IN THE MATTER OF THE SECOND HAZELWOOD MINE FIRE INQUIRY

WITNESS STATEMENT OF JAMES ANTHONY FAITHFUL

Date of document:	13 November 2015
Filed on behalf of:	GDF SUEZ Australian Energy
Prepared by:	
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A. INTRODUCTION

Role and professional background

1 My name is James Anthony Faithful. My work address is Brodribb Road, Hazelwood.

2 I am employed by Hazelwood Power Corporation Pty Ltd (**"HPC"**) at the Hazelwood Coal Mine as the Technical Services Manager - Mine.

3 I have worked on-site at the Hazelwood Mine since January 2013. My responsibilities at the Mine include management of the Mine's rehabilitation, survey, geological, hydrogeological, geotechnical and mine planning personnel and their related activities.

4 I am responsible for the planning and implementation of the long term rehabilitation program at the Mine. Melissa Schenkel (Environmental Officer) and Romeo Prezioso (Senior Mine Planner) assist me with the Mine's rehabilitation program, by identifying areas internal and external to the Mine which may be suitable for progressive rehabilitation works to be undertaken, taking account of current and future operational requirements.

5 I hold a Bachelor of Engineering (Mining) with honours from Ballarat University and Masters of Business Administration from Deakin University.

6 I have over 15 years' experience in mining, at a range of open cut and underground mining operations in Western Australia, New South Wales, Victoria and Tasmania.

7 Prior to working at the Hazelwood Mine, I was employed in the mining industry as follows:

- **GHD Pty Ltd (GHD Engineering Consultants)** – as Principal Mining Engineer, Senior Mining Engineer and Mining Engineer;
- **Leighton Contractors Pty Ltd (previously HWE Mining)** - as Technical Services Superintendent / alternate Quarry Manager;
- **Unimin Australia Pty Ltd** – as Operations Superintendent;
- **Coal and Allied Industries Ltd** (a Rio Tinto company) - as Mining Engineer/Dragline Engineer, Production Supervisor (Dragline, Drill and Blast, Projects), Mining Engineer, Drill and Blast Engineer/Supervisor and Shotfirer/Operator;
- **Rio Tinto Limited** (Merlin/Argyle Diamond Mine) - as Acting Mine Production Superintendent/Project Engineer; and
- **Aberfoyle Resources Ltd** (Hellyer Mine) - as Student Engineer/Trainee Miner.

8 This statement has been prepared in response to paragraphs 1 to 12 of the letter from this Board of Inquiry to King & Wood Mallesons dated 9 October 2015. The 12 paragraphs of the letter from the Board are replicated in this witness statement as headings. A copy of the Board's letter is at **Annexure 1**.

9 In June 2014, I provided a witness statement to the 2014 Hazelwood Mine Fire Inquiry on the issue of the rehabilitation of the Hazelwood Mine. A copy of my previous witness statement (without annexures) is at **Annexure 2**.

10 During the 2014 Hazelwood Mine Fire Inquiry, I gave evidence before the Board on two occasions, namely:

(a) on 28 May 2015 (on the management of the Hazelwood Mine Fire, in my capacity as Acting Director of Mining at the time of the Mine Fire, and an Emergency Commander in the early stages of the Mine Fire on 9 and 10 February 2015); and

(b) on 12 June 2015 (on Mine rehabilitation).

11 In preparing this witness statement, I have drawn upon (and updated, to the extent necessary, to reflect the position as at November 2015), sections of my witness statement for the 2014 Hazelwood Mine Fire Inquiry dated June 2014.

12 The information within this witness statement is based on my own knowledge, and enquiries that I have made of relevant personnel within the Mine.

13 In this witness statement, I make reference to a number of annexures which are confidential and commercially sensitive to GDFSAE. I understand that GDFSAE's solicitors intend to make an application under s 73 of the *Inquiries Act 2014* (Vic) for an order restricting the publication of these annexures.

14 In paragraphs 238 – 242 of this statement, I refer to learnings from a recent study tour that I undertook of certain lignite (brown coal) mines in Germany (Garzweiler mine, Hambach mine, Inden mine, Lichtenberg mine, Mucheln mine (now Lake Geiseltal) and the Profen mine, together with the Culmitzsch tailings pond). These mines were at varying points on the rehabilitation pathway, however in certain cases, were nearing final rehabilitation and were currently being used for a range of purposes including boating, parks, recreation, forestry, cropping, housing, wineries and restaurants.

B. BACKGROUND

(1) Provide a brief overview of the ownership and management of the Hazelwood Mine

Mine ownership

15 The Hazelwood Coal Mine (**"Mine"**) and Hazelwood Power Station ("**Power Station"**) are owned and operated by the Hazelwood Power Partnership ("**HPP**").

16 Since 7 June 2013 the partners of HPP have been:

(a) National Power Australia Investments Ltd;

(b) Hazelwood Pacific Pty Ltd;

(c) Australian Power Partners BV; and

(d) Hazelwood Churchill Pty Ltd.

17 Hazelwood Power Corporation Pty Ltd ("**HPC**"), a wholly owned subsidiary of HPP, is the holder of mining licence MIN5004 granted by Order in Council under s 47A of the *Electricity Industry Act 1993* (Vic) on 10 September 1996 (the "**Mining Licence**").

18 The Mine has been owned and operated by HPP and HPC, in accordance with the Mining Licence, since the time of privatisation.

19 HPC and the various partners holding interests in the HPP are wholly owned subsidiaries of International Power (Australia) Holdings Pty Ltd (**"IPAH"**). The ultimate holding companies of IPAH are Engie S.A (previously known as GDF Suez S.A) and Mitsui & Co Ltd.

20 A simplified corporate structure diagram, depicting the corporate structure through which these companies own the Mine, is at **Confidential Annexure 1**.

21 For convenience, throughout this Witness Statement, I refer to the various corporate entities operating the Mine as "**GDFSAE**".

Management of the Mine

22 A chart of the senior management team for the Mine and Power Station (also including employees) is at **Confidential Annexure 2**.

23 As noted in the chart, the Asset Manager for Hazelwood in its entirety (i.e. the Mine and Power Station collectively) is Mr George Graham.

24 Mr Graham is supported by a range of senior managers including:

(a) Mr Tony Innocenzi, Strategy, Planning, Programs, Risk and Compliance Director;

(b) Mr Steve Harkins, Head of Occupational Health, Safety and Environment and Industrial Relations;

(c) Mr Wilco Seinen, Chief Financial Officer;

(d) Mr Garry Wilkinson, Mine Director; and

(e) Mr Wayne Buckley, Asset Management Director.

25 The Director of the Mine is Mr Garry Wilkinson. I report to Mr Wilkinson. Mr Wilkinson is also supported by a number of senior managers and other professionals, including:

(a) Mr Robert Dugan, Mine Production Manager;

(b) Mr David Baxter, Maintenance Manager;

(c) Mr Glenn Asling, Human Resources Business Partner;

(d) Mr Colin Brick, Mine Financial Controller; and

(e) Mr Stan Kemsley, Technical Compliance Manager.

(2) Provide details of the mining licences granted to operate the Mine, including a plan of the licence area

26 As noted above, the Mine is operated under the Mining Licence.

27 The Mining Licence is for a term of 30 years (i.e. expiring in September 2026).

28 The Mining Licence, as granted, contained:

(a) a Schedule of Conditions;

(b) an Authority to Commence Work, being Schedule A to the Order in Council;

(c) a document entitled '*Mining Licence Application: Work Plan Submission*' dated 1 June 1995 ("**Initial Work Plan"**), including:

(i) a document entitled *'5 Year Rolling Mine Rehabilitation Plans: Summer - Autumn 1996'*, being Schedule B to the Order and Annexure 1 to the Work Plan;

(ii) a document entitled *'Report to Generation Victoria Morwell Mine: Morwell Mine Rehabilitation Concept Master Plan'* dated December 1994, being Annexure 2 to the Work Plan;

(iii) a document entitled *'Land Capability Analysis: Hazelwood Power Corporation Mine and Environs'* dated May 1995, being Annexure 3 to the Work Plan;

(iv) a series of figures and site plans, being Section 10 of the Work Plan; and

(v) a document entitled *'Regional Monitoring Program: Latrobe Valley Open Cut Coal Mines'* which formed part of the Work Plan.

29 The Mining Licence has been varied since its grant, including in order to:

(a) amalgamate and incorporate into the Mining Licence additional mining licences MIN5449, MIN5450, MIN5451 and MIN5452 granted in relation to the West Field Phase 2 extension of the Mine, on 11 July 2006 (see amalgamation documentation at **Annexure 3**); and

(b) impose additional conditions with respect to Risk Management, on 20 January 2015 (see Instrument of Variation at **Annexure 4**).

30 As a consequence of the approval of the Phase 2 extension of the West Field of the Mine, it is contemplated in the Work Plan variation approved on 11 May 2009 that mining operations will continue into 2031 – i.e. that a renewal of the Mining Licence will be sought.

31 Further, GDFSAE is presently preparing a Work Plan Variation application that it expects to submit to the Department of Economic Development, Jobs, Transport and Resources ("**DEDJTR"**) in early 2016. The Work Plan Variation application proposes a variation in the planned sequence and timing of the mining operations contuinng to 2033 (**"Further WPV Application"**).

32 The Mining Licence excludes the Hazelwood Power Station, and the Hazelwood Cooling Pond.

33 A Plan showing the boundaries of the areas within the boundaries of the Mining Licence (**"Mining Licence Area"**) is at **Annexure 5** to this statement.

34 The Mining Licence contains the following conditions with respect to Mine rehabilitation and rehabilitation bonds (and more generally, compliance with Work Plans and Regulations):

1. WORK PLANS & ENVIRONMENTAL MANAGEMENT

1.1 Work shall be carried out in accordance with the approved work plan (incorporating a rehabilitation plan) as amended from time to time in accordance with the Mineral Resources Development Act 1990 (MRD Act). Where any inconsistency occurs between the work plan and other licence conditions or regulations, the licence conditions and regulations have precedence.

…

15. PROGRESSIVE REHABILITATION

15.1 Progressive reclamation will be conducted as per the rehabilitation plan. In addition, any further rehabilitation work will be carried out at the direction of an Inspector.

15.2 As and when directed by an Inspector of Mines, despite any compensation agreements between the licensee and the owner of any private land in the licence, the licensee shall undertake progressive reclamation of land on the area subject to surface disturbance.

16. FINAL REHABILITATION

16.1 Final reclamation will be in accordance with the rehabilitation plan and any additional requirements as directed by an Inspector.

…

20. REHABILITATION BOND

20.1 The licensee shall lodge with the DNRE a rehabilitation bond as described in Section 80(1) of the Act when required in accordance with these conditions. The bond must be lodged in the form of a bank guarantee issued by a bank licensed under the *Banking Act 1959* (Cth).

20.2 The licensee shall be required to lodge that bond upon the licensee ceasing to be a State Owned Corporation and upon being directed to do so by the Minister for Agriculture and Resources.

20.3 The level of this bond has initially been assessed at $15 million.

21. APPLICATION OF REGULATIONS

21.1 The *Mineral Resources (Health and Safety for Large Open Cut Mines) Regulations 1995* will apply to the licensee

21.2 Any subsequent Regulations issued under the act will also apply.

….

35 It can be seen that the Mining Licence requires GDFSAE to undertake both progressive and final rehabilitation in accordance with the "rehabilitation plan" and any further directions issued by an Inspector.

36 A number of additional requirements with respect to the operation and management of the Mine, and reporting upon aspects of the operations of the Mine, arise under the current Regulations (the *Mineral Resources (Sustainable Development) (Mineral Industries) Regulations 2013* (Vic), for example:

(a) **Regulation 35:** a requirement to submit an annual return of expenditure and activities containing the information set out in Schedule 19, relevantly including details of land disturbance, rehabilitation and estimated rehabilitation liability;

(b) **Regulation 44:** a requirement for prescribed mines such as the Mine to meet stability requirements and processes set out in Part 2 of Schedule 15, including:

(i) an assessment of the geotechnical and hydrogeological risks;

(ii) a description of the controls that will be implemented to eliminate or reduce the geotechnical or hydrogeological risks to an acceptable level including—

(A) a description of any proposed groundwater control system;

(B) particulars of other measures to ensure the stability of the mine, associated infrastructure and adjacent land;

(C) a plan for monitoring the stability and groundwater management of the declared mine; and

(D) a description of the process for reviews of the assessment, plan, actions and controls relating to the declared mine.

(c) **Regulation 45:** a requirement for prescribed mines such as Hazelwood to submit a 6 monthly report to the Department Head which outlines outcomes of reviews of the assessment, plan and controls for the management of geotechnical and hydrogeological risks for the declared mine, taking into account the results of monitoring carried out under the monitoring plan.

(3) Provide details of the water licences or water entitlements held by the Mine, including details of the type and volume of water that the Mine is authorised to take and use under the licences or entitlements and any conditions governing the use of water, e.g. are the entitlements associated with power generation

Groundwater Licence

37 HPC is the holder of Groundwater Licence 2007412, issued by the Minister responsible for the Water Act on 1 September 1995 ("**Groundwater Licence"**). A copy of the Groundwater Licence is at **Annexure 6**.

38 The Groundwater Licence authorises HPC to extract groundwater '*for the purpose of achieving safe and stable conditions in the Hazelwood Mine*.'

39 The Groundwater Licence was granted for a period of 30 years, and is valid until 1 September 2025.

40 The Groundwater Licence is subject to the following conditions:

(a) the Licensee is only authorised to take and use groundwater for the purposes of, and incidental to, mining for coal and generating electrical energy;

(b) the Licensee must only take and use groundwater on the land covered by the Mining Licence;

(c) the Licensee must meter all groundwater extractions and keep an accurate record of the quality of groundwater taken;

(d) on an annual basis, the Licensee must provide the Minister (or its delegate) details of the location of each bore from which groundwater is extracted;

(e) the Licensee must compensate any person whose existing authorised use of water is adversely and materially affected by the taking of water under the Licence;

(f) the Licensee must undertake a regional monitoring program of the nature, scope and extent as previously undertaken by the State Electricity Commission of Victoria (as detailed in the approved work plan); and

(g) the Licensee must comply with the provisions in its mining licence, approved work plan and the rehabilitation plan dealing with the regional monitoring program and remedial action.

