REPORT

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Review of Application

TE KUHA MINE

Submitted to:
Department of Conservation
10 Sewell St
Hokitika 7810

West Circle

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1 Introduction

Te Kuha Limited Partnership has applied to the Department of Conservation, for an Access Arrangement (AA) and Concession, to construct a coal mine (known as "Te Kuha Coal Project") and associated infrastructure, including an access road in the lower Buller area.

West Circle has been engaged to review the application from a general engineering, mining and construction perspective and especially any off-site effects.

2 Mine Planning

Mine design and planning at a conceptual level has been undertaken. The design is based on relatively low level of exploration information and further investigation is recommended (Avery, 2014a). The design information is appropriate for the concept stage of mine planning.

The assumptions and design criteria, such as bench heights and angles, swell factors, are all appropriate for concept design phase. Further geotechnical work would be required at all stages of the project.

The volume of coal (2.8Mm3) to be removed is slightly less than the swell volume of the overburden (3.7Mm3) meaning the final landform will need to be slightly higher on average than the existing landform.

A table of estimated volumes of soil/vegetation and overburden for each year of mine life has been produced. The total mine footprint is 85.97ha and is reached in year 11. The maximum disturbed area (without rehabilitation material) is 61.26ha also in year 11 (Avery, 2014b). This means the theoretical maximum area that could be available for VDT is 24.71ha (85.97ha - 61.26ha) unless some of the temporary rehabilitation can be moved as VDT a second time.

A concept water management plan has been developed by CRL (Pope, 2014b). This provides indicative stormwater volumes, sediment control plans and discharge points.

Mine planning has also considered soil and vegetation stripping and stockpiling. Rehabilitation planning is not detailed enough at this stage to quantify vegetation direct transfer (VDT) amounts - although the application states the intention is to use this methodology where practical.

3 Access Road

A separate report, covering the access road where it passes through public conservation land, was submitted to the Department in 2014 (Smith, 2014).

The effects of the access road further up are likely to be similar with the following distinctions:

The road may be more visible in areas of short stature forest or vegetation
Steeper terrain may require larger cut/fill
The stream crossings will have lower flow volumes but may have steeper beds
Storm run-off from areas surrounding the road may be faster and require additional controls

It is also noted that the effects of the road on landscape, flora/fauna and aquatic values have been assessed by others for the Department.

4 Pits

4.1 Design

Two pits are proposed, one for the Brunner seam and one for the Paparoa seam. The pits overlap at the northern end of the mine requiring removal of the Brunner seam first.

Pit design assumptions are considered appropriate for the concept design stage - pending further geotechnical assessment.

4.2 Backfilling

The application includes proposed backfilling of both pits at end of mine life. Coal production is scheduled to cease in year 15, allowing a further 3 years (until year 18) for backfilling and rehabilitation.

Backfill provisions will add significantly to the bond quantum as the estimated backfill cost is $9.5 million (Avery, 2014a). In addition 53ha of rehabilitation with a planting cost alone of approximately $20,000/ha is $1.06 million.

4.3 Ridgeline area

The ridgeline area is of particular interest to the Department as a strip along the eastern side of the ridge is in the Mount Rochford - Conservation Area. The area is steep and broken with bluffs, pavement and boulder areas, a small active slip and a range of vegetation and forest types present. Deconstruction of the ridge is proposed as part of the Paparoa pit shell. Backfilling to existing ridge height is also proposed.

Based on recent experience in a similar ridgeline situation at Stockton mine the Department could expect boulder roll, blast fly rock and sediment to be potential issues on this area. Careful, detailed planning and management would be required to successfully mitigate all the issues. Significant time and cost implications are possible if for example a rock catching fence was required.

5 Overburden dumps / ELF

Overburden dumps have been designed to avoid areas with high value ecosystems identified in the vegetation and fauna report as far as practical (Mitchell Partnerships, 2013).

A final engineered landform (ELF) is proposed which requires significant backfilling of pits and recontouring of overburden. Geotechnical stability analysis has not yet been undertaken on the ELF.

6 Infrastructure area

The location of the infrastructure area is not specifically shown on the mine plans however it is stated as being included in the main lower dump (Avery, 2014a).

The application states that the facilities would occupy 3,200m2 and include:

- Office
- Workshop
- ROM pad
- Other infrastructure such as settling ponds, laydown, parking, generators etc.

Some coal stockpiles would be required at the mine site ROM pad.

The majority of coal storage however would be off-site at the railway siding site.

Based on other similar scale mines West Circle estimates the infrastructure area, containing the above items, would likely occupy 1-3 ha in extent (Echo mine: 3.4ha including coal stockpiles and road truck loadout ; Cascade mine 1.8 ha).

