

Sirius Minerals Plc

**Woodsmith Mine, Phase 4 Works**

**NYMNPA 94 - Construction Method  
Statement**

40-ARI-WS-71-PA-MS-1051

Rev 0 | 26 May 2017

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 234376

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# 1 Introduction

## 1.1 Purpose and scope of document

This document has been prepared on behalf of Sirius Minerals Plc and forms the Construction Method Statement (CMS) for the Phase 4 Works at Woodsmith Mine. This CMS is required to partially discharge condition 94 of the North York Moors National Park Authority (NYMNP) planning permission NYM/2014/0676/MEIA, and has been prepared in accordance with current good practice.

This CMS details the works to be undertaken during the Phase 4 Works at Woodsmith Mine only. Further Construction Method Statements will be submitted to discharge condition NYMNP 94 for subsequent phases.

## 1.2 Compliance with Condition NYMNP 94

The wording of planning condition 94 and where the necessary material has been provided within the report is set out in Table 1.1 below:

**Table 1.1: Details of NYMNP Planning Condition 94**

NYMNP Condition 94	Compliance with Condition 94
Prior to the commencement of each phase of the development at Dove's Nest Farm or Lady Cross Plantation in accordance with the approved Phasing Plan, a Construction Method Statement shall be submitted for that phase, and approved in writing by the MPA, in consultation with the appropriate Highway Authority. Each approved Statement shall be adhered to throughout the construction period. The Statements shall provide for:	This CMS is provided for Phase 4 Works at Woodsmith Mine only. Other phases will have bespoke CMS documents.
(i) The parking of vehicles of site operatives and visitors clear of the highway;	Section 3.2
(ii) Loading and unloading of plant and materials;	Section 3.3
(iii) Storage of plant and materials used in constructing the development;	Section 3.4
(iv) Erection and maintenance of security fencing;	Section 3.5
(v) Wheel washing facilities;	Section 3.6
(vi) An outline construction method for sub-surface works including adherence to the 'rack and pillar' method of mining described in the SEI (14th February 2015) and the SRK Subsidence Memorandum (15th May 2013);	Section 3.7

<b>NYMNP Condition 94</b>	<b>Compliance with Condition 94</b>
(vii) Buildings and structures associated with the mine and tunnel shafts;	Construction of these is not included in Phase 4.
(viii) Welfare/office building and security gatehouse;	Section 3.8
(ix) Screening bunds;	Section 3.9
(x) Hardstandings;	Section 3.10
(xi) Shuttle Bus terminal;	Construction of this facility is not included in Phase 4.
(xii) Park-and-Ride lay-by;	Construction of this facility is not included in Phase 4.
(xiii) Emergency helipad;	Construction of this facility is not included in Phase 4.
(xiv) Lighting columns;	No permanent lighting is to be installed during Phase 4. The provision of temporary lighting for the works is described in the CEMP (Planning Condition 93)
(xv) Internal access and haul roads;	Section 3.11
(xvi) Domestic wastewater (foul sewage) treatment plant;	Section 3.12 describes the management of domestic wastewater during the Phase 4 Works. Construction of the foul sewage treatment plant is not included in Phase 4.
(xvii) Non-domestic wastewater treatment plant and settlement tanks;	Management of non-domestic wastewater in the concrete batch plant is described in the concrete batch plant Method Statement in Appendix C. Management of non-domestic wastewater in the bentonite plant is described in Section 3.14.2 Construction of the non-domestic wastewater treatment plant is not included in Phase 4.
(xviii) Surface water attenuation ponds, settlement ponds, swales and wetland areas;	Section 3.13
(xix) Temporary spoil and Polyhalite storage areas;	Section 3.14 describes the preparation and operation of the temporary inert spoil storage area. Preparation of the temporary Polyhalite storage area is not included in Phase 4.
(xx) Road widening and provision of right hand turn areas;	Construction of these is not included in Phase 4.
(xxi) Removal of any temporary structures; and	No removal of temporary structures required in Phase 4.
(xxii) Formation of spoil mounds and the establishment of vegetation on them.	Section 3.15
The CMS shall contain a construction timetable and order of works noting any construction dependencies, refer to any inherent mitigation measures required to address adverse impacts identified in the EIA and cross refer to the	Section 3.16

NYMNP Condition 94	Compliance with Condition 94
CEMP in relation to any additional avoidance or mitigation measures	

## 2 Overview

### 2.1 Scope of this CMS

This CMS relates to the Phase 4 Works at Woodsmith Mine only. For elements of the Works to be executed in Phase 4 that are similar to, or an extension of those executed in previous phases, for example earthworks and the formation of bunds/screening mounds, the methods adopted will be those described in the Phase 3 Site Preparation Works CMS (40-ARI-WS-71-MS-1050-0-IFU, Arup 2017) and these have not been repeated in this CMS.