41 Under the Groundwater Licence, HPC is authorised to extract groundwater from the M1 and M2 aquifers beneath the Mine, at the quantities specified in the table below:

	M1 Aquifer		**M2 Aquifer**		
Year	**Rate Extractions ML/Month**	**Annual Volume ML**	**Rate of Extraction ML/Month**	**Annual Volume ML**	**Total Annual Volume ML**
1996	367	3,212	1,640	19,680	22,892
1997	367	3,212	1,640	19,680	22,892

1998	367	3,212	1,640	19,680	22,892
1999	367	3,212	1,640	19,680	22,892
2000	367	3,212	1,640	19,680	22,892
2001	367	3,212	1,640	19,680	22,892
2002	367	3,212	1,640	19,680	22,892
2003	367	3,212	1,640	19,680	22,892
2004	367	3,212	1,640	19,680	22,892
2005	367	3,212	1,640	19,680	22,892
2006	367	3,212	1,640	19,680	22,892
2007	367	3,212	1,640	19,680	22,892
2008	367	3,212	1,606	19,272	22,484
2009	367	3,212	1,606	19,272	22,484
2010	367	3,212	1,606	19,272	22,484
2011	367	3,212	1,606	19,272	22,484
2012	367	3,212	1,606	19,272	22,484
2013	367	3,212	1,606	19,272	22,484
2014	367	3,212	1,606	19,272	22,484
2015	367	3,212	1,606	19,272	22,484
2016	367	3,212	1,606	19,272	22,484
2017	367	3,212	1,606	19,272	22,484
2018	367	3,212	1,606	19,272	22,484
2019	367	3,212	1,606	19,272	22,484
2020	367	3,212	1,439	17,268	20,480
2021	367	3,212	1,439	17,268	20,480
2022	367	3,212	1,439	17,268	20,480
2023	367	3,212	1,439	17,268	20,480
2024	367	3,212	1,439	17,268	20,480
2025	367	3,212	1,439	17,268	20,480

42 Aquifer depressurisation is undertaken at the Mine in order to lower aquifer / groundwater levels, so as to enable mining operations to be conducted to the full depth of the M1 coal seam. Aquifer depressurisation is a standard means in an open cut mining context of counteracting hydrostatic pressures within the aquifers following the removal of weight from the floor of the Mine from the mining of coal, to prevent floor heave and maintain stability. The depressurisation of the M1 and M2 aquifers, and the use of the water thereof, is discussed in further detail in paragraphs 73 - 76 below.

Power Station Water Licence

43 A Water Services Agreement between HPC and Gippsland Water dated 29 July 1996 provides for the supply of an additional 14GL of water per annum to the Power Station (at an average daily demand of 38,000 kilolitres, and peak daily amount of 40,000 kilolitres). A copy of the Water Services Agreement is at **Annexure 7**.

44 The Water Services Agreement is for a term of 25 years. There is provision within the Water Services Agreement for further terms of 5 years.

45 The water supplied by Gippsland Water under the Water Services Agreement is sourced from the Moondarra Reservoir, and is pumped via steel and concrete pipes owned by Gippsland Water to the Power Station.

46 The Water Services Agreement does not contain any conditions expressly governing the purposes for which the water may be used, however it is apparent from the drafting of the Agreement (including the recitals, the location to which the water is to be delivered, and the circumstances in which the agreement can be assigned) that it is envisaged that the water would be used in connection with the operation of the Hazelwood Power Station.

47 The water supplied under the Water Services Agreement is presently used for a number of purposes including:

(a) general service water for the Power Station (approximately 15% is purified for use in the Power Station Boilers);

(b) general water consumption on-site; and

(c) high pressure fire service water for use in the fire suppression systems within and around the Power Station.

(4) Provide details about the location and size of the Mine, the geological formation being mined including depth and footprint, and the characteristics of coal mined in the Mine.

48 The Mine is located immediately south of the township of Morwell, approximately 150km east of Melbourne, as shown in the plan below:

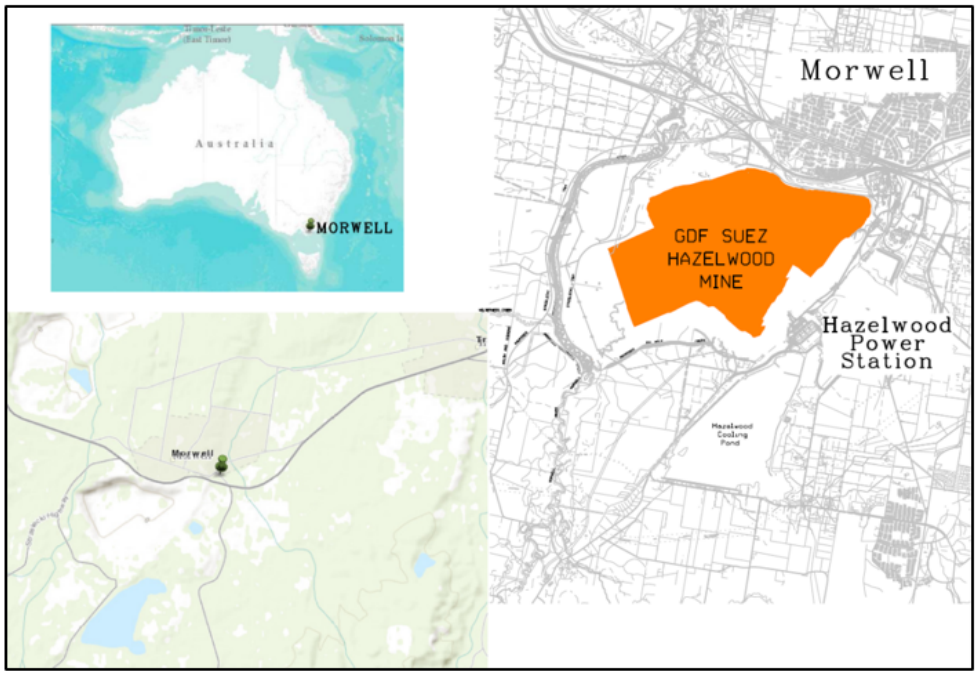

Figure 1: Location of the Mine

49 The Mining Licence Area is 3,290 hectares, comprising:

(a) the area of the open cut of the Mine ("**Mine Area"**): 1260 hectares;

(b) overburden and waste rock dumps: 838 hectares;

(c) tailings storage facilities: 49 hectares; and

(d) total area disturbed by mining operations: 2543 hectares.

50 The perimeter of the Mine is about 18 kilometres in length, and there are about 24 kilometres of coal conveyors, 100 kilometres of roads, 100 kilometres of pipework and 50 kilometres of overhead power lines within the Mine.

51 The key infrastructure of the Mine includes:

(a) 5 bucket wheel excavators (referred to as "**dredgers**");

(b) operational batters, presently in the West Field of the Mine (including the batters and benches on which conveyors M520, M620, M720 and M820 are situated);

(c) permanent batters, including in the East, South East and South West Fields of the Mine (including the batters and benches on which conveyers M540-M560, M640-660, M740-M760, M840-M860 and the M300 conveyer system are situated);

(d) an internal ash disposal facility on the floor of the Mine (the Hazelwood Ash Retention Area ("**HARA"**));

(e) an overburden dump on the floor of the Mine ("**Internal Overburden Dump"),** to which overburden is sent via a travelling "stacker"; and

(f) internal dams/ dirty water ponds on the floor of the Mine (e.g. overburden dump run-off treatment pond, recirculation pond).

52 Relevant external infrastructure associated with the Mine's operations includes:

(a) external tailings storage facilities (Hazelwood Ash Pond 4 ("**HAP4"**) and Hazelwood Ash Pond 1 ("**HAP 1"**);

(b) external overburden dumps to the east and west of the Mine (Eastern Overburden Dump and Western Overburden Dump) – which are not active operational dumps; and

(c) external dams (e.g. Hazelwood Cooling Pond, Treated Effluent Pond).

53 The location of the infrastructure referred to above is depicted in the plan below:

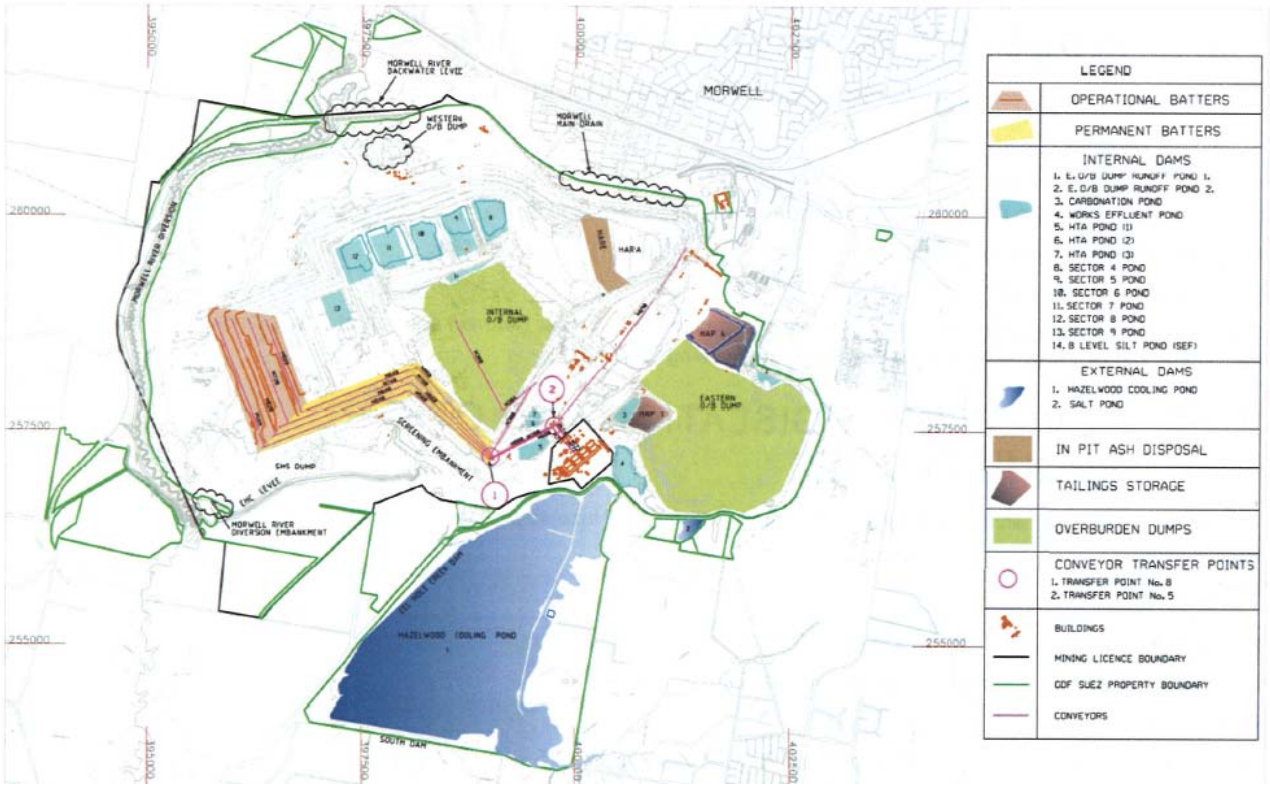

Figure 2: Key infrastructure of the Mine

M1 coal

54 Mining operations at the Mine involve the mining of coal from the M1 coal seam.

55 The Mine produces about 18 million tonnes of coal from the M1 coal seam annually using dredgers which are capable of digging about 55,000 tonnes of coal per day.

56 More than 175 Mm^3 of overburden and 720 Mt of coal have been mined at Hazelwood to date, removing more than 1,000 Mt of weight from the floor of the Mine.

57 From time to time, the mining operations at the Mine have also involved the extraction of Kaolin Clay from a small section of the M1 interseam. This is permitted under the Work Plan Variation dated 5 May 1997.

58 The main strata at the Mine, in order of increasing depth, are as follows:

- **Overburden**: is typically 9 – 16m thick, varying in quality. A significant geological feature of the Morwell area is the presence of deep craters (inert fire holes) that have been burned into the top of the M1 seam and are now filled with overburden of up to 50m in thickness;
- **Morwell 1 (M1) Coal Seam**: is approximately 80 – 100m thick. The seam is continuous except for a thin clay parting confined to the east side of the cut;
- **Interseam (M1 clay)**: is typically 15 – 25m thick. The upper portion of this stratum consists of a layer of essentially silty clay, the thickness of which varies from about 3m to in excess of 15m. It contains the M1 Clay, which is composed of kaolinite and quartz;
- **M1 aquifer**: is divided into four discrete sand layers: A0; A1, A2 and A3 sands. The aquifer is confined by ligneous, silty clay. Piezometric pressures of these aquifer layers, prior to mining, were close to ground surface;
- **Morwell 2 (M2) coal seam**: has a thickness from 15m in the west to 55m in the north-east, averaging about 40m. The M2 coal seam is older and has a high calorific fuel value. Moisture contents typically range around 58%, with a density of 1.14 tonnes/m^3;
- **M2 clay**: generally varies in thickness up to 10m except in the northern portion of the Mining Licence Area where several isolated pockets appear to vary up to 30m in thickness;
- **M2 aquifer**: is up to 200m thick and consists of six, mostly discrete sand layers known as 2A, 2B, 2C, 2D, 2E and 2F. These layers commonly consist of well sorted, fine to medium gravel. In some parts of the Mine, a fresh to extremely weathered basalt (Thorpdale Volcanics) occurs between 2A sands. The basalt provides additional weight over the underlying sediments and where it is weathered it acts as an aquitard between the 2A sands and the underlying sand layers (2B, 2C, 2D, 2E and 2F).

