undertaken by Sirius and construction work is underway.

Under the ITC appointment, RPA is required to complete two Technical Due Diligence Reports to assist the future Lenders in their evaluation of the Project for the proposed financing of the Project.

To assist with the due diligence review, RPA has retained the specialist services of GCG Ltd. (GCG) to review the tunnelling and port elements of the Project, and Graham Daws Associates Ltd (GDA) to review the mine geotechnical aspects.

The first phase of the ITC due diligence was carried out by RPA in Q4 of 2017 and Q1 of 2018 and resulted in the Phase 1 report titled 'Independent Technical Engineer Initial Due Diligence Report on the North Yorkshire Polyhalite Project, UK' (Phase 1 Report) dated 19 April 2018.

RPA's Phase 1 Report summarised the results and observations from RPA's first site visit in October 2017, and presented a gap analysis style technical review of the DFS and any new engineering resulting from the front-end engineering and design (FEED) activities undertaken by Sirius, since the completion of the DFS. At the request of Sirius, RPA did not carry out a detailed review of the capital and operating cost estimates nor the Project economic analysis as these were being updated at the time.

Since the Phase 1 Report was completed, a revised project definition (for the purposes of the Stage 2 financing) was developed. This assumed that Phase 1 production would be 10 million tonnes per annum (Mtpa), comprising POLY4 granules and coarse ground

polyhalite (7 Mtpa and 3 Mtpa respectively), which would be exported via the existing Redcar Bulk Terminal (RBT) berth on Teesside under a materials handling agreement with Redcar Bulk Terminal Ltd (RBTL). Certain other design changes were introduced to various elements of the Project, mainly as a result of the normal evolution and development of the engineering at this stage of Project implementation.

A Phase 2 Draft ITC Report (the Report) summarising RPA's observations and conclusions from the September 2018 site visit and RPA's review of further and more recent project data provided by Sirius, was issued by RPA dated January 18, 2019. The Report included a review of the June 2018 Stage 2 Re-estimate of capital costs.

The Report was provided to the Lenders Working Group (LWG) that was engaged with Sirius during Q1, 2019, to consider potential project financing arrangements.

Subsequent to the issuance of the Report, RPA was requested by the LWG to provide additional review and opinion in certain areas of the Phase 2 Draft Report. RPA subsequently issued an Addendum to the report, dated 25 February 2019, addressing the LWG's requests including review of the Sirius financial model.

Since RPA's draft report was produced in January, Sirius has updated its mine design, operating cost estimates and prepared a Life-Of-Mine (LOM) plan based on increased production of 13 Mtpa (Phase 1a), following the completion of Project construction and development and the ramp-up of production to 10 Mtpa (Phase 1). This provides the Base Case for this report.

This final technical due diligence report has been prepared for the benefit of J P Morgan (JPM) and other future Lenders and reflects the status of the Project as of the end of April 2019.

All currency in this report is US dollars ($ or US$) unless otherwise noted.

PROJECT SUMMARY

The Project is located between Whitby and Teesside in North Yorkshire, United Kingdom and comprises the development of a deep underground mine (approximately 1,600 metres below surface (mbs)) to exploit the polyhalite resources contained in the Fordon evaporite deposits and includes a number of major infrastructure components across the region:

- An underground mine at the Woodsmith site.
- A 37 km long conveyor tunnel from the mine to the processing facility.
- A processing facility at the Wilton International site (Wilton) on Teesside.
- A storage and ship loading facility at the existing RBT wharf on the River Tees.

In the initial construction and development phase of the Project (Phase 1), production will ramp-up to 10 Mtpa of product. Production will then be expanded, in Phase 1a, to 13 Mtpa and, possibly in the future, to 20Mtpa in Phase 2. Some of the mine infrastructure, such as the mine hoists and MTS main conveyor system, has been designed for the planned future capacity.

Polyhalite is a naturally occurring evaporite mineral comprising hydrated sulphates of potassium, calcium, sulphur and magnesium; four of the six macro-nutrients that are essential to plant growth. The polyhalite resource consists predominantly of two seams, called the Shelf Seam and the Basin Seam, containing polyhalite with a grade greater than 80%.

The polyhalite will be mined and processed by Sirius to produce a granulated fertiliser product that will be sold under the tradename of POLY4. A coarse ground (ungranulated) product will also be marketed by Sirius.

The various components of the Project are spread across a wide area in the northeast region of England from the main mine site located near Whitby in North Yorkshire to the minerals handling and port loading facilities located on Teesside.

The key elements of the Project comprise the following:

1. The Woodsmith Mine (the Mine), located approximately 6 km south of Whitby will be an underground mine developed to produce polyhalite ore, that will be processed at Wilton to produce the final product of POLY4. The Mine site elevation is +200 metres Above Ordnance Datum (mAOD).

2. Facilities at the Mine include:

    - The necessary infrastructure, both above and below ground, that will be required to support the mining and transportation of the polyhalite mineral, including power supply (11 kV and 66 kV), water supply (raw, potable and fire water), domestic and non-domestic waste water treatment, security, road infrastructure, buildings (offices, workshops and stores) and communication systems.

- Surface and subsurface infrastructure works including winder houses and enlarged foreshafts to a depth of approximately 45 m to accommodate the headframes and minimize the visual impact of the two main deep shafts.

- Production Shaft, primarily used for hoisting mined polyhalite from the ore body to the Mineral Transport System (MTS) Level at approximately 340 mbs and as a second means of egress to the surface for personnel.

- Service Shaft, to enable the movement of personnel and materials for the mine development between the surface, the Mine and the MTS Levels.

- Primary mine ventilation fans and air refrigeration system located on the surface and connected underground to the downcast Service Shaft.

- MTS Shaft, to enable the construction and the movement of personnel and materials between the surface and the MTS Level during the MTS tunnel construction. Once complete the temporary headframe and hoisting equipment will be removed and this shaft will be converted into a ventilation up cast shaft.

- Tunnel Boring Machine (TBM) Launch Chamber, located at the MTS level, excavated from the base of the MTS Shaft to facilitate the underground assembly and launch of TBM Drive 3 northward from Woodsmith towards Lockwood Beck. In its final configuration this chamber will accommodate the MTS conveyor tail-end drive station and maintenance locomotive station.

- System of underground caverns at the MTS level to connect the Production, Service and MTS shafts to the MTS TBM launch chamber and tunnel at the MTS Level.

- Mine development at the shaft bottom and production level.

- The mine production areas where the polyhalite ore will be mined and conveyed back to the production shaft and loaded into the shaft skips. The ore production will come from room and pillar mining utilising a combination of sets of continuous miners and drill and blast equipment.

3. The MTS comprising the 37 km long MTS tunnel connecting the Mine from underground at the MTS level at 340 mbs to the surface portal at Wilton on Teesside.

    - The tunnel will provide a services corridor for various project infrastructure and services including water, electrical and communications systems, a maintenance railway and the conveyor system to transfer the run-of-mine (ROM) ore from the Production Shaft discharge point at the MTS Level, to the portal at the Wilton.

    - Lockwood Beck Shaft, located approximately 24 km from Woodsmith Mine, to enable the development and the movement of personnel and materials for the MTS tunnel construction. Once complete the temporary headframe and hoisting equipment will be removed and this shaft will be converted into an intervention and escape shaft and an emergency ventilation shaft.

      TBM launch and reception chamber at the base of the Lockwood Beck Shaft. Once construction is complete, the cavern will host emergency refuges and a conveyor booster station.

- The in-tunnel belt conveyor, forming part of the MTS, will be capable of transporting up to 20 Mtpa of ROM ore.

4. The Materials Handling Facility (MHF) at the Wilton site, comprising ROM ore and finished product storage, comminution and granulation facilities, designed for an initial Phase 1 capacity of 10 Mtpa of ore, producing up to 7 Mtpa of granulated product and 3 Mtpa of coarse product.

5. The Port Handling Facilities (PHF) located between the River Tees and the Wilton International site at Teesside and adjacent to the existing RBT wharf owned by RBTL. The PHF will be designed for the export of 10 Mtpa of product and includes:

    - a covered 3.5 km overland conveyor from the MHF site to the harbour at the port site;
    - covered storage, reclaim and screening facilities;
    - one 5,000 tonnes per hour (tph) ship loader;
    - use of the existing RBT wharf.

The port works to be carried out by Sirius will involve the preparation of land and construction of product storage sheds (the PHF) on land adjacent to the RBT wharf (not at the MHF as previously envisaged), and construction of the outload and ship loading circuit at the RBT berth.

Phase 1 of the Project will comprise the design and construction of the Project infrastructure and ramp-up to an initial production target of 10 Mtpa.

Sirius has now prepared a new mine plan and production expansion case, which is based on increasing the annual production to 13 Mtpa (Phase 1a), approximately two years after having attained the 10 Mtpa target. Sirius has decided to undertake the expansion to 13 Mtpa following significant progress in securing offtake agreements for additional sales of POLY4. Since the RPA Phase 2 draft report was issued in January 2019, Sirius the total offtake under agreement has increased to 11.7 Mtpa.

The expansion case to 13 Mtpa is the Base Case considered in this report.

In order to achieve the expansion production target of 13 Mtpa, Sirius will need to:

- Construct a second and identical processing train at the MHF that will increase the production capacity for granulated POLY4 product, to at least 13 Mtpa.
- Develop the Bran Sands wharf (as envisaged in the DFS) in order to be able to export the additional production.

- Increase the underground mining fleet to support six working production areas.

There is potential for the mining rate to be further increased to 20 Mtpa (Phase 2) and the Project infrastructure is being developed with this ultimate target in mind. This is not considered in the Base Case reviewed in this report.

PROJECT STATUS

The following section provides the current status of the Project construction works and engineering as at the end of May 2019.

Project construction began in May 2017 and is projected to be completed in 2023. Sirius expects to achieve ramp-up to 10 Mtpa in Q3 2024, however a more conservative ramp-up has been applied for the lenders Base Case, which is based on achieving this production target of 10 Mtpa by December 2024.

Construction activities are on a 24 hours per day, seven days per week basis.

The Project has been fully permitted by the North York Moors National Park Authority (NYMNPA) and Redcar and Cleveland Borough Council (RCBC) for a period of 103 years from 19 October 2015.

Since completion of RPA's Phase 1 review, Sirius has progressed significantly with the procurement and appointment of its primary consultants, main contractors, and supply contracts. These are shown in Table 1-1.

TABLE 1-1 KEY APPOINTED CONTRACTORS AND CONSULTANTS AS OF MAY 2019
Sirius Minerals PLC - North Yorkshire Polyhalite Project

Project Area	Contract	Contractor	Contract Type
MHF	Materials Handling Facility	WorleyParsons (formerly Jacobs)	Design & Build- Target Cost
MSD	Mine Site Development Works	DMC	Design & Build - Target Cost
MSD	Concrete and Civil Works at Woodsmith	PJ Carey	Construction only - Schedule of Rates
MSD	Shaft Lining Design	Arup	Consultancy Services
MSD	Concrete Supply	Breedon	Supply - Schedule of Rates
MSD	Winder Procurement	OLKO	Supply - Lump Sum
MTS	Tunnel Drives 1, 2 & 3 and MTS fit-out	STRABAG	Design & Build - Schedule of Rates
Other	Binder supply	ADM	Supply - Price per tonne
Other	Electricity Supplies - Woodsmith and LB	N Power	Supply only
Other	Engineering services	Arup	Consultancy Services Agreement
Other	Construction Power Supply Infrastructure - Woodsmith, Lockwood Beck and Wilton	Siemens	Supply - Lump Sum
Port	Port Handling Facility	McLaughlin & Harvey	Design & Build - Lump Sum
Port	Materials Handling Agreement	RBTL	Take or Pay - Rates

WOODSMITH MINE SITE

The focus at the Woodsmith site during 2019 is on the completion of surface and pre-sinking works to allow the start of main shaft sinking activities by DMC in the last quarter of the year.

Construction contractors, P J Carey Contractors Ltd (Carey), are carrying out the pre-sinking works for the three shafts at Woodsmith and also constructing the winder foundations and other civil construction works on the site.

Various secondary enabling work packages are progressing at Woodsmith, including installation of the liquefied natural gas (LNG) plant, extension of laydown areas, enhancing construction power distribution around the site, Siltbuster installation for water treatment prior to discharge, water treatment plant for shaft water treatment and various spoil management and landscaping regimes.

Shaft sinking contractors DMC have mobilised and are active at both Lockwood Beck and Woodsmith sites.

SERVICE SHAFT

Excavation of the Service Shaft headframe chamber to a depth of 45 m within the D-wall has been completed and excavation of the foreshaft section to 115 mbs has commenced. The foreshaft section is presently being sunk using grouting and a conventional method with a segmental lining being installed as sinking progresses. At the end of May, the total depth of the Service Shaft was 74 m.

The shaft is due to be handed over to DMC in Q4 2019.

The winder foundations works are in progress together with the construction of the winder basement walls and floor. The erection of the permanent winder house steelwork is in progress.

The first Shaft Boring Roadheader (SBR) is undergoing factory trials and testing in Germany and is due for delivery in Q3 2019.

Engineering is substantially complete for the winder building and headframes, with work continuing to optimise the service shaft foreshaft floor and collar configuration.

Figure 1-1 shows the status of the Service Shaft as at the end of May 2019.

FIGURE 1-1 SERVICE SHAFT AT END OF MAY 2019

Sirius Photo

Sirius Photo

PRODUCTION SHAFT

D-walling of the headframe chamber and foreshaft to a depth of 120 m was completed in December 2018.

Marriott Drilling Group (Marriott) completed the planned milling out the drill casing for drill holes SM14A and SM14B. This has been done to avoid interference with the future SBR sinking operations.

Carey has commenced D-wall capping beam excavations and bulk excavation of the shaft within the D-wall. The construction of the winder and building foundations is underway.

Figure 1-2 shows the status of the Production Shaft as at the end of May 2019.

FIGURE 1-2 PRODUCTION SHAFT AT END OF MAY 2019

WOODSMITH MTS SHAFT

The construction of the Woodsmith MTS shaft is carried out using a Herrenknecht Vertical Shaft Sinking Machine (VSM) and a slipform concrete lining. As at the end of May 2019, the upper 115 m has been completed.

Progress with the VSM was slower than planned, with cutting rates in harder sandstones and machine availability lower than expected. As a result, the completion of the shaft is behind schedule.

The shaft lining is currently being grouted, after which the shaft will be handed over to DMC, to commence shaft sinking operations to the MTS Level at approximately 340 mbs. Preparatory surface civil works for the shaft winder are underway.

Figure 1-3 shows the status of the Woodsmith MTS shaft as at end of May 2019.