### 2.2 Scope of Works

Phase 4 comprises the construction of diaphragm walls to a depth of 60m in preparation for the formation of the foreshafts for the production and services shafts and. The works to be executed are summarised below.

- Operation of the concrete batch plant;
- Installation, commissioning and operation of a bentonite plant to supply support fluid to the diaphragm wall trenches;
- Installation of concrete guide walls (including construction of concrete walls down to 1.5 to 1.75 m below ground level (bgl) and excavation of starter trenches to 3.5m below ground level);
- Mobilisation to site of diaphragm walling equipment (cutters, cranes, workshops etc.);
- Diaphragm wall construction to 60m bgl at the Production, Service and Mineral Transport System shafts;
- Limited continuation of earthworks to create an area for future storage of spoil;
- Deposition of excavation arisings from construction of the guide walls and diaphragm walls in the earthworks bunds.

### 2.3 CMS overview

The CMS provides an overview of the resource requirements and the plant and working methods that are anticipated to be used during the Phase 4 Works. It includes the measures to be taken to ensure that the works are carried out in accordance with the requirements of both the planning permission and of Sirius Minerals Plc and, above all, are carried out safely and in compliance with all statutory obligations.

The works described in the method statement will be executed by Associated Mining Construction UK Ltd, (AMC) Principal Contractor for shaft sinking; and its diaphragm walling specialist sub-contractor Bauer Technologies.

AMC has prepared a Project Management Plan (PMP) for the Phase 4 Works in accordance with its quality management procedures. The PMP is the main tool used by the Contractor to manage the safety, health and environmental (SHE) aspects of the delivery of the works, including resource and materials use. The PMP for the Phase 4 Works is included as **Appendix A**.

In addition, and as specified in the PMP document, Method Statements have been developed for each of the key activities. These provide a more detailed appraisal of the resource, plant and materials required, and specific control measures relating to that work activity. Method Statements have been produced by both AMC and Bauer for their respective areas of work. The Method Statements are included in Appendices B to F.



## 3 Construction Method Statement

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### 3.1 Management and control of the Works

The Contractor's arrangements for management and control of the works are defined in the AMC PMP in **Appendix A**. The PMP addresses the key items listed below.

- Management team roles and responsibilities (PMP Section 2)
- Quality management (PMP Section 3)
- Health and safety management (PMP Section 7)
- Environmental management (PMP Section 8)
- Project communications (PMP Section 9)
- Site controls (including the provision of welfare facilities) (PMP Section 10)

The PMP includes as an appendix an Environmental Management Plan, which in turn incorporates the Environmental Emergency Preparedness Plan and Site Waste Management Plan.

### 3.2 Parking of vehicles

Cars will be parked within the designated parking area shown on drawing 40-ARI-WS-71-CI-DR-1081, which has capacity for 58 cars. An additional 10 parking spaces will be provided for use by Bauer management staff and visitors close to the temporary office and welfare accommodation described in Section 3.8. All visitors to the site will park within the designated car parks, and no parking will be permitted on the public highway.

### 3.3 Unloading and loading of materials

#### 3.3.1 Unloading

The areas for storage have been planned to prevent excessive handling of material and to facilitate loading and unloading.

The principle materials to be delivered during the Phase 4 Works comprise:

- Sand and aggregates for concrete production
- Cement powder
- Bentonite powder
- Reinforcement steel
- Chemical additives for concrete and bentonite slurry
- Fuel

Aggregates will be delivered in sheeted rigid and articulated tippers which will discharge their loads into the prepared aggregate bins within the concrete batching plant compound. Full details of the procedures are included in the concrete batching plant operating method statement in **Appendix C**.

Bulk cement powder will be delivered in tankers which unload via sealed pipelines directly to the cement storage silos within the concrete batching plant. Full details of the procedures are included in the concrete batching plant operating method statement in **Appendix C**.