59 Graphical depictions of the materials at the Mine (not to scale) are set out below:

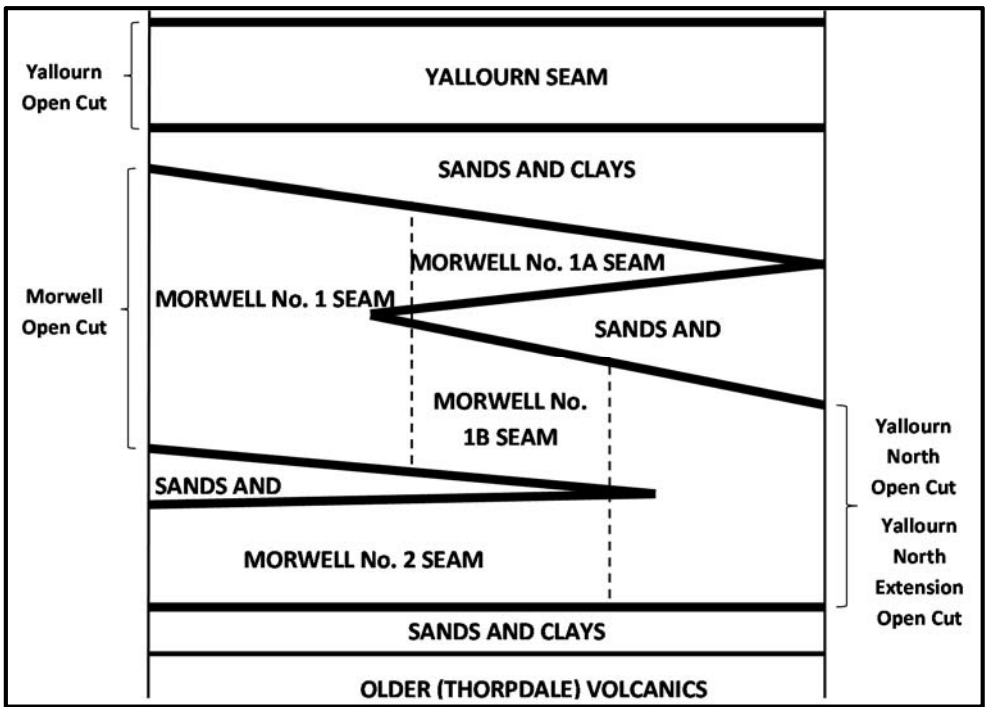

Figure 3: Diagrammatic representation of the stratigraphic column of the upper Latrobe Valley coal measures of the Morwell- Yallourn area

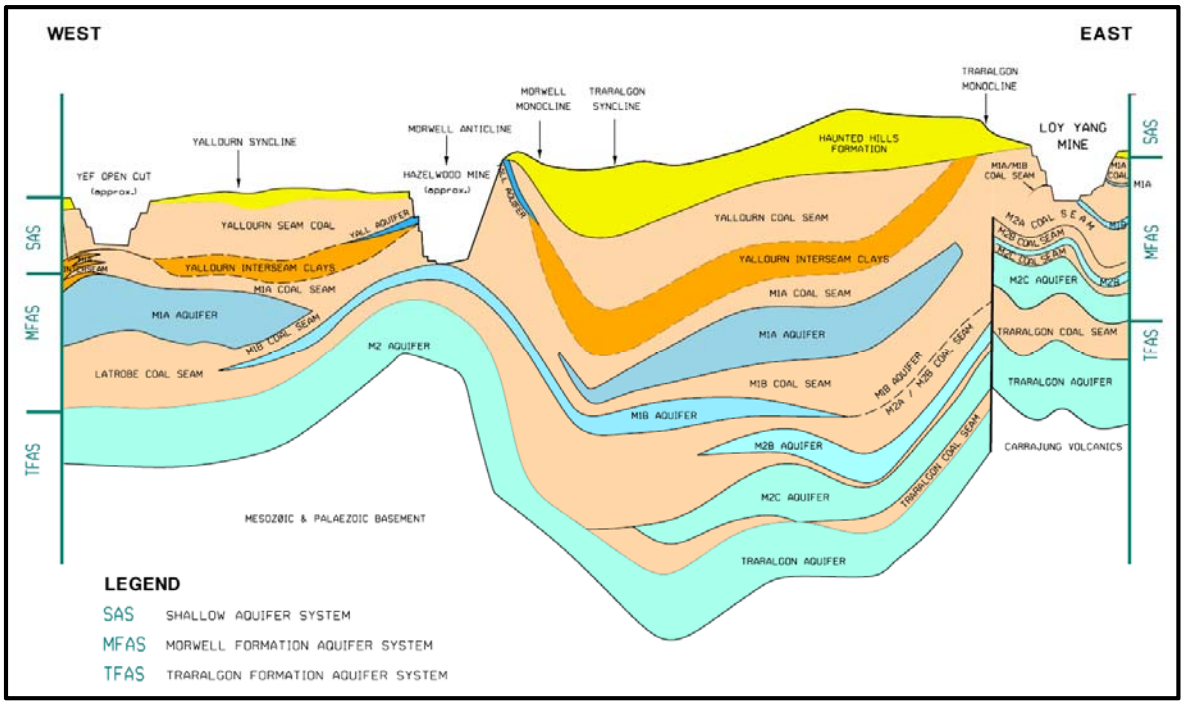

Figure 4: East-West Section through Yallourn East Field / Hazelwood / Loy Yang Mines

60 M1 coal has a moisture content of 62% and has a density of 1.11 tonnes/m^3.

61 M1 coal, without structural defects, is generally a moderate to low permeable material, which suggests that M1 coal water pressures are not normally subject to rapid changes.

62 The development of the Mine has revealed numerous defects in the M1 coal. Subsequent to regional faulting, the coal measures were extensively eroded. Later, close, near parallel cracking occurred, largely due to tectonic differential movements and also possibly due to pressure relief from erosion.

63 Within the East Field of the Mine, the M1 seam is intensely jointed, particularly along certain zones where individual joints may be spaced at around 0.3m or less. Nearly all of the joints are oriented in a NNW - SSE direction.

64 Further details in relation to the geology, hydrogeology and hydrology of the Mine, and the geotechnical model and risk assessment management procedures adopted at the Mine in order to monitor and maintain stability of the batters and floor of the Mine are outlined in the Ground Control Management Plan ("**GCMP"**), at **Confidential Annexure 3**. The GCMP contains a glossary which defines a number of the technical phrases used within this witness statement.

Physical characteristics of the Mine

65 Due to the depth of the M1 coal seam, the Mine is characterised by steep, multi-levelled batters which, in the operating phase, are typically at a slope of about 1H:1V. The Mine walls typically consist of 6 - 7 levels, approximately 100 - 120m high from their base (the floor of the Mine), to their peak (surface or "grass" level). Each level typically comprises a flat section known as a bench or berm, and a steep sloping section known as a "batter". This is diagrammatically represented as follows:

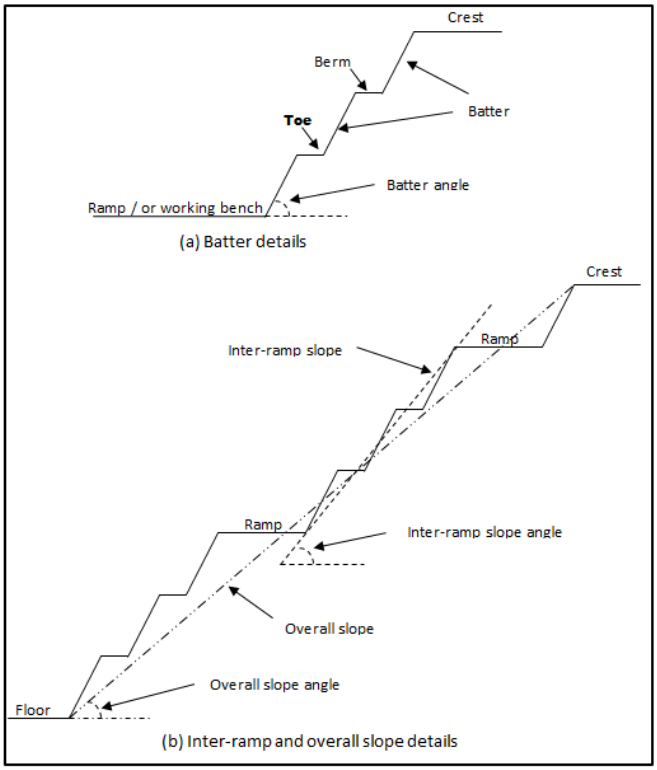

Figure 5: Details of Mine batters / overall slopes

66 Taking the example of the Northern Mine wall, which is the part of the Mine closest to the Morwell township, the entire wall is commonly referred to as the "Northern batters" with smaller individual sections of the wall named according to the stage of the mine field development in which they were created: i.e. East Field Northern batters, South West Field Northern batters.

67 As noted above, the overburden layer overlying the coal is typically 9 – 16m thick, and the M1 coal seam is approximately 80 – 100m thick.

68 The overall ratio of coal to overburden (known as the "strip ratio") at the Mine is therefore approximately 5:1 to 4:1.

69 This ratio of overburden to coal is much smaller than is the case for some other open cut coal mines (for example, the Anglesea Mine, where the strip ratio of coal to overburden is about 1:1 to 1:2).

70 Practically, this means that a much smaller volume of overburden needs to be removed to uncover the coal and therefore there is less overburden available for use in rehabilitation operations.

71 Further, the depth of the coal seam and small amount of overburden means that a remnant mine void will be left at the cessation of mining operations, which will need to form part of the final landform for the site. It would be impracticable to externally source the volume of material necessary to re-fill the void.

72 The composition of the overburden that is generated at the Mine from mining activities is such that a significant amount of the overburden is not suitable for use in connection with the rehabilitation of batters at the Mine. This is due to the properties of the overburden (namely, its silty and saturated nature). It is for this reason that large volumes of overburden from the Mine's West Field development has been placed on the floor of the Mine in the internal overburden dump.

Aquifer depressurisation

73 In order to ensure the stability of the Mine's floor, operating faces and permanent batters, GDFSAE depressurises the M1 and M2 aquifers, through a series of vertical bores and pumps which connect to those aquifers. Aquifer depressurisation is sometimes referred to as aquifer dewatering or removal of groundwater. Other mines in the Latrobe Valley, and oil and gas operations in Bass Strait, also undertake aquifer dewatering, and on this basis, there are regional effects on aquifer levels which are taken into account by GDFSAE in conducting its operations under the Mining Licence.

74 As noted in paragraph 73 above, aquifer depressurisation is undertaken by GDFSAE in order to maintain floor stability.

75 The Mine currently pumps approximately 30 litres a second from the M1 aquifer, and about 360 litres a second from the M2 aquifer.

76 The majority of the water taken from the aquifers is pumped into the clean water ponds. From there, the water is further used within the Mine as follows:

(a) in the Mine's dirty water system (which is sent around the Mine, in a reticulated system, and is available both for fire/dust suppression, and wash down);

(b) to a large water tank on grass level above the southern batters of the Mine (**"C Tank"**), and subsequently the Hazelwood Cooling Pond. From time to time water from the Hazelwood Cooling Pond overflows into Eel Hole Creek and subsequently the Morwell River. Such discharges are subject to EPA licence conditions; and

(c) a small volume is discharged into the Mine dirty water ponds.

(5) Provide a brief history of the operation of the Mine including the variations and expansions to the mine, the mine's approved Work Plans including any Work Plan variation, and the relationship of the Mine with the Hazelwood Power Station.

History of Mine ownership and development

77 The State Electricity Commission of Victoria (**"SECV"**) initiated the "Morwell Project" in 1949, which included:

(a) the development of the Mine (then known as the Morwell Mine); and

(b) the construction of the Morwell Briquette Works (now Energy Brix).

78 In the early period of the Mine's operations, coal was loaded into train carriages, and transported to the Morwell Briquette Works and (offsite) Morwell Power Station.

79 The Hazelwood Power Station was constructed in the 1960s. It was initially planned to comprise six 200MW units - which were constructed, and sequentially entered into operation, in the mid to late 1960s. Due to forecast growth in demand for electricity, two additional units were approved in the mid-1960s and entered into operation in the early 1970s.

80 The Mine and Power Station were owned and operated by the SECV (1949 – 1994) Generation Victoria (1994 - 1995) prior to privatisation in September 1996. HPC was established as a privatisation vehicle in approximately 1995, with the State owning all shares in HPC until those shares were acquired by HPP in September 1996.

81 The Mine has been developed in the following sequence (note, all dates are approximate):

(a) East Field (1955 to 1975);

(b) South West Field (1975 to mid 1990s);

(c) South East Field (mid 1990s to mid 2000s); and

(d) West Field (mid 2000s – present).

82 In 2016, coal mining operations are scheduled to commence in the North Field of the Mine.

Work Plans for the Mine

83 A copy of the initial Work Plan for the Mine approved in September 1996 ("**Initial Work Plan"**) is at **Annexure 8**.

84 Variations to the Work Plan have been approved by DEDJTR and its predecessor agencies, on the following dates:

(a) 5 May 1997;

(b) 20 May 1997;

(c) 1 October 1997;

(d) 9 October 1997;

(e) 6 December 2000;

(f) 22 February 2001; and

(g) 11 May 2009.

85 I understand that copies of each of the above-mentioned Work Plan variations were supplied to the Board of Inquiry on 19 June 2015 in response to a Notice to Produce.

86 The most substantial of the Work Plan variations, is the revised Work Plan approved on 11 May 2009 which provides for Phase 2 of the West Field Development of the Mine – including the North Field Development (**"Work Plan Variation"**), a copy of which is at **Annexure 9**.

87 The Work Plan Variation comprises the current work and rehabilitation plan for the Mine.

88 A Work Plan Variation application which was submitted to DEDJTR's predecessor DSDBI in 2013, which I referred to in my evidence to the 2014 Hazelwood Mine Fire Inquiry, has since been withdrawn by GDFSAE in order for further refinements to be made, and in order for feedback received from DEDJTR to be reflected in the final version that is submitted for approval.

89 As noted above, GDFSAE intends to submit a Further WPV Application in early 2016. it is presently intended that the Further WPV Application will provide for:

(a) minor variations to the sequence and timing of each planned further stage of the mining operations, whereby 8 units of the Power Station will continue in operation to 2025, and 4 units to 2033;

(b) a revised method for the progressive and final rehabilitation of Mine batters involving a cut and fill mining activity referred to as a "dozer push", whereby coal from one mining bench is redistributed to another bench above or below, in order to achieve the final desired profile of coal in the batter. This is in contrast to a "truck and shovel" operation for batter rehabilitation works, whereby a large volume of coal is removed from a 3:1 batter so as to achieve the desired profile, and carted away to a dump location;

(c) a minor extension to the area which is proposed to be mined in the North Field of the Mine; and

(d) minor revisions to the planned sequence of progressive rehabilitation (which includes rehabilitation works on the East Field Southern Batters of the Mine, being the area that is visible from the Princes Freeway, being brought forward).

The relationship between the Mine and the Power Station

90 As noted above, the Mine and Power Station are both owned and operated by HPC and HPP.

91 The Mine and the Power Station operate 24 hours a day, 7 days a week.

92 The Power Station generates about 11 TWh of electricity per year, and supplies of up to 25% of Victoria's baseload electricity (5.6% of the National Energy Market).

93 In simple terms, coal that is 'won' from the mining operations with the Mine is delivered to the Power Station to be burnt within one of eight units, in order to generate electricity. The route through which coal is delivered from the Mine to the Power Station is as follows:

(a) coal is transported out of the Mine via a series of conveyors;

(b) the conveyors deposit coal within the Slot Bunker, a concrete structure above the southern batters of the Mine (which holds enough coal to supply the Power Station for approximately 6-8 hours); and

(c) coal is drawn out of the Slot Bunker, via separate conveyors, and transported to individual Power Station units.

94 The Power Station dictates the Mine's production targets – the greater the demand in electricity, the more coal the Mine produces.

95 Due to the combustible nature of uncompacted brown coal, large stockpiles are not maintained at the Mine, with the exception of the limited volume of coal in the Slot Bunker. This has the result that the Mine and Power Station operations are largely "just in time". The limited supply of coal stored in the Slot Bunker has a reduced risk of spontaneous combustion as it is protected from wind, and is turned over in a short period of time.

96 A further relationship between the Mine and the Power Station arises from the fact that ash from the Power Station's operations is sent to the HARA on the eastern end of the floor of the Mine (in addition to HAP1 or HAP4 (external ash storage)).

