SECTION 4

Contents

Tables

Figures

4 Project Description

HEM is seeking to remove emplaced carbonaceous materials from three past coal mining locations (i.e. Aberdare East, Neath and Richmond Main East) for transport to an operational chitter processing facility as additional feedstock for an existing and approved rehabilitation operation (i.e. Hebburn No. 3).

Section 4 of the Environmental Assessment Report outlines the complete process, and describes in detail the extraction, haulage and rehabilitation of materials from the three sites. **Figure 4.1** highlights the relevant components of the project and their relationship to the existing approved Hebburn No.3 processing facility.

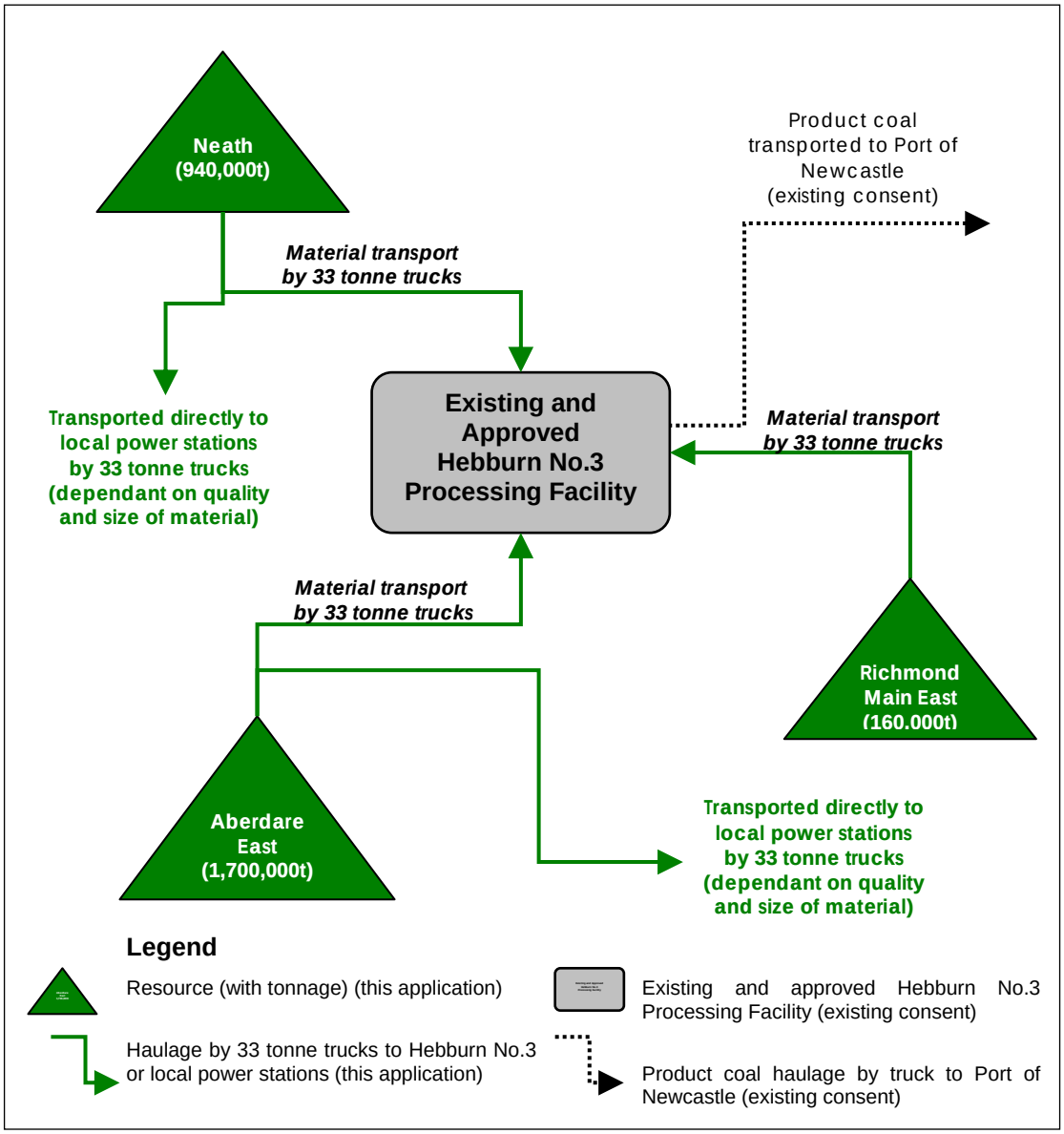

Figure 4.1: Global project schematic, highlighting the aspects relevant to this application and relationship with the existing approved Hebburn No.3 Processing Facility.

With modern day processing methods and a more flexible coal market the removal of coal from these emplacements is an economically viable activity, with the product coal being suitable for the export market and domestic power generation. The processing of the carbonaceous material also yields a coarse reject material suitable for use as construction fill, road sub-grade and other construction purposes.

4.1 Predicted Project Duration

The total duration of all aspects of the project is not anticipated to exceed 3.5 years, inclusive of an extreme 50% allowance for potentially unfavourable meteorological conditions where limited material extraction could occur. A break down of the anticipated duration of each site is presented in **Table 4.1**. If haulage rates were increased the duration of potential impacts at the sites would be decreased.

Table 4.1: Duration of the various components of the project.

Resource	Quantity	Duration in weeks		
		Continuous Extraction[1]	Rehabilitation	Total[2]
Aberdare East	1.7Mt	103	10	155
Neath	0.94Mt	57	10	96
Richmond Main East	0.16Mt	10	2	12

[1]. Continuous extraction undertaken 5 days per week, 10 hours per day, 10 laden vehicles per hour.

[2]. Inclusive of 50% unfavourable meteorological limitations, where no work can proceed to provide a worst case scenario for duration.

4.2 Project Need

The emplaced carbonaceous materials, otherwise referred to as tailings and chitter, represent reject material from past coal operations of the Cessnock and Kurri Kurri and potentially Newcastle coal fields. At that time, the material was unsuitable for the market and was consequently rejected and placed in emplacements. Some emplacements were capped with clay or chitter while others (primarily chitter emplacements) received no rehabilitation at all. Many of these carbonaceous emplacements release into the surrounding environment a variety of contaminants, principally salt and acid, which compromises a variety of environmental values in the surrounding landscape. The emplacements are also capable of spontaneous combustion that represents a significant safety and environmental hazard.