FIGURE 1-3 WOODSMITH MTS SHAFT AT END OF MAY 2019

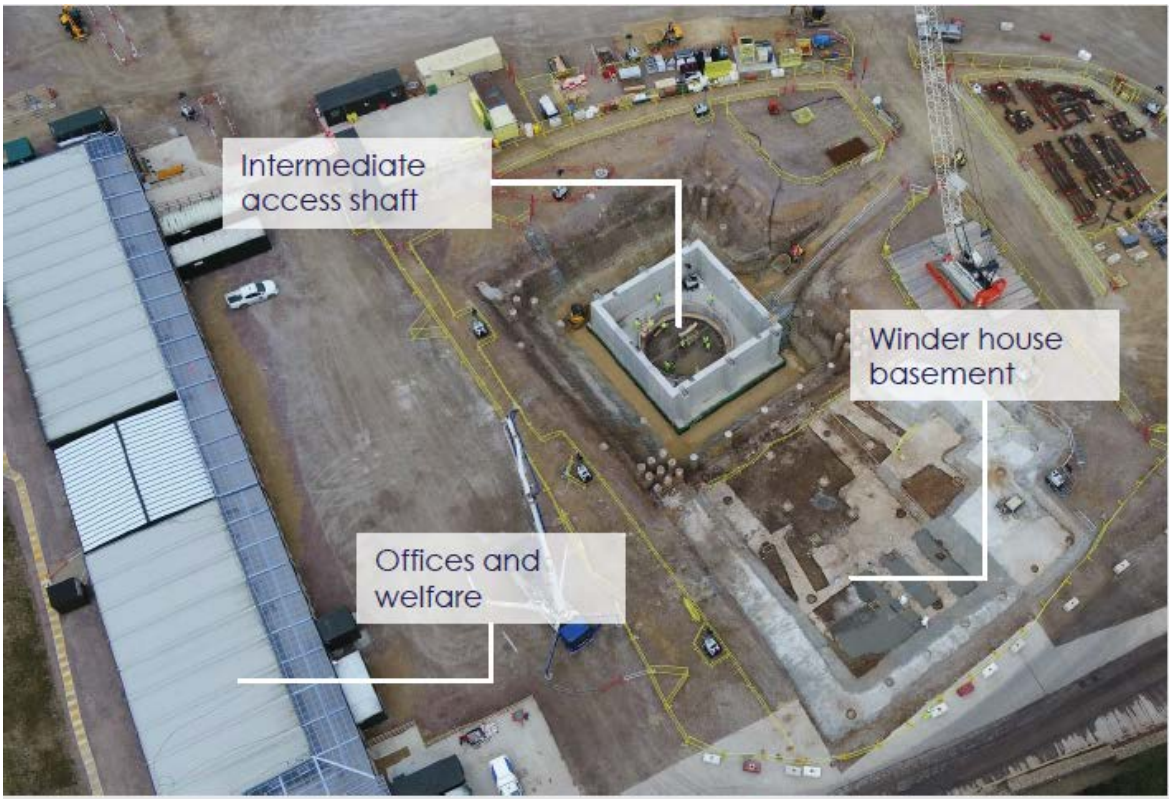
Sirius Photo

LOCKWOOD BECK MTS SHAFT

The secant piled wall at the top of the foreshaft has been completed as has the preparatory grouting works to seal the highly fractured geological structures between ground surface and 60 mbs (Figure 1-4).

Construction of the collar is complete and bulk excavation within the piled wall is underway to a current depth of 20 mbs. On completion of the foreshaft to 47 mbs, DMC will install the sinking Galloway stage to allow main shaft sinking to the MTS Level to commence.

FIGURE 1-4 LOCKWOOD BECK MTS SHAFT AT END MAY 2019



Sirius Photo

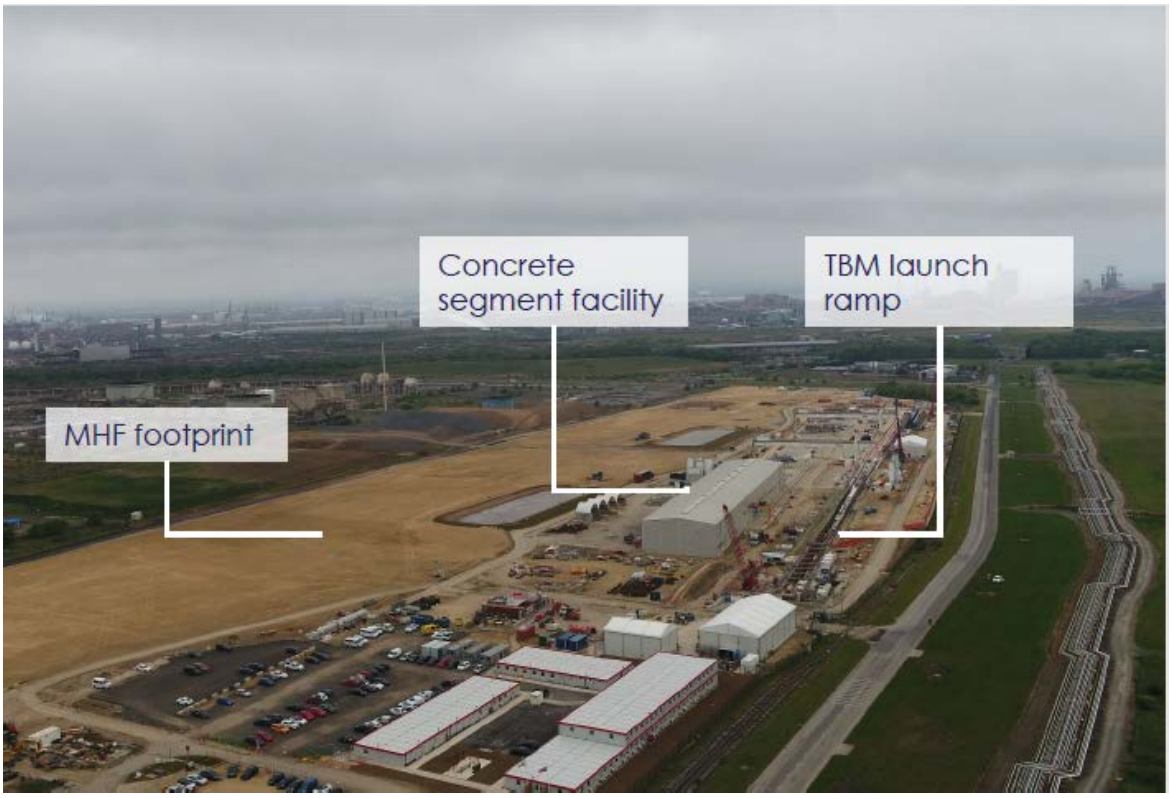
WILTON – MTS TUNNEL WORKS

Execution of the MTS tunnelling scope of works commenced in 2018 with construction of the Wilton Portal at Teesside for Drive 1 and erection of the tunnelling segment factory.

The MTS Drive 1 has commenced with the completion of the surface portal and start of the tunnelling works.

Other MTS work at Wilton includes the completion of the tunnel segment lining factory, segment storage area, and TBM assembly facilities (Figure 1-5). Construction of the segment factory and batching plant works is complete and segment production has commenced.

FIGURE 1-5 WILTON SITE AT END OF MAY 2019



Sirius Photo

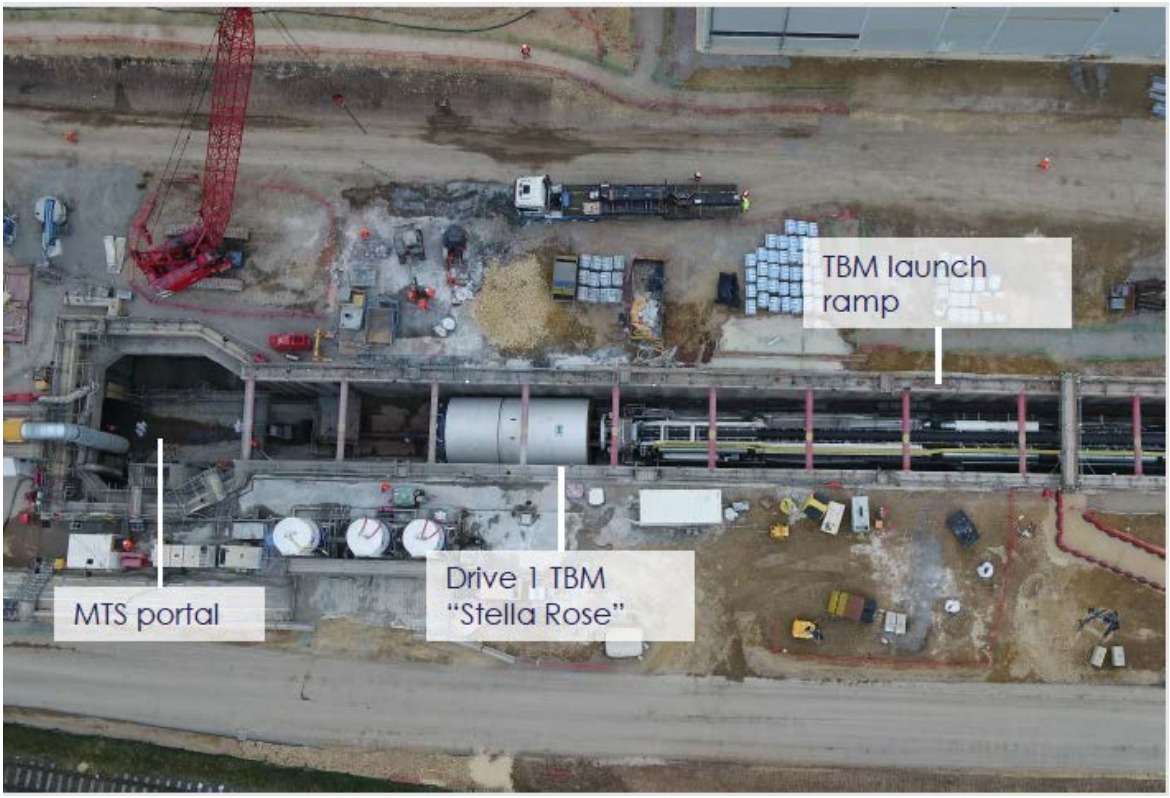
TUNNEL DRIVE 1

The MTS tunnel Drive 1 started in December 2018. Ground conditions have been better, and drier, than expected and the decision has been made to launch the TBM at approximately 100 m rather than the initially planned 125 m.

The TBM has been delivered to site, assembled, and officially launched on 12 April 2019 as planned. Currently, it is being advanced down the portal slope to the face of the SCL section of the tunnel. The TBM equipment train is being installed and final tunnel segments will be erected within the SCL section once the TBM has been positioned at the face of the SCL section.

Figure 1-6 shows the Wilton-MTS Drive 1 as at the end of May 2019.

FIGURE 1-6 WILTON – MTS DRIVE 1 AT END OF MAY 2019



Sirius Photo

MATERIAL HANDLING FACILITY (MHF)

MHF enabling earthworks are 70% complete as at the end of May 2019.

ENGINEERING AND PROCUREMENT

DMC is continuing with engineering on the four shafts. Procurement of long lead items is in progress, including structural steel, hoists and winches, sheaves, air compressors and the Galloways. Fabrication of the two SBRs has commenced.

Arup is progressing surface works engineering and finalizing the shaft liner designs with DMC.

The specification, value engineering, design and procurement of the various elements of the MTS Fit-Out scope is ongoing. Procurement for the conveyor is in progress with bids received from three preferred OEMs.

The MHF optimisation phase and value engineering is ongoing. The first granulator has been installed in Wilton and scale-up trials to finalise the MHF flowsheet (by specifying the

final number of granulators) are ongoing. Initial results suggest that a reduction in the number of Eirich granulators will be possible.

OVERLAND CONVEYOR (OLC)

The OLC design is ongoing with lower alignment of the crossings and the simplified design achieved. Procurement of the OLC is almost completed with an award expected in the near future.

Discussions with key third-party stakeholders are ongoing to conclude arrangements for the OLC construction programme and final route alignment.

PHF

Port design work is ongoing through McLaughlin & Harvey Ltd (McL & H) to optimise the foundation designs for the sheds and to assess, select, and integrate the right materials handling equipment (reclaimers, screens, shiploader, conveyor etc.).

Successful small-scale trials to test use of Redcar Mudstone as a capping material for placement below the port storage sheds have led to larger scale trials with Redcar Mudstone excavated from the SCL section of Drive 1.

Decommissioning and demolition of the existing stockyard equipment at the PHF site has been commenced by RBTL.

SCHEDULE

Sirius reports Project progress monthly by way of progress percentages indicating Earned Value for each Project work package contract and for the Project overall.

As of the end of April 2019, based upon the Project Earned Value for each project work package/contract, overall progress on the Project is reported to be approximately 16.7%.

CONCLUSIONS AND OBSERVATIONS

- RPA has not identified any fatal flaws with the Project design, construction, or future operating plan. RPA has reviewed the technical aspects of the Project and is of the opinion that the Project is based on reasonable Mineral Resource and Ore Reserve estimates that support a long mine life.
- RPA did not review the commercial marketing plans or pricing for the product.

- The purpose of RPA's technical due diligence review is for potential lender financing. RPA's technical review focusses on the appropriateness of the design of the various key elements of the Project to achieve initial and steady-state production targets of 10 Mtpa and 13 Mtpa respectively, the Project construction risks, particularly those associated with the MTS tunnel and the deep Woodsmith main shafts, and the future operational and production plans that would support the repayment of a structured project financing by commercial lenders.

- Overall, the Project design and the mine plan are being developed in a reasonable manner, however, RPA has identified some technical issues with respect to the construction, geotechnical conditions, and mine planning that should be addressed in the detailed engineering phase of the Project and in the further development and iterations of the underground mine design and the LOM plan.

- RPA notes that there are reasonable and achievable mitigative actions available for those areas identified for follow-up or further work, and that these are unlikely to have a material impact on the Project's economics.

- Sirius and its appointed contractors are still finalising the detailed design for many elements of the Project facilities and infrastructure and, in RPA's opinion, the more critical design issues and risk mitigation measures can be expected to be addressed during the finalisation of the detailed engineering.

- Specific conclusions, recommendations, and technical risks are provided in the following section by area.

GEOLOGY AND MINERAL RESOURCES

- RPA found no material issues with the updated geological model or 2019 Mineral Resource estimate and makes the following conclusions and observations.

- The geological model and Mineral Resource estimate have been updated by SRK Consulting (UK) Ltd. (SRK), on behalf of Sirius, since the Phase 1 review. Most of the recommendations made by RPA in the Phase 1 Report have been addressed by Sirius in the update.