C. MINE REHABILITATION

'Final' and 'progressive' rehabilitation

97 The Mining Licence and Work Plan Variation differentiate between the following rehabilitation concepts:

(a) rehabilitation works to be undertaken throughout the life of the Mine (**"progressive rehabilitation**"); and

(b) rehabilitation works to be undertaken at the end-of-life of the Mine, following the cessation of mining operations ("**final rehabilitation"**).

Progressive rehabilitation

98 In planning progressive rehabilitation works within the Mine, the following factors and constraints need to be taken into account:

- **operational areas of the Mine:** areas of the Mine in which active coal mining operations are being undertaken (currently: the West Field), or in which mining operations are proposed to be undertaken in the future (the West Field Northern Batters (**"WFNB"**) or the South West Field Northern Batters (**"SWFNB**", the locations of which are noted in Figure 6 below), are not available for rehabilitation works;

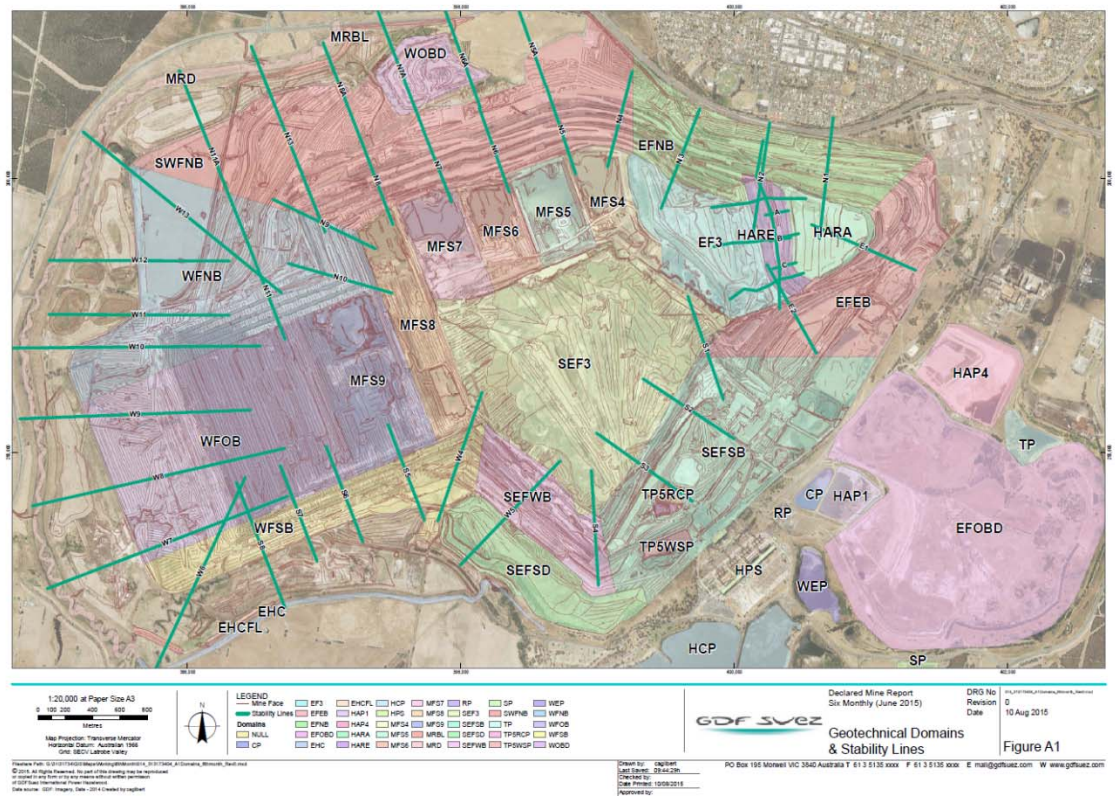

Figure 6: Geotechnical Domains of the Mine

- **areas of the Mine containing critical Mine infrastructure:** as noted above, the Mine operates 24 hours, 7 days a week, in order to continually supply coal to the Power Station, and generate up to 25% of the State of Victoria's baseload electricity. A wide range of infrastructure is essential to the Mine's ongoing safe operations and this infrastructure cannot be compromised by rehabilitation works. Critical infrastructure for the Mine includes:

- **conveyors -** which transport coal and overburden from the Mine's operations

  along the WFNB, West Field Southern Batters ("**WFSB"**), South East Field Western Batters (**"SEFWB"**) and South East Field Southern Batters (**"SEFSB**") as noted on Figure 6 above;

- **ash and overburden dumps** on the floor of the Mine which receive ash from the Power Station, and certain overburden from the mining operations (which is not suitable for use in rehabilitation works). These dumps perform a vital operational purpose, and are important from the perspective of weight balance;

- **transport routes** – through which critical mine infrastructure such as dredgers and conveyors will be transported (and later, perhaps operated) as mining operations move from the West Field to the North Field;

- **power lines -** which run across the floor of the Mine, and up Mine batters, supplying power to important mine infrastructure such as conveyors, dredgers and fire service and dewatering pump stations;

- **dams and ponds** situated on the floor of the Mine beneath the northern batters which perform a range of integral services including flood management, and the storage and filtering of rainfall runoff within the Mine and water used in the Mine's operations (such as fire service and wash down water);

- **pump stations** situated on the floor of the Mine servicing the Mine's operations, including the fire services network;

- **fire services mains and pipes** - including additional pipework installed in response to the 2014 Mine Fire;

- **roads, ramps and benches** – most of which are required as part of the Mine's operations (for example, for access to various parts of the Mine for operation and maintenance requirements);

- **horizontal bores** – which help control water levels within the batter, in order to ensure stability;

- **vertical bores-** which provide for the monitoring and management of aquifer levels beneath the Mine;

- **other geotechnical equipment positioned on the batters –** in order to monitor conditions and manage batter stability – e.g. piezometers, inclinometers, extensometers, survey prisms; and

- **roadside/underground drains -** which drain water way from the batter, in order to ensure stability.

- **availability of sufficient quantities of suitable overburden:** the composition of the overburden (dirt and clay overlying the coal, utilised in rehabilitation works) varies throughout the Mine. Overburden is not always suitable for placement on batters. As noted in the Work Plan, the overburden currently being mined from Block 1C in the West Field is not suitable for placement on the batters of the Mine given its composition (saturation levels), and on this basis is being placed on the floor of the Mine. Further, only a certain volume of overburden is available from the mining operations conducted annually within the Mine;

- **construction constraints:** typically, given the ground conditions at the Mine, earthworks projects such as rehabilitating batters utilising truck and shovel techniques

can only be carried out between November and April due to difficulties with the wet weather outside of this period;

- **infrastructure positioned above the batters:** in order to reduce the grade of the batter and allow for future land use, an area of land at the top of the batter typically needs to be removed. Mine infrastructure above the batter (on the crest, or 'grass level') such as roads and power lines are likely to be affected by such works. Further, potential impacts on third party infrastructure such as:

    - Ausnet Services' high voltage power lines which service other Gippsland towns such as Leongatha, Yallourn and Morwell as well as the GDFSAE site;

    - the Princes Freeway; and

    - the Morwell Main Drain,

    would need to be assessed and managed (including with the relevant third parties).

99 Where an area of the Mine such as a Mine batter is identified as being potentially suitable for progressive rehabilitation works, broadly speaking, the steps involved in planning and conducting the rehabilitation are as follows:

(a) first, stability assessments are required. This step is crucial and can take a period of at least 6 to 12 months for an area of the Mine such as the Northern Batters, which is in close proximity to the Morwell township and third party infrastructure. Stability assessments take the current known stability of the batters and then model the stability level after the proposed rehabilitation is completed. A range of variables including batter profiles, groundwater levels, seismic events, and weather events are simulated to determine how the rehabilitated batters would perform under varying load conditions. Once that assessment is undertaken, controls are then simulated to ensure that the resulting batter safety factors are not compromised. Such controls include horizontal bores, open drains and vertical pumping bores;

(b) secondly, planning is undertaken for the rehabilitation works. Based on the desired batter profile (or 'steepness'), the extent to which the existing batters need to be re-profiled (or 'laid back') has to be determined;

(c) thirdly, mining infrastructure situated in the vicinity of the batters that may need to be relocated or removed is identified. Depending on the nature of the infrastructure and the stage of the mining sequence that has been reached, infrastructure which is required for the ongoing operation of the Mine will need to be relocated or rebuilt within a different location;

(d) once the necessary relocated infrastructure is rebuilt, the coal and overburden can be removed, and the batters are laid back to the desired profile. Traditionally, this work has been completed using a method referred to as "truck and shovel". As noted above, excavators (shovels) are used to progressively remove the coal and the overburden from each of the levels and this material is carted away in trucks;

(e) once the necessary coal is removed/relocated, overburden is then used to cover the newly profiled coal batters. The layer of overburden is typically about 1 metre deep. In order to do this, additional suitable overburden material may have to be located. The material within the Mine is not of a consistent composition and overburden from some areas is more suitable for use in batter rehabilitation works than other parts of the Mine. Mining up until October 2015 has been in Block 1C, where the overburden has been unsuitable for batter rehabilitation, and has been placed on the floor of the Mine. The Mine is currently developing into North Field, where there is a higher percentage of more suitable overburden and rehabilitation plans are currently being reviewed in order to possibly accelerate some rehabilitation in some areas; and

(f) after the batters are laid back, re-sloped, and covered in suitable overburden, topsoil is spread on the batters and the area can be revegetated, and any necessary geotechnical equipment (e.g. horizontal bores, standpipes, inclinometers, extensometers) is installed.

Final rehabilitation

100 The approved final rehabilitation plan for the Mine since the time of privatisation and the grant of the Mining Licence, has been for the Mine to be gradually flooded to form a lake within the base of the remnant void following the removal of mining infrastructure. The surrounding coal batters above the future water level will be re-profiled so that they have a more gentle grade leading down to the future lake. The re-profiled batters above the future water level are to be covered with overburden and re-vegetated, so as to blend into the surrounding environment and support a range of future land uses.

101 The approved final rehabilitation plan for the Mine was relevantly considered in:

(a) the lengthy environmental and planning approvals process with respect to the West Field Phase 2 extension of the Mine, which included a detailed Environmental Effects Statement ("**EES"**), Planning Scheme Amendment and related Panel Inquiry); and

(b) the Work Plan Variation approved by DEDJTR's predecessor in May 2009.

102 It is proposed that weight balance in the floor of the Mine be achieved by way of a combination of dumping of internally sourced overburden during the operational phase of the Mine, and the weight of the water within the lake.

103 As the lower levels of coal within the Mine will be submerged by the future lake, it is only the exposed coal levels *above* the future water level that require rehabilitation by way of laying back and reshaping the coal batters, and covering with overburden.

104 GDFSAE, in conducting the operations of the Mine in accordance with the Work Plan Variation, is well down the path of initiating the approved final rehabilitation plan for the Mine, particularly from the perspective of:

(a) the progressive rehabilitation completed within the Mine to date, which has in part, reshaped and revegetated certain batters above the future water level of the lake;

(b) the in-pit dumping of overburden and ash, which provides additional weight on the floor of the Mine; and

(c) the geotechnical and hydrogeological studies that have been completed or are currently underway in order to support the implementation of the approved final rehabilitation plan.

105 I tend to refer to the final rehabilitation model for the Mine as a "*partial lake within the remnant void, with battered down surrounding slopes*". The reference to a *partial* lake reflects the fact that it is not proposed at this stage that water will fill the entire void of the open cut. The level of the Mine floor is approximately RL - 60. The initial water level of the lake within the Mine void to achieve weight balance will be RL- 22 (i.e. 38m or approximately one third of the depth of the Mine void). The eventual level that the modelling indicates the lake will fill to is RL+ 8, i.e. approximately 68m deep or 50% - 60% of the depth of the Mine void.

106 In my opinion, the current approved final rehabilitation plan for the Mine is the most well developed and feasible rehabilitation option, in light of:

(a) the size of the Mine void;

(b) the lack of a sufficient volume of materials to fill the void (and the fact that it is not economically feasible to conduct an earthworks project involving the filling of the void with material, in any event); and

(c) the requirement to allow the M1 and M2 aquifers underlying the Mine, which have been artificially lowered through aquifer depressurisation to facilitate the mining operations, to rebound and reach regional equilibrium so as to ensure the long-term stability of the landform.

(6) Describe the rehabilitation plans for the Mine to date pursuant to the Mine's mining licence and Work Plan (and Work Plan variations)

Plans for the progressive rehabilitation of the Mine

Initial Work Plan

107 At the time that Initial Work Plan for the Mine was approved in September 1996, the progressive rehabilitation program for the Mine was outlined in Five Yearly "Rolling Rehabilitation" Plans, which were subject to annual review (and to the extent necessary, variation).

Work Plan Variation

108 Under the Work Plan Variation, progressive rehabilitation works were outlined for the remaining life of the Mine (at that time, anticipated to be approximately 2031), with progressive rehabilitation tied to each stage of Mine development.

109 As noted above, certain Mine infrastructure (e.g. roads, conveyors, pumps, powerlines, ponds, ash and overburden dumps, exposed coal batters in operational fields) is critical to the Mine's ongoing operations, and cannot feasibly be decommissioned, and the relevant land area rehabilitated, during the working life of the Mine. The Work Plan Variation identified and scheduled rehabilitation works which were considered to be capable of being undertaken within the Mine during its working life, without impacting on critical infrastructure, safety and the Mine's operations. The remaining portions of the Mine Area will be rehabilitated following the cessation of the Mine's operations, as part of the 'final' rehabilitation works.

110 The areas within the Mine that are to be rehabilitated each year during the earthworks season as part of the progressive rehabilitation program are determined by Melissa Schenkel, Environmental Officer, Romeo Prezioso, Senior Mine Planner, and myself in reference to the Work Plan Variation, and the operational requirements of the Mine.

111 Since 2013 / 2014, the budget for annual progressive rehabilitation works has been included in the 'Medium Term Plan' (**"MTP"**) set for the Mine, which covers all planed operational expenditure (opex) and capital expenditure (capex) for the Mine.

Plans for the final rehabilitation of the Mine

Initial Work Plan

112 As regards the planned final rehabilitation of the Mine, the Initial Work Plan stated as follows:

> **6. MINE REHABILITATION**
>
> …
>
> **6.1 FINAL CONCEPT PLAN**
>
> A Rehabilitation Concept Master Plan has been produced for the Mine. Its purpose is to provide an overall vision for the ultimate rehabilitation of all land disturbed by mining activities.
>
> The plan shows the proposed rehabilitation treatment for all areas, including the Mine proper, overburden dumps, buffer areas, transport corridors, operational areas and infrastructure.
>
> Refer Figure 11: Drawing No. P45/197/43 "*Mine Final Rehabilitation Concept Plan"*
>
> The preferred option for the worked out part of the Mine is to create a lake. At this time only preliminary studies into the creation of a lake have been carried out.
>
> The areas surrounding the Mine will ultimately be used for grazing, conservation,

active and passive recreation, wetlands habitat and forestry. A Land Capability Analysis was used to enable broad recommendations to be made on land use and management.