The extent of past rehabilitation works have had limited success in containing the environmental impacts arising from these emplaced carbonaceous materials on the surrounding environment. Past rehabilitation works represented a “temporary” solution, with the potential failure of the rehabilitation works considered likely in the absence of further remedial actions and continual management.

This project represents the definitive management outcome for these carbonaceous emplacements by removing the source material from the environment. The removal of the material will enhance the local environment over time.

URS undertook a study on behalf of the DPI-MR in 2003 titled “Public Report on Acid Mine Drainage from Derelict Mine sites in the Lower Hunter Coalfield” that investigated derelict mines sites and evaluated there environmental risk. Aberdare East and Neath were part of this study. It was concluded that both sites were a medium risk as they contained significant volumes of acidic material. The study also stated that many management techniques were expensive and labour intensive, with the best long term solution involving the removal of the acid source; which is the purpose of the proposed HEM Project.

The recovery of this material value adds to a previously abandoned waste, that still has a calorific value. The recovery and reuse of this waste represents a significant environmental benefit in terms of reduced greenhouse emissions and environmental impact compared to the extraction of a similar volume of virgin coal from a open cut or underground mining operation.

The rehabilitation will also remove a significant social and financial burden on the local community, local and State governments (in particular at Aberdare East, and Neath), whilst generating approximately 50 local employment opportunities, and injecting revenue to the state government in the form of taxes and royalties paid on product coal generated at the Hebburn No.3 processing facility.

4.3 Project Description Overview

The project will involve a number of integrated processes, which are discussed in this section of the Environmental Assessment Report. The following key elements underpin the proposed operation:

- The quality and extent of the resource;
- Site extraction processes used to acquire the carbonaceous materials;
- Topsoil management;
- Material transportation;
- Water management;
- Final Landform; and
- General rehabilitation methods.

The processing, treatment and disposal of slimes, water management, product coal haulage and final landform at the Hebburn No.3 processing facility is part of an existing approved consent.

Each of the above processes is to be undertaken in accordance with a Mine Operations Plan (MOP) in conjunction with an Environmental Management System (EMS). The MOP will contain specific details regarding the mechanics of the operation, with the EMS providing support in the management of the following important environmental matters:

- Climatic triggers for managing dust and noise associated with the project;
- Vegetation management protocols including the protection of threatened biodiversity;
- Sediment and erosion management procedures;

- Traffic management;
- Water management; and
- Topsoil resources and rehabilitation works.

Existing bushland tracks are proposed to alleviate the impact of truck movements on the public road network where possible, these tracks will be upgraded to a condition that will permit all weather access. Rehabilitation is proposed for each of the chitter resources to a condition that is commensurate with the surrounding environment and consistent with agreed outcomes from key stakeholders. The final landscape vision for Aberdare East and Richmond Main East is expected to be a rural landscape characterised by the establishment of a native grass coverage and riparian vegetation in key areas, with the final landscape for Neath being the revegetation of native vegetation similar to the surrounding bush land environment.

4.4 Resource Summary

Presented in the following sections is a description of the resources contained within Aberdare East, Neath and Richmond Main East including a general description, resource history, quantity composition and the existing site conditions.

4.4.1 Aberdare East

Aberdare East Colliery operated from 1968 to 1982 in a virgin area of coal resulting from the combination of a number of Caledonian Colliery leases. It is located adjacent to the South Maitland Railway, south east of Cessnock High School and south of the Aberdare Shaft Colliery.

After closing in 1982, the surface facilities were used by Coal & Allied for their Apprentice Training School until 1988. In 1989, Hunter Plant Operators Training School took over the surface and use the facilities to train earth moving personnel to this day.

The coal from Aberdare East (and apparently some from Aberdare North Tunnel) was washed at the Aberdare Shaft Colliery Washery, north east of the Aberdare East pit top. This washery ceased operations in 1982 when Aberdare East Colliery closed.

The above information was sourced from the History of the Greta Coal Measures accessed on the Newcastle Regional Museum website.

The Tailings Dam emplacements on the Aberdare East site resulted from the reject created by the Aberdare Shaft Colliery washery, primarily from washing Aberdare East coal. The Chitter Resource area was a former coal stockpile pad, and is thought to have a mix of product coal and reject material.

The key aspects of the resource are summarised below in **Table 4.2**.

Table 4.2: Key Aspects of the Aberdare East Resource.

Name	**Aberdare East (ABE)** The Aberdare East Resource has been sub-divided into two areas, these being: • Tailings Dams Area; and

	• Chitter Resource Area. A separate resource called the Aberdare East Rail Siding has been removed under S11A of the Mining Act 1992 and State Environmental Planning Policy No 55 – Remediation of Contaminated Lands, and is not covered by this application.
Location	South of the South Maitland Railway and Cessnock Street, Aberdare (Figure 1.1). Former site of the Aberdare Shaft Colliery and Aberdare East Washery. Approximate centre of the site is 347710ME 6364550MN (MGA Zone 56)
Estimated Chitter and Tailings Emplacement Quantity	• Tailings Dams Area– 1.5Mt (0.85Mt tailings, 0.65Mt chitter); • Chitter Resource Area – 0.2Mt.
Estimated Chitter and Tailings Emplacement Quality	• Tailings – Raw Ash 20 - 40%, Sulphur 0.5 -1.5%; • Chitter – Raw Ash 20 – 60%, Sulphur 0.25 -1.5%.
General Chitter and tailings Emplacement Characterisation	• The Tailings Dams are a 'turkeys nest' emplacement, with dam walls constructed of chitter. The site is capped with clay and chitter and is predominantly grassed with some woody vegetation. There is a significant acid drainage problem emanating from this emplacement; • The Chitter Resource is a flat chitter emplacement with a good topsoil and clay cover, predominantly grassed with some small woody vegetation.

4.4.2 Neath

Neath Colliery operated from 1907 to 1951. Neath Open Cut operated from 1949 to 1959.

Chitter, shale, inferior coal and pit-rubbish reject material from the picking belts presented a problem at Neath Colliery. Many large "dump" heaps were made along the inside arc of the Neath Colliery rail sidings. Possibly because this was on the lower side of the slope, it made for convenient discharge and unloading.