- Compared to the Mineral Resource estimate reviewed in the Phase 1 Report, the total estimated tonnage of Indicated Mineral Resources in the Shelf Seam has increased by 100 Mt from 820 Mt to 920 Mt and the polyhalite grade has marginally decreased from 87.3% to 87.1%.

- The estimated tonnes of Inferred Mineral Resources in the Shelf Seam have decreased by 30 Mt from 840 Mt to 810 Mt and the polyhalite grade has decreased from 85.7% to 82.3%.

- Drilling and field procedures were carried out to industry standards.

- Sample preparation, analysis, and security procedures are adequate for use in the estimation of Mineral Resources.

- The drill hole database used for Mineral Resource estimation consists of diamond drill core and chip samples. When validating the drill hole database,

RPA noted some minor issues which do not materially affect the Mineral Resource estimate; however, these should be resolved in future models and estimates. These have been identified to Sirius.

- Some improvements in data management procedures are required, however, the drill hole database is of sufficient quality to support the estimation of Mineral Resources.

- In comparison to the geological model reviewed in Phase 1, which identified a single envelope of polyhalite based on a minimum polyhalite grade of 80%, the current geological model prepared by SRK separates the polyhalite in the Shelf Seam into three bands consisting of an upper and lower high grade band with a lower grade band in the middle. Importantly, the model also identifies the nature of the waste material above, between, and below the polyhalite bands. The gamma signature from downhole geophysical logging was used to define the polyhalite bands.

- The current geological model was created using seam modelling techniques and software, which gives a more representative shape to the stratigraphy as compared with the previous wireframed model.

- No further structural interpretation has been completed since the previous model. Low displacement faults were not incorporated into the current geological model. The Donovan and Whitby Faults were used to limit the northern and eastern extents of the reported Mineral Resource.

- While the modelled polyhalite bands are considered to be consistent in grade, thickness and elevation, the reality could be more complex as these parameters are observed to change over short distances in some of the surface drill holes. These variations are not considered to be material to the resource estimate and model and will be managed in the detailed short-term mine planning, based on the planned underground exploration and resource definition drilling and the high-density grade control drilling.

- The current block model is a Vulcan Horizon Adaptive Rectangular Prism (HARP) model with a 250 m by 250 m horizontal block size, which is a change from the standard 50 m by 50 m block model reviewed in Phase 1. While the larger block size is more representative of the large distances between the parent holes, the short scale variability seen between some of the closer spaced parent holes and parent and daughter holes is not well represented with this larger block size.

- Geostatistical analysis was completed for polyhalite, anhydrite, and halite in Shelf Seam bands B1, B2, and B3. RPA notes that the structure of the variograms is limited due to the small number of samples and spacing of the drill holes.

- Only a few samples are available for defining the density of the polyhalite and, in one instance, part of a denser anhydrite sample has been used to determine the density of band B3. No physical samples were used to determine the density of band D1. The density of this band was determined from geophysical measurements. RPA does not consider the limited density results to be a material issue for the global Mineral Resource estimate.

- Indicated and Inferred Resources have been identified for the Project. Resource classification was based on quantity and quality of data, geological understanding, quality of estimation, major faulting, permitting, continuity, and potential for economic extraction (based on mining panels with a minimum thickness of 2 m and a minimum grade of 80% polyhalite).

- The extent of the Indicated Resources has not changed since Phase 1; however, the extent of the Inferred Resources has been reduced. This reduction has occurred because the thinner and lower grade seams in the south of the Project area do not meet the criteria for potential economic extraction. This has no impact on the currently projected mine life.

- Band D1 was estimated using different interpolation inputs and methodologies than the B bands. It also lies below a significant thickness of anhydrite in the area of immediate interest, which would make this band difficult to mine based on the current mine plan. RPA is of the opinion that band D1 should be classified as Inferred Resources. Band D1 has not been considered in the Ore Reserves or in the current mine plan and so has no impact on the Project economics considered in this report.

- In RPA's opinion, the current block model adequately represents the global grade and tonnage. Due to the distance between the surface drill holes and the large block size used in the model, local scale variation in thickness and grade cannot currently be modelled with precision. RPA does not consider this to be an issue at this stage of the Project. If carried out as planned by Sirius, then the results from the underground, closely spaced resource definition and grade control drilling can be expected to provide the necessary definition that will allow refinement of the model and the detailed mine planning for operations.

- The 2019 Mineral Resource estimate focusses on the Shelf Seam. The Basin Seam is included in the Mineral Resource statement as an Inferred Resource of 960 Mt at 86.3% polyhalite. In RPA's opinion, the Basin Seam, which has only been intersected by one recent drill hole (SM1) and one historical drill hole (SB1), requires re-estimation based on learnings from the Shelf Seam estimation. The new Basin model is truncated east of drill hole SM7 by the Whitby Fault. The Inferred Resources in the Basin Seam are not included in the current LOM plan.

ORE RESERVES AND MINING

Since the Phase 1 Report, Sirius has undertaken a considerable amount of further mine planning and optimisation work to refine and improve the mine plan and to raise the confidence levels in the assumed productivities used for the LOM production schedule. The majority of the observations and recommendations made by RPA in the Phase 1 Report have been addressed in the further work carried out by Sirius.

As noted, the geological model and Mineral Resource estimate have been updated since the Phase 1 review and provide the basis for the latest 2019 mine plan.

RPA found no material issues with the 2019 mine plan and makes the following conclusions and observations:

- Sirius commissioned SRK to produce an updated Ore Reserve estimate, which was included in the latest Competent Persons Report (CPR) prepared for the Project by SRK, dated February 2019.

- The 2019 Ore Reserve has been reported in accordance with the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (JORC 2012 Code). SRK reported Probable Ore Reserves for the Shelf Seam of 290 Mt at an average polyhalite grade of 88.8%. No Inferred Mineral Resources have been included in the estimated Ore Reserves.

- The mine plan and LOM production schedule have been updated by Sirius for the expansion case production of 13 Mtpa of polyhalite. The latest mine planning is based on various optimisation and engineering studies together with productivity studies and simulations carried out by Sirius and the equipment manufacturers. This has increased the confidence levels in the assumed productivities used for the 2019 LOM production schedule.

- The 2019 mine plan has been developed based on individually mining the three bands of polyhalite in the Shelf Seam defined by polyhalite grade in the 2018 geological model prepared by SRK.

- The 2019 mine plan envisages the extraction of 543 Mt polyhalite over a post construction mine life of approximately 44 years, commencing from early 2022 and ending during 2066.

- Approximately 293 Mt of Indicated Mineral Resources are proposed to be mined over the mine life. The LOM includes the extraction of 250 Mt of Inferred Resources.

- During the first 25 years of the mine plan (2022 to 2046), approximately 278 Mt of polyhalite is proposed to be extracted, comprising approximately 256 Mt of Indicated Resources and 22 Mt of Inferred Resources. In the first ten years of mine life, only 1 Mt of Inferred Resources is scheduled for extraction; the majority of the Inferred Resources are proposed to be extracted from 2039 onwards, i.e. in the last six years of the first 25-year period.

- Given the continuous nature of the deposit and the high level of resource confirmation drilling planned by Sirius in the early years of the mine life, there is a reasonable expectation that most of the Inferred Mineral Resources included in the LOM plan will be converted to Indicated Mineral Resources and Ore Reserves. As a result, RPA does not consider the inclusion of Inferred Resources to be a material issue for the Project economics.

- The basic mining concept of room and pillar mining has not changed since the DFS and Phase 1 Report, and the use of continuous miners (CMs) for primary development and some of the production has been retained. However, the mining layout and the method of extracting the mineral has been modified to include the use suites of large drill rigs and battery-powered Load Haul Dump (LHD) units for drill and blast (D&B) production. Long hole drills will be used for mining the thicker sections of Band B2. During the first 25 years of the mine life, approximately 35% of the total mined tonnes in the mine plan will come from the D&B production areas, with 65% coming from the CM production.

- The 2019 mine plan includes the introduction of a sixth production area applying long hole retreat stoping to extract Band B3, starting in 2026. This method of production supports the production increase from 10 Mtpa to 13 Mtpa.

- RPA concurs with the introduction of the D&B methods as it allows much more production flexibility at lower cost should it be necessary to adjust the mine plan due to localised geological structural conditions or fluctuations in the mined grade.

- Since RPA's Phase 1 Report, Sirius has undertaken further detailed productivity simulations with two preferred equipment suppliers, Komatsu and Epiroc, to confirm the equipment selection and productivities used in the mining schedule. The CM productivity has been adjusted downwards from previous assumptions. D&B productivities have been simulated by the equipment supplier using a number of different equipment configurations. RPA considers the assumed productivities to be reasonable for use in the mine production schedule.

- The proposed mining equipment fleet to achieve 13 Mtpa comprises two sets or suites of CM equipment and four suites of D&B equipment. Adequate equipment has been included in the equipment fleet to achieve the projected production of 13 Mtpa. A swing CM suite will be included to provide additional production capacity if required and allow for scheduled overhauls of the machines.

- Due to wide spacing of the surface drill holes and the current relatively low granularity of the polyhalite grade in the geological model, there will be local scale variability of polyhalite grade and geological structures that cannot currently be modelled in the current mine plan. This may result in some minor losses of Indicated Mineral Resources (and Ore Reserves), however, due to the large scale of the deposit and the inherent flexibility of the mine plan, this is not considered to constitute a material risk to the Project economics.

- As soon as sufficient underground openings have been developed, Sirius intends to carry out an extensive and ongoing underground programme of close centred resource definition and grade control drilling, the results of which will be used to refine the geological model and develop a grade control model. The concepts for this drilling were described in the Phase 1 Report and have not been developed further as yet.

- Detailed mine planning will be based on the resulting refined models. RPA considers this approach to be appropriate, however, it is noted that this will likely result in adjustments being made to the current mine layout and LOM plan. Such changes are unlikely to materially impact the Project economics.

- Underground development is scheduled to start in 2022, with the establishment of a ventilation connection between the two main shafts, the construction of an equipment erection chamber and assembly of the first CM. During this period, polyhalite production will be limited to approximately 1,000 tonnes per day (tpd). Single shift development operations have been assumed over an eleven-month period.

- Following a period for shaft installation and commissioning, Sirius has scheduled the construction and installation of the underground mine infrastructure, primary pre-production development and the assembly, commissioning of the second CM and three D&B equipment suites over a six-

month period to the end of 2023. Production has been limited to 2,000 tpd from each equipment suite to allow for installation and commissioning of the mine infrastructure.

- By the end of 2023, production is anticipated to be the equivalent of approximately 2.5 Mtpa. Ramp up to the equivalent of 10 Mtpa production occurs over the next ten months to November 2024, which marks the end of the initial ramp-up period.

- A further increase in production is planned through 2025 to the monthly production rate of 1.08 Mt per month (annual 13 Mtpa production), which is scheduled to be achieved by August 2025, following the introduction of the sixth production area. The first full calendar year at 13 Mtpa production is 2026.

- No changes are required to the hoisting system to achieve the 13 Mtpa production, which is designed for a total capacity of 13.4 Mtpa.

- RPA considers the ramp-up to 10 Mtpa and the increase to 13 Mtpa to be reasonable.

SHAFT CONSTRUCTION

- The main access to the Production Level of the Mine is via two vertical circular, concrete lined shafts, approximately 1,600 m deep and 6.75 m in diameter located at the Woodsmith site. Two other shallower shafts, the MTS access shaft and the ventilation shaft, will also be constructed at the site, and connected underground to the main shafts.

- As reported in the Phase 1 Report, the main shafts will be sunk by North American contractor, DMC Mining Services (DMC), using SBR equipment supplied by Herrenknecht.

- The SBR equipment is being substantially redesigned and some of the equipment and systems upgraded based on the experience gained by the manufacturer and DMC on the Jansen shafts in Canada.

- Based on further information acquired from the latest drill hole, SM14B, the shaft lining design has been refined by Arup to suit the SBR method of sinking and the anticipated hydrogeological and geotechnical conditions.

- The final design for approximately 50% of the shaft depth to approximately 750 m consists of a drained cast-in-place high strength concrete lining that increases in thickness with depth. Three types of composite lining consisting of a combination of high-strength cementitious grout or geofoam with Spheroidal Graphite Iron (SGI) tubbing have been designed for the shaft sections through the Sherwood Sandstone Group (SSG) strata and the Carnallitic Marls.

- The detailed design analysis, including finite element analysis, has been rigorous and appears to have resulted in optimal lining designs. Arup and DMC are continuing to further refine the final designs.

- Following the completion of drill hole SM14B, detailed hydrogeological and grouting studies have been carried out by Arup and DMC to determine the requirements for cover drilling and grouting through the SSG aquifer. The

proposed drilling and curtain grouting methods are reasonable and well developed. If properly implemented, the cover drilling and grouting planned should reduce the risk of encountering uncontrolled water ingress into the open shaft excavations and should be effective in controlling water ingress into the shaft during excavation to manageable quantities.

- Throughout the SSG, it will be necessary to maintain a cover of probe holes drilled in advance of the shaft excavation, which will be used for hydrogeological testing and to determine the extent of grouting needed in that section. If grouting is required, these will also be used for the grout curtain. Additional grout holes will be drilled as required by the testing.

- Using the hydrogeological test work from SM14B, and the latest assessment that the bulk permeability of the SSG is low, DMC has made an assessment that 13 probe and grout curtains will be required through the SSG. Based on this assessment, a reasonable time allowance of 156 days has been included in the shaft sinking schedule for cover drilling and grouting through the SSG.

- RPA notes that the permeability of the SSG is considered to be predominantly fracture flow driven, which may make the success of curtain grouting more problematic. There remains a moderate risk, that higher permeabilities than are predicted by the SM14B data may be encountered, requiring more curtain grouting than presently anticipated. On the other hand, RPA notes that should the conditions prove to be better that anticipated, then less grouting will be required. The risk of additional grouting being required has been addressed in the Schedule Risk Assessment (SRA) carried out by Sirius.

- The estimated advance rates assumed by DMC in the shaft construction are based on excavation experience at the Jansen mine in Canada. The rates applied in the top 750 m of the shaft average 3.3 m/d. The machines are being designed to achieve these rates, and on paper, the estimated rates appear achievable, with better than the expected average sinking rates leading to a shorter sinking schedule. These rates are high, however, when benchmarked against conventional shaft sinking rates, and RPA is of the opinion that it may prove difficult to maintain such high average productivities, leading to a potential increase in the shaft construction time.

- Overall, RPA considers that Sirius and DMC are giving due consideration to all of the foreseeable risks associated with the shaft construction and are taking reasonable steps to mitigate them. Nevertheless, there remains a moderate risk that additional delays to the shaft construction may occur due to operational issues with the SBR equipment, and unforeseen ground and hydrogeological conditions particularly in the SSG and Carnallitic Marls.