Refer Appendix 2: "*Morwell Mine Rehabilitation Concept Master Plan*".

Refer Appendix 3: "*Land Capability Analysis HPC Mine and Environs*".

113 A copy of the *Morwell Mine Rehabilitation Concept Master Plan* is at **Annexure 10**.

114 The Morwell Mine Rehabilitation Concept Master Plan contained a detailed diagram depicting the proposed future land uses at the Mine in the lands surrounding the proposed lake (see below). This concept plan was prepared in 1994, at which time the Mine lands were publicly owned, and presupposed that the Mine would ultimately be for public use and amenity. As noted in the diagram, the proposed future land uses included:

(a) grazing;

(b) conservation zones;

(c) recreation (active/passive) including picnic areas, nature trails, car parks and boat ramps;

(d) forestry (open woodland/plantation); and

(e) various water courses and wetlands.

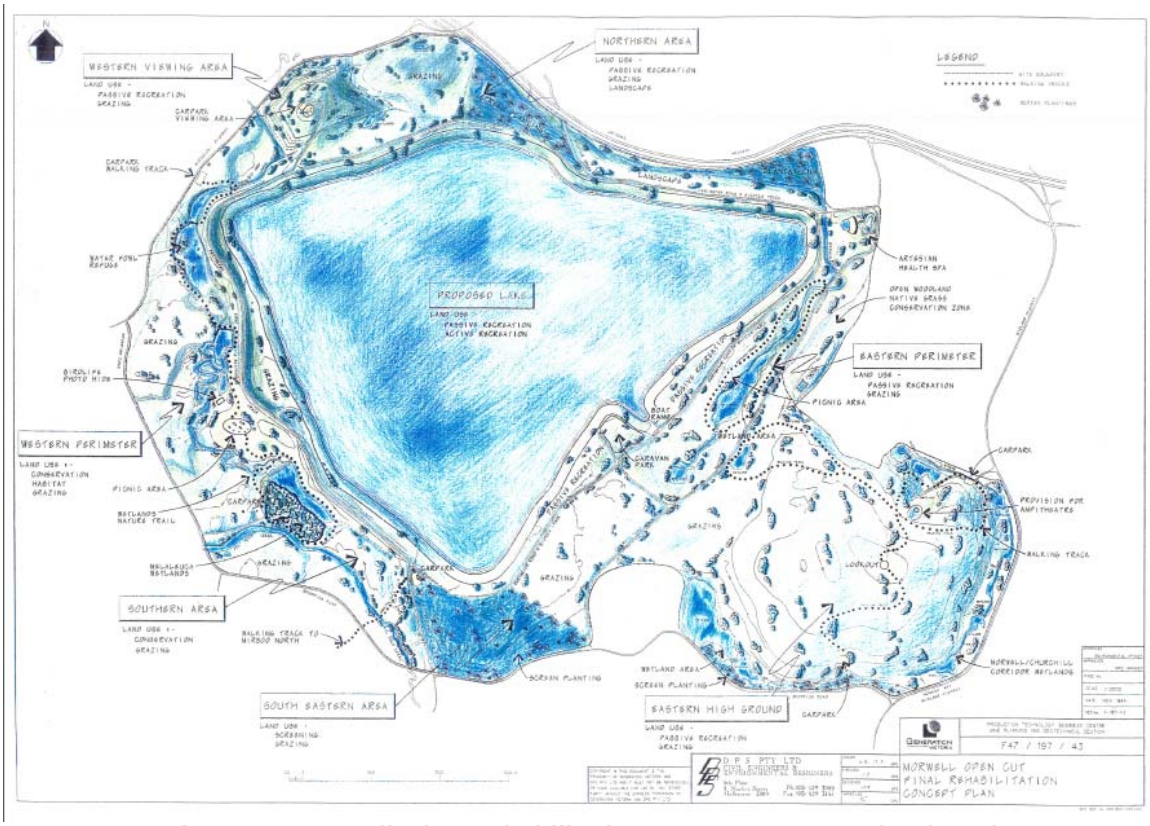

Figure 7: ***Morwell Mine Rehabilitation Concept Master Plan (1994)***

115 The intended future land use of the lake itself was passive recreation and active recreation.

116 The Morwell Mine Rehabilitation Concept Master Plan acknowledged that further studies were required in relation to the proposal to flood the Mine in order to form a lake, as follows:

The formation of a lake in the Open Cut is the preferred option for ultimate rehabilitation, however further investigation of potential effects of flooding the Mine would be required prior to implementation. Areas which will require further study on potential flooding option impacts are:

- Methods, costing and timing of flooding the mine;
- Stability of the mine batters;
- Earthmoving impacts, both local and regional;
- Groundwater impacts, both local and regional;
- Micro-climate impacts.

Work Plan Variation

117 The Work Plan Variation states as follows in relation to final (end-of Mine life) rehabilitation plans with respect to the Mine:

6.2 Rehabilitation Goals and Objectives

The strategic rehabilitation and mine closure goal for the ultimate completion of the Hazelwood Mine, including West Field, is to:

> *Provide a technically feasible, safe, stable and sustainable landscape that reflects the aspirations of stakeholders within the practical constraints of rehabilitation for the Mine (EES).*

The goal requires the following objectives:

- A safe and stable self-supporting structure;
- To maximise opportunities for a self-sustaining ecosystem;
- To minimise the use of natural resources; and
- To minimise the cost of recover of resources.

…

6.4 Mine Closure Concept

The constrain[t]s arising from issues, described in section 6.3, particularly timely access to coal batters and benches, limit opportunity timely access to coal batters and benches, limit opportunities for progressive rehabilitation.

The following mine closure concept is considered the base case as it is unreasonable to prejudge community aspirations that may prevail at the time of closure.

Base Case

The main features of the conceptual mine closure and rehabilitation plan for the Hazelwood Mine are:

- **Pit void:** the pit will be allowed to fill with water creating a lake. This will initially take place by continuing aquifer depressurisation pumping, until the weight is enough to stabilise the batters (currently estimated to be RL – 22m). The pit lake will then fill slowly over a period of decades or more to its hydrological equilibrium (currently estimated at RL + 8m).

- **High-magnesium ash:** the power station coal ash is environmentally relatively benign as will be placed at the eastern end of the void, in the Hazelwood Ash Retention Area (HARA). It is separated from the lake by the Hazelwood Ash Retention Embankment (HARE).

- **Overburden batters:** overburden batters will be reshaped to no steeper than 3H:1V with safety berms introduced where the vertical distance exceeds 20m, topsoiled and seeded.

- **Coal batters:** new permanent coal batter faces will be shaped to no steeper than 2.5H:1V and preferably 3H:1V. Non-permanent coal batters will be maintained as they are until they are dug as permanent coal batters. Existing batters and benches carrying critical conveying infrastructure are considered non-permanent batters as the digging program has been revised to allow a final retreat digging pass that will convert them to permanent batters, i.e. no steeper than 2H:1V and preferably 3H:1V. Once the bench has been completed, exposed coal will be progressively covered with overburden from the working face of the mine and revegetated on decommissioning.

- Mining infrastructure will be decommissioned and removed;

- **Public access:** these are matters to be discussed closer to the time of closure, although the intent is to ensure a site that provides safe access if that is deemed to be a requirement at the time.

- **Ecological function:** revegetation options are constrained by a shortage of topsoil. IPRH has developed a site-specific species planting guide.

…

6.7.2 Further Work – Mine Closure Investigations

Further investigations to provide data for mine-closure planning may be required to address the complex issues associated with, in particular, long-term stability of the mine. These investigations include a review of previous studies to establish whether the results of those studies hold for expected changes in external influences.

118 GDFSAE has obtained an updated Morwell Mine Rehabilitation Concept Master Plan which takes account of the enlarged Mine including the West Field (Phase 2) development. A copy of the updated Concept Plan is below:

Figure 8: Updated Morwell Mine Rehabilitation Concept Master Plan (2015)

119 A high resolution version of the updated Morwell Mine Rehabilitation Concept Master Plan is at **Annexure 11**.

120 The majority of the land within the Mining Licence Area is privately owned by HPC/HPP. Future land uses of this privately owned land will be assessed closer to the time of closure.

(7) Describe the rehabilitation work completed at the Mine to date pursuant to the Mine's mining licence and Work Plan (and Work Plan variations).

121 The total area of land within the Mining Licence Area that has been rehabilitated to date is approximately 557 hectares.

122 The specific areas within the Mining Licence Area that have been rehabilitated are shaded in green and orange on the below diagram**:**

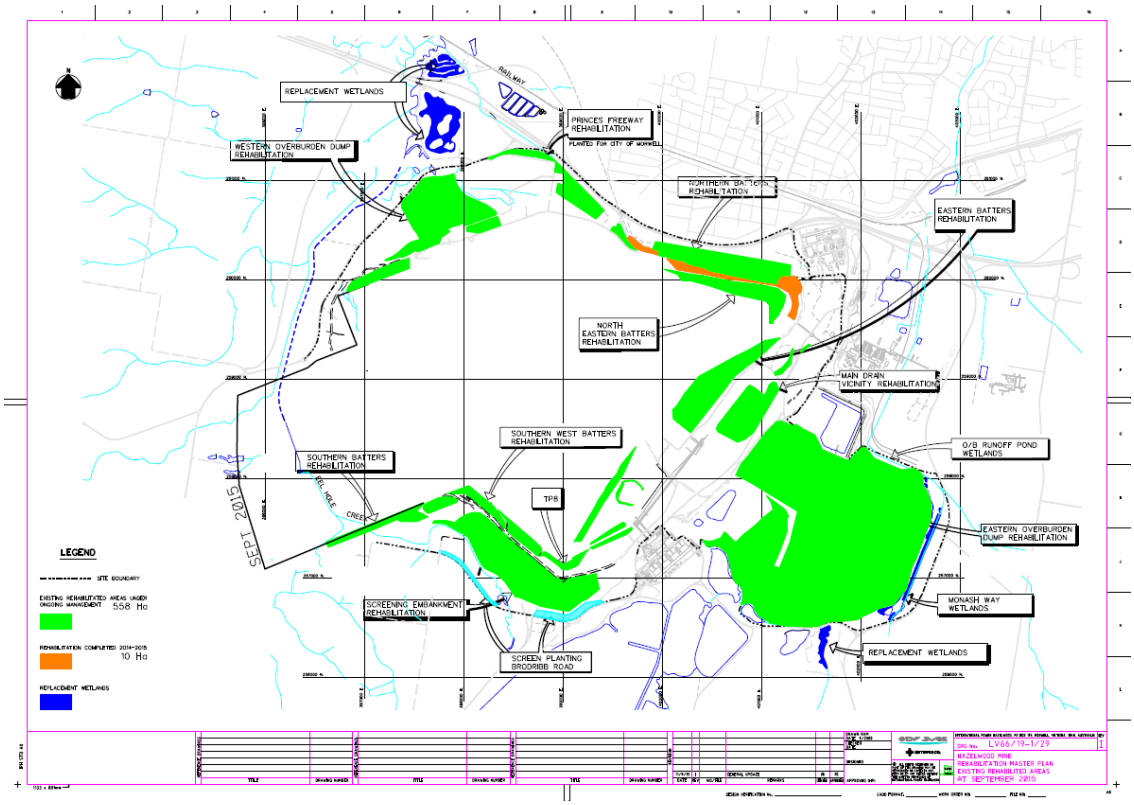

Figure 9: Rehabilitated areas within the Mining Licence Area as at September 2015

123 A high resolution version of this plan of rehabilitated areas is at **Annexure 12**.

124 Prior to the privatisation of the Mine, the SECV/Generation Victoria had rehabilitated about 116 hectares of land within the Mining Licence Area (with limited records available regarding any rehabilitation undertaken in the period prior to 1992). However, hectare figures do not paint the full picture. The majority of the rehabilitation works carried out prior to privatisation were "easy wins" – e.g. rehabilitation of waste dumps external to the Mine Area, where all that was required was grading the overburden material (which was already relatively flat), and topsoiling and re-vegetating the area. I understand that no rehabilitation works were undertaken within the Mine Area itself prior to privatisation.

125 Since the time of privatisation, Hazelwood has rehabilitated about 441 hectares of land within the Mining Licence Area. This includes approximately 116 hectares within the Mine Area, including the Mine's East Field Northern and Eastern Batters, on which rehabilitation works have been a significant undertaking.

126 A further 14 hectares of batter rehabilitation works are planned along the Northern Batters, moving westwards, in late 2015 / early 2016.

127 Hydrogeological conditions and any movements within the rehabilitated slopes are monitored in accordance with GDFSAE's standard operating procedures (such as the GCMP). In conducting its progressive rehabilitation operations, Hazelwood has a good track record of delivering stable slopes with minimal erosion. For example, as regards to the more than 25 hectares of batter rehabilitation works undertaken on the northern batters since 2009, there have been no significant earth movement or erosion events related to rehabilitation.

128 A photograph of certain of these rehabilitation works, whilst in progress, is set out below:

Figure 10: Northern Batters rehabilitation works in progress – late 2014/2015

129 Progressive rehabilitation works undertaken within the Mine are reported upon in Environmental Review Committee (**"ERC"**) Reports produced by Hazelwood every quarter under its Mining Licence. These reports are provided to a range of regulators and agencies that have representatives on the ERC, including DEDJTR, the Department of Environment, Land, Water and Planning (**"DELWP"**), EPA Victoria, the West Gippsland Catchment Management Authority, the Victorian Farmers Federation; and Latrobe City Council. The ERC meets on a quarterly basis, and meeting minutes are taken.

130 Further, officers from DEDJTR and its predecessor agencies regularly view rehabilitation works within the Mine, as part of their routine Mine visits.

131 Whilst there are powers to do so under the Mining Licence, on the basis of my enquiries, I understand that at no time since privatisation:

(a) has Hazelwood been directed by the Minister or by DEDJTR (including its predecessor agencies) to undertake further rehabilitation within the Mine; or

(b) has the Minister or DEDJTR (including its predecessor agencies) directed the Mine to undertake different, greater in size or faster rehabilitation of any areas within the Mine.

132 Hazelwood considers that it is compliant with the current approved rehabilitation plan as contained in the Work Plan Variation, and on the basis of the evidence provided by Ms Kylie White, Executive Director, DSDBI, to the first Hazelwood Mine Fire Inquiry, I understand that DEDJTR is of the same view.

(8) Describe the future rehabilitation work to be done under the Work Plan, identifying the date by which rehabilitation of the Mine is required to be completed. Include any details of modelling (including ground stability, water modelling and fill times) or expert assessments undertaken concerning rehabilitation of the Mine.