By the late 1930's these chitter dumps and hills had reached mountainous proportions. Fortunately for Neath Colliery, up to this period no spontaneous combustion had taken place in these heaps. This material was sold to the Sydney electricity generation powerhouses. These powerhouses had been fitted with equipment and furnaces to handle and burn this type of coal. Over a lengthy period, the chitter dumps at Neath Colliery were loaded by a front-end loader straight into NSW Government Railways "U" Class 25 tons carrying capacity rail wagons. These were dispatched in train loads of 22 vehicles direct to Bunnerong Powerhouse.

Neath Washery used "Diester" washing tables that were constructed in 1957 and screens to handle and improve the quality of open-cut coal production. Although quite small, these tables

were very effective in removing stone and other impediments. Coal being lighter, floated in water over the riffles or removing grid. The stone and heavier rubbish, by a form of gravitation, moved out sideways to drop out into a chute -a simple but effective operation.

In 1964 Coal & Allied Limited sought to increase the quantity being processed. To achieve this, a second-hand washing plant was transferred to Neath Colliery pit-top to replace the small "Diester Table" unit. This second-hand washing plant showed very good results, providing some 75% recovery from about 1250 tons treated daily.

A brand new washery plant, an "Acco Little Jig" manufactured in early 1968 replaced the second-hand unit installed in 1964. This new plant washed with a kind of wave action.

Up until 30 April 1988, coal production from Aberdare North Tunnel was washed at Neath Colliery washery, then if necessary transported to the Coal & Allied Hexham Plant for blending, or alternatively dispatched direct to Port Waratah for shipment. When Aberdare North Tunnel closed at the end of April 1988, so did Neath Colliery washery.

The above historical information was sourced from the History of the Greta Coal Measures accessed on the Newcastle Regional Museum website.

At 1250 tonnes per day, 220 days per year and a 75% yield, the total amount of chitter and tailings produced from 1957 to 1988 would have been 2.13 MT. It is likely that most of this chitter and tailings remains at site in several emplacements adjacent to the washery area and in final voids of the open cuts. There could be a small additional amount from the picking belts and screens that operated prior to the washery, but most of this original material appears to have been sold to Bunnerong Power Station.

The key aspects of the resource are summarised below in **Table 4.3**.

Table 4.3: Key aspects of the Neath Resource

Name	**Neath** The Neath Resource has been sub-divided into four areas: • Washery – Chitter and tailings emplacements east of former coal washery; • Southern Tailings Dam Toe – Chitter emplacement north west of former coal washery area and east of the southern tailings dam wall; • Southern Tailings Dam – Tailings dam west of washery chitter and tailings; and • Northern Tailings Dam – Tailings dam at northern extent of site, to the north of the southern tailings dam.
Location	North of Maitland Road, Neath, off David Street. Site of the former Neath Colliery and coal washery (Figure 1.1). Approximate centre of the site is 350847ME 6367300MN (MGA Zone 56).
Estimated Chitter and tailings Emplacement Quantity	• Washery - 111,905t • Southern Tailings Dam Toe - 82,117t • Southern Tailings Dam - 457,763t • Northern Tailings Dam – 283,814t

Estimated Chitter and Tailings Emplacement Quality	• Tailings – Raw Ash 20 - 40%, Sulphur 0.5 -1.5% • Chitter – Raw Ash 20 – 60%, Sulphur 0.25 -1.5%
General Chitter and tailings Emplacement Characterisation	• Washery – Chitter dumps and tailings dams built with chitter walls, capped with topsoil, light woody vegetation and grass cover; • Southern Tailings Dam Toe – Chitter emplacement at toe of southern tailings dam, probable co-contributor to significant acid water emanating from site, has a sporadic grass cover and occasional woody vegetation; • Southern Tailings Dam – Tailings dam, capped with layer of chitter and topsoil, dam wall also chitter, grass cover, probable co-contributor to significant acid water emanating from site; and • Northern Tailings Dam – Tailings dam, capped with layer of chitter and topsoil, dam wall also chitter, grass cover.

4.4.3 Richmond Main East

The key aspects of the resource are summarised below in **Table 4.4**.

Table 4.4: Key aspects of the Richmond Main East resource.

Name	Richmond Main East (RME)
Location	North of Richmond Vale Road and East of the Kurri-Mulbring Road, Richmond Vale. (Figure 1.1). Approximate centre of the site is 360642mE 6364097mN (MGA Zone 56)
Estimated Chitter and tailings Emplacement Quantity	• RME - 160,000t
Estimated Chitter and Tailings Emplacement Quality	• Chitter – Raw Ash 30 – 60%, Sulphur 0.45 -0.7%
General Chitter and tailings Emplacement Characterisation	RME - The chitter appears to have been capped in parts with topsoil and grassed, but dump edges up to 8 metres high were not battered and the steep slopes are poorly vegetated and inconsistent with the surrounding landscape.

The history regarding the Richmond Main East emplacement is unknown. Its location adjacent to the Richmond Vale Railway and the presence of the occasional rotted sleeper and rusted fishplate on the top of the dump suggest the material was transported there by rail. It could be that the emplacement was created as a high level crossing for Wallis Creek as the grades and the location would certainly have enabled it to be used for this purpose. Suffice to say however that HEM does not know the source of the material.

HEM was made aware of the resource by a former Coal & Allied officer responsible for their derelict mines. The former Coal & Allied officer had been contacted by a local resident in the 1980s when a fire had been discovered in the emplacement. The local resident had presumed it was a Coal & Allied dump, but this could not be confirmed from any information within Coal & Allied records relating to the emplacement. Coal & Allied did however extinguish the fire in the emplacement at the time at their cost.

4.5 Site Infrastructure

There will be minimal infrastructure required at the three sites. Given the size of the emplacements at Aberdare East and Neath, these sites will require a small site compound containing the following infrastructure:

- 2m chain wire enclosure for protection of machinery and crib hut;
- Small portable crib hut and / or shipping container, used by site personnel for breaks and storage of first aid and tools and machinery if required; and
- Portable toilet.

As Richmond Main East is relatively small and is expected to be removed within a relatively short time frame no infrastructure other then a portable toilet will be installed at this site.

4.6 Equipment Fleet

The equipment fleet proposed for the operations at the three sites is anticipated to be as shown within **Table 4.5**. Some equipment will be dedicated to an individual site while other machinery will be moved between the sites.