GENERAL INFRASTRUCTURE

- The granted planning consents contain restrictive conditions that have to be adhered to for all of the Project development within the NYMNP. Sirius is developing the mine site infrastructure to fully comply with the imposed planning conditions.

- Road access to the Woodsmith Mine site is good and the necessary road improvements into the site have been completed in accordance with the planning consents.

- Sufficient temporary support buildings including showers and changing rooms, canteen facilities, workshops, stores, and offices for mine construction are located at Woodsmith site. These are occupied by staff from the Owners Team and the principal contractors on site. The buildings are of a modular construction and as such are capable of being easily expanded, subject to planning permission.

- The temporary power supplies currently installed at Woodsmith, Lockwood Beck, and Wilton will be adequate for the construction requirements. In the longer term, the distribution network will be adequate to distribute energy to the Woodsmith Mine surface complex and for the underground mine production. The electrical design is presently being completed for the MHF facilities at Wilton and the PHF at Bran Sands. Sirius has signed an agreement with Sembcorp Utilities UK to provide the permanent 66 kV power supply to the Woodsmith Mine site and the Wilton and Bran Sands facilities.

- The design is based on an initial electrical load list that identifies the major load centres. The use of the MTS tunnel for the 66 kV power supply cable avoids permitting and construction of overhead or buried cables through the national park. Overall, the power supply strategy appears sound and should provide sufficient energy to the Project.

- A modern fibre optic project-wide integrated communication and Supervisory Control and Data Acquisition (SCADA) system is being planned that will run from the Mine to the port via the MTS tunnel, with a parallel standby cable. A number of systems would be run from this system such as secure data, voice and video communications between sites and personnel, operations and management data to control the plant and related equipment data etc.

- Appropriate arrangements for the control and discharge of domestic and non-domestic waste water (NDWW) are being put in place, designed to cope with the predicted water coming from the shaft construction works and longer term mine and MTS tunnel drainage.

MINE INFRASTRUCTURE

- The engineering for the underground infrastructure is still at an early level of definition and generally has not been advanced significantly since the Phase 1 Report. RPA considers that the current status of the engineering for the underground infrastructure remains at an early feasibility study level of definition.

- Sufficient detail exists to provide confirmation that there are no major gaps in the equipment requirements and the planned systems. Any equipment gaps are likely to be well within the contingency allowance for the underground mine and unlikely to be material to the capital estimate.

- The lead time to the start of underground development provides sufficient time to undertake the detailed engineering needed for the underground infrastructure.

- The mine ventilation study undertaken by Howden has confirmed the required airflows and the cooling requirements necessary to operate the mine at 10 Mtpa, while maintaining acceptable environmental conditions underground.

- The principal ventilation challenge will be management of heat and dust and maintaining minimum air speeds of at least 0.25 m/s in the 16 m wide roadways. The Howden ventilation study confirmed that bulk air cooling will be required from the start of production, in order to maintain air temperatures in return roadways below 28ºC, and provides basic specifications for the necessary primary ventilation fans, refrigeration plant and bulk air-cooling systems.

- Six production panels are required to achieve 13 Mtpa production rates. The present ventilation design and airflows are based on a maximum of six working areas. The ventilation capacity is limited by the maximum airspeed in the two main shafts with little spare capacity. At full production of 13 Mtpa, additional measures such as controlled partial re-circulation and additional underground air cooling may be required.

- The use of electric equipment, in particular electric LHDs, will aid the mine ventilation by eliminating diesel particulate contamination.

- Sufficient time does exist in the Project Schedule for detailed engineering of the ventilation equipment to be completed, procured and installed by the start of production.

- The detail of the underground electrical reticulation systems is at a relatively early stage of engineering. As with the other infrastructure the basic concepts for the equipment have been established and will be subject to further design as the mining equipment electrical loads are confirmed. RPA did not identify any obvious gaps.

- The intended mine utilisation voltages of 11/3.3/1.1/0.69 kV and 230 V selected as the voltage supplies for development and production equipment are in accordance with current equipment manufacturers ATEX flameproof (FLP) standard and mine products which have proved reliable over many years with readily available spares.

- Due to the large number of individual loads and the transmission distances, RPA agrees with the use of 11 kV transmission distribution systems and equipment utilisation 3.3 kV voltage for large kW drives employing ATEX underground FLP equipment.

- RPA did not identify any issues with the electrical design concepts being adopted or identify any obvious gaps in the scope of supply.

- Planned control and monitoring systems for the mine are in line with modern mine installations.

- The basic concepts for the underground minerals handling have not changed since the Phase 1 Report with the exception of the decision to move away from the use of Flexible Conveyor Trains (FCTs) behind the CMs. The adoption of shuttle cars and large battery LHDs provides more flexibility in the movement of mineral from the CM and D&B production units and RPA concurs with this selection.

- The conveyor system has been specified for commonality of drives and structure to allow flexibility during the operational mine life and reduce the spares holding requirements.

- The mine drainage system is largely as described in the DFS and Phase 1 Report and no further work has been done in this area.

- The risk of water flow into the mine is well understood and clearly recognised by Sirius. The known major faults that may interconnect with the overlying SSG have been identified in the mine plan and substantial barrier pillars left around them. Similarly, suitably sized barrier pillars have been left around known drill hole locations.

- The risk of significant water ingress into the mine workings is considered to be very low and RPA considers the current design pumping capacity to be conservative with the proposed pumping capacity well above any mine inflow.

MINERAL TRANSPORT SYSTEM

- The MTS provides an infrastructure and minerals transport corridor between the Woodsmith Production Shaft at the MTS Level and the MHF at Wilton. The tunnel portion of the MTS will connect the Mine site to the MHF at Wilton and will be approximately 37 km long with an internal diameter of 4.9 m.

- Since the completion of RPA's Phase 1 Report, Sirius has appointed STRABAG AG (STRABAG) to design and construct all of the underground works associated with the MTS tunnel and caverns. The two MTS shafts will be sunk to full depth by DMC after construction of the foreshafts has been completed by another contractor.

- The engineering of the MTS is currently being advanced by the appointed contractor, STRABAG, based on a reference design developed by Arup and included in the tunnelling design and build contract. By June 2019 the construction of the portal structure at Wilton was complete and mining for the first tunnel drive had begun.

- As part of developing a detailed design, the tunnel diameter has been space-proofed for the MTS fit-out requirements and, as a result, the tunnel reference design diameter was increased to 4.7 m. RPA understands that both contractors bidding for the tunnel works, and the TBM manufacturer, recommended that the diameter should be increased to 4.9 m to improve TBM productivity and to de-risk the construction. Sirius has adopted this diameter for the final design and RPA agrees that the increased diameter is an improvement in the overall design.

- The tunnel will be completed in three approximately equal length drives using TBMs, with Drive 1 commencing from a surface portal at the Wilton site, close to the MHF. It is to be lined with pre-cast concrete segmental rings. Each ring will be 350 mm thick and 1.5 m long ring and will consist of six reinforced concrete segments.

- The lining segments for Drive 1 will be produced at a manufacturing facility adjacent to the portal at Wilton and recently commissioned. The current intention is to produce the segments for Drives 2 and 3 at another location within the larger Wilton site. These segments will then be transported by road to Lockwood Beck and Woodsmith.

- Drive 2 will commence at the Lockwood Beck Shaft and drive southwards towards Woodsmith Mine. Drive 3 will be driven northwards from Woodsmith

towards Lockwood Beck. The two drives will meet at approximate mid-distance from the two sites.

- The MTS caverns at Woodsmith and Lockwood Beck and most of the tunnel alignment will be located in the Redcar Mudstone, which has been proven to be a low permeability stratum with reasonably consistent properties throughout the tunnel alignment. The Redcar Mudstone Formation is an approximately 300 m thick unit, which contains significant vertical lithological variation.

- Considerable further ground investigation has been undertaken by Sirius during 2018 and this has been used to establish the reference design and determine the excavation classes contained in the STRABAG contract. The interpretation of the additional information is currently being used by STRABAG to complete the detailed design of the tunnel and the TBMs.

- Ground investigations have been completed for all tunnel drives. There are unavoidable gaps in the borehole spacings for three tunnel drives. The Redcar Mudstone Formation is an approximately 300 m thick unit, which contains significant vertical lithological variation, however, a consistent and reasonably detailed understanding of the stratigraphy for the Redcar Mudstone has been established and this reduces some of the risks arising from the small number of deep MTS tunnel boreholes.

- The resolution of the geophysical surveys used to identify geological faulting is such that not all the faults that may be present are detectable. As a result, it is likely that some currently unidentified faults will be encountered by the TBMs.

- The original vertical alignment was reviewed by STRABAG to minimise encounters with hard bands within the geology. Compared to the Phase 1 Report, the alignment is deeper at Lockwood Beck. These changes mean that Drives 1 and 3 will be driven downhill and Drive 2, driven uphill.

- There have been minor changes made to the horizontal alignment of the MTS tunnel. The geological model has been refined by Sirius and STRABAG as a result of further ground investigation.

- The proposed tunnel alignment is crossed by several geological faults that cross the alignment generally at angles greater than 45°. The character of these faults and/or fault zones is a key potential geological hazard for the design and construction of the MTS tunnel.

- Data on the creep, swelling, and slaking properties of intact Redcar Mudstone has been acquired during the recent ground investigations. These properties can result in increased ground loading on the lining; however, the test results indicate a low to medium risk of this occurring. Mitigations for these phenomena include the TBM design and grout design, the robust lining design, and the long-term monitoring arrangements.

- Clogging of apertures in the cutter head caused by degradation of the mudstone during excavation is a potential TBM hazard. The data gathered during the ground investigations suggests that this is an intermittent and generally low risk.

- The Drive 1 tunnel spoil will be transported by belt conveyor to the Wilton portal and will be taken from there by lorry to one of three locations. Drive 2 spoil will be temporarily stored at Lockwood Beck and transported by lorry to one of the

two Bran Sands sites described above. Drive 3 spoil and all the spoil generated by shafts and caverns at Woodsmith will be retained in a series of bunds within the Woodsmith site. There appears to be sufficient space to dispose of/re-use the additional spoil arising from the Phase 1 to Phase 2 increases in the MTS tunnel and shaft diameters.

- The Drive 1 TBM is a Herrenknecht Single Shield TBM with some STRABAG specific modifications. It has been assembled at the Wilton portal and has started tunnel construction. The TBMs for Drives 2 and 3 will be broadly the same as that for Drive 1. Potential changes are understood to include the provision of a thicker steel skin for the shield and the provision of a larger drive radius (within the same overall shield diameter of the Drive 1 TBM).

- The Drive 2 TBM will be lowered down the Lockwood Beck Shaft and assembled in the launch cavern. The Drive 3 TBM will be lowered down the MTS Shaft at Woodsmith and assembled in a pre-formed launch cavern.

- STRABAG will need access to, and interaction with, the shaft sinking contractor at the interface between the shafts and the launch caverns at Woodsmith and Lockwood Beck MTS shafts. Although the portal at Wilton is on the same site as the MHF, the interface is limited because the portal structure is complete. As a result, immediate interaction between the MHF and MTS contactors is limited.

- The tunnel will be fitted out after construction with various project infrastructure components including a high-speed belt conveyor, maintenance railway, power supply cables, communications network, pump pipes and passive gravity drainage for any ingress water.

- The permanent services within the MTS tunnel will be mounted to the tunnel lining at the sides of the tunnel. These services include the Woodsmith 66 kV and the Lockwood Beck 11 kV power supply cables and the pumped drainage that will transport any ingress water to Wilton. No permanent walkways will be provided in the tunnel and pedestrian man access will not be permitted.

- Fixed emergency refuges will be provided in the MTS Woodsmith and Lockwood Beck caverns. Consideration is being given to provision of mobile refuges attached to the maintenance locomotives and for the provision of a fixed refuge at the meeting point of Drives 2 and 3.

- Previously calculated water ingress rates for the MTS tunnel have been revised by Arup for both construction and long-term cases.

- The majority of MTS construction risks are anticipated by the re-measurable elements in the STRABAG contract.

- STRABAG is a highly experienced contractor and it is reasonable to assume that the detailed design responses to all of the identified ground hazards will be incorporated into the final design with appropriate mitigations adopted.

MATERIAL HANDLING FACILITY

- The MHF will be located at the Wilton site on Teesside, which covers an area of approximately 37.5 ha comprising a mix of brownfield and greenfield conditions.

- The processing of the polyhalite to produce the POLY4 granules is relatively simple, involving crushing, grinding, screening, starch addition and granulation, drying and wax coating.

- Since the Phase 1 Report, Sirius has carried out further optimisation work on the flowsheet, based on additional test work, and the present MHF process flowsheet has evolved from that presented in the Phase 1 Report.

- The currently designed MHF has been specified as a single line capable of producing 7 Mtpa of granulated POLY4 product and 3 Mtpa of coarse ground product.

- Sirius has engaged Worley Parsons Ltd. (Worley), formerly Jacobs Engineering (Jacobs), under an Engineering, Procurement and Construction (EPC) target cost contract to design and construct the MHF. Worley was involved in undertaking some of the initial engineering and test work completed by Sirius.

- Worley has been undertaking an optimisation study for the plant. Sirius expects this to lead to some layout and flowsheet refinement with associated cost reductions, however, RPA has not been made aware of any changes being made to the flowsheet or plant design.

- The metallurgical test work has inevitably been constrained by the small quantity of drill core samples available for this purpose. Sirius has done its best to overcome this shortage of material by obtaining polyhalite material from other sources for crushing and grinding tests. Sirius has been able to obtain polyhalite material, which is expected to have similar characteristics to the mineral to be mined from the deposit, in order to conduct the necessary testwork and trials.

- This approach leaves some uncertainty about how representative these samples may be of the actual ROM mineral feed. Sirius also has limited knowledge of the variability of the processing properties of the ore within the resource and there is a minor risk that this might influence the results obtained. RPA notes that any differences between the polyhalite from the Mine and that used in test work to date may impact process guarantees.

- As the samples were not obtained from crushed ore, the particle size distribution of the samples submitted for crushing test work may be unrepresentative of the particle size distribution of the ROM ore feed to the plant. As this applies to three consecutive stages of crushing and grinding, there is some risk of compounding errors in the estimation of the particle size distribution. The risk is mitigated to an extent by the intention to build and run a pilot plant in advance of the MHF. This pilot plant will process ROM ore obtained from the initial mine development phase, offering the opportunity for fine-tuning of the MHF design if needed.

- Sirius has built a small demonstration plant, which includes a full-scale granulation unit, that will process the initial production of polyhalite (up to approximately 1,000 tpd). Operation of the demonstration plant should provide the opportunity to determine the necessary changes in time for the start-up of the main plant.