7 Topsoil & Vegetation stockpiles

Mine planning has included a materials balance for each year of mine life. This includes disturbed area of mine, area rehabilitated, and volume of soil/veg in stockpile.

8 Water Management

A conceptual water management plan has been developed by CRL Energy (Pope, 2014a & Pope, 2014b). The plan draws on information from the mine planning as well as site climate, surface and groundwater flows, water quality and rock geochemistry.

The water management plan and mine plan is not detailed enough at this stage to identify specific discharge points or volumes, however the proposal is to split discharge flows across 3 existing creeks to maintain base flows and proportion of storm flows.

8.1 Erosion and sediment control

The water management plan identifies erosion and sediment production as issues requiring control. Total suspended solids (TSS) load is seen as a critical water management issue (Pope, 2014a).

There are inconsistencies throughout the application and supporting documents in relation to design storms, pond types and erosion control practices.

Stormwater retention is proposed on site utilising sumps and the mine pits to retain a 1 in 2 year, 24 hour duration design storm event (Pope, 2014b). It is expected that stormwater flows exceeding the design storm would flow off-site with only primary sediment settling i.e. dirty water would flow from site whenever a storm exceeded a 1 in 2 year event.

The application (BTW South, 2013) states that a 1 in 20 year design storm will be used for water management, however this is unlikely to be realistic for stormwater retention purposes.

Removal of suspended sediment using Flow Max technology is also proposed. This is a mechanised sediment removal system with unspecified effectiveness or flow throughput. Flow Max is unlikely to remove very fine sediment but would be useful for heavier sediments where space constraints restrict use of settling ponds.

Flocculant addition is proposed, as required, where discharges occur into water treatment sumps.

Coal fines should also be expected in the stormwater system from the mine pit and the ROM pad areas - however no mention of treatment of these has been found in the application. Experience elsewhere on the West Coast shows that coal fines can be effectively removed with the addition of flocculant.

No further detail about sediment characteristics or flocculent types has been provided at this stage.

Further design work and planning for stormwater and sediment control is recommended.

8.2 Water treatment ponds and sumps

Two water management ponds are proposed. A long-term dam is proposed in the north western corner of the mine (approx. 0.6 ha). A second temporary sump is proposed in the south western corner of the mine which is relocated as the mine develops to a more central location.

The water management plan states that the dams will total 60,000m3 of storage with additional storage available in the pits. The maximum expected volume of storm run-off to be managed is 123,000m3 meaning approximately 63,000m3 of in pit storage would be required to achieve full containment of the storm.

The temporary dam storage area is shown as smaller than the permanent dam area - but assuming they were equal a combined area of 1.2ha of storage area would available and would therefore need to be at least 5m deep across its full extent to contain the proposed 60,000m3 assuming no sediment storage.

Any water storage dam holding more than 20,000m3 would also require a building consent.

It is likely that to achieve the proposed storm containment additional or larger water treatment dams would be required.

Using pits for stormwater retention requires assessment of pumping capacity and spillway provisions in the event a larger storm event is encountered.

Further planning would need to be completed to refine many of the assumptions used in the concept plan.

8.3 Drainage

Detailed drainage design has not been completed at this stage.

Significant changes to headwater inputs and stormwater flows would be expected during mine life. These issues are covered in the freshwater report prepared for the Department by Streamlined.

The application states that drainage patterns will be reinstated to reflect pre-mine catchments as closely as possible.

Drainage patterns would change throughout the mine life and need frequent planning and re-assessment. Final drainage planning needs to be incorporated into the final ELF design.

8.4 AMD management

Acid mine drainage (AMD) is caused by the oxidation of sulphur present in pyrite, a common component of Brunner Coal Measures (BCM).

Analysis of rock samples from drilling at the Te Kuha site indicate there is a relatively low level of AMD risk on site (Pope, 2014a).

As with other mine sites the relationships between acid base accounting data and lithology/rock type, depth, proximity to coal are not strong (Pope, 2014a).

The expected AMD risk is low however some potentially acid generating (PAG) rock is still present and the AMD potential remains. The overlying strata can vary widely both spatially and within lithology.

Contingency planning to mitigate any unexpected AMD would be prudent. An example of this would be provision for PAG cells, capping and leachate drains in the overburden dumps. Contingency planning is also recommended by CRL in its “Integrated Report” (Pope, 2014b).

The application allows for a small lime dosing plant and settling pond to treat AMD if it is present (BTW South, 2013). This would rely on collector drains from the dumps and potentially pumping to the treatment site from the lower main dump.

9 Final landform

A final landform concept plan has been provided. This is purely topographical and does not include vegetation type cover for rehabilitation areas, drainage or other information.