Table 4.5: Proposed equipment fleet

Equipment and Estimated size	Anticipated No. Required
20 -30t excavator	2
27-33 t road registered semi trailers, or truck and dog	6 to 10
14ft grader, moved between sites	1
Road registered water cart, servicing all sites	1 to 2
D6-D8 bulldozer, moved between sites as required	1
20 – 50t Front-end loader, moved between sites as required	1

Water carts servicing the sites will operate (spraying water) regularly along roads where residents could be affected, and occasionally along other unsealed roads. Should the 1 to 2 water carts be unable to effectively reduce dust where needed, additional water carts will be commissioned.

4.7 Resource Extraction

The removal of the carbonaceous materials from each of the three emplacement areas, will be undertaken using front end loaders or excavators loading into trucks up to 33 tonnes capacity. Trucks would then haul material along one or a combination of haulage routes to the Hebburn No.3 processing plant for processing. The process involved in removing chitter from these sites will be undertaken in three stages, these being:

- Pre-extraction preparation;
- Extraction; and
- Post extraction landform management and rehabilitation.

These are discussed in detail in the following sections.

4.7.1 Pre-extraction

Pre-extraction works are described below:

- The limit of each resource, as specified in this Environmental Assessment Report, is to be delineated in the field using steel/timber posts or fluoro paint as required, prior to the initiation of any earthworks;
- Installation of anemometer at Neath and Abedare East to monitor wind conditions;
- Clean water diversion channels and sedimentation basins are to be constructed together with various sediment erosion and control measures. The construction of these will occur prior to the start of operations and will be continuously maintained and modified as the extraction progresses;
- Erection of site compound;
- Haulage corridors are to be formed to an all weather standard; and
- Stockpile pads are to be formed and adequately bunded to fully contain the stored materials (i.e. topsoil and/or chitter etc).

Pre-extraction works are to be completed to a satisfactory standard prior to the initiation of extraction works and are to be maintained in accordance with the MOP and EMS.

4.7.2 Extraction

Extraction methods will commence after the implementation of pre-extraction environmental and infrastructure works in accordance with the MOP and supporting EMS. The extraction processes are generally consistent between each of the sites. The extraction works are described below:

- Strip topsoil from the initial extraction point and the adjoining work area for storage in a temporary stockpile used for progressive rehabilitation;

- Within the working tailings cell excavate drainage trenches around the perimeter of the cell to facilitate drainage of the tailings;

- Establish a work face of depth equal to the resource thickness for resource areas that are less than 4 m in depth. For those areas with a resource thickness greater that 4 m, a first pass working face will be established (i.e. 3-4 m in thickness), with a second pass working face to be established after sufficient progression of the initial working face; and

- Continue to strip topsoil from the adjoining work area for use in the rehabilitation phase, where possible spreading the topsoil over previously worked areas, to minimise additional handling and stockpiling of soils to facilitate progressive rehabilitation where possible.

It is expected that the emplacements will be removed insitu by excavator or front end loader to trucks for haulage off site, however, it is possible that stockpiling of material will be required to allow correction of moisture contents, and flexibility in haulage of material to Hebburn No.3, local power stations or local collieries. The volume of stockpiled material will be kept to a minimum to reduce handling costs.

As previously identified, Aberdare East and Neath represent two sites that contain a mixture of chitter and tailings deposits, with Richmond Main East containing only emplaced chitter. The extraction process for tailings differs to chitter emplacements due mainly to the water content and stability of these emplacements. Methods for extracting these resources are described below.

4.7.2.1 Tailing Emplacements

The removal of the tailings emplacements are potentially a hazardous operation due to the water content of the tailings and its propensity to be geotechnically unstable, as such operational procedures must be cognisant of the potential limitations during extraction.

Tailings will be collected and removed from the site and generally transported to Hebburn No. 3 for processing. It is possible that a market may exist at power stations or neighbouring collieries for material finer than 100 microns. In this case the material would be transported directly to these markets.

There are two potential tailings cells that could be encountered; these being; (i) free draining tailings, and (ii) tailings that do not free drain, this could vary from cell to cell and may also vary across each tailings cell and is likely to be a function of particle size and the tailings clay content. While it is expected from observations of tailings at Wambo, Liddel and Hexham that tailings will largely drain freely, a contingency has been included should the tailings retain water.

Free Draining Tailings

The following extraction procedure applies to tailings emplacements that are free draining:

- Dewater tailings using trenches located along the sides of each tailings cell. The water seeping into these trenches will be drained to sumps and depending on quality either reused onsite for dust suppression or pumped directly to the underground workings via a discharge bore, or through shaft/drift seals;

- Remove chitter and/or clay capping;

- A 3-4m high face will be developed starting at the edge of the tailings cell breaching the tailings wall to provide a safe extraction height; and

- Progressively move through the tailings emplacement, on a cell to cell basis.

Water Retaining Tailings

The following extraction procedure applies to tailings emplacements that do not drain freely and retain water, this will be identified following an assessment of the effectiveness of the dewatering trenches explained above:

- Remove chitter and/or clay capping;

- Removing thin layers of the tailings from the top down, when a moisture content of approximately 15% is established thereby minimising the creation of excessive dust during the removal process; and

- As each layer is removed it will expose underlying tailings to sun and wind evaporative mechanisms thereby progressively drying the next layer for extraction;

Wet tailings will be extracted from within the tailings cell prior to the removal of the outer dam walls to contain undesirable movement in the resource. However, the dam walls will be lowered with the lowering of the tailings to increase sun and wind drying. Tailing cell walls contained wholly within the emplacement area may be removed without risk of the tailings migrating unexpectedly into the adjoining environment as the outer walls will remain intact throughout the operation.

To minimise the area of exposed tailings typically approximately 5ha (dependent on drying rates) would be open at any one time. This will provide sufficient flexibility for the removal of tailings to meet Hebburn No.3, local power station or local colliery needs.

4.7.2.2 Chitter Emplacements

Chitter emplacements are relatively stable and may be removed using heavy machinery without the additional safety issues associated with the tailings deposits. The following process describes typical chitter removal:

- Remove chitter and/or clay capping;

- A 3m to 4m high face will be developed starting at the edge of chitter to provide a safe extraction height using a front end loader or excavator;

- The chitter will be loaded directly into a truck and transported to Hebburn No.3; and

- Where the chitter is greater then 3-4m thick it will be removed in two passes staged to allow the removal of the entire chitter thickness progressively across the resource.

4.7.2.3 Heat Affected and Highly Weathered Materials

In all of these emplacements there is expected to be material that has either been heat effected or burnt form spontaneous combustion or is too highly weathered to economically recover a suitable product. Richmond Main East and Neath are both known to contain burnt chitter and tailings.