- It is proposed to screen the pellets at 5 mm and 2 mm to ensure that the feed to the dryers is coarser than 2 mm and finer than 5 mm. There may be some

shrinkage and breakage in the dryers and the wax coating drums and there may be some risk of exceeding the permitted particle size range.

- The demonstration plant provides a good opportunity to fine-tune the cut points of the screens. RPA notes that such fine-tuning may narrow the acceptable size range, which may reduce the proportion of acceptable pellets from each batch of the mixer granulators.

- The demonstration plant provides a good opportunity to fine-tune various elements of the plant in advance of completion and commissioning of the main MHF plant. However, RPA notes that design changes at this stage of the MHF development may result in additional costs.

- The production ramp-up of the plant is governed by the rate at which mining production can be increased. There are no other polyhalite plants available with which to compare and benchmark. However, the initial period of the ramp-up is considered to be slower than a typical mineral concentrator, while the subsequent increase in planned throughput to nameplate capacity is much faster than would normally be expected. It is acknowledged that the MHF is simpler than a typical mineral concentrator so it is not unreasonable to expect a somewhat faster production ramp-up. Overall, the planned ramp-up rate for the MHF is therefore not unreasonable.

- RPA considers that the provision of just eight mixer granulators may prove insufficient to achieve the planned throughput and recommends that this be considered as part of the final design review being undertaken by Worley.

- Overall, RPA sees no major issues with the flowsheet of the MHF or the current design. Worley is an accomplished and experienced engineering company that can be expected to ensure the design of the plant is fit for purpose.

PORT HANDLING FACILITY

- At the time of the Phase 1 review of the Project in October 2017, Sirius intended to build a wharf on the River Tees, adjacent to the existing RBT berth. During 2018, Sirius negotiated a Materials Handling Agreement with RBTL, for the use of the RBT wharf to berth, load, and un-berth bulk carriers, thereby removing the need to initially build a wharf adjacent to the RBT wharf.

- Sirius will construct the PHF adjacent to the RBTL wharf to receive, store, screen and transfer the final products to the ships. This is a change from the previously envisaged port arrangements.

- The final product from the MHF will be transferred to the PHF via the OLC. The present scheme (included in the capital estimate) is a three-flight twin conveyor belt system that follows the already permitted route. The conveyors are each rated at a nominal capacity of 1,500 tph.

- Following optimisation work by Sirius, an alternative conveyor routing is being considered that would allow a single flight curved conveyor to be used. This would have the advantage of reducing degradation of the granules during transfer to the PHF. The permitting of this route is currently in progress.

- At the time of writing, the procurement of the OLC is presently out to tender, based on an outline specification and reference design prepared by Sirius. RPA reviewed the specification and design and concurs with the detail.

- With the exception of the permitting of the altered OLC route alignment, RPA did not identify any risks or issues with the OLC other than those normally associated with the operation of long conveyor transport systems.

- Sirius intends to sign an EPC contract for the provision of the OLC during 2019, and the functional specification seen by RPA will be incorporated into the EPC contract. At this stage, it is not entirely clear how the OLC will be contractually integrated into the already procured packages associated with the MHF and PHF, however, RPA notes that the technical interfaces between the respective packages are relatively straight forward.

- The PHF comprises the materials handling systems and all associated structures, infrastructure and the services required to convey coarse and granulated polyhalite from the MHF at Wilton, to a large storage facility at RBT and from there an out-loading facility at the RBT berth on the River Tees where the products are loaded into seagoing vessels.

- The PHF flowsheet consists of infeed tripper conveyors, storage sheds, reclaim systems, a separate screen building to screen out under and over-size material and transfer conveyors to the ship-loader and finally onto the ship-loader.

- The facility is currently designed to transfer two different products (approximately 7 Mtpa of granular POLY4 product and approximately 3 Mtpa of coarse product) from the end of the OLC through the storage and screening facilities and ultimately onto the ships.

- The minimum usable (reclaimable) storage capacities to be provided will be 185,000 tonnes of POLY4 granules and 71,500 tonnes of coarse ground product.

- Sirius (as York Potash Processing & Ports Limited) has signed an EPC design and build contract for the entire scope of the PHF with McL & H.

- RPA reviewed the scope of supply of the McL & H EPC contract and did not identify any obvious gaps.

- The contract price comprises fixed prices for the majority of the scope of supply (approximately 83% of the total contract value), with the remaining 17% allocated to provisional sums that are to be agreed with Sirius following further site investigation and detailed engineering.

- RBTL operates a 320 m long wharf which can accommodate vessels with a draft of up to 17 m and is presently fitted with two ship loaders which can operate on grab or hook for unloading bulk or conventional cargoes respectively. The berth can accommodate the Panamax size ships that Sirius intends to use for shipping.

- Under the signed agreement, RBTL will operate and maintain the berth and operate and maintain the new shiploader to be provided by Sirius as part of the PHF installations. Sirius will be responsible for the operation and maintenance of the PHF.

- RPA visited the RBT wharf during the October 2018 site visit, and gained a general impression of the overall condition of the structure. Sirius employed Royal HaskoningDHV (RHDHV) to undertake an inspection of the RBT wharf and to prepare a report on the condition of the wharf and its suitability for the export duty being considered by Sirius. RHDHV is a reputable independent and specialist consulting firm, familiar with inspecting marine structures such as this. In the light of the RHDHV inspection and report, RPA did not consider it was necessary to carry out a detailed site inspection of the wharf for the Phase 2 due diligence report, which would require several days on site, and RPA has relied on its review of the RHDHV report to confirm the condition of the wharf.

- The size of the vessels used for export depends on where the product is going and the maximum draft that the destination port can provide. The RBT wharf is sufficiently long and has sufficient draft for the largest bulk carriers that Sirius will need to use for the export of the polyhalite.

- Sirius has carried out an initial assessment of the demand, seasonality, and shipping requirements for the polyhalite using a dynamic model prepared by RHDHV. The model was used to predict the percentage of time that there would be ships on the wharf (the Berth Occupancy). RPA has reviewed the results and concurs with them, although it is noted that the original estimate of the berth occupancy for Sirius vessels appeared to be high at 80%. More recent modelling, taking into account the Sirius Marketing Division's estimate of sales, indicates that berth occupancy for Sirius vessels is likely to be approximately 64%. RPA considers this to be an acceptable and an achievable level of occupancy since most offtake agreements are on CIF/CFR terms, giving Sirius more control over the actual shipping requirements.

- It is understood that RBT may continue to provide services to other clients during the period it handles cargoes of polyhalite for Sirius and this was taken into account in assessing the capability of RBTL to meet its obligations to Sirius. However, RBTL has an absolute obligation to meet the contractual annual throughput of 10 Mtpa from Sirius.

- Although there is a possible issue with RBTL using the berth for other customers, RPA did not identify any major risks with the plan to utilise the RBT berth.

- Since the RBT wharf has a limitation of 10 Mtpa, as part of the expansion case to 13 Mtpa, Sirius intends to construct its own wharf at Bran Sands as envisaged in the DFS. This work would be undertaken during 2024 and 2025.

- The construction of the wharf will require the construction of a new quay, dredging of an approach channel and berthing pocket, a new shiploader and the conveying equipment to connect the PHF stockyard to the new wharf and shiploader. The engineering for this has not been undertaken to date. Capital costs have been based on a historical budget quotation received from McL & H.

- It is understood that a similar shiploader will be used to that being procured for the RBT facility. This has a capacity of 5,000 tph, providing adequate capacity to achieve the increased export throughput.

- Sirius already owns the freehold of the necessary land and is negotiating a 70-year lease of a jetty area from the Crown. The development of the berth is permitted by the existing Development Consent Order (DCO).

ENVIRONMENTAL AND SOCIAL ASPECTS

- Sirius has obtained planning permission under UK national planning requirements for all of the Project components to allow production up to 13 Mtpa on a rolling twelve-month basis

- Planning consent was originally granted by each of the Local Planning Authorities (LPAs) (NYMNPA, RCBC, and Scarborough Borough Council (SBC)) between August and October 2015 for the Mine and MTS, MHF, construction housing and worker park and ride schemes, with numerous conditions attached, which must be discharged by the Project prior to or during the specified works.

- An environmental statement, documenting a detailed environmental impact assessment (EIA) process for the mine site, MTS and MHF, prepared by RHDHV, was submitted as part of the planning applications.

- An impressive amount of effort and time has been invested by Sirius investigating the environmental and social implications of the Project and how best to manage them and to comply with UK legal requirements.

- The Company is very focussed on being fully compliant with its obligations under the granted planning consents and associate conditions and to date has been successful in doing so.

- Sirius is employing best practices in ensuring that the unique environmental and social sensitivities of the Project are emphasised and regularly reinforced among all Project workers. Environmental issues are raised at weekly site meetings and there are regular tool box talks delivered by contractor and Sirius environmental team representatives.

- Sirius maintains a comprehensive planning conditions tracker relating to each phase of the works, which records planning condition submissions and formal discharges by the LPAs. RPA's review of this showed that all conditions for which submissions have been made to discharge planning conditions in the first six phases of the Project to date have been discharged, are in process of being so or are not applicable to the current phase of the Project.

- In addition to the planning conditions, Sirius has entered into S106 agreements with the determining authorities under the Town and Country Planning Act 1990 to address aspects of the Project beyond the scope of planning conditions.

- S106 agreements have been made between Sirius and NYMNPA and RCBC requiring bonds to be set up to provide for the reinstatement of the Woodsmith Mine and Lockwood Beck sites should construction or operational mining activities cease with no reasonable prospect of them recommencing.

- Sirius is obliged to have sufficient fiscal arrangements in place at the start of construction to pay for all of the S106 contributions, which are due over the following 10 years. An escrow account has been set up by Sirius from which

the LPAs would be able to draw should Sirius default on payment. RPA has seen the Escrow Agreement, dated 26 April 2017.

- To manage the environmental and social (E & S) requirements of the Project, Sirius, has developed a Construction Environmental Management Framework (CEMF) and a Community and Stakeholder Engagement Framework (CSEF). Under the CEMF, each Project contractor is required to produce a site-specific environmental management plan, which is implemented within the framework of its own Environmental and Social Management System (ESMS).

- Sirius is working collaboratively with its contractors and its technical consultants to develop the ESMS documents, drawing on the specific expertise and well-established planning, monitoring, controlling and reporting procedures of the contractor. The main contractor at each site is required to manage day-to-day environmental activities, in accordance with its site-specific CEMP.

- RPA reviewed the CEMF and CSEF and a number of recommendations were communicated to Sirius prior to the completion of this report. Sirius has undertaken to adopt these recommendations.

- The potential effects of the Project, particularly during the construction phase, on surface water systems at the Woodsmith Mine and Lockwood Beck were a concern to planners and other stakeholders and resulted in related planning conditions.

- A surface water drainage management system was in the process of being constructed at the Woodsmith Mine during RPA's site visit. It consists of an integrated system of collection ditches, swales and pipes, an oil separator, a silt removal facility and a series of attenuation ponds and, finally, engineered wetlands prior to discharge into a local watercourse. The wetlands were observed during the site visit and a rapidly developing natural ecology was noted.

- Similar systems and processes have been installed at Lockwood Beck.

- RPA considers that Sirius and its contractors have developed a comprehensive programme for monitoring and inspections and the surface water management/ pollution control structures appear to have been carefully designed.

- There is a potential minor risk of acid generation and sulphate-rich leachates from the Redcar Mudstone material coming from the tunnel construction. A precautionary approach to leachate management of the bunded materials should be considered, with designs included in the plans for leachate collection and treatment and the treatment of acid/ neutral runoff during bund construction. If it is generated, this leachate will be collected in the bund's underdrainage systems and may require treatment methodologies beyond the current system of sedimentation ponds, wetlands. This issue was discussed with Sirius and JPM during the period of RPA's review and is included in the agreed EP action plan contained in the Report .

- The current strategy for spoil disposal relies heavily on the temporary stockpiling of spoil materials, particularly at Lockwood Beck. This will lead to double-handling with greater environmental risk, for example in terms of noise, dust, greenhouse gas (GHG) emissions and the potential for acid rock drainage

(ARD). RPA recommends that the strategy be reviewed so that specific environmental risks like these are factored into the strategy.

- Project-related traffic volumes and heavy-goods vehicle (HGV) movements during the long construction phase are key concerns for the Project and many of its stakeholders, which are addressed in strict planning conditions and S106 obligations.

- Sirius' traffic management strategy is to use approved routes for contractors, limit the number of parking spaces at Woodsmith Mine site, and restrict on-site parking to workers who car-share and operate a mine worker park and ride scheme.

- Vehicle movements are monitored with an automatic traffic counter (ATC) positioned at the site access and there is a booking system for deliveries managed by the main contractor at each site.

- RPA considers that there is a minor risk that the impact from the numbers of HGVs moving between the Wilton portal, Bran Sands, and the Steelworks site will be felt by the residents of Dormanstown over an extended period of working, which could give rise to complaints.

- Sirius appears to have a well-resourced and well-organised system in place for addressing any concerns related to increased traffic across the area of interest. However, RPA notes that of the 60 complaints in the period Q1 2017 to Q2 2018. for Woodsmith Mine, 30 related to construction traffic.

- Sirius is taking appropriate steps to manage noise and vibration management during the construction activities at all its sites and has a real-time noise monitoring system which sends alerts by e-mail if the noise thresholds are approached.

- Site construction is presently at or near peak surface activity and once the majority of construction activity moves away from the surface, many significant noise sources will be removed.

- RPA considers that the potential noise impacts are being well managed and notes that Sirius is taking further steps to reduce noise, for example, by removing the need for generated power on the sites.

- There may be some increased noise and vibration impacts at Lockwood Beck from blasting during the early stages of shaft sinking and increasing HGV movements relating to the transport of extractive materials. However, generally, no surface vibration above the thresholds established in the permissions and assessed in the submissions are predicted.

- The Lockwood Beck site is the most visible of the three sites and is adjacent to several houses. As work proceeds at the site, there is going to be rapid change and potential disruption, including traffic, noise, vibration (including blasting), light and other visual impacts. Sirius will need to invest particular efforts to maintain its social licence to operate at this site.

- Biodiversity aspects of the Project are covered by the planning process and a landscape and ecology management plan (LEMP) prepared for the Woodsmith Mine construction phase has been approved by the NYMNPA. RPA considers

that Sirius has adopted an appropriate precautionary approach to minimising Project-related risks to wildlife.

- The Project is generally in compliance with the Equator Principles (EPs) although some gaps, particularly around the ESMS and associated documentation, and Stakeholder Engagement documentation have been noted and are highlighted in the report and the EP action plan.