Bentonite powder will be delivered in tankers which unload via sealed pipelines directly to the bentonite storage silos within the bentonite batching plant. Full details of the procedures are included in the bentonite plant operating method statement in **Appendix G**

Reinforcing steel will be delivered on flat-bed lorries and will be unloaded using crawler cranes in the laydown areas shown on drawing ARI-WS-71-CI-DR-1081. Procedures for lifting are provided in the diaphragm walling method statement in **Appendix D**.

Additives for concrete and bentonite slurry may be bagged powders on pallets or liquids in intermediate bulk containers (IBC's or "pallet tanks"). Both of these will be off-loaded from delivery vehicles within the designated areas for storage of the additives using all-terrain fork-lift trucks or tele-handlers.

Procedures for fuel deliveries are included in Section 8.2 of the Environmental Management Plan included as Appendix B to the PMP included in **Appendix A**.

### 3.3.2 Loading

The only materials requiring loading for transport will be concrete, for transport from the batching plant to the working area, and wastes that require disposal off site.

Concrete will be discharge directly from the concrete batching plant into conventional concrete trucks. The arrangements are described in the concrete batching plant Method Statement in **Appendix C**.

Other materials requiring loading on to site transport will generally be handled using all terrain fork-lifts or telehandlers. Loading will only take place on level stable ground to minimise the risk of loads becoming unstable and spilling. The handling of materials on site will be controlled to protect land and water in accordance with Section 8.2 of the Environmental Management Plan included as Appendix B to the PMP included in **Appendix A**

The types of waste that are expected to arise are identified in the Site Waste Management Plan included as Appendix D to the Environmental Management Plan, which forms Appendix B to the PMP, **Appendix A**. The waste will be handled in accordance with the Site Waste Management Plan.

Any non-domestic waste water and waste bentonite slurry requiring disposal off-site will be pumped from holding tanks into road going tankers for onward transport to suitably permitted waste management facilities.

### 3.4 Storage of plant and materials

Suitable and sufficient provisions for the storage of plant, equipment and materials have been established to protect the environment, secure from trespass by unauthorised persons and to minimise wastage.

The areas for storage have been planned to prevent excessive handling of material and to facilitate loading and unloading.

Materials requiring storage include:

- Sand and aggregates for concrete production
- Cement powder
- Bentonite powder
- bentonite slurry
- Reinforcement steel
- Chemical additives for concrete and bentonite slurry
- Fuel

The nature of the materials being held on site will dictate the storage methodology adopted.

Sand and aggregates will be stored in aggregate bins comprising reinforced concrete push-walls to three sides within the concrete batching plant compound adjacent to the mixer.

Cement powder will be stored in silos within the concrete batching plant compound and bentonite in silos within the bentonite plant compound.

Steel will be stored in the laydown areas shown on drawing ARI-WS-71-CI-DR-1081.

For materials that have the potential to cause harm to the environment, the following principles will be adopted:

Chemicals and fuel will be stored in sealed containers on a suitable bunded, impervious hardstanding. Bunds will be capable of holding 110% of the total capacity of all containers stored within the bunded area. The chemical and fuel storage areas will be located as far from all drains and watercourses on the site as possible, and in any event no closer than 10m. No materials will be stored on land within a Site of Special Scientific Interest / Special Area of Conservation (SSSI/SAC).

Spill kits will be stored adjacent to the storage areas as well as at other key locations around the site. Personnel trained in the deployment of spill kits will be present on site at all times during working activities.

The handling of materials on site will be controlled to protect land and water in accordance with Section 8.2 of the Environmental Management Plan included as Appendix B to the PMP included in **Appendix A**.

### 3.5 Erection and maintenance of security fencing

The erection of security fencing is addressed in the Phase 3 Site Preparation Works CMS (40-ARI-WS-71-MS-1050-0-IFU).

Perimeter fences will be inspected on a daily basis. Should any breaches be identified, temporary measures to secure the boundary will be made immediately and a permanent repair will be implemented as soon as practicable.

### 3.6 Wheel cleaning facilities

The wheel cleaning facilities are described in the Phase 3 Site Preparation Works CMS (40-ARI-WS-71-MS-1050-0-IFU).

All vehicles that have travelled off the surfaced access road will be required to pass through the wheel cleaner before exiting the site.