Progressive rehabilitation

133 As noted above, the Work Plan Variation outlines the progressive rehabilitation works that are planned to be undertaken throughout the remaining life of the Mine.

134 Under the Work Plan Variation, the progressive rehabilitation program is heavily tied to the nature of the sequence of the mining operations, including the location of mining infrastructure, and the overburden that becomes available from the mining operations in the various fields of the Mine. This is on the basis that:

(a) it is most cost effective to use overburden that becomes available from the mining operation itself;

(b) procuring overburden specifically from other parts of the Mining Licence Area, or from outside of the Mine, has an additional environmental impact (i.e. effectively constitutes "digging a new hole, to fill an existing one"); and

(c) the largest cost items in rehabilitation works, are the costs of any necessary road transportation of materials, given the large volumes involved. Materials that may be required to be transported to/from the location of rehabilitation works include overburden and topsoil (to be placed on the batter), and coal (removed from the batter to achieve the desired profile). On this basis, it is cost effective to undertake rehabilitation works in close proximity to a Mine field that is being mined, on the basis that there is:

(i) proximate large-scale mining infrastructure which can be utilised to remove materials in large volumes (e.g. bucket wheel excavators);

(ii) fixed infrastructure, which can be used to transport materials (e.g. conveyors); and

(iii) a proximate supply of overburden (becoming available from the mining operations.

135 In the paragraphs below, I describe the future progressive rehabilitation work to be done undertaken within the Mine Area in reference to the Work Plan Variation. As noted above, GDFSAE intends to submit a Further WPV Application in early 2016, which if approved, will marginally vary the sequence and timing of certain of the proposed rehabilitation works.

Areas to be progressively rehabilitated at the end of Block 1C mining

136 Given the unsuitability of the materials in fields 1A, 1B and 1C (the West Field) for placement on batters, under the Work Plan Variation, progressive rehabilitation of several areas of the Mine Area will be undertaken at the *conclusion* of Block 1C mining, at which time the red shaded areas are proposed to be rehabilitated:

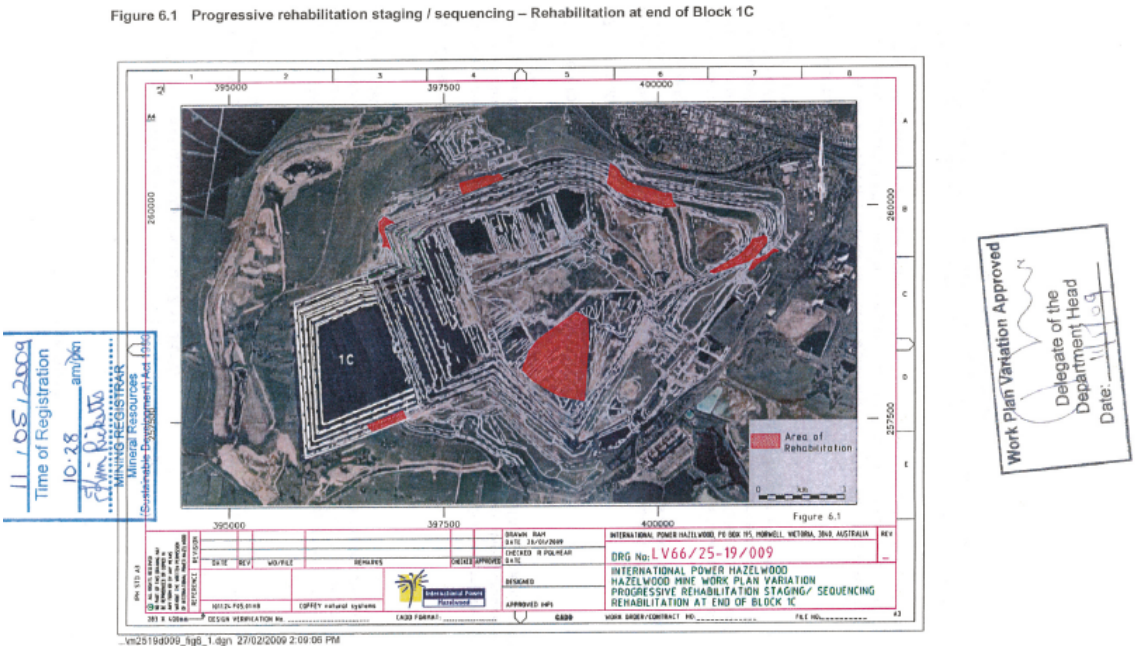

Figure 11: Progressive rehabilitation at end of Block 1C (Work Plan Variation Fig 6.1)

137 Block 1C is presently still being mined. Under the Work Plan, the expected dates for completion of mining of Block 1C are as follows:

- **Overburden mining** – (2010 – 2015); and
- **Coal mining** – (2011 – 2019).

138 During hearings of the 2014 Hazelwood Mine Fire Inquiry, a difference of opinion emerged between myself and Ms Kylie White, Executive Director, Earth Resources Regulation Branch of the Department of State Development, Business and Innovation (**"DSDBI"**) as to the interpretation of rehabilitation dates within the Work Plan Variation.

139 Specifically, the issue was whether the rehabilitation shaded in red on the plan above was due to commence by 2019 (my interpretation), or whether it had to be completed by 2019 (Ms White's interpretation). Certain of the rehabilitation shaded in red had been completed at the time of the 2014 Hazelwood Mine Fire Inquiry, in any event.

140 In the period since the 2014 Hazelwood Mine Fire Inquiry, GDFSAE has further consulted with DSDBI / DEDJTR in relation to this issue. In an email dated 13 November 2014, Ms Anne Bignell of DSDBI clarified that DSDBI would expect the rehabilitation shaded in red above to commence "*once mining commences of overburden suitable for use in rehabilitation, this being the commencement of mining in Block 2A*". The mining of overburden suitable for use in rehabilitation in Block 2A is currently scheduled to occur in early 2016. In her email, Ms Bignell further noted that DSDBI "*would be concerned if, after the commencement of mining in Block 2A, overburden is not used towards meeting the rehabilitation outcomes associated with the mining sequence. Dates are indicative*."

141 A copy of Ms Bignell's email dated 13 November 2014 is at **Annexure 13**.

Areas to be progressively rehabilitated at the end of Block 2B mining

142 Overburden materials from Block 2B mining operations are inherently more stable materials than the overburden from Blocks 1A, 1B and 1C mining operations.

143 On this basis, the overburden from Block 2B mining operations have been scheduled for use in rehabilitation works on permanent eastern and southern batters, as follows (blue shaded areas):

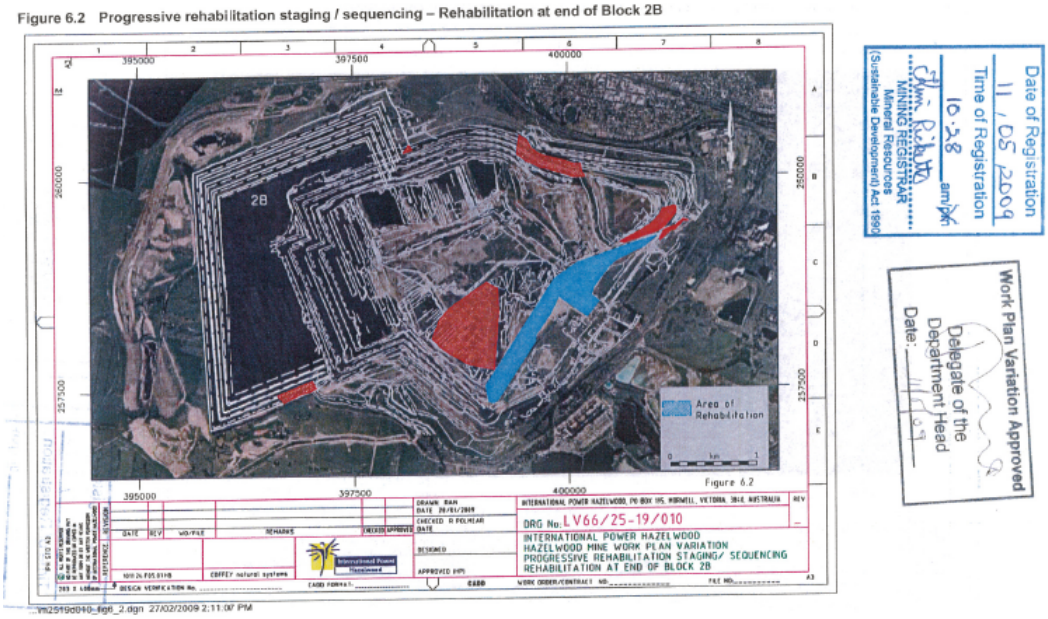

Figure 12: Progressive rehabilitation at end of Block 2B (Work Plan Variation Fig 6.2)

144 Under the Work Plan, the expected dates for mining of Block 2B are as follows:

- Overburden 2018 – 2025; and
- Coal 2019 – 2028.

145 As noted above, the date of the commencement of overburden mining operations in Block 2B has been brought forward to 2016, with coal mining operations in Block 2B scheduled to commence in 2017.

146 GDFSAE has already completed partial rehabilitation of the East Field Northern Batters shown on the above figure, and in this regard, is ahead of the progressive rehabilitation schedule set in the Work Plan Variation.

Areas to be progressively rehabilitated at the end of Blocks 3 and 4 mining

147 The rehabilitation planned at the end of Blocks 3 and 4 is as follows:

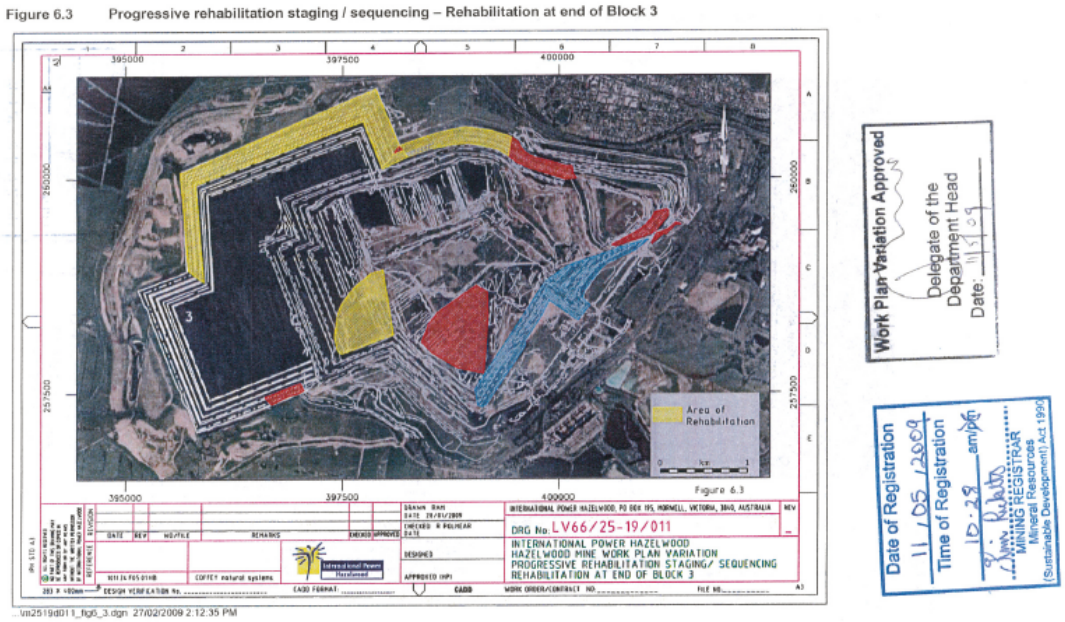

Figure 13: Progressive rehabilitation at end of Block 3 (Work Plan Variation Fig 6.3)

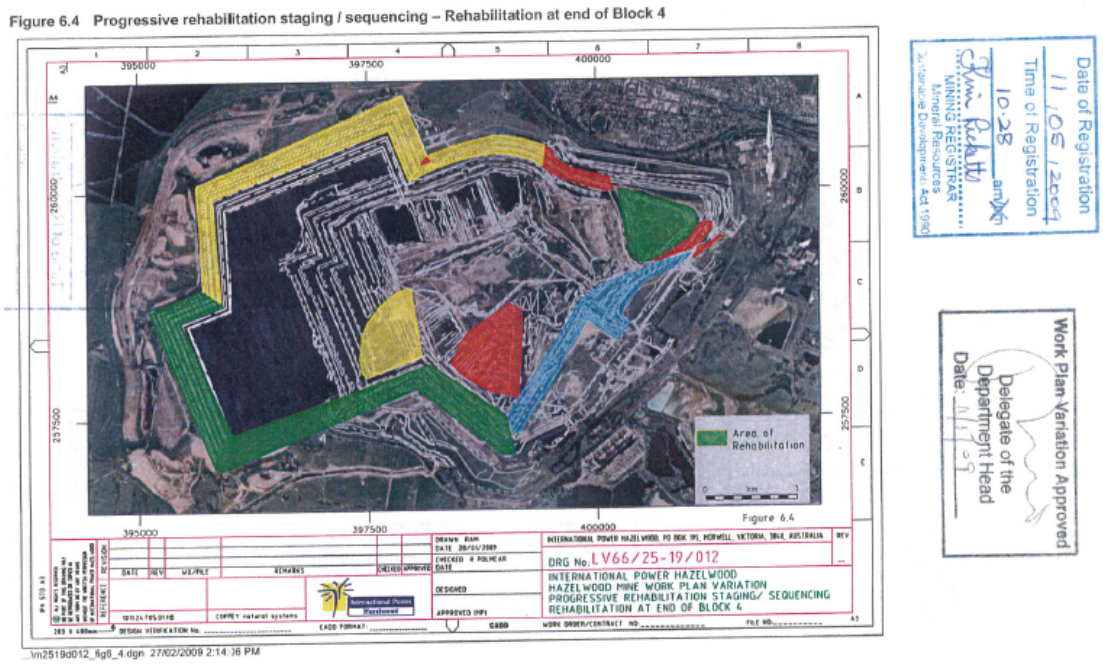

Figure 14: Progressive rehabilitation at end of Block 4 (Work Plan Variation Fig 6.4)

148 Under the Work Plan, the expected dates for mining of Block 3 are as follows:

- Overburden: 2026 to 2028; and
- Coal: 2027 to 2031.

149 Under the Work Plan, the expected dates for mining of Block 4 are as follows:

- Overburden: 2028; and
- Coal: 2027 to 2031.

Final rehabilitation

Key concept in relation to the final rehabilitation of the Mine

150 As noted above, the key rehabilitation concept on which the Work Plan Variation, and the rehabilitation plan approved upon the grant of the Mining Licence in 1996 are based is that at the end of the life of the Mine, the Mine void will be partially flooded to form a lake, with the surrounding land areas re-profiled and revegetated to gradually lead down to, and integrate with, the future lake.