- The gaps are not considered material to the Project; however, RPA considers that Sirius will need to address them during the Project's development and in its environmental and social management activities as an obligation to the Lenders under the EP.

- In addition, a number of recommendations have been made in order to address gaps between current activities and Good International Industry Practice. In most cases, Sirius is already aware of these gaps and is working with its consultants to close the gaps on documentation and test work, and with contractors to close implementation and performance gaps.

- Overall, Sirius has developed a workable environmental and social management model that is based largely on the ability of contractors to deliver good performance. Based on the evidence seen during the RPA site visit, the contractors on site at that time are complying with the requirements of the Sirius environmental and social systems and management plans. Continued diligence by Sirius will be needed as the site activities increase to ensure continued good performance by all the Project contractors.

- The core Land, Environment and Planning team comprises seven individuals, including two environment officers who work on-site and have first-hand mining-environmental experience of the nearby Boulby Mine of Cleveland Potash Ltd. The team works closely with the health and safety team, which consists of six individuals, some of whom have mine site experience.

- Sirius' community relations core team consists of three personnel, two of whom have significant local experience prior to working with Sirius.

- The environment team is represented at senior management level through the Owners Team Chief Development Officer (CDO), who has overall responsibility for delivering the Project. The community relations team is represented at senior level by the External Affairs Director. Both these senior managers report directly to the CEO. RPA considers this to be an appropriate organisation that results in a short reporting route to the CEO and Company Board for all environmental and social matters.

- In RPA's opinion, Sirius has established a team that is well-suited and experienced to the environmental and social challenges of delivering the Project within the national park.

PROJECT SCHEDULE

- Since the completion of the Phase 1 Report, Sirius has developed a detailed and updated integrated Master Project Schedule using Primavera P6 software, which incorporates all areas of the current Project scope and is based upon the agreed project execution schedules for each awarded contract and work package.

- The schedule currently contains in excess of 3,000 task items and has been built in accordance with industry practice. RPA considers that it will be suitable for project monitoring and control during the execution of the Project.

- The specific Critical Path (CP) to first polyhalite production (defined as the time when the shaft sinking reaches the top of the polyhalite horizon at approximately 1,500 mbs) is shown as December 2021 and is driven by the Woodsmith Service Shaft sinking schedule, which is reported to be tracking approximately eight weeks behind the baseline.

- In addition to the CP to first polyhalite, the Project's overall CP which tracks the scheduled production ramp-up to production of 10 Mtpa runs through the tunnel construction and fit-out of Drives 2 and 3 of the MTS and includes the commissioning of the MTS conveyor systems. The criticality of the MTS tunnel construction and fit-out works is a change to the schedule seen previously by RPA during the Phase 1 review.

- The Sirius baseline schedule envisaged overall Project completion (ramp-up to 10 Mtpa) being achieved by Q3 2024. Following review of the production ramp-up period with RPA during the due diligence process, the overall Project completion (ramp-up to 10 Mtpa) has been moved out to December 2024, which reflects the discussions with RPA and is included in the lenders Base Case.

- Ramp-up to the expanded annual production of 13 Mtpa takes place during 2025 with the introduction of a sixth operating panel, and the steady-state monthly production rate of 1.08 Mt is achieved in November 2025. The first full calendar year at 13 Mtpa of production is 2026 and production continues at this rate to the end of the mine life during 2066.

- As of the end of April 2019, overall Project progress based on Earned Value is reported to be 16.7%.

- For the construction of the mine, the biggest and most obvious schedule risks relate to the shaft sinking and the tunnel construction as well as the interfaces between the two. The design and construction interfaces between the main shafts and the MTS mineral handling and infrastructure systems have been mitigated to some extent by the award of the MTS fit-out contract to STRABAG.

- The main areas of construction risk with both shafts and tunnel are well known by Sirius and both primary contractors are very experienced in undertaking the work for which they have been appointed and are presently finalising their detailed design. RPA expects that during the design development process suitable mitigation measures to deal with the foreseeable risks will be incorporated into the construction equipment and methods.

- Nevertheless, it will be impossible to mitigate all eventualities and in RPA's opinion, some construction delays are likely. It is noted that the main contractors are incentivised to achieve the contractual dates for completion, however, this does not remove the risk of unforeseen construction delays.

- The schedule risk assessment (SRA) carried out internally by Sirius identified that under their worst-case scenario, the Project completion could be delayed by approximately five months. RPA considers that the assessment was carried

out by Sirius in a robust manner and is of the opinion that a six months delay should be considered by Lenders as a down-side sensitivity.

EXECUTION AND MANAGEMENT PLAN

- As per the Phase 1 Report, Sirius implementation plan envisages that a Sirius Owners Team will directly manage the construction works carried out by the contractors.

- Sirius retains overall control of the various Project work sites while the respective contractors each have responsibility for planning, managing, and monitoring their work activities and work areas.

- Health and Safety (H & S) management is a high priority for Sirius and a dedicated team of H & S specialists are in place. As with other aspects of the Project, the success for the management of safety relies heavily on the appointed contractors and their internal management plans and policies.

- During the site visit, RPA noted that the contractors in place at the time had appropriate H & S systems in place and were providing a high level of H & S management.

- To manage the Project, Sirius has established a large Owners Team, which is a well-structured matrix organisation with clear project management responsibility for the work areas split by geographical location.

- Sirius has largely completed the recruitment of the Owners Team needed to deliver the current phase of the Project. The senior positions in the project organisation have been filled with industry experienced individuals appointed to the senior management roles.

- RPA is of the opinion that Sirius has assembled a senior management team that is capable of implementing the engineering and construction phase of the Project.

- The staffing plan for the current stage of the Project totals 183 staff. Approximately 80% of the project team are direct employees of Sirius with the balance consisting of consultants' staff, individual contractors, and secondees.

- The Owners Team will develop during the life of the Project in a phased manner as construction activities commence in each of the Project areas.

- Sirius has a well-established and appropriate recruitment plan in place to hire the required numbers of people and to date has been successful in finding personnel to fill all positions in the project team. However, in RPA's opinion, it may prove challenging to continue to find and appoint sufficient numbers of adequately experienced and competent project staff to support and complement the senior team, already in place. Since the Project timeline is long, there is likely to be attrition of the team over time, requiring an on-going recruitment effort.

- The contracting strategy adopted by Sirius has led to the majority of contracts (by value) being awarded as fixed price, re-measurable (Bills of Quantities applied to fixed unit rates) or as target cost contracts rather than cost and hours

reimbursable contracts. This should allow Sirius to retain control of the Project outturn costs.

- RPA notes that the forms of contract being used will not eliminate or avoid cost variations should the scope, technical specifications, or site conditions change or vary.

- The award of large work packages to experienced contractors should contribute to reducing the level of management and interface controls, however, Sirius must ensure that it allocates sufficient experienced contract administration staff to each of the contracts.

- A key aspect of the Project delivery relates to interface management between the various work packages. This has been mitigated to some extent by placing the two largest packages of work, for shaft sinking and tunnelling, with only two contractors.

- A formal interface management system has been developed by Sirius for use on the Project that puts in place procedures for addressing Construction and Design Interface Management. The interface system requirements have been, and are being, incorporated into the various contracts and services.

- A detailed interface matrix has been developed and all key contractors are required to appoint dedicated interface managers. This approach appears to be working effectively so far and these procedures should mitigate the typical interface issues and risks such as of packages gaps that are often seen on complex projects.

- Sirius intends to establish a separate and dedicated team, directed by a Completion Manager, to be responsible for and manage the completion and commissioning procedures and the process of handover from construction.

- The responsibility for commissioning will be split by geographical location; namely the Woodsmith and Teesside areas. RPA considers the intended structure to be appropriate. Fundamental to the success of commissioning will be the recruitment of the key individuals and the involvement of the contractors and vendors.

- The Project commissioning programme will stretch over a number of years, with commissioning of some equipment and Project elements coinciding with on-going construction. This will make the commissioning process complex. A conceptual construction completion, handover, and commissioning strategy has been prepared by Sirius and in general is appropriate, however, considerable further detail will be required to ensure a smooth completion and handover process to the operations teams is achieved.

CAPITAL COSTS

- The Stage 2 Re-estimate of Direct and Indirect capital cost expenditure required the for Phase 1 construction and development is $3,600 million (excluding escalation and contingency). Contingency and escalation allowances total $456 million, giving a total Stage 2 capital cost estimate of $4,056 million.

- The re-estimated Stage 2 capital cost estimate as presented to RPA is well structured, with appropriate consideration given to project definition, work, and

contract packages that clearly identifies all areas where the level of engineering completed still requires further work and development.

- Sirius' procurement process for the major packages is nearing completion and the Stage 2 Re-estimate is based upon $3,278 million (91.0%) of the Works having been procured and awarded under a combination of re-measurable (fixed unit rate), cost reimbursable, and target price contracts. This is due to the nature of the Project scope as well as the nature of the various contract types that have been awarded.

- RPA considers the Project maturity to fall within the 30% to 75% band for project definition deliverables with 91% of the costs being based on procured contracts. Consequently, RPA is of the opinion that the estimating methods applied, and the level of project maturity, meet the requirements of the Association for Advancement of Cost Engineers (AACE) Class 2 estimate, with an accuracy range between -5% and +10% of the final Project cost (excluding contingency).

- RPA notes that the Sirius Financial Model includes two additional capital allowances of $87 million and $113 million, for the supply and installation of the OLC and additional Owners Costs.

- The capital cost estimate includes an allowance of $80 million for the production mining equipment, which is based on budget estimates provided by the preferred suppliers, Komatsu and Epiroc.

- Sirius intends to enter into leasing arrangements with the suppliers for this equipment. The financial model therefore excludes the capital cost for the mining equipment, which is covered by the inclusion of a lease allowance in the operating cost of $2.00/t of ROM ore at the production rate of 10 Mtpa. The leasing cost is projected to fall to $1.62/t once steady-state production of 13 Mtpa is achieved. These allowances are subject to confirmation based on the terms of the lease arrangements (yet to be agreed), however appears to be reasonable based on the Sirius leasing estimate provided to RPA.

- The majority of procured contracts are fixed unit rate or reimbursable that will be subject to remeasurement dependent on the actual extent of the scope (i.e. final design and actual quantities), and for the two largest contracts (tunnels and shafts) the nature of site conditions encountered. These aspects can be managed by effective site construction management and contract administration by establishing and using a project wide trend and change control procedure. However, RPA is of the opinion that there remains the potential for variability in the outturn cost and the Project Schedule (both positive and negative).

- A significant proportion of the equipment required for the Project will be sourced from within the European Union. Although Sirius has already placed firm orders for a large proportion of the equipment, there may be some impact of Brexit on the importation and cost of the construction and permanent equipment sourced from within European Union. The potential financial impact is impossible for RPA to assess and is not in RPA's area of expertise.

- Sirius used a Quantitative Cost Risk Analysis (QCRA) method to determine the contingency, risk, and escalation allowances and applied the P65 CRA results to the Stage 2 Re-estimate.

- The risk and opportunity register developed as part of the contingency assessment identifies the critical factors which could lead to potential capital cost overruns to various aspects of the Project, including the underground mine, MHF, and MTS and the supporting infrastructure.

- RPA considers the QCRA was completed using a thorough process resulting in reasonable and acceptable levels of contingency allowances against which Project change can be successfully managed, subject to the use of the application of effective change management procedures. The use of the P65 results is considered to be appropriate given the high level of confirmed, contracted costs in the estimate.

- RPA's review did not identify any significant cost adjustments that would fall outside of the contingency and the risk allowances included in the estimate.

- The contingency allowance has been subject to a rigorous and robust method of analysis, based on the risk and opportunity register developed by Sirius and the use of Monte Carlo simulation.

- Should Lenders wish to add additional conservatism and consider a further provision for cost overruns, RPA considers this can be satisfactorily determined using the results from the QCRA developed by Sirius. RPA recommends for this purpose that a suitable provision for additional overrun costs equal to the P90 values for the Risk/Opportunity values derived in the QCRA prepared by Sirius should be considered. This amounts to a total cost overrun allowance of US$272 million, or 7.6% of Base Estimate Total Cost at US$3,600 million. This represents an additional $78.6m to that currently contemplated by the existing contingency allowance.

- The Stage 2 Re-estimate clearly identifies the incurred costs to date, which totalled $345.4 million, to 30 June 2018, when the Re-estimate was prepared. This informs the estimate and was used as a primary input in conjunction with the developed cost estimates for the current Project scope. At the end of April 2019, the incurred costs associated with the Stage 2 Re-estimate have risen to $748 million (and total costs incurred of $770 million in the financial model), which is tracking (3.7%) behind the forecast and spend profile since resetting of the baseline in November 2018. Some of the underspend to date against forecast is explained by the deferment of certain non-critical path activities until the completion of the Phase 2 financing.

- The expansion case of 13 Mtpa, requires additional capital investment in the order of $377.5 million in real terms, for the provision of the Bran Sands berth, the second processing line in the MHF and the additional underground mining equipment. Sirius has prepared a budget estimate for the expansion case of 13 Mtpa, which is included in the Base Case financial model.

- The estimate is based on agreed rates taken from the procured contract with Worley Parsons for the 10 Mtpa capacity MHF and the McL & H budget quotation for the Bran Sands berth used in the DFS estimate. The estimate also includes a contingency of 13% ($42.5 million), and annual escalation allowance of 2% from 2019. The estimate appears to be appropriate for use in the financial model, however further detailed engineering will be required for the Bran Sands berth in particular, in order to refine the estimated capital cost for the expansion case. As noted earlier, Sirius intends to lease the mining equipment, and $10.7 million has been included for the additional mining equipment.

OPERATING COSTS

- Operating costs for production have been re-estimated by Sirius for the 13 Mtpa case from first principles and are based on the LOM schedule. The input assumptions utilities consumption for the MHF and port have been factored from the 10 Mtpa estimate.

- RPA reviewed the operating cost inputs used for the financial model and finds them to be consistent with operating cost estimates prepared for the various operational areas of the Project.

- The LOM All-in nominal total operating costs (including royalties) are estimated to be $44,873 million. Excluding royalties, total nominal operating costs are $35,465 million.

- LOM Direct real operating costs per tonne of product are $32.78/tonne at 10 Mtpa and $30.92/tonne at 13 Mtpa, no contingency has been applied to the direct operating costs.

- Table 1-2 provides a breakdown of the LOM real operating costs by operational area.

TABLE 1-2 LOM DIRECT REAL OPERATING COSTS
Sirius Minerals PLC - North Yorkshire Polyhalite Project

Category	10 Mtpa ($/t)	13 Mtpa ($/t)
Mining Production	10.25	9.78
Shaft	3.41	2.82
MTS	1.38	1.42
MHF	8.55	8.87
Port	2.12	2.21
Owners Costs	1.30	1.03
Sub-total	**27.03**	**26.14**
Outsourced Capital	5.75	4.79
Total Direct Operating Costs	**32.78**	**30.92**

- Annual total direct operating costs are estimated to average approximately $340 million at steady state production of 13 Mtpa.