These materials will be managed onsite through either the blending of higher quality materials to meet power station requirements (for some weathered material) or stockpiling onsite for blending with the topsoil for rehabilitation (burnt and weathered material). Analysis of the burnt material has identified that it is an inert substance, with a high porosity and would make an effective component to potting mixes, and would therefore potentially provide some positive benefits as a growing medium for the purposes of site rehabilitation.

4.7.3 Extraction Sequence

Each resource will be extracted in a specific sequence to maximise positive environmental outcomes and minimise the short term adverse environmental impacts. The following sections describe the extraction sequence proposed for each of the emplacements.

4.7.3.1 Aberdare East Sequence

The Aberdare East resource has been broken into 8 areas (Tailings Dam represented by A-G and Chitter Resource by H) as illustrated in **Figure 4.2**. **Table 4.6** provides a brief description of each area along with the relevant details of the extraction sequence. The sequence has been designed with several environmental and safety considerations, including the stability of the tailing cell walls and the need to create a 'wall', separating the excavation works from nearby sensitive receptors. This sequence may require subtle variation during extraction to account for unforeseen site conditions.

Table 4.6: Extraction sequence and site description at Aberdare East

Area	Description	Extraction Sequence	Details of Extraction or Disturbance
C	Topographical high point of tailings dams, area capped with weathered chitter, average grass cover some established trees. Tailings range from 4m deep in the southern corner to over 10m deep in the northern corner.	1 or 1 and 2A	This area is the starting location for the tailings dam extraction, with the work commencing in the southern corner and progressing in a northerly direction. The depth of the initial tailings extraction will be dependant on the stability of dam walls in the surrounding tailings cells. The two scenarios are: 1. Work the area to its full depth, using two passes as required; or 2. Work the area to a level contiguous with the surrounding Areas, B, D and E, and then remove after Area D.
D	Area capped with clay, good regrowth occurring in southern end. Tailings range from 2 to 6m deep.	2	This area will be removed after Area C, starting in the southern corner and progressing to the north. If second option used in Area C then this will be first area to be topsoiled and vegetated.
G	Smallest of the areas, capped in clay, good grass cover and some established trees over some of the area and some salt and acid scalding on north western edge. Tailings range from 1 to 2m deep.	4	Removed after Area D.

Area	Description	Extraction Sequence	Details of Extraction or Disturbance
B	Area capped with clay, numerous wattles and good grass cover. Tailings approximately range from 3 to 6m deep.	5	Extraction will start in south eastern side and progressing north west.
E	Closest area to residential properties, area capped with clay, good grass cover some established trees. Resource ranges from 1 to 4m deep. Unlike other areas comprises tailings on the eastern end and predominantly chitter on the northern end.	3	Final tailing cells to be removed. Left to last to provide an environmental bund. This area will be removed after Area B, starting on the southern side and progressing to the north west.
H	This area is the Chitter Resource area that was previously rehabilitated by the Department of Mineral Resources (now Primary Industries). The area is capped with clay with a good grass cover and some emerging woody vegetation. It was the former stockpile pad for the collieries. The chitter resource is expected to range between 1 to 3m deep.	6	The resource in this area will be extracted after the completion of the Tailings Dams area to an acceptable standard of the Department of Mineral Resources.
A	Lowest area of tailings dams, characterised by acid and salt scalds, limited resource, some scrap metal and building waste.	Proposed site for main sedimentation dam and possible borehole discharge, to be constructed prior to extraction activities	
F	This area does not have any economic resources and represents the drainage channel that diverts fresh water around the site, The open sandstone channel reaches up to 4m deep.	This area will be one of the final areas to be rehabilitated following the establishment of the creek line through the topographic lows of the re-established valley. The rehabilitation and hence, re-diversion of existing flows will occur after the creek line is vegetated, stable and water qualities draining from the rehabilitation are of an acceptable quality.	

Figure 4.2: Aberdare East resource areas.

4.7.3.2 Neath Sequence

The Neath resource has been broken into 4 areas as illustrated in **Figure 4.3**. **Table 4.7** provides a brief description of each area along with the relevant details of the extraction sequence.

Table 4.7: Extraction sequence and site description at Neath

Area	Description	Extraction Sequence	Details of Extraction or Disturbance
South Tailings Dam	This area is capped by chitter and clay and contains bother chitter and tailings emplacements. The dam ranges from less then 1m deep in the west to more then 8m deep at its eastern extent.	1	This area will be the first area worked at Neath starting in the north eastern corner and progressing in a south westerly direction.
South Tailings Dam Toe	This area immediately abuts the eastern side of the South Tailings Dam and is characterised by salt and acid scalding, with poor vegetation cover. The eastern boundary of this area is the dismantled railway siding. The area contains chitter ranging in depth from less then 1m to approximately 6m.	1	This area will be worked concurrently with the South Tailings Dam to allow flexibility to maintain chitter feed to the Hebburn No.3 Processing facility if tailings within the dam are only suitable for the power stations/blending. The resource will be worked from the north western corner to the south eastern corner, maintaining a working face between the operations and the nearby residences.
Washery	The washery area contains both chitter emplacements and tailings emplacements, it is generally capped with clay and has a sporadic grass cover and high wattle cover with occasional established eucalypts.	2	This area will be recovered following the removal of the South Tailings Dam Toe and will generally be worked from north west to south east.
North Tailings Dam	This area is capped by chitter and clay, and contains predominantly tailings (excluding the chitter walls). The dam ranges from less then 1m deep in the west to more then 8m deep at its eastern extent.	3	This area will be recovered following the removal of the South Tailings Dam. Works are proposed to commence in the north eastern corner and progressively extract the resource from north east to south west.

4.7.3.3 Richmond Main East Sequence

The Richmond Main East resource is illustrated in **Figure 4.4** and is comprised of chitter only and will be extracted in an orderly process from west to east. A working face will be established on the western extremity of the resource, and worked across the resource in two levels where required, allowing the complete removal of the resource as the operation moves east.

A small section of the resource is located above the outer bank of Wallis Creek. This section will be removed last and rehabilitated immediately to minimise the potential of sediment entering Wallis Creek during a flood event.

Figure 4.3: Neath resource areas.

Figure 4.4: Richmond Main East resource.