151 A pit lake has long been the preferred final land form for the Mine site, on the basis that:

(a) the M1 and M2 aquifers beneath the Mine have been artificially lowered by way of aquifer depressurization, in order to facilitate the mining operations (n.b. aquifer levels are also impacted upon by dewatering operations at the other Latrobe Valley Mines, and by oil and gas operations in the Bass Strait);

(b) any final landform for the Mine which meets the objectives of being stable, and requiring limited ongoing management (e.g. by way of continuing aquifer depressurisation), will require the M1 and M2 aquifers to rebound and reach equilibrium with regional levels of those aquifers; and

(c) given the size and depth of the Mine, it would be impractical to refill the remnant void with materials.

152 As the lower levels of coal within the Mine will be submerged by the future lake, it is only the exposed coal levels *above* the future water level that require rehabilitation by way of laying

back and reshaping the coal batters, and covering with overburden.

153 Working coal batters at the Mine are typically at a slope of about 1H:1V. During rehabilitation, the batters are laid back to a slope of no steeper than 2.5H:1V and preferably 3H:1V. Reshaping of batters for the purpose of rehabilitation is for several reasons, including:

- to ensure the stability of soil placed on the batters;
- to enable revegetation;
- to make the area visually compatible with surrounding land; and
- to make the areas capable of being used by the public and for other purposes post closure.

154 The Mine is about 120 metres deep and current plans exist for the water level in the Mine to initially reach what we call RL – 22 ("RL" meaning "relative level" to sea level), which is 22 metres below sea level. As further discussed below in paragraph 177 to 180, recent modelling undertaken by consultants GHD indicates that this may be able to be achieved within approximately 7 years of the pit flooding commencing, post cessation of mining operations.

155 The future lake is expected reach an eventual estimated water level of RL + 8. The Mine crest itself on grass level is approximately 60 metres above sea level, which means that the water level will be approximately 80 metres below grass level, leaving approximately 60 metres of exposed coal batters requiring rehabilitation. A simple graphical depiction of this paragraph is as follows:

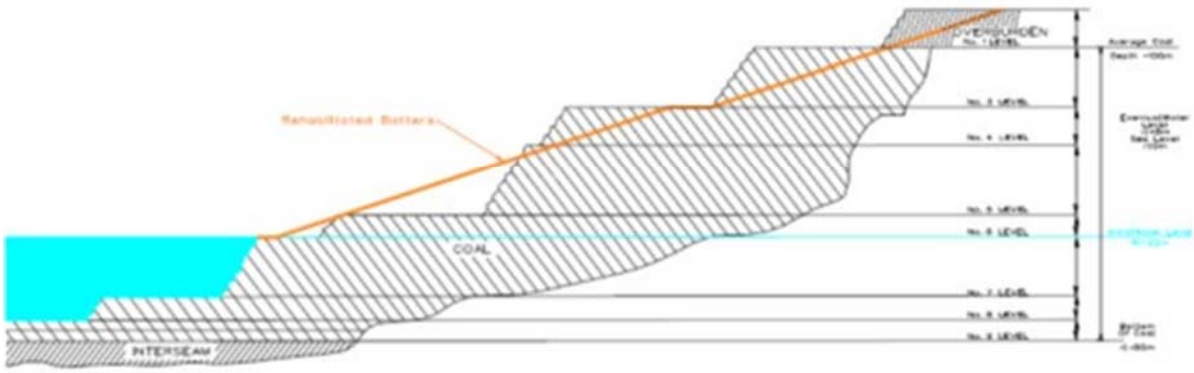

Figure 15: Future water level of Mine lake relative to rehabilitated batters

156 Together with a commercial partner, GDFSAE is presently exploring options for the potential future use of high-magnesium ash from the Power Station's operations which has been deposited within the HARA on the floor of the Mine, and in HAP1 and HAP4 within the broader Mining Licence Area.

(9) Describe any limitations or matters that may affect the future rehabilitation work to be done under the Work Plan, including ground stability and water.

Progressive rehabilitation works

157 As noted above, the progressive rehabilitation works that have been undertaken on the batters of the Mine in recent years have been successful. On this basis, GDFSAE does not envisage any significant issues in continuing with its progressive rehabilitation program within the Mine, provided it continues to undertake:

(a) the detailed prior planning measures (including stability assessments) referred to in paragraph 99 above; and

(b) post-rehabilitation monitoring of Mine batters, as referred to in paragraph 127 above.

Fire risk management

158 Since the time of the Hazelwood Mine Fire in 2014, when conducting rehabilitation works on internal mine batters and inside the fire break, GDFSAE has made an operational decision to not plant any large vegetation, such as trees, on the basis that they might provide a fuel source for any fire which commences within, or spots into, the Mine.

159 GDFSAE has instead focussed on planting low shrubs and grasses which will assist in anchoring the overburden/clay material on the newly rehabilitated batter.

160 Fire risks on rehabilitated slopes are managed in accordance with GDFSAE's standard fire and emergency policies and procedures (which have been substantially revised since the 2014 Hazelwood Mine Fire), such as those listed below:

- Specifications for Grass Slashing (Paradigm Doc ID: 17240);
- Specifications for Mulch Mowing (Paradigm Doc ID: 17241);
- Guidelines For Season Specific Fire Readiness and Mitigation Planning (Paradigm Doc ID: 36546);
- Checklist For Season Specific Fire Readiness and Mitigation Planning (Paradigm Doc ID: 36549);
- Mine Vegetation Assessment for Fire Risk (Paradigm Doc ID: 51447); and
- Risk Assessment - GDF Suez Mine Fire Break 27th February 2015 (Paradigm Doc ID: 50978).

161 On rehabilitated batters where exposed coal has been covered, the fire risk is managed in an equivalent fashion as any other grassed areas surrounding the Mine. One of the main control measures to manage fire risk are the management of vegetation (fuel) levels via GDFSAE's slashing program conducted in preparation for high risk fire periods, the maintenance of fire breaks around the Mine, and the availability of on-site fire suppression equipment.

Sequence of progressive rehabilitation works

162 As operational requirements change throughout the life of the Mine, it is possible that certain areas which have been identified for progressive rehabilitation works under the Work Plan Variation, may not be available for rehabilitation at the nominated time. For example, a waste dump which is proposed to be rehabilitated, will not be available for rehabilitation if it is still being utilised, and is essential in supporting the Mine's ongoing operations, Conversely, where mining operations are finalised ahead of schedule in a particular area of the Mine, the area may become available for earlier progressive rehabilitation works.

163 The Work Plan Variation has been prepared in a flexible manner – i.e. it identifies a range of areas of the Mine to be progressively rehabilitated over a 5 -10 year period, as each mining block is developed. This approach enables GDFSAE to sequence the relevant works in accordance with its operational requirements.

164 If, in the future, GDFSAE formed the view that it was not practicable having regard to operational requirements to rehabilitate a certain area of the Mine in which works had been proposed to be undertaken under the Work Plan Variation, GDFSAE would take the approach of identifying an alternative land area elsewhere in the Mine which is capable of having rehabilitation works undertaken upon it. GDFSAE would liaise with DEDJTR officers in relation to the revised proposed sequence of rehabilitation, and to the extent necessary,

seek approval from DEDJTR of a Work Plan variation.

Final rehabilitation works

165 On the basis of my own knowledge, enquiries, and review of the available technical documentation for the Mine, the key matters which I consider may pose particular challenges with respect to the final mine rehabilitation works to be undertaken at the Mine in accordance with the Work Plan Variation, are as follows:

(a) water supply and rate of filling;

(b) water quality within the lake; and

(c) management of the stability of the Mine floor / batters.

166 In addition, I appreciate that fire risk management throughout the final rehabilitation process is an issue of particular interest to the Board, and on this basis, I also address this issue below.

167 GDFSAE currently has work and studies underway in order to further investigate, better understand, appropriately plan for and proactively manage each of the matters listed above.

168 Whilst the nominated matters are of significant technical complexity, with proactive planning, continued co-ordination between the Latrobe Valley mines, and input from suitably qualified technical specialists, I am confident that these issues can be adequately managed. This is particularly the case following my recent trip to Germany (discussed further in paragraphs 238 – 242 below), in which I observed several successful examples of rehabilitated mines, in which similar issues have been successfully managed and a stable final landform achieved.

Water supply and rate of filling

169 As noted above, over time, the M1 and M2 aquifer levels have been lowered via aquifer depressurisation in order to facilitate the mining operations.

170 So as to ensure the long term stability of the rehabilitated landscape at the Mine (without, for example, a requirement to indefinitely undertake aquifer depressurisation), these aquifers will need to be allowed to recover and reach natural regional equilibrium.

171 As the M1 and M2 aquifer levels recover, the base of the Mine will flood.

172 In order to maintain the stability of the batters of the Mine and prevent heave in the floor of the Mine, the M1 and M2 aquifer levels need to be actively managed and continually monitored during the filling process via an ongoing dewatering regime.

173 After a period of time, there will be sufficient weight in the floor of the Mine from the volume of water in the pit lake (and from the internally sourced overburden that has been dumped on the floor of the Mine), to counteract hydrostatic pressures within the M1 and M2 aquifers. This point is referred to as the point at which ‘weight balance’ is achieved.

174 The time that it will take to fill the lake to the point of reaching weight balance, is ultimately dependent upon the sources and volumes and water being drawn upon.

175 Potential means of filling the lake within the pit of the Mine which have been identified in approved rehabilitation plans, approval documents and studies to date as being potentially feasible (subject to environmental impacts being further assessed, and relevant approvals being obtained), are as follows:

(a) continuing to depressurise the M1 and M2 aquifers, and discharging the relevant waters into the base of the Mine to assist in the rate of filling;

(b) redirecting part of the Power Station’s water entitlements (14ML/ year) into the base of the Mine, subject to a change in use being permitted by Gippsland Water; and

(c) discharging the water from the Hazelwood Cooling Pond into the base of the Mine, and subsequently redirecting rainfall within the Hazelwood Cooling Pond catchment into the base of the Mine.

176 From a regional hydrological perspective, a further option is to divert part of the flows within the Morwell River into the floor of the Mine.

177 In 2015, GHD was retained by GDFSAE in order to further assess ground (aquifer) and surface water issues associated with the final rehabilitation of the Mine, and in particular:

(a) to predict post-Mine closure aquifer depressurisation requirements from the perspective of maintaining Mine floor stability, and taking into account regional factors impacting upon aquifer levels (including the other Latrobe Valley mines, and oil and gas operations in the Bass Strait); and

(b) to predict the rate at which the future lake within the Mine void will fill, under the following alternative water supply scenarios:

(i) Scenario 1: no external sources of water other than rainfall and groundwater seepage into the mine pit void (from the recovery of the M1 and M2 aquifers);

(ii) Scenario 2: rainwater recharge, groundwater seepage and groundwater pumping at 9,160 ML/yr for two years (2033 – 2034), and 6,465 ML/yr for four years (2035 - 2038) post mining;

(iii) Scenario 3: rainwater recharge, groundwater seepage and groundwater pumping at 9,160 ML/yr for two years (2033 – 2034), and 6,465 ML/yr for four years (2035 - 2038) post mining and 25GL of water from the Hazelwood Pondage. The rate of transfer was based on the installed pump capacity of 11 pumps with a capacity of 350 L/s. Timing was assumed to be on mine closure;

(iv) Scenario 4: the same as scenario 3 (described above), except with the addition of annual discharge of catchment runoff from the Hazelwood Pondage into the Mine void. The historic annual average catchment runoff volume of 8,383 ML/yr was estimated from the long-term water balance for the Hazelwood Cooling Pond over the period 1900 to 2012 (GHD, 2013). The rate of transfer was limited to the installed pump capacity of 11 pumps with a capacity of 350L/s; and

(v) Scenario 5: the same as Scenario 4 (described above), however, discharge from the Hazelwood Cooling Pond catchment runoff ceased after the water level in the Mine Void reaches the stable level of -20 mAHD.

178 A copy of the GHD report entitled *Hazelwood Groundwater Modelling Report* dated September 2015 is at **Annexure 14**.

179 It is important to note that none of the scenarios which were modelled by GHD drew upon Hazelwood's full water entitlements - namely, an ability to extract groundwater at 22,892 ML/year, and to draw upon the additional 14GL/ annum supply of water to the Power Station under the Water Services Agreement. In other words, the GHD study is highly conservative.

180 Nevertheless, the results of the modelling undertaken by GHD with respect to scenarios 4 and 5 above indicate that the lake within the Mine void is capable of filling to the point at which initial weight balance is achieved, within a period of 7 years (c.f. 160 to 200 years for scenarios 2 and 3).

181 On the basis of the GHD study, therefore, water supply is considered unlikely to be an issue with respect to the final rehabilitation model for the Mine.

182 The GHD study has identified areas requiring further analysis, which GDFSAE is intending to progress.

Water quality in lake

183 One of the issues which is acknowledged by GDFSAE as requiring further investigation and analysis (particularly once the proposed sources of water for the future lake within the Mine are confirmed in consultation with relevant regulators), is the potential quality of the future water in the lake, having particular regard to:

(a) the proposed future uses, and intended environmental values of the lake;

(b) the potential for mixing of water sources (e.g. aquifer and surface water);

(c) the materials within the Mine void that will be flooded, e.g. exposed coal;

(d) potential future hydrological linkages between the pit lake and external waterways (upstream and downstream);

(e) potential future hydrological linkages between the pit lake and groundwater; and

(f) the lower profile of the pit lake relative to surrounding lands, and the potential for it to receive a high volume of sediment (including as a by-product of the batter rehabilitation works), which in the absence of a 'flushing' mechanism, may collect within the lake.

184 From a recent tour that I conducted of rehabilitated coal mines in Germany, and discussions with relevant Mine managers and government officials, I observed that water quality issues are critical in the design of a lake within a mine void. One means that I observed that was adopted to address the issue of water quality, was for a mine void to be completely flooded and connected with an adjacent river, such that all water in the river flows through the lake. This has the result that:

(a) the mine lake is continually 'flushed' – assisting with water quality, oxygenation, etc; and

(b) the mine lake is capable of performing an environmental function, by way of removing sediment and debris from the river.

185 In an Australian context, a design of this nature could also have water security benefits during time of drought (e.g. water could be released to downstream users as required), and flood storage retention capacity.

186 To date, only very preliminary studies of potential water quality within the future Mine lake have been undertaken. These studies have considered the effects of leaching coal, overburden and dense-phase ash, and shown water quality in the mine lake will meet relevant guidelines for recreational use, if that were desirable, assuming the level of RL-22 m is adequate for stability reasons and the coal seams and clay interseam layer remain intact (see EES Part 1, page 8-19 (copy at **Annexure 15**)).