- The LOM operating costs have been split into Fixed and Variable cost categories as summarised in Table 1-3. The mining fixed and variable operating costs were estimated from first principles by Sirius.

TABLE 1-3 LOM FIXED AND VARIABLE OPERATING COSTS
Sirius Minerals PLC - North Yorkshire Polyhalite Project

Category	LOM Costs ($ millions)
Fixed Costs	
Labour Costs	2,222
Fixed Consumables Cost	97
Fixed Overhead Costs	519
Subtotal	**2,838**
Variable Costs	
Raw Material & Reagents Costs	1,476
Operating Supply Costs	1,473
Maintenance Supply Costs	3,770
Utility Costs	4,107
General & Administration Costs	23
Product Realization Charges	504
Subtotal	**11,354**
Total LOM Operating Costs	**14,192**

- Unit variable costs have been calculated with OEM input based on initial budget quotes received from Komatsu and Epiroc. These two OEMs are expected to provide and maintain the two fleets of continuous miner and four sets of drill and blast equipment. Initial budget quotes have been obtained by Sirius for this service.

- The average LOM total mining operating cost is $12.60/tonne mined (including shaft operations), or approximately $164 million per year, and comprises 48% of the total annual operating cost for production.

- Sirius has developed the cost estimate for the MHF operations using estimates of consumption of key quantities such as power, compressed air, reagents, and estimates for labour. For the 13 Mtpa production case, the inputs have been scaled from those estimated for 10 Mtpa.

- Starch binder is the largest consumable required for the production of POLY4 product. The 13 Mtpa case cost estimate has been based on the consumption of starch being 0.78%. RPA understands that this is based on recent test work results, not seen by RPA. The price assumption for starch supply is taken from the agreement with Archer Daniels Midland (ADM), dated 30 July 2018.

- Power is the biggest contributor to the operating costs. The power cost has been determined from the estimated power demand for the Mine, MTS, MHF, and port facilities at steady-state production of 13 Mtpa using a unit power supply cost of $94.23/MWh (£70.67/MWh) based on current traded prices. The estimated steady-state annual power cost is $64.7 million, or $5.0/t.

- RPA notes that the power consumption assumptions for 13 Mtpa production case for the MTS, MHF, and port have been scaled from the 10 Mtpa consumption estimate. This is acceptable for this level of estimate, however, will need to be considered in more detail in subsequent estimate updates. Sirius is of the view that

the increased power demand for 13 Mtpa may provide some leverage in negotiating lower energy rates than are presently being assumed in the estimate.

- Sirius has developed Owner operating costs which are included as fixed annual costs covering costs including Owners team labour, environmental management costs and land costs.

- The steady state Owners' costs are estimated to be $12.4 million per annum, which RPA considers reasonable.

- The labour cost estimate is based on a detailed build-up of the labour complement, grade and cost to the company, which was reviewed by RPA. This has been used to estimate the total labour cost. Labour costs for the whole operation at steady-state production are based on a total complement of 685 personnel. The total labour cost, at steady-state production of 13 Mtpa, is estimated to be approximately $52.1 million per year.

FINANCIAL MODEL

RPA has reviewed and confirmed the inputs to the Project financial model titled "SXX-NYPP-Confidential-FM-v5.0-2019-06-27.xlsx" prepared by Sirius. RPA confirms that the model inputs are consistent with, and correctly reflect, the views of RPA. The model is based on the latest LOM plan and ramp-up discussed with RPA.

Mine operating costs are based on the latest operating cost model provided to RPA and are presented in US dollars ($) unless otherwise stated. All operating costs have been estimated by Sirius from first principles.

- $258 million in equity and Stage 1 financing through December 2016 considered sunk.

- 10 Mtpa initial capital estimate of $3,931 million starting in January 2017 and ending in October 2024.

- First intersection of the polyhalite seam in December 2021 and commercial deliveries of polyhalite under offtake contracts from February 2022.

- Ramp-up period to 10 Mtpa begins in August 2023, following commissioning of the MTS.

- Phase 1, 10 Mtpa production rate achieved in December 2024.

- Phase 1a, 13 Mtpa (expansion phase) capital expenditure of $417 million starting in January 2024 and ending September 2025.

- Ramp up to 13 Mtpa production (monthly rate of 1.08 Mt per month) begins in August 2025 and is achieved in November 2025.

- Annual production of 13 Mtpa is achieved from 2026 and continues at this rate until the end of mine life.

The Project physicals and cost inputs were reviewed. This included the associated process operating costs, transportation charges, royalties, and capital expenditures (both initial and sustaining).

The Base Case model uses product price and cost escalation of approximately 2% per annum, respectively, and includes outsourced port costs and hedged exchange rates during construction with forward curves thereafter. The model considers a LOM to 2066.

As noted elsewhere, the 44-year mine life relies on the conversion of Mineral Resources currently classified as Inferred Mineral Resources. RPA notes that while there is a reasonable expectation of conversion of Inferred Mineral Resources into Measured and Indicated Mineral Resources, there can be no certainty that all of the Inferred Resources will be successfully converted. Given the scale and nature of the orebody and the long mine life, however, RPA does not consider this to be a material issue for the Project economics being projected in the Sirius financing plan.

Some of the key parameters and assumptions for the model are as follows:

BASE CASE

PHYSICALS

LOM

- Ore production over LOM (including the ramp-up period) of 543 Mt at 82.4% polyhalite.
- Pre-production development period of approximately 60 months (2018 to 2023).
- Commercial production period: 2025 to 2066.
- LOM mining operations occur over 44 years from 2022.
- Indicated Mined Tonnes: 257 Mt (47% of total)
- Inferred Mined Tonnes: 287 Mt (53% of total)
- Granular Product Sales: 409 Mt

- Crushed Product Sales: 134 Mt

First 10 Years following ramp-up (2025-2034)

- Ore mined: 128 Mt (99% Indicated Resource)
- Product Sales by Size: 128 Mt:
  - Granulated Product: 97 Mt (76%)
  - Course Product: 31 Mt (24%)

ECONOMIC INPUTS

The financial model uses hedged exchange rates to December 2024 and then forward curve exchange rates thereafter until the end of mine life.

Table 1-4 presents the foreign exchange rates that have been applied by Sirius.

TABLE 1-4 FOREIGN EXCHANGE RATES
Sirius Minerals Plc – North Yorkshire Polyhalite Project

Currency	Dec-16	Jun-17	Jun-18	Jun-24	Jun-30	Jun-40	Nov-48 to EOM	USD CAGR %[1]
British Pound Sterling	0.771	0.776	0.752	0.746	0.700	0.621	0.566	(0.9%)
Euro	0.994	0.889	0.855	0.786	0.706	0.619	0.557	(1.4%)
Canadian Dollar	1.344	1.350	1.296	1.311	1.301	1.291	1.263	(0.08%)
Australian Dollar	1.354	1.346	1.321	1.409	1.431	1.484	1.490	0.4%
Polish Zloty	3.823	3.720	3.692	3.735	3.735	3.735	3.735	0.4%

Note: USD depreciation Compound Annual Growth Rate (CAGR) is calculated from June 2018 to November 2048.

Revenue

Product sale assumptions have been provided by Sirius in the financial model and accepted by RPA. It is noted that escalation has been applied to uncontracted sales prices at a rate of 2% per year once each product and customer price deck ends.

Capital Costs

The capital costs originate from the Stage 2 Re-estimate, that has been reviewed by RPA.

- Initial Pre-production capital to 10 Mtpa: $3,931 billion:
  - Includes $119 million escalation allowance
  - Includes $143 million capital contingency at P65 level of confidence.

  - Includes $194 million risk/opportunity cost overrun contingency.
  - Includes $113 for additional Owners Costs not included in the Stage 2 Re-estimate.
  - Includes $87 for procurement of OLC (excluded from Stage 2 Re-estimate as deferred capital).

- Applying above stated foreign exchange rates, the initial capital estimate currency basis consists of 80% GBP, 15% EUR, and 5% USD plus the remaining currencies.
- Total Capital Expenditure to achieve 13 Mtpa production rate: $4,348 million:
  - Includes initial capital cost plus expansion capital of $417 million to achieve the 13 Mtpa rate.
- Sustaining capital: $181 million.
- Working capital:
  - Days Sales Outstanding – 30 days uncontracted; 90 days contracted.
  - Days Payables Outstanding – 30 days.
  - Consumables inventory in warehouse calculated in operating and capital
  - costs.
  - $43 million required upfront before start of commercial production in January 2025.
  - $321 million required in first five years of commercial production.
  - All working capital adjustments net to zero of mine life.

Operating Costs

The Base Case assumes a production rate of 13 Mtpa with the port capital costs for the export of up to 10 Mtpa outsourced as an operating expense. The expansion capital for the construction of the Bran Sands berth is not assumed to be outsourced.

All operating costs are estimated in GBP and converted to USD using foreign exchange rates noted earlier. An Escalation Index (EI) of 2% per year has been applied to the general operating costs starting in January 2019 through the end of mine life in January 2066.

The Materials Handling Agreement (MHA) costs include a separate escalation index of 1.5% per year starting in January 2025 (Dec 2024 MHA EI = 1.00) through the end of mine life in January 2066 (MHA EI = 1.84).

The ship loading lease (SL) costs also include a separate escalation index of 2% per year starting in August 2020 (Jul 2020 SL EI = 1.00) through to the end of mine life in January 2066 (HL EI = 2.49). The EI is also applied to the handling fee.

Total nominal operating costs are $44,873 million with average LOM unit operating cost of $82.60 per tonne product as shown in Table 1-5.

TABLE 1-5 TOTAL NOMINAL OPERATING COSTS
Sirius Minerals Plc – North Yorkshire Polyhalite Project

Description	$ millions	$/t Product
General Operating Costs	31,638	58.25
Outsourced Operating Costs	3,796	6.99
Subtotal Operating Expense	**35,434**	**65.24**
Royalty Expense	9,408	17.32
Other Costs (S106 and Restoration bonds)	31	0.06
Total Operating Costs	**44,873**	**82.60**

A further breakdown of nominal outsourced operating costs is presented in Table 1-6.

TABLE 1-6 NOMINAL OUTSOURCED OPERATING COSTS
Sirius Minerals Plc – North Yorkshire Polyhalite Project

Description	$ millions	$/t Product
10 Mtpa Mining Equipment Lease Cost[1]	39	0.07
13 Mtpa Mining Equipment Lease Cost[2]	850	1.56
Subtotal Mining Equipment Lease Costs	889	1.64
Materials Handling Agreement Cost (ship loading)	1,449	2.67
Availability Fee and Ship loading Lease Cost	1,211	2.23
Handling Fee	247	0.45
Subtotal Port Outsourcing Costs (port lease)	1,458	2.68
Total Outsourced Operating Costs	**3,796**	**6.99**

[1] 46-month lease term from Feb 2022 to December 2025
[2] Lease term from Jan 2026 through LOM

Royalty expenses incurred on the Project are as follows:

- Mineral Rights: 2.5% of gross revenue
- Sirius Minerals Foundation: 0.5% of gross revenue
- Hancock Prospecting: 5% of gross revenue up to threshold of 1.1 million tonnes per month of product sold, 1% of gross revenue on incremental tonnes of product sold above threshold.

Other operating costs refer to

- Monthly restoration bond management fees (0.5% of monthly bond balance which ends in November 2022)
- Monthly restoration bond insurance premium (3% on $24 million bond redemptions through LOM)

Miscellaneous Costs

- S106 Closure costs: $210 million.
- Restricted cash related to a Reinstatement Bond of $24 million together with payment security of $35 million.

CASH FLOW ANALYSIS

RPA summarised the Project inputs into a simplified cash flow model in order to confirm the cashflows presented in the Sirius financial model.

At steady state production of 13 Mtpa, the average nominal annual after-tax free cash flow is projected to be $1.2 billion.

SENSITIVITY ANALYSIS

RPA recommends that the following sensitivities be applied to the Base Case set out in the foregoing section to stress test the Project economics for the risks identified by RPA in this report. The Base Case includes contingency capital at P65 confidence level.

RPA recommends that the sensitivities be considered individually rather than cumulatively.

1. Total capital cost sensitivity range of -5% to a downside of the P90 cost over-run provision (additional $78.6 million).
2. Total operating cost sensitivity range of -10% to +5%.
3. Annual production range of -15% to +10%
4. Overall downside construction schedule delay of six months.

RECOMMENDATIONS

Following RPA's review of the Project documentation provided by Sirius, RPA makes the following recommendations for further work.

GEOLOGY AND MINERAL RESOURCES

Although not material to the estimated Mineral Resources, RPA makes a number of recommendations which, if addressed, should improve subsequent geological models and Mineral Resource estimates.

1. Implement appropriate electronic database software to store, validate, and manage data.

2. Correct noted database issues:
    - Adjust the drill hole collars to the correct vertical datum and adjust the geological model accordingly.
    - Assess whether incorrect positioning of drill hole E3 could be compounding any existing dip in the stratigraphy and refine the geological interpretation around this hole.
    - The geophysical data for drill holes SM14B and SM14B-Z holes should be reviewed and reconciled with the existing geological interpretation and the outstanding SM14B QXRD results.

3. Collect additional density samples from a wider range of locations.

4. Classify the entire D1 band as Inferred Resources.

5. Reconcile the relationship between the Shelf and Basin seams in future geological models and Mineral Resource estimates.
    - The Basin Seam, which has only been intersected by one current drill hole (SM1) and one historical drill hole (SB1) requires re-estimation based on learnings from the Shelf Seam estimation.

6. Execute the planned closer spaced underground resource definition drilling to assess:
    - The short-scale variability in polyhalite thickness, elevation, and grade.
    - The nature and frequency of faults, halite domes and other sedimentary features.

MINING

7. Develop the detailed engineering for the shaft bottom infrastructure to confirm the cost assumptions included in the capital estimate.

8. Complete a detailed construction and installation schedule for the shaft bottom infrastructure and fit-out.

9. Align the OEM equipment supply and quotations with the currently envisaged equipment fleet.

INFRASTRUCTURE

10. Complete the main shaft lining designs based on continued analysis and assessment of the latest hydrogeological and geotechnical data.

MTS

11. Complete the final detailed engineering of the tunnel and installed equipment.

RISKS AND OPPORTUNITIES

RISKS

RPA has assessed critical areas of the Project and identified risks associated with the technical and cost assumptions used. RPA has classified these risks as low/minor/moderate/major/high and commented on risk mitigation in the development and operating plan. In all cases, the level of risk refers to our subjective assessment as to how the identified risk could affect the achievement of the Project objectives.

