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Title: Mr

First Name: Harley

Surname: Schinagl

Organisation represented (if applicable): Indigenous Design

Email address: [REDACTED]

Mobile: [REDACTED]

Content of submission (you can choose multiple): Latrobe Valley Mine

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24 August 2015

Dear Board of Inquiry,

RE: WRITTEN SUBMISSION RELATING TO MINE REHABILITATION

Background to Indigenous Design's involvement in mine rehabilitation

Indigenous Design (ID) was established in 1987 and was first engaged by mines in the Latrobe Valley in 1998 to undertake revegetation and weed control work on their land. Since then, the level of service ID provides to GDF Suez Hazelwood and EnergyAustralia Yallourn has expanded to include a broader range of conservation and restoration works as well as consultation on matters relating to the environment and vegetation. Some of these projects include:

- Ecological assessments and native vegetation offset proposals to supplement the Environmental Effects Statement for the Yallourn Mine Maryvale Field Extension;
- Ecological restoration of recent river diversions on the Morwell and Latrobe Rivers;
- Restoration of the Morwell River wetlands;
- Protection and enhancement of native vegetation remnants around the mines as offsets;
- Regular flora and fauna surveys to increase knowledge of local biodiversity;
- Extensive revegetation projects including direct seeding of trees and grassy understorey;
- Rehabilitation trial programs using novel methods and materials.

Today ID employs approximately 60 staff across three office locations. One of these locations is Morwell, which employs 16 staff and facilitates the clients listed above (among others).

While the individual projects for each client have varied over time, it can be stated that ID has had a strong involvement in the establishment of native vegetation on rehabilitated land at both mines. Resulting from engagement from proactive clients, ID has helped establish and trial rehabilitation projects that have produced results that are of significance to the industry.

The following short discussion does not individually address each term of reference. Rather it highlights the importance of establishing functioning ecosystems in former mining areas and has little input into other geotechnical components of rehabilitation that are expected to be well discussed during the inquiry.

Rehabilitation standards – Functioning ecosystems

“Functional – A landscape that effectively self-regulates and utilizes available resources such as water and energy, and provides the goods and services required by populations, including humans, living in the landscape.”

(Tongway and Ludwig 2011)

The community has certain expectations of rehabilitation that sit beyond the framework of the current mine Work Plans. These expectations vary based on the community’s understanding of mining practices, their feelings towards the mining industry and their understanding of complex environmental systems. These views can be formed through a lack of available information and highlight the need for greater clarity in communicating the results of progressive rehabilitation.

ID suggest that a more thorough framework is adopted that not only quantifies the outstanding footprint of disturbance (which is already undertaken), but objectively qualifies the areas that are considered rehabilitated against an agreed standard. Assessing the quality of rehabilitation and its ecosystem function is crucial to ensure that the landform becomes part of the broader landscape after mining and does not become a community liability, even when geotechnical standards are met. For example, an area of rehabilitation may be effectively stable, but may have long term land management issues that affect the broader community. Conversely, assessing the quality would help gauge the point where a mining body is no longer tied to the land without any long term risk to the community caused by dysfunctional landscapes.

Objective measurement

Landscape Function Analysis (LFA) can assist rehabilitation planning by identifying the suitability of soil and rock material for new landform production and topsoil deployment. LFA was developed by Mr. David Tongway at the CSIRO and has been applied to mine site rehabilitation across the world. LFA is an assessment method that quantifies visually assessable indicators on the soil surface and presents them as indices representing stability, infiltration and nutrient cycling. Using its full suite of tools, it can monitor a range of other ecosystem attributes such as vegetation diversity, structure, complexity and more. Assessment can also take place on undisturbed reference sites, and disturbed analogue sites to add further comparative value to the information it provides. When results are plotted temporally, the results can show the rate of change of the landscape indices and predictions can be made as to when these indices will reach a sustainable level (refer to Figure 1), which can be performed within the Excel spreadsheet.

Interpretational Framework

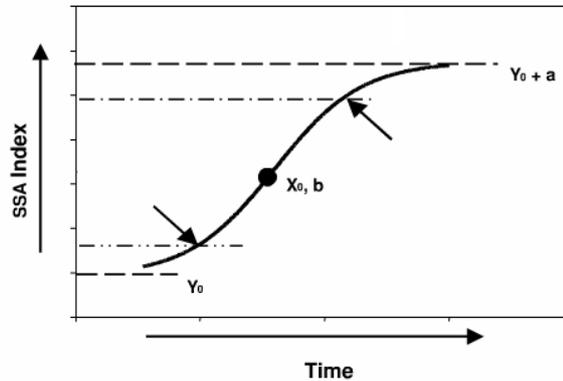


Figure 45. Depicts a fitted sigmoid relationship of the form $y = y_0 + a / 1 + e^{-(x-x_0)/b}$.

y represents an indicator of landscape function (soil stability in this case),
 (y_0+a) represents the value of the upper asymptote,
 y_0 the computed value of the lower asymptote,
 x_0 represents the location of the inflection point of the curve on the x-axis and
 b the gradient at the inflection point, represents the rate of increase of the assessed index over time.

Figure 1: Interpretation framework for LFA showing the predicted trajectory of measured landscape indices over time (taken from Tongway and Ludwig 2011)

Under the interpretation framework of LFA (Figure 1), Y_0 represents the functional status at time zero (completion of the geotechnical phase) and Y_0+a represent a final state, whose values are derived from a well-elected analogue site, within biogeochemical bounds of the region (Tongway and Ludwig 2011). Locations on the trend line in between the minimum and maximum represent different thresholds that may affect the final outcomes of the landscape. Use of such a tool for measuring rehabilitation trend could be inextricably tied to the management and review of rehabilitation targets and even to rehabilitation bonds and their projected release based on a previously agreed level to be reached. Moreover, early detection of possible failure can signal repair before the task becomes very expensive and technically difficult.

LFA has been used as a monitoring tool at both Yallourn and Hazelwood mines. Collectively, their monitoring networks are set to reach 87 transects by 2016 with the oldest of these first being assessed at Yallourn in 2005. Areas assessed include rehabilitated land, interim rehabilitated land (disturbed land that is stabilized in the interim but subject to flooding in the final lake model), unrehabilitated land, long term rehabilitated land and undisturbed remnants. While the range of results are too detailed to discuss in a concise fashion, it can



be stated that the rehabilitation standards achieved in some areas of the mines have exceeded the same index measured in undisturbed remnants. This highlights the commitment made by both mines in establishing functioning ecosystems in and around their sites. The emerging technology of drone-acquired high-resolution imagery is highly compatible with LFA.

While the details of LFA can be quite complex, the results can be displayed in a clear and concise manner. Publicising results in a clear, simple fashion could help reengage the community and provide further opportunity for regulators and mine operators to quantify the quality of rehabilitation being undertaken. This also provides an avenue for quantitatively determining residual mine rehabilitation liability important for ensuring the community is financially protected.

Kind Regards

Alan Noy - Director
Indigenous Design Environmental Services Pty. Ltd.
Indigenous Design Land Management Pty. Ltd.

Mr. David Tongway AM, Landscape Ecologist (former CSIRO)

References

Tongway and Ludwig (2011) Restoring Disturbed Landscapes: Putting Principles into Practice, Island Press Washington DC.