4.8 Topsoil and Vegetation Management

The majority of 'capping' used in past rehabilitation of sections of the three resources has been locally sourced from 'borrow pits', which yielded material primarily of clay composition. Not all of the resources have been entirely capped with this clay material with some areas being capped with chitter. The upper layers of the chitter capping is typically highly weathered and has little economic potential but may have significant rehabilitation value from seed banks and organic matter. Screening to remove coarse chitter will be considered in order to improve the "soil" value for this purpose. The clay and upper layers of the chitter capping will be removed and stockpiled in discrete locations in accordance with the best practice for topsoil preservation.

The stockpiled chitter and clay capping will have adequate perimeter sediment and erosion controls to ensure there are no impacts on the surrounding environment.

Areas containing high proportions of noxious weed will be managed through application of a herbicide prior to removal, and stockpiled in a separate location to the main soil stockpile to minimise the spread of weeds in the rehabilitation.

Surface vegetation will be removed prior to topsoil removal and stockpiled to facilitate its future inclusion within the rehabilitated landscape to improve habitat and minimise erosion.

4.9 Post Extraction Landform and Rehabilitation

The final landform at each site will be stable and where possible mirror original topography. Where this is not possible a stable self-draining landscape will be created. The following procedures will be undertaken to achieve this outcome:

- Reshape landforms within the extraction area to blend in with surrounding landscape;
- Progressively topsoil the final landform and vegetate to stabilise soils;
- Create sedimentation detention basins coupled with a borehole to underground workings down gradient of the site to help manage post extraction acid and salt leachate (at Abedare East and Neath);
- On the achievement of set water quality within the detention basin (potentially 6-12 months after rehabilitation) the borehole and basin will be decommissioned; and
- Clean water diversions around the site will be decommissioned and rehabilitated to permit surface water flows through the rehabilitated site.

The final landform and hence the rehabilitation approach will be subject to negotiations with the respective landholders and key government agencies and will be detailed within the Rehabilitation Plan for the MOP. However, the preferred landform and rehabilitation for each site is described below and discussed further in *Section 5*.

Realignment and rehabilitation of drainage lines will be undertaken in accordance with the Land and Rehabilitation Plan prepared for the Mine Operations Plan. The management plan and subsequent rehabilitation will be cognisant of the Land and Water Resources Research

and Development Corporation guideline titled “Rehabilitation Manual for Australian Streams” 2000.

There are two principal rehabilitation approaches proposed, these being:

- Grassland vegetation consistent with rural landscapes of the lower Hunter Valley region; and
- Native vegetation consistent with the surrounding landscape.

Rehabilitation works resulting in a grassland vegetation cover will primarily involve the introduction of various native species common to the locality together with non-invasive exotics suitable for agricultural land uses. Native plant species used in the rehabilitation of final landforms containing native vegetation cover will reflect one or more of the locally occurring native vegetation types, these being:

- Lower Hunter Spotted Gum Ironbark Forest;
- Kurri Sand Swamp Woodland; and
- Hunter Lowlands Redgum Forest.

While it is not the intention to reinstate the ecological diversity contained within these vegetation types across the rehabilitated areas, it is however expected that the rehabilitation works will create a self sustaining, functional, vegetated landscape promoting the development of more complex ecological processes consistent within the surrounding vegetated landscapes.

The protection and maintenance of these sites will be ensured through the securities held within the Mining Act 1992. However, unlike a coal mine the intended legacy of these works is the rehabilitation of the land surface to stable and safe landform that mirrors the original topography, with no final voids, steep batters, spontaneous combustible materials or material that could create the problems that exist today at Aberdare East and Neath.

In the longer term, management at these sites will be dependant on the landholder (crown, and freehold) and controlled under the EP&A Act, 1979 and the Native Vegetation Act 2003.

The final landuse of the site will ultimately be determined by the landowner and be consistent with the Rural 1(a) zoning following appropriate acknowledgement from regulatory authorities that a safe, free draining and stable site has been established in accordance with requirements set out within the Rehabilitation Plan in the MOP.

4.9.1 Aberdare East Final Landform

The final landform for Aberdare East will be a continuation of the surrounding gently sloped valley with the re-establishment of a slow meandering drainage line. A corridor of riparian vegetation along each side of the drainage line will be established to promote improved water quality. Outside of the riparian corridor non-invasive pasture grasses are planned to provide good soil stabilisation. At the topographical low point of the site a sedimentation dam will be constructed to capture, and control any sediment, acidic or saline waters that may briefly leach from the site following rehabilitation.

The sedimentation dam will be maintained along with the borehole discharge until the water quality improves to levels generally consistent with up gradient waters. When water qualities are found to improve the sedimentation dam will be decommissioned.

4.9.2 Neath Final Landform

The final landform for Neath will mirror the original ground contours where possible and result in two gently sloped gullies joining in a sedimentation dam to capture, control any sediment, acidic or saline waters that may briefly leach from the site following rehabilitation.

Neath is wholly contained within a vegetated landscape dominated by Lower Hunter Spotted Gum Ironbark Forest and is therefore ideally suited to rehabilitation using native plants contained within this vegetation type. While the majority of the site will be returned to native vegetation consistent with the surrounding landscape, the main historical infrastructure areas will be grassed to allow future generations easier interpretation of the historical aspects of the site.

The sedimentation dam will be maintained along with the borehole discharge until the water quality improves to levels generally consistent with up gradient waters. When water qualities are found to improve the sedimentation dam will be decommissioned.

4.9.3 Richmond Main East Final Landform

The landform proposed for Richmond Main East will be a gentle undulation consistent with the surrounding landscape. Similar to the other sites a sedimentation basin will also be established, however it is expected that this basin will be substantially drier then the Aberdare East and Neath sites.

Negotiations with the landowner has established that the preferred final landform should be suited to grazing, however given the site is located adjacent to Wallis Creek a corridor of the site along Wallis Creek will be revegetated using appropriate riparian plant species, cognisant of the Hunter – Central Rivers Catchment Management Authority publication entitled Wallis Creek Rivercare Plan.

4.10 Haulage Routes and Rates

HEM has identified several potential haulage routes between the three carbonaceous emplacements and Hebburn No. 3 processing facility, each utilising a combination of public roads and/or existing tracks throughout the surrounding bush land areas. The selection of the proposed routes has sought to minimise impacts on the local community, road users, residents, infrastructure and the environment. Proposed haulage routes include local Council and Road and Traffic Authority roads, bush land tracks on private and crown lands and existing fire trails through Werakata National Park.