RISK ANALYSIS DEFINITIONS

The following definitions have been employed by RPA in assigning risk consequence factors to the various aspects and components of the Project:

1. **Low –** Risks that are considered to be average or typical for a deposit of this nature and could have a relatively insignificant impact on the economics. These generally can be mitigated by normal management processes combined with minor cost adjustments or schedule allowances.
2. **Minor –** Risks that have a measurable impact on the quality of the estimate but not sufficient to have a significant impact on the economics. These generally can be mitigated by normal management processes combined with minor cost adjustments or schedule allowances.
3. **Moderate –** Risks that are considered to be average or typical for a deposit of this nature but could have a more significant impact on the economics. These risks are generally recognizable and, through good planning and technical practices, can be minimized so that the impact on the deposit or its economics is manageable.
4. **Major –** Risks that have a definite, significant, and measurable impact on the economics. This may include basic errors or substandard quality in the basis of estimate studies or project definition. These risks can be mitigated through further study and expenditure that may be significant. Included in this category may be environmental/social non-compliance, particularly in regard to Equator Principles and IFC Performance Standards.
5. **High –** Risks that are largely uncontrollable, unpredictable, unusual, or are considered not to be typical for a deposit of a particular type. Good technical practices and quality planning are no guarantee of successful exploitation. These risks can have a major impact on the economics of the deposit including significant disruption of schedule, significant cost increases, and degradation of physical performance. These risks cannot likely be mitigated through further study or expenditure.

The following definitions have been employed by RPA in assigning risk likelihood to the various aspects and components of the Project:

1. **Rare –** The risk is very unlikely to occur during the Project life.
2. **Unlikely –** The risk is more likely not to occur than occur during the Project life.
3. **Possible –** There is an increased probability that the risk will occur during the Project life.
4. **Likely –** The risk is likely to occur during the Project life.
5. **Almost Certain –** The risk is expected to occur during the Project life.

RISKS SUMMARY TABLE

A summary of the Project related risks identified by RPA in its review for each main area is shown in Table 1-7.

TABLE 1-7 RISK SUMMARY TABLE
Sirius Minerals – North Yorkshire Polyhalite Project

LIKELIHOOD						
	Almost Certain					
	Likely					
	Possible		1, 5, 10	2, 4, 10	3, 8, 9	
	Unlikely	7		6		
	Rare					
		Low	Minor	Moderate	Major	High
		CONSEQUENCE				

Section Key:

1 – Geology and Mineral Resources
2 – Mine Design and Mineral Reserves
3 – Shaft Construction
4 – MTS
5 – MHF
6 - Port
7 - Environment, Social and Permitting
8 - Capital Cost
9 – Operating Cost
10 - Other

The Project related risks identified by RPA in its review are described in Table 1-8.

TABLE 1-8 RISK ANALYSIS
Sirius Minerals PLC - North Yorkshire Polyhalite Project

Project Element	Issue	Risk Consequence	Risk Likelihood	Mitigation
Geology and Mineral Resources				
	The structure, frequency, extent and nature of low displacement faulting is greater than currently anticipated.	Possible	Minor	Closer spaced underground resource definition drilling and grade control drilling will provide a good understanding of faulting at a mining scale.
	Polyhalite, anhydrite and halite grade and thickness more variable than currently modelled.	Possible	Minor	Closer spaced underground resource definition drilling and grade control drilling will allow the thickness and grade variation to be increased.
	Issues in the drill hole database materially impact the spatial location and volumes of the polyhalite bands.	Unlikely	Low	Correct database issues.
Mining and Reserves				
	Grade of polyhalite is more variable than presently expected.	Likely	Minor	Continuous grade control drilling to inform short-term mine planning. Abandon lower grade sections. Consider changing mining extraction method.
	Planned mining cut has to be reduced to maintain grade, increasing reducing the Ore Reserves and increasing operating cost.	Possible	Low	Stockpiles may allow more low-grade material to be included in the mine plan.
	Panel productivity is reduced due to grade variation and geological issues, leading to higher equipment usage and increased mining cost.	Possible	Minor	Maintain a good grade control drilling programme to inform short term mine planning.
	Shortfall in production tonnes.	Possible	Moderate	Implement stockpile strategy to smooth production, increase silo capacity where possible.
	CMs unable to meet production targets.	Possible	Low	Obtain performance guarantees from Komatsu. Confirm productivities based on latest mine plan. Obtain performance guarantees from Komatsu.

Project Element	Issue	Risk Consequence	Risk Likelihood	Mitigation
	Productivity from drill and blast not achieved.	Possible	Low	Provide additional D & B equipment in equipment fleet. Consider increasing number of drill rigs or automate drill rigs. Epiroc to confirm productivities based on latest mine plan.
	Production loss due to water ingress.	Major/Moderate	Rare	Implement seismic and geotechnical monitoring plan. Ensure adequate stand-off distances from all faults. Probe drill when approaching known or suspected faults. Draw up emergency plan for water inrush.
	Insufficient numbers of skilled labour are available.	Possible	Low	Implement recruitment plan and start recruitment drive well in advance of needs. Recruit labour from contractors at completion of construction. Carry out training during initial shaft bottom development. Commence skills and technical training programmes with external providers. Recruit experienced labour from adjacent mine
	Insufficient Ore Reserves to support mine plan.	Unlikely	Minor	Complete updated Ore Reserve estimate. Adjust mine plan to latest Ore Reserves estimate Implement underground resource definition drilling as soon as practicably possible once access to polyhalite is achieved to confirm Indicated Resources and to upgrade Inferred Mineral Resources.
	Ore Reserves are less than estimated due to faulting or low-grade material for first 25 years of mine life.	Low	Moderate	Implement underground resource definition drilling as soon as practicably possible once underground access is achieved to identify local scale faulting. Continue resource drilling throughout mine life to convert Inferred Resources to Indicated Resources and replenish depleted Ore Reserves.
	Estimated mining costs are too low.	Unlikely	Minor	Confirm cost parameters such as blasting patterns and support requirements. Complete more detailed mine planning to increase definition and confidence level in the operating cost model.

Project Element	Issue	Risk Consequence	Risk Likelihood	Mitigation
	Mine production ramp-up is not executed as planned.	Possible	Moderate	Complete detailed engineering of permanent installations and prepare detailed installation and construction schedule for permanent shaft bottom installations ramp-up plan. Hire and train labour before required. Hire contractors for main installations and pre-production development.
Shaft Construction				
	SBR equipment does not perform as anticipated, resulting in slower than anticipated sinking and lining rates during sinking.	Possible	Major	Confirm current DMC productivity assessments during detailed design and planning stage of shaft construction. Ensure that the schedule reflects latest information and adequate float is included in the DMC target schedule. Ensure that adequate cost overrun contingencies are built into the capital budget estimate to cater for reasonable construction delays.
	Hydrogeological conditions create unexpected problems during shaft construction.	Possible	Moderate	Expand on baseline database, ensure good control on grouting in SSG, provision for additional standby pumping capacity in case of emergency. Refine and review all hydrogeological test data to re-confirm hydrogeological interpretation.
	Shaft excavation hits untreated fracture or fissure containing high pressure/high flow water	Possible	Major	Ensure good control on grouting in SSG. Provision for additional standby pumping capacity in case of emergency.
	Probe drilling and cover grouting is more time consuming and less effective than expected.	Possible	Moderate	Use all available data to design and plan the cover grouting. Re-visit the schedule float already included in the DMC target schedule to ensure it is sufficient. Ensure that adequate cost overrun contingencies are built into the capital budget estimate to cater for reasonable construction delays.
	Residual water inflow during shaft sinking adversely affects performance of SBR.	Possible	Moderate	Refine cuttings clearance systems on SBR to deal with potentially wet material. Increase water handling capacity. Refine lining design for SSG zones to minimise residual water ingress and optimise installation methods.
MTS Construction				

Project Element	Issue	Risk Consequence	Risk Likelihood	Mitigation
	Faulting or other ground conditions cause an increase in duration and/or contract value via contract re-measurable rates.	Possible	Moderate	Robust TBM specification. Contingency planning for TBM recovery if necessary.
	Ironstone bands and concretions causing an increase in duration and/or contract value via contract re-measurable rates.	Possible	Moderate	Change vertical alignment to avoid known bands. Robust TBM specification
	Rock strength and/or abrasivity causing an increase in duration and/or contract value via contract re-measurable rates.	Unlikely	Minor	Robust TBM specification.
	Tunnel lining fails due to high in-situ stresses.	Unlikely	Minor	Robust lining design.
	Tunnel spoil causes ARD issues.	Possible	Minor	Carry out testing of spoil to determine ARD potential. Develop disposal strategy to minimise potential impacts if ARD is an issue.
	Delay to start of tunnel construction due to late shaft completions.	Possible	Moderate	Manage interfaces between STRABAG and DMC. Maintain shaft sinking progress in line with schedule.
	Tunnelling rates are not achieved.	Possible	Moderate	Apply risk provisions in contracts to mitigate. Re-confirm assessment of tunnelling conditions.
	MTS conveyor fails during operation.	Unlikely	Major	Condition monitoring of belt, drives and structure. Regular planned maintenance regime.
MHF				
	HPGR throughput is not achieved.	Unlikely	Moderate	Confirm test work results and refine process design criteria.
	Mined ore is markedly different to material used for test work	Possible	Minor	
	Product is not to specification grade	Rare	Moderate	Ensure mine produces ROM ore above the minimum grade specification of 85%.

Project Element	Issue	Risk Consequence	Risk Likelihood	Mitigation
	Granulator planned throughput is not achieved.	Possible	Moderate	Include provision for additional mixer granulators in the design of the MHF.
Port				
	Breakdown of the ship loader and/or breakdown of the conveyor/reclaim system.	Unlikely	Moderate	Implement planned maintenance scheme and ensure RBTL undertakes adequate maintenance of all bulk handling equipment and hold strategic spare parts for the most likely breakdowns to ensure any downtime can be minimised.
	Shortage of pilots.	Rare	Low	Ensure that adequate pilots are available to call on.
	Fender damage preventing ships berthing.	Rare	Low	Ensure that RBTL holds sufficient spares for quick repairs to the fendering system.
	Power outage.	Rare	Moderate	Provide adequate back-up supply of electrical power in the event of a main power outage.
	Major breakdown of the OLC or at the MHF/mine.	Rare	Minor	Provide sufficiently sized stockpiles to avoid having to stop ship loading in the event of a major breakdown of product to the PHF.
Environmental and Social				
	Traffic volume is a sensitive issue.	Unlikely	Low	Maintain good traffic management and community consultation.
Capital Cost Estimate				
	Base capital estimate is exceeded.	Possible	Major	Ensure that adequate contingencies are included in the estimate. Final procurement of contracts remains within budgeted forecasts. Strong change control mechanism in place to limit variations and cost inflation.
	Brexit impacts importation and cost of construction and permanent equipment sourced from within European Union.	Likely	Moderate	Advance procurement of equipment as far as possible prior to Brexit in 2019. Forward hedging of major currencies.

Project Element	Issue	Risk Consequence	Risk Likelihood	Mitigation
Operating Cost Estimate				
	Mining productivity assumptions used as the basis for operating costs too low.	Unlikely	Moderate	Review productivity assumptions. Include contingency allowances for some elements of the operating costs. Re-assess operating costs following completion of the next stage of mine planning.
	Labour costs rise due to shortage of labour and Brexit.	Possible	Moderate	Escalated labour costs in estimate.
Others				
	Brexit impacts availability of labour.	Possible	Moderate	Maximise employment from local region and within UK.

OPPORTUNITIES

A summary of the Project related opportunities identified by RPA in its review is shown in Table 1-9.

TABLE 1-9 OPPORTUNITIES
Sirius Minerals PLC - North Yorkshire Polyhalite Project

Project Element	Opportunity	Action Required
Mining		
	Shafts completed ahead of schedule and in line with DMC targets.	Confirm current DMC productivity assessments during detailed design and planning stage of shaft construction. Ensure that preparatory shaft works are completed on or ahead of schedule.
	Mining productivity assumptions are conservative resulting in increased production at lower operating costs.	
MTS		
	Tunnel drives completed ahead of schedule and in line with STRABAG targets.	
Capital Costs		
	Potential capital savings, in $ terms, due to changes in exchange rates.	Forward hedging of currencies.
	Potential capital savings due to MHF optimisation.	Complete MHF optimisation.

LIST OF ABBREVIATIONS

Units of measurement used in this report conform to the metric system. All currency in this report is US dollars ($) unless otherwise noted.

a	annum
A	ampere
bbl	barrels
btu	British thermal units
°C	degree Celsius
C$	Canadian dollars
cal	calorie
cfm	cubic feet per minute
cm	centimetre
cm^2	square centimetre
d	day
dia	diameter
dmt	dry metric tonne
dwt	dead-weight ton
°F	degree Fahrenheit
ft	foot
ft^2	square foot
ft^3	cubic foot
ft/s	foot per second
g	gram
G	giga (billion)
Gal	Imperial gallon
g/L	gram per litre
Gpm	Imperial gallons per minute
g/t	gram per tonne
gr/ft^3	grain per cubic foot
gr/m^3	grain per cubic metre
ha	hectare
hp	horsepower
hr	hour
Hz	hertz
in.	inch
in^2	square inch
J	joule
k	kilo (thousand)
kcal	kilocalorie
kg	kilogram
km	kilometre
km^2	square kilometre
km/h	kilometre per hour
kPa	kilopascal
kVA	kilovolt-amperes
kW	kilowatt
kWh	kilowatt-hour
L	litre
lb	pound
L/s	litres per second
m	metre
M	mega (million); molar
m^2	square metre
m^3	cubic metre
µ	micron
masl	metres above sea level
mbs	metres below surface
µg	microgram
m^3/h	cubic metres per hour
mi	mile
mi^2	square mile
min	minute
µm	micrometre
mm	millimetre
mph	miles per hour
MVA	megavolt-amperes
MW	megawatt
MWh	megawatt-hour
N/mm^2	newtons per square millimetre
oz	Troy ounce (31.1035g)
oz/st, opt	ounce per short ton
ppb	part per billion
ppm	part per million
psia	pound per square inch absolute
psig	pound per square inch gauge
RL	relative elevation
s	second
st	short ton
stpa	short ton per year
stpd	short ton per day
t	metric tonne
tpa	metric tonne per year
tpd	metric tonne per day
$	United States dollar
USg	United States gallon
USgpm	US gallon per minute
V	volt
W	watt
wmt	wet metric tonne
wt%	weight percent
yd^3	cubic yard
yr	year