There is no geotechnical stability analysis provided. A recommendation to undertake further geotechnical assessment is included in the mine planning document (Avery, 2014a).

The Department typically requires a geotechnical stability analysis for large highwalls and overburden dumps - however until field assessment work has been completed any stability analysis would only be considered approximate. Once work commences, assessment of open ground can be undertaken with improved reliability of results.

Further final landform design is recommended and could be addressed through specific management plans.

10 Rehabilitation

Rehabilitation is designed to progressively occur each year and follow the progression of the dumps up hill (Avery, 2014a).

Approximately 40% of the progressively rehabilitated area will eventually need to be re-handled to allow material to be recovered to fill the final void (Avery, 2014a).

A significant portion of the rehabilitation will need to wait until the backfilling of the pits is completed. It is estimated 53ha of the total 85.97ha will need to be rehabilitated after coal production has ceased.

The application includes assessment of vegetation on the site including broad assessment of plant communities that would benefit from direct transfer - termed “high value ecosystems”. The high value ecosystems include: herb fields, yellow-silver pine and manuka shrublands and some rock field areas (Mitchell Partnerships, 2013).

The opportunity for direct transfer at Te Kuha will be limited by mine scheduling to between 10 and 20% of the overall footprint (Mitchell Partnerships, 2013).

In practice even 10 - 20% (or 8.5ha - 17ha) of VDT may be difficult to achieve due to operational factors such as availability of suitable areas to source and relocate VDT to at appropriate times. Further planning would be required to integrate VDT source areas and with mine scheduling at a sufficiently detailed level to give any more confidence to these estimates and may be impractical at this stage.

The vegetation and fauna report (Mitchell Partnerships, 2013) identifies the relatively flat areas along the ridge top, with short stature vegetation, as the most likely candidates for VDT. Flat areas around the hut are suitable for VDT but unlikely to be used as there would be no available area to transfer the sods to in the early stages of the mine.

A rehabilitation plan and a direct transfer plan are proposed in the application as part of a suite of management plans for the project (BTW South, 2013).

11 Conclusions

- Concept mine planning including a materials balance has been completed and is appropriate for this stage of the project.
- Access road construction and operation, on public conservation land, is likely to be relatively straightforward. The main effect is expected to be stormwater and associated sediment run-off from the road.
- Until further assessment work is carried out there remains some geotechnical risk around pit highwall and overburden dump stability. However design changes and other methods (such as bolting) exist to manage that risk. Other mines in the area successfully manage geotechnical risk. It is not considered significant in terms of the project’s feasibility.
- The ROM pad, office, workshop, infrastructure location is not specified in the mine plans and is likely to be larger than the 3,200m2 allowed for in the application.
- The ridgeline area may pose significant deconstruction and reconstruction issues and requires careful planning.
- Management of stormwater and associated sediment load is critical.

- AMD risk appears relatively low based on sampling and analysis to date - however on-going sampling and contingency management are required especially given the variability in geochemistry present.

12 Recommendations

Further investigation work is recommended to provide further confidence to the mine planning including:

- Geotechnical assessment and stability analysis
- Ridgeline planning
- Additional sampling for geochemistry/ABA.
- Contingency planning for AMD
- Scheduling of VDT for high value ecosystems
- Rehabilitation planning including effect increased hydraulic conductivity of overburden
- Stormwater and sediment control ponds - further design and development of a sediment and erosion control plan
- Final landform drainage plan and stream reinstatement - concept designs.

13 References

Avery, M (2014a) Te Kuha Project - Stevensons Mining Limited. Mine Design and Planning. Avery Consulting. June 2014. 55pp.

Avery, M (2014b) Te Kuha Project - Stevensons Mining Limited. AVC2014 Data for Stevenson V6 04Oct14.xls. Spreadsheet.

BTW South (2013) Application for Access to Undertake Opencast Coal Mining and Related Activities on Public Conservation Land. Report prepared for Te Kuha Limited Partnership. 18 December 2013. 468pp.

Mitchell Partnerships (2013) Vegetation and Fauna of the Proposed Te Kuha Mine Site. Report prepared for Te Kuha Limited Partnership. Oct 2013.

Pope, J (2014a) Te Kuha Mine – Water Management Plan Information Report. Report prepared by CRL Energy for Stevenson Te Kuha Mining Ltd. 26 August 2014.52pp.

Pope, J (2014b) Te Kuha Mine – Water Management Plan –Integrated Report. Report prepared by CRL Energy for Stevenson Te Kuha Mining Ltd. 26 August 2014. 27pp.

Smith, M (2014) Te Kuha - Access Road Review. Report prepared by West Circle Ltd for Department of Conservation. 28 July 2014. 8pp.