For areas that require haulage through the Werakata National Park an alternate route has also been proposed on established public roads and existing tracks.

The haulage of product coal from the Hebburn No.3 processing facility was approved under an existing consent, the approved haulage rate of 10 laden trucks per hour will not be increased.

Potential haulage routes selected for the movement of carbonaceous materials are identified in **Figure 4.5**. and involve consideration of the following matters:

- Traffic considerations including intersection management and safety;
- Acoustic and dust impacts resultant from truck movements; and
- Ecological impacts.

A description of each proposed haulage route is provided in the following sections.

4.10.1 Aberdare East

There are several potential haulage routes that have been identified as shown in Figure 4.5 and described below:

A1. Entry/exit through Government Circuit adjacent to South Maitland Railway, onto Caledonia Street, Allandale Street, Lake Road and Hebburn Road to the processing plant;

A2. Entry/exit through southern entry of Government Circuit opposite Ellalong Street, Caledonia Street, Allandale Street, Lake Road and Hebburn Road to the processing plant;

A3. Entry/exit via A1 or A2, Caledonia Street, Allandale Street, Lake Road, Leggetts Drive and HEZ Spine Road.

The above haulage routes could also be coupled with access through the Werakata National Park immediately south west of the processing plant along the Tomalpin Fire Trail.

Alternatively a potential access route applies to the haulage from the processing plant north along Hebburn Road, across to Neath Road south to Caledonia Street in Kearsley and enter the site via A1 or A2.

Combinations of two of the above haulage routes may also prove beneficial from an operational and environmental perspective.

The HEZ Spine Road, Leggetts Drive and Lake Road could be adopted if the preferred route could not be used. This route is not preferred as it involves a substantially greater distance to be travelled per trip (22.9km as opposed to 9km for route A1), and also involves trucks being on public roads for the greatest amount of time, increasing the impact on surrounding traffic.

The preferred haulage route would be entry/exit through A2, Caledonia Street, Allandale Street, Lake Road and Hebburn Road to the processing plant, empty trucks returning would follow the Tomalpin Fire Trail to Caledonia Street and continue to Government Circuit.

4.10.2 Neath

There are several potential haulage routes that have been identified as shown in Figure 4.5 and described below:

N1. Entry/exit David Street, east on Maitland Road, cross South Maitland Railway north on Neath Road, south east on power easement (Energy Australia) to Hebburn Road, south on Hebburn Road to processing plant and return via same route.

Figure 4.5: Proposed haulage routes.

N2. Entry/exit through David Street, across Maitland Road continue on David Street to South Maitland Railway in south east direction, go south along western edge of railway line to southern Energy Australia easement, then east along Energy Australia easement across Neath Road and follow fire trail through Werakata National Park to Hebburn Road then south on Hebburn Road to processing plant and return via same route.

N3. Entry/exit through David Street, across Maitland Road continue on David Street to South Maitland Railway in south east direction, go south along western edge of railway line to northern Energy Australia easement, then east along Energy Australia easement to Neath Road, north on Neath Road, south east on power easement (Energy Australia) to Hebburn Road, south on Hebburn Road to processing plant and return via same route.

Combinations of two or more of the above haulage routes (or portions of haulage route) may also prove beneficial from an operational and environmental perspective.

The preferred haulage route is via N2, followed by N3 if haulage through the Werakata National Park is not possible.

Should the Werakata National Park fire trails or Neath Road haulage not be permitted, there are no feasible haulage options to Hebburn No. 3 Processing Plant without substantial impacts to the local community. Road haulage impacts would occur to the residents of Cessnock, Abermain, Weston, Kurri Kurri or Pelaw Main. In addition, there would be substantial costs to HEM associated with increased haulage and would also involve increased greenhouse gas emissions.

4.10.3 Richmond Main East

There are limited potential haulage routes for this resource, the most appropriate being described below. All haulage routes utilise existing bush tracks:

R1. Exit west along graded abandoned railway easement through Lot 19 DP1061633 into ALC 4242, south into Lot 14 DP716009 running along northern side of airstrip to the Kurri Kurri-Mulbring Road approximately 600m south of the HEZ Spine Road. North on Kurri-Mulbring Road, west on the HEZ Spine Road, south west on Hospital Road, south on Hebburn Road to Processing Plant. Return via same route.

Empty trucks returning from delivering product coal to Port of Newcastle, will in some instances continue south past the HEZ Spine Road and turn left into the Richmond Main East access road, this will minimise the number of trucks turning right from the HEZ Spine Road and reduce haulage distances.

4.10.4 Haulage Rates

The Hebburn No.3 processing plant generally requires 100,000 to 120,000 tonnes of chitter and tailings per month at current processing rates to meet product coal demand at Port Waratah. A 5 day week, up to 12 hour day operation involving up to 18 laden trucks per hour with 27-33 tonne capacity has been assumed as the nominal haulage rate across the three sites. Haulage rates from individual sites will be restricted to 10 laden trucks per hour (refer **Table 4.8**) on average from any one site, to ensure traffic safety and to minimise impacts to adjoining receptors.

Table 4.8: Proposed haulage rates

Site	Average Laden Trucks Per Hour
Aberdare East	10
Neath	10
Richmond Main East	10

To achieve 18 laden trucks per hour it will be necessary for at least two (2) of the sites to be working concurrently. Up to 30 laden trucks per hour from the sites may occur under optimum meteorological conditions to provide a "resource buffer" in the event of adverse meteorological conditions.

4.10.5 Product Haulage Direct to Power Stations

Resources contained within Neath and Aberdare East are predominantly tailings that may be suitable for direct use in power stations without the need for processing at Hebburn No. 3. Materials meeting particle size and moisture content goals will be transported directly to either Upper Hunter or Central Coast power stations using road registered semi-trailers via the existing main road network.

Alternatively opportunities may arise to enter into agreements with local collieries to transport fine materials directly to these facilities to be blended with coarse material and transported by rail to port. The collieries that may be suitable for this type of arrangement include Southland / Austar mine at Bellbird south of Cessnock, the Bloomfield or Donaldson coal mines east of Maitland. Should an agreement be negotiated for the haulage of material to these sites Cessnock City Council, Department of Planning and the public would be notified.

4.11 Water Management

Water extraction and slimes disposal at the Hebburn No.3 processing facility are managed under separate development consent.

