5 Geochemistry

5.1 Assessment of project changes

The locations of the tailings emplacements; the footprint and height of B-OOP E waste rock emplacement; and the inclusion of linings in tailings emplacements are the only changes to the Project that could affect geochemistry-related impacts. The changes to the tailings and waste rock emplacements will not change the geochemistry of leachate and will therefore not change the assessment impacts. As described in Section 3.3, it is now proposed to line the floor of tailings emplacements to reduce seepage from these structures to groundwater.

Thus, overall, the changes will marginally reduce the predicted impacts as presented in the EA (Chapter 6 and Appendix C).

5.2 Response to submissions

5.2.1 Sample coverage

Submission

NA-13

Issue

The DP&I comments that the acid and metalliferous drainage (AMD) assessment is based on samples from a limited number of cores, two of which are outside of the mining area and none of which are from Mining Area C. A justification for sampling effort should be provided.

Response

As described in the main EA (Section 6.2), 59 discrete lithological samples from four cores and 11 washery waste samples were analysed. These cores were collected along a 14-km long north-west to south-east transect passing through Mining Areas A and C. As can be seen in the main EA (Figure 6.1), there is no significant variability in the AMD characteristics between these cores. The composition of strata in Mining Area B is similar to that in the other mining areas and AMD characteristics are expected to be similar.

Despite this, additional AMD test work is under way as part of detailed mine planning. A total of 83 additional samples are being analysed from mining area A, mining area B and mining area C. The following laboratory analyses are being conducted:

- batch leach pH in a 1:2 mix with distilled water (83 samples);
- batch leach electrical conductivity in a 1:2 mix with distilled water to determine potential salinity (83 samples);
- total sulphur (83 samples);
- chromium reducible sulphur to differentiate acid-forming from non acid-forming sulfur species (for samples with greater than 0.5% total sulfur); and

- maximum potential acidity (MPA), extended boil net acid generation test (NAG), acid neutralisation capacity (ANC) and net acid production potential (for samples with greater than 0.5% total sulfur).

In addition, leachate from a representative suite of at least 15 samples will be analysed for pH, salinity, sulphate concentration and metal concentrations. While it is not expected, if this further analysis indicates that leachate has pH, salinity or metal concentrations that may result in impacts beyond those predicted in the main EA (Section 6.5), batch leach columns tests will be used to investigate the concentration of these parameters in the leachate.

This work started in December 2012 and will be completed in March 2013 (excluding leach column tests if required). The final report will be provided to the DP&I and published on CHC's website.

5.2.2 Whaka coal seam acid generation

Submissions

NA-1, NA-13

Issue

The DP&I comments that the likely volumes of potentially acid forming (PAF) waste streams, particularly associated with the Whaka Coal seam, should be identified and a justification should be provided for not maximising recovery of coal from the Whaka seam. In addition, the EPA comments that the Whaka coal seam has some potential to generate acidic drainage and that further examination of this is required.

Response

The AMD assessment combined with the geological model identifies the following PAF, PAF-LC (potentially acid forming – low capacity) or UC PAF (uncertain potentially acid forming) materials:

- a band of waste rock about 4 m thick that is above the Trinkey seam;
- some of the waste rock between the Trinkey and Whaka seams;
- the Whaka seam;
- a band of waste rock that is about 2 m thick between the Whaka and Flyblowers seams; and
- rock within the Lower Ulan Seam.

As stated in the main EA (Section 6.3), it is likely that the actual volume of PAF, PAF-LC or UC PAF waste rock will be close to 9% of the total volume of waste material.

As described in the main EA (Section 3.5.7), the first coal will be obtained from a 'box cut'. The PAF materials excavated from this box cut will be buried in the out-of-pit waste rock emplacements. This will minimise exposure of PAF material to oxygen in the air and reduce the potential for reactions that lead to AMD. Once there is sufficient mined-out void, PAF material will generally be buried below the water table where AMD is not expected to occur. The groundwater monitoring program will include parameters indicative of AMD, including pH, sulphur concentrations and metal concentrations. The additional test work described in Section 5.2.1 includes analysis of at least seven samples from in or adjacent to the Whaka seam to further characterise the AMD potential of these materials.

Whaka coal is poor quality. Run-of-mine (ROM) coal from the Whaka seam could be washed to produce product coal that meets the required specification (26% ash) but the yields would be below 50% (ie the amount of product coal would be less than half of the amount of run-of-mine coal). For example, samples collected from borehole LD03 indicate that the seam has a raw ash of 48%, which would produce product coal with 32% ash at a yield of 43%. Therefore, it is not economic to mine this seam now but coal quality and washability assessments are continuing to determine if some sections can be economically recovered.

5.2.3 Preparation of an acid mine drainage management plan

Submissions

NA-1

Issue

The EPA comments that an acid mine drainage plan should be prepared that includes contingencies to manage acid forming material should this be larger than expected.

Response

The further AMD assessment described above will allow the proposed management measures to be refined, including the management of specific overburden units. As stated in the main EA (Section 6.4), the waste management plan will detail measures to minimise the likelihood of AMD occurring, AMD monitoring and how PAF material that may cause AMD will be managed. A management plan that considers all waste streams will be implemented more efficiently to prepare and implement than dividing measures across a series of narrower management plans (eg one for AMD) in isolation.

5.3 Conclusion

Additional analytical work is under way to confirm the quantity of AMD material and refine management measures. As the proposed Project changes will not change the geochemistry assessment as presented in the EA, there is no need to modify the proposed management measures or statement of commitments for geochemistry.