### 3.7 Outline construction method for sub-surface works

Sub-surface works to be implemented in Phase 4 comprise the construction of guide walls for the diaphragm wall cutter, and the construction of diaphragm walls to a depth of 60m below ground level. This will include the establishment and operation on site of three diaphragm walling rigs; construction of reinforced concrete guide walls; operation of the concrete batching plant established in Phase 3 and establishment and operation of a bentonite slurry plant to provide support fluid used in the diaphragm walling operation.

Method statements for these activities are presented in the following document:

- 40-AMC-WS-10-SW-RA-0001, Mobilisation/demobilisation of diaphragm walling equipment (**Appendix B**).
- 40-AMC-WS-72-SW-RA-0002, Concrete batch plant operation and maintenance (**Appendix C**).
- 40-AMC-WS-10-SW-RA-0004, Installation of diaphragm wall shafts (**Appendix D**).
- 40-AMC-WS-10-SW-RA-0006, Installation of guide walls (**Appendix E**).
- 40-AMC-WS-10-EN-PL-0002, Slurry management plan (Bentonite) (**Appendix F**).
- 40-AMC-WS-10-SW-RA-0005, Operation of slurry plant (**Appendix G**).

During these works, the dewatering system installed during phase 3 will operate to control the ground water level locally to the works, initially to a level of 1.5m below the working platform level for guide wall construction, then to 3m below working platform level for diaphragm walling. In addition to controlling groundwater level, the dewatering system will be used to provide an early indication of any bentonite losses into the Moor Grit aquifer.

Water from the dewatering system will be discharged via a holding tank with a capacity of 10m<sup>3</sup> where it can be monitored visually for evidence of turbidity.

Should evidence of bentonite be observed, the following action will be implemented:

1. A sample will be taken from the sampling tap of each active well to identify the source of the bentonite.
2. The affected well or wells will be temporarily isolated and the discharge from the dewatering system monitored to confirm that the flow is now free from bentonite.
3. In the event that flow remains contaminated with bentonite step 1 will be repeated.
4. Turbid water held in the holding tank will be pumped to the site-wide surface water drainage system to discharge via to on-site facilities for removal of silt.
5. The affected well or wells will be restarted once corrective action has been taken to prevent bentonite losses from the D-wall trench in accordance with the Slurry Management Plan (**Appendix F**).

The full monitoring programme for diaphragm wall slurry losses is included as Appendix F to the Environmental Management Plan which forms Appendix B to the PMP in **Appendix A**.

### **3.8 Welfare, offices and security gate house**

The shared office and welfare facility established during the phase 3 Site Preparation Works will be occupied by the Sirius construction management team and AMC once erection and fit out has been completed in accordance with the phase 3 Site Preparation Works CMS.

In the interim, the Sirius Management team will continue to occupy the NMC facilities identified on drawing 40-ARI-WS-71-CI-DR-1087.

Temporary office and welfare cabins will be established at the northern end of the construction platform as shown on drawing ARI-WS-71-CI-DR-1087 for use by the Bauer construction workforce. The temporary office and welfare facility is described in diaphragm walling mobilisation Method Statement in **Appendix B**.

A security cabin will be established on the site access road within the site in the location shown in figure 1 below. All visitors will be required to sign-in to site at the security cabin. A lay-by is provided for parking whilst signing in, so as not to block the access road for incoming deliveries, and a turning area is provided for use by vehicles refused access.

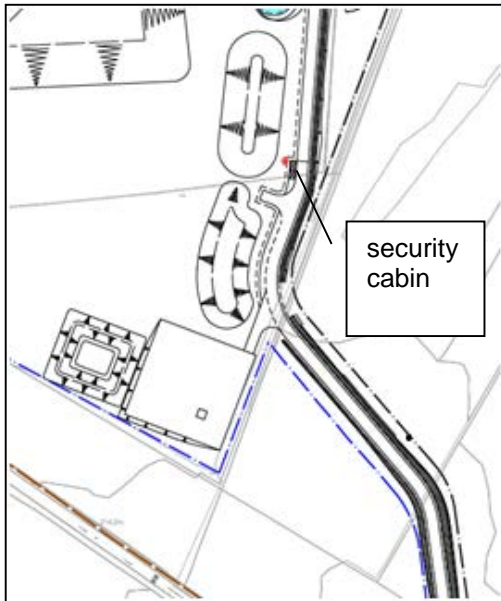


Figure 1: Location of new security cabin

### 3.9 Screening bunds

Construction of screening bunds is described in Section 3.3 and Appendices B and C of the Phase 3 Site Preparation Works CMS. (40-ARI-WS-71-PA-MS-1050). The same methods will continue to be employed during phase 4, and have not been reproduced within this document.