4.11.1 Groundwater

Groundwater management will be required at Neath and Aberdare East. Richmond Main East is not known to contain any appreciable water within the resource, nor will waters be discharged to underground workings.

There are two types of groundwater at Neath and Aberdare East; deep groundwater in old underground workings and shallow groundwater within the resource areas generated as a result of surface water infiltration from higher in the catchment.

Excess waters of poor quality drawn from within the tailings cells at Neath and Aberdare East or generated through contact with extraction areas will be discharged to the underground workings beneath the Aberdare East and Neath sites.

Water will be disposed of into the abandoned underground workings via either a pipeline into existing shafts/drifts or a purpose drilled bore.

It is expected that the water pumped into underground workings will be of higher quality than the existing water and should therefore have no detrimental impact on the deep groundwaters.

4.11.2 Surface Water

All three sites have existing clean water diversions in place keeping clean water outside the emplacement footprint from entering the emplacements. The diversions will be maintained and improved to ensure the passage of clean surface waters around the site into the local catchment.

Surface waters and seepage waters collected within the operational footprint of each resource will be captured onsite in sedimentation dams. Use of collected waters will be conditional on the water quality, as water trucks will be used for dust suppression over the majority of the site, and may move between sites, it is considered prudent to use clean water sourced from the public water supply network, unless captured water is of a high quality.

Excess poor quality surface water will be disposed of within old underground workings, as discussed within the groundwater section.

As a contingency to the disposal of waters to the old underground workings the treatment of the acid mine drainage using lime, or a range of alternative ameliorants will be investigated. Treatment systems (utilising lime or similar) will need to adequately manage iron hydroxide sludges typically generated in the treatment process. Management outcomes for these sludges vary, but may include disposal to licensed landfill or potentially with appropriate dosing the blending of sludges back into the soils can also be an effective management practice.

The use of sedimentation dams will also assist the management of salt discharges into the surrounding environment. Residual salt levels can only be progressively reduced over a longer period of time that involves water mixing and slow discharges, coupled with improved soil condition and vegetation cover.

4.12 Waste Management

Waste generation on these sites will be very limited and may include metal and timber and plastics associated with the construction of the site infrastructure and piping networks, a small amount of domestic rubbish and effluent. Effluent will be managed onsite through the use of portable toilets that will be managed by approved contractors. Waste management will generally follow the hierarchy listed below:

- Avoidance
- Reduction;
- Reuse;
- Recycling or reclamation;
- Waste treatment; and
- Disposal.

A Waste Management Plan will be developed as a component of the proponent's Statement of Commitments and the Mine Operations Plan.

4.13 Employment

The proposed project will have limited additional employment opportunities for staff and contract services to facilitate the extraction of carbonaceous materials from each of the sites. However, it is anticipated that the proposed project will substantially improve the economic viability of existing operations at Hebburn No. 3.

The current workforce consists of 11 directly employed staff and 17 earth moving contractors, 23 trucking contractors and 6 maintenance contractors. The increase of carbonaceous resources resulting from this proposed project directly benefits existing employment through improved job certainty and duration.

4.14 Mining Operations Plan

Prior to the commencement of site rehabilitation HEM is required under the Mining Act 1992 to develop and have approved a detailed Mine Operations Plan (MOP). The MOP must contain detailed plans of the proposed rehabilitation operations, and also a detailed environmental management system (EMS) that is supported by equally detailed environmental management plans. The environmental management plans will address the following items.

- Air pollution
- Erosion and sediment
- Surface water pollution
- Ground water pollution
- Contaminated polluted land
- Threatened flora
- Threatened fauna
- Weeds
- Operational noise
- Visual, stray light
- Aboriginal heritage
- Spontaneous combustion
- Bushfire
- Hydrocarbon contamination
- Public safety
- Other issues and risks
- Final Landform and Rehabilitation

4.15 Monitoring and Reporting System

Each site will be required to obtain a mining lease under the Mining Act 1992 and a Environmental Protection Licence (EPL) under the Protection of Environment and Operations Act 1997 (POEO Act).

A key requirement of the mining lease will be the regular preparation of a environmental management report to be prepared every 3, 6 or 12 months as specified by the Department of Primary Industries – Mineral Resources (DPI–MR). The report will address operations undertaken onsite including the extraction, rehabilitation, monitoring, and complaints during the period.

An EPL will be required for each site, and will regulate the level of monitoring of waters, noise and air quality required. The EPL will require that appropriate record and actions be undertaken for all complaints and that breaches of the conditions of the licence are reported within 24 hours to the DEC. The EPL is prepared and submitted on a annual basis to the DEC.

4.16 Alternatives to Proposed Project

Table 4.9 describes key aspects of the project where alternatives have been considered.

Table 4.9: Alternatives and justification of proposed development

Alternatives	Justification
Haulage routes.	Several alternative haulage routes where canvassed throughout the assessment process with only the more achievable routes presented in the description, and the preferred haulage routes selected on the basis of traffic, noise, dust and ecological considerations.
Methods of resource recovery.	There are limited methods available to recover the resource, the methods described where primarily selected on the basis of safety considerations.
Extraction Sequence.	There are several potential combinations of the extraction sequence, those presented were based on providing a safe, economic and environmentally sound method that minimised noise and dust impacts on surrounding receptors. Some localised variations may be required to “chase” coarser more free draining tailings to ensure safety and efficiency in the operations.
Final Landform.	The final landform at each site has limited alternatives, as the primary aim is to remove the carbonaceous material and establish the original ground contours. The selection of a temporary detention basin coupled with the borehole discharge as a feature down gradient of the sites is proposed as it provides a low level of maintenance and will help reduce residual salt and acid discharges to the downstream catchment for a period after site rehabilitation. Following the achievement of an accepted water quality within the detention basin, the bore hole will be capped and the detention basin decommissioned and surface water diversions incorporated to permit water flows into the downstream catchment.
Rehabilitation.	The rehabilitation proposed is conceptual only and would be finalised within the site Rehabilitation Plan of the MOP, after consultation with the key stakeholders.
Leave in current state, and do not rehabilitate.	Without this project these sites will continue to be a financial burden and environmental and safety hazard. The removal of the resource is the only method that will provide an absolute solution through removing the problem source. Other rehabilitation methods such as further capping and vegetation management are a financial burden to State government revenues for derelict mine rehabilitation and denies employment security and extended employment duration to over 50 employees.