### 3.10 Hardstandings

The Phase 3 Site Preparation Works CMS (40-ARI-WS-71-PA-MS-1050) sets out details of the hardstanding and access roads construction in Phase 3. No additional hardstandings will be constructed in phase 4.

### 3.11 Internal access and haul roads

During the phase 4 works all access to the site will be via the new site access road constructed from the B1416 on the southern boundary of the site. The access road provides a surfaced route to the key areas where bulk materials will be unloaded and loaded, in particular the concrete batching plant and bentonite plant. The haul road also provides a surface route from the diaphragm wall working area and the bentonite plant to the inert spoil stockpile area to the south of the concrete batching plant. The access road will be maintained by regular sweeping with a road sweeper fitted with spray bar or a tractor and brush as appropriate.



An additional temporary haulage route will be established from the northeastern corner of the working platform passing between the topsoil and subsoil storage bunds to access the northern extension to the screening bund on the western boundary of the site, as illustrated in figure 2 below. This route will only be used by all terrain dumpers and so will be unsurfaced. Topsoil will be stripped from the haul route and placed into the topsoil storage mound in accordance with the soil management plan.

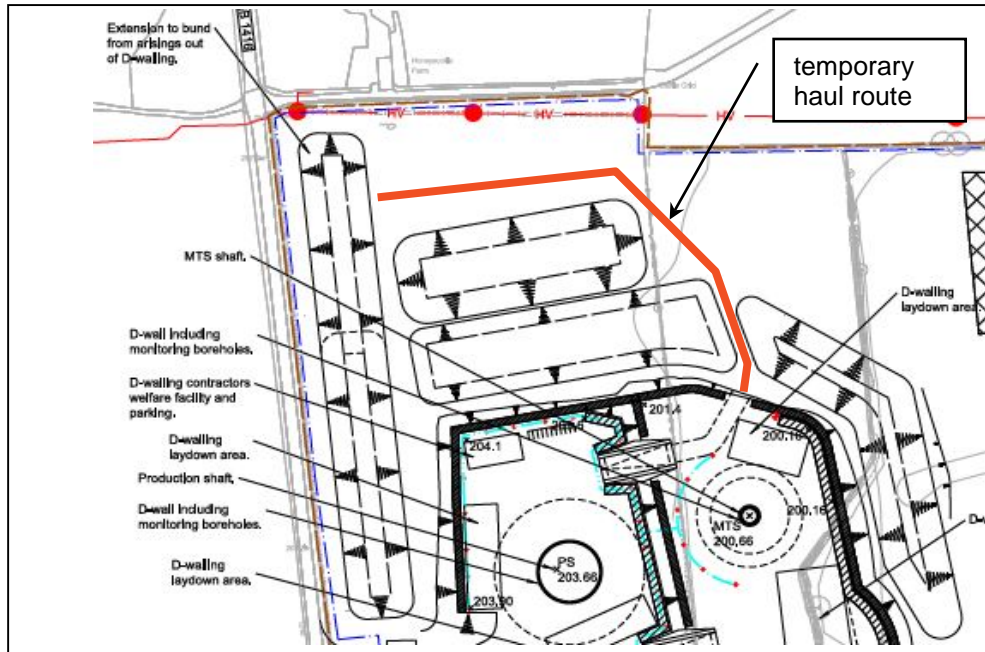


Figure 2: Temporary haul route

### 3.12 Domestic wastewater

Domestic wastewater will be collected in sealed tanks and will be removed from site on a regular basis via tanker, and disposed of to a suitably permitted facility.

### 3.13 Surface water attenuation ponds, settlement ponds, swales and wetland areas

Construction of these was described in the Phase 3 Site Preparation Works CMS. (40-ARI-WS-71-PA-MS-1050) and is not reproduced within this document.

### 3.14 Temporary spoil storage areas

A temporary spoil storage area will be established to the south of the concrete batching plant as shown on drawing ARI-WS-71-CI-DR-1081. Only inert spoil will be handled or deposited in this area, therefore no special precautions for the protection of groundwater are required. Preparation of the area will be limited to the removal of topsoil to temporary stockpile in accordance with the Soil Management Plan (planning condition 76). A temporary storage area for clay for

layer re-use was established in phase 2 to the north of the working platform (refer to drawing ARI-WS-71-CI-DR-1081) and will continue to be used in phase 4.

### 3.14.1 Spoil from guide wall construction

Spoil arising from guide wall construction will comprise clay and broken rock. Spoil meeting the requirements for class 6H, 6I, 6J, 7C or 7D of the Specification for Highway Works, which is suitable for later re-use in constructing the final reinforced soil screening bund on top of the working platform at the end of the construction programme, will be deposited in a temporary spoil mound in the temporary spoil storage area.

Spoil that is unsuitable for this use, for example soft clay or oversize cobbles and boulders of rock, will be transported to the environmental bund at the north-western corner of the site.

### 3.14.2 Spoil from diaphragm wall construction

The arisings from diaphragm walling will be separated from the bentonite slurry in the bentonite plant as described in the Slurry Plant Operation Method Statement included in **Appendix G**.

As they are discharged from the desander these arisings are expected to have a high moisture content. The arisings will be discharged onto a sealed, bunded concrete slab which will contain any run-off, allowing it to be collected and pumped into the waste slurry storage tank for disposal off-site, or re-used after treatment within the bentonite process. Once any free water has drained off, the arisings will be sampled and tested to confirm acceptability for retention on site in accordance with the "Specification for diaphragm wall arisings for reuse as inert class 4 material in the permanent and temporary landscaped screening bunds" included in the Groundwater Management Scheme (40-FWS-WS-70-WM-PL-0010). Arisings that do not meet the chemical acceptability criteria will be loaded into road-going tipper wagons for disposal off-site. If necessary tippers with sealed tail-gates will be used to prevent loss of any very wet material onto the public highway.

Arisings meeting both the chemical acceptance criteria and geotechnical acceptance criteria will be transported to the temporary inert spoil storage area where they will be deposited on the temporary storage mound and spread and compacted using a dozer.

Arisings that meet the chemical acceptance criteria but fail to meet the geotechnical acceptance criteria because they are too wet will be conditioned by drying and re-tested prior to incorporation in the storage mound. Generally arisings will be air dried either by spreading in a layer and leaving to dry, or by windrowing and repeatedly turning the windrows using an excavator until a satisfactory condition is achieved. Should this not be possible due to weather conditions, the arisings may be dried by the controlled addition of small quantities of lime using proprietary lime spreading equipment. The conditioning will be carried out in the temporary spoil storage area.



Arisings from the bentonite plant will be transported to the spoil storage area during both day and night shifts. At night, spoil will be block tipped and will not be spread and compacted until the following day shift.

### 3.14.3 Waste bentonite slurry

Waste bentonite slurry will be discharged via a decanter station into skips within the bentonite plant compound as described in the Bentonite Plant Operation Method Statement in **Appendix G**. The slurry will be pumped from the skips into road going tankers for off-site disposal in accordance with the Site Waste Management Plan (Appendix D to the Environmental Management Plan which forms Appendix B to the PMP included in **Appendix A**).

Spoil from the decanter will be managed in accordance with Section 3.14.2 above.

## 3.15 Formation of spoil mounds and the establishment of vegetation on them.

The formation of spoil mounds is described in Phase 3 Site Preparation Works CMS (40-ARI-WS-71-MS-1050-0-IFU) and is not reproduced here.

## 3.16 Construction timetable and sequence of work

The Phase 4 Works described in the CMS are scheduled to occur between July 2018 and May 2018.

The works are planned to be carried out in the following sequence:

- Construction of guide walls at the services shaft.
- Erection and commissioning of the bentonite plant (concurrent with guide wall construction).
- Commencement of diaphragm walling at the services shaft.
- Construction of guide walls at the production shaft.
- Commencement of diaphragm walling at the production shaft.
- Construction of guide walls at the MTS shaft.
- Commencement of diaphragm walling at the MTS shaft.

The schedule and sequence is subject to change depending upon actual progress on site.

## **Appendix A**

### **AMC UK Project Management Plan**

## **Appendix B**

### **Method Statement - Mobilisation of Diaphragm Walling Equipment**

## **Appendix C**

### **Method Statement - Operation of concrete batch plant**

## **Appendix D**

### **Method Statement - Diaphragm wall construction**

## **Appendix E**

### **Method Statement - Guide wall construction**

## **Appendix F**

### **Bentonite slurry management plan**

## **Appendix G**

**Method Statement - Slurry plant  
operation**