187 As noted above, water quality has been identified by GDFSAE as a priority area for analysis.

Management of floor / batter stability during flooding process

188 A critical issue in implementing the final rehabilitation concept for the Mine, is managing batter and floor stability during the period in which the Mine is being flooded to form a lake (including so as to minimise regional land movements and impacts on surrounding infrastructure, and environmental impacts).

189 As outlined in Work Plan Variation, and the high level geotechnical studies conducted in the context of the 2004 EES concerning the Phase 2 West Field development of the Mine (see EES Part 1, page 8-19), stability is to be primarily maintained by way of:

(a) an ongoing aquifer depressurisation regime, until the point of weight balance is achieved; and

(b) in the case of the floor of the Mine –

(i) the weight of the water within the lake; an

(ii) placement of *internally sourced* overburden in specified areas of the Mine.

190 Practically speaking, internally sourced overburden will be placed in strategic locations throughout the Mine where additional weight support is required, or where buttressing / toe support of batters is necessary, in order to ensure batter stability at the time that the open cut pit is flooded.

191 In other words, it is not envisaged under the approved rehabilitation plan, and relevant studies conducted to date, that significant volumes of externally sourced overburden will need to be transported into and placed within the Mine in order to provide additional weight and assist in forming a stable landform.

192 In mid-2015, GDFSAE retained GHD to undertake some preliminary modelling of potential factors of safety in various sections of the Mine floor and batters, throughout the lake flooding process. This study is presently ongoing.

193 The aim of this modelling is to identify batters within the Mine which may require additional support during the lake flooding process, e.g. by way of the placement of overburden at the toe of the batter, to provide additional toe support or buttressing, so as to prevent movement and instability.

194 By identifying these requirements more than a decade out from the planned time of closure, the necessary overburden dumping and toe support construction can scheduled and completed in a cost effective manner during the Mine's operational cycle.

195 GDFSAE proposes to monitor and manage geotechnical stability during the Mine flooding process in accordance with the detailed procedures for monitoring geotechnical conditions in all areas of the Mine, outlined in the GCMP. The GCMP contains detailed procedures for the monitoring and management of batters, taking into account a range of factors relevant to risk, and consequences of risk, such as:

(a) personnel safety;

(b) public safety;

(c) commercial loss;

(d) environment;

(e) image and reputation;

(f) GDFSAE asset integrity; and

(g) third party assets.

(10) Provide details of whether there have been any risk assessments conducted with respect to fire hazards in relation to the rehabilitation undertaken to date or proposed to be done, including progressive rehabilitation.

196 Since the time of the first 2014 Hazelwood Mine Fire Inquiry, Hazelwood has procured several risk assessments with respect to fire risks in a range of areas within the Mine Area, including worked out batters (with exposed coal), operational areas, and rehabilitated areas / other vegetated land within the Mining Licence Area.

197 The risk assessments include:

(a) GHD (April 2015) – *GDF-SUEZ Hazelwood – Hazelwood Mine Fire Preparedness Support Risk Assessment* (copy enclosed at **Annexure 16**); and

(b) GHD (July 2015) – Report for Energy Australia Yallourn, GDF SUEZ Hazelwood and AGL Loy Yang - *Latrobe Valley Mine Fire Risk Assessment Workshop Summary Report* (copy at **Annexure 17**).

198 These risk assessments have considered the efficacy of a wide range of fire preparedness and response measures at the Mine (and other Latrobe Valley mines), including:

(a) fixed fire services infrastructure (the Mine's reticulated fire services system with hydrants and sprays);

(b) mobile fire services infrastructure (e.g. 30,000L tankers, water carts, ex CFA tankers);

(c) fire prevention and response policies and procedures (e.g. systems of 'hot works permits', fire preparedness plans, pre-established Emergency Command structures, hot spot monitoring, annual fire training);

(d) integration with external emergency services agencies; and

(e) rehabilitation of exposed coal surfaces, where practicable.

199 New mining licence condition 1A imposed on GDFSAE in January 2015 requires GDFSAE to undertake comprehensive risk assessments with respect to the Mine, including as regards fire, geotechnical and hydrogeological risks, water risks (pollution), air risks (fugitive dust and noise) and the risk of criminal acts (including terrorism).

200 A revised Risk Assessment and Management Plan (**"RAMP"**) for the Mine was submitted to DEDJTR by GDFSAE in November 2015 in accordance with condition 1A of the Mining Licence, a copy of which is at **Confidential Annexure 4**. The RAMP was produced with input from a range of independent experts from external consultancies GHD and Coffey, and representatives of the CFA and Victoria Police.

Fire risks associated with progressive rehabilitation works

201 In the case of fire risks which arise during the course of progressive rehabilitation works within the Mine, all major earthworks projects within the Mine (including rehabilitation works) are subject to operational risk assessments, which involve consideration of the risk of fire. Suitable means for managing fire risks are determined on a case to case basis, in reference to a range of operational factors, including:

(a) the location of the works;

(b) the time of year at which the works are being conducted;

(c) any hazardous or flammable materials in the vicinity of the works (e.g. exposed coal, vegetation, other fuels);

(d) the extent to which the area is to be manned throughout the course of the works, including by a suitably qualified "Mine Fireman" pursuant to a hot works permit;

(e) potential ignition sources (e.g. earthmoving machinery); and

(f) proximate fire service infrastructure (e.g. the reticulated fire service system and related hydrants and sprays).

202 Progressive rehabilitation works are also undertaken in accordance with GDFSAE Hazelwood Mine's standard risk management policies and procedures, including:

(a) the Safety Management System for the Mine under the *Occupational Health and Safety Act 2004* (Vic), developed in accordance with ISO 31000:2009, and which includes risk control measures to manage the Major Mining Hazard of Mine Fire;

(b) the GCMP; and

(c) Hazelwood's fire and emergency policies and procedures which have been substantially revised since the time of the 2014 Hazelwood Mine Fire Inquiry, and include:

(i) *Mine Fire Service Policy and Code of Practice* (Paradigm Doc ID: 2589);

(ii) *Fire Instructions – Mine* (Paradigm Doc ID: 2758);

(iii) *Emergency Response Plan – Mine* (Paradigm Doc ID: 2895);

(iv) *Electrical Safety Bushfire Mitigation Plan* (Paradigm Doc ID: 44944).

(v) *Specifications for Grass Slashing (Paradigm Doc ID: 17240) and Mulch Mowing* (Paradigm Doc ID: 17241);

(vi) *Guidelines For Season Specific Fire Readiness and Mitigation Planning* (Paradigm Doc ID: 36546); and

(vii) *Checklist For Season Specific Fire Readiness and Mitigation Planning* (Paradigm Doc ID: 36549).

Fire risks associated with final rehabilitation works

203 As regards potential fire risks during the course of the final rehabilitation works, the following issues, in particular, are acknowledged by GDFSAE as requiring further consideration, risk assessment and management:

(a) when the Mine is flooded, the fire service pumps positioned on the floor of the Mine, servicing the reticulated fire service network, will need to be removed and relocated, in order to remain in service as the water level within the Mine rises over time;

(b) certain batters in the lower part of the Mine are not proposed to be reshaped / have overburden placed over them, as they will be covered by the future water level of the pit lake. However, the filling of the lake will take a period of several years to achieve, leading to a requirement for fire protection infrastructure and measures in areas of exposed coal in the meantime; and

(c) in order for Mine batters to be rehabilitated above the future water line of the proposed lake, reticulated fire service pipework on certain levels of the Mine will need to be removed in order to provide access for earthmoving equipment. This will leave an area of exposed coal during the course of the reshaping works, which does not have proximate fixed fire service infrastructure.

204 Potential means of managing these risks throughout the final rehabilitation process, identified by GDFSAE to date, are as follows:

(a) repositioning the fire service pumps on floating pontoons, which can rise with the level of the pit lake throughout the filling process, and remain in operation;

(b) on the Mine levels that will be flooded over time – leaving fire service pipework in situ, and removing it progressively as the water level rises; and

(c) limiting the size of the areas that are the subject of batter rehabilitation works at any one time, or otherwise positioning mobile fire service infrastructure into the location of the works.

(11) Provide details of the current and past rehabilitation liability assessments for the mine together with any variations to those assessments.

Estimated rehabilitation liability

205 Enclosed at **Annexure 18** is a copy of Hazelwood's Annual Activity and Expenditure Return form for 2014/2015, submitted in accordance with Regulation 35 and Schedule 20 of the

Mineral Resources (Sustainable Development) (Mineral Industries) Regulations 2013 (Vic).

206 I understand that copies of Hazelwood's Annual Activity and Expenditure Return forms for 2013/2014 and 2012/13 were provided to the Board on 19 June 2015 in response to a Notice to Produce.

207 Pursuant to Schedule 20, item 9(e), the Annual Activity and Expenditure Return form for 2014/2015 includes a report of Hazelwood's estimated rehabilitation liability for the Mine Area, in the amount of $73.4 million.

208 The detailed calculations underpinning this rehabilitation liability assessment are enclosed at **Confidential Annexure 5**. These costings estimate the future rehabilitation works which will required to be undertaken within the Mine Area, having regard to:

(a) the current areas of the Mine;

(b) progressive rehabilitation conducted within the Mine to date;

(c) future mining operations to be conducted within the Mine;

(d) future progressive rehabilitation works to be undertaken within the ;

(e) the rehabilitation methods to be utilised at the end of life of the Mine; and

(f) reasonable estimates of applicable rates for materials and labour.

209 These costings constitute the most up-to-date and comprehensive costings with respect to the rehabilitation of the Mine Area.

Draft URS costings

210 On 14 October 2015, GDFSAE was provided with a draft rehabilitation cost estimate prepared by URS consultants in the context of the DEDJTR Rehabilitation Bond Review Project.

211 URS / DEDJTR have sought further data from GDFSAE for the purposes of refining these draft costings - for example, regarding the area of certain sections of the Mine, material quantities, and applicable rates for a range of materials. GDFSAE has recently provided this further data to DEDJTR.

212 At a meeting with DEDJTR and URS on 13 October 2015, GDFSAE provided feedback on aspects of the methodology which it understands has been adopted by URS in preparing the draft costings, namely, that the draft costings do not take account of the progressive rehabilitation to be undertaken throughout the remaining life of the Mine under the Work Plan Variation, or of the methods to be adopted by the Mine in conducting final rehabilitation. As noted in paragraphs 134 and 219 - 222 above, these works are coordinated with the Mine's operations, in order to achieve cost efficiencies. GDFSAE understands that this feedback will be further considered by URS / DEDJTR.

213 Other than the meeting on 13 October 2015, and the request for data, GDFSAE has not had any involvement in URS's review.

(12) Provide details of any assessments obtained or undertaken by the mines in relation to the likely or estimated costs of the rehabilitation planned (including progressive rehabilitation).

High-level GHD costings (2012)

214 A high level estimate of the potential costs associated with the rehabilitation of the Mine was prepared for HPC / HPP in January 2012, by consultants GHD.

215 The costings prepared by GHD are set out in **Confidential Annexure 6**.

216 I was not employed by GDFSAE at the time that these costings were prepared, and was not involved in their preparation. I understand, however, that they were prepared in connection with the discussions that were occurring at that time between HPP / HPC and the Australian Government with respect to the proposed 'Contracts for Closure' policy concerning certain electricity generators within the National Electricity Market, including Hazelwood. The Australian Government abandoned the Contracts for Closure policy in September 2012.

217 The costings are very high level, and appear to be incomplete - particularly as regards the material volumes and rate assumptions for batter and re-profiling works (which comprise a very substantial proportion of the total estimated cost). An important assumption that appears to have been made by GHD in preparing these costings is that rehabilitation of batters is to be undertaken with bulldozers pushing down onto benches the coal which is removed from the batter to form the final profile, with that coal collected and transported away by road in a "truck and shovel" operation. An assumption has been made that all of the coal is to be transported for a distance of 3 km.

218 Under the Mine's current operational and rehabilitation plans, it is likely that only the East Field Northern Batters will require rehabilitation to be undertaken via a truck and shovel operation (and require road transportation of materials). The East Field Northern Batters are blocks 1 – 4 of 26 in the plan enclosed at **Annexure 19**.

219 The remaining area of batters within the Mine (blocks 5 – 26) are planned to be rehabilitated to their final profile after the time that the Mine's operations have moved into the North Field (in 2016 onwards). This will mean that significant mining infrastructure will have been moved into that area, including bucket wheel excavators and conveyors.

220 Rehabilitation of blocks 5 – 26 will be conducted in a "retreat mining" operation, whereby working in a counter clockwise direction from Block 5 through to Block 26, Mine batters will be rehabilitated into their final profile, and mining infrastructure progressively removed.

221 These rehabilitation works will be able to utilise bucket wheel excavator and fixed conveyor systems in the North, West and South West Fields which will provide a much more cost effective means of transporting the excess coal removed from the re-profiled final batters, to the Power Station or other point of sale (e.g. Energy Brix), together with other materials.

222 It is common mining practice to account for rehabilitation activities within the detailed operational plans for the development of a mine, so as to identify and capitalise on efficiencies of this nature. GDFSAE's Hazelwood mine plan has been prepared in accordance with this standard practice, and takes account of both:

(a) the progressive rehabilitation to be cost-effectively completed over the life of the Mine under the Work Plan Variation as a component of the Mine's operations; and

(b) cost effective means of conducting final rehabilitation, having regard to available infrastructure.

223 Given the differences in methodology, and the different purposes for which the GHD and GDFSAE costings were prepared, it is difficult to make sensible comparisons between them.

224 In my view, GDFSAE's costings for the future rehabilitation of the Mine contained within Confidential Annexure 5 more accurately reflect the rehabilitation liability for the Mine, in that they are prepared in reference to GDFSAE's own mining and rehabilitation methods.

Rehabilitation cost estimates – assumptions and methodology

225 As a general comment, I consider that it is important for the Board to bear in mind that the key drivers behind any mine rehabilitation cost estimates, are the methodology followed in the preparation of the cost estimate, and the underlying assumptions with respect to the necessary works.

226 Significantly different rehabilitation liability figures can be derived, depending upon the assumptions that are made with respect to:

(a) rehabilitation timing;

(b) rehabilitation methods, equipment, labour and supervision;

(c) final batter profile;

(d) necessary volumes of / means of sourcing and transporting overburden;

(e) geotechnical and hydrogeological conditions;

(f) the factors of safety to be targeted in conducting the works;

(g) fill time for the future lake, and final depth;

(h) requirements for ongoing aquifer pumping;

(i) suitable means of managing fire risks;

(j) the 'confidence level' to which costs are estimated; and

(k) whether account is taken of the potential for unintended adverse outcomes of the rehabilitation works (e.g. batter failure), and costs any necessary works in response.

227 On this basis, sound methodology and assumptions are critical in producing reliable rehabilitation cost estimates – and regard must be had to these issues when interpreting any cost estimates.

Further WPV Application

228 As noted above GDFSAE intends to submit a Further WPV Application in early 2016, which amongst other things, varies the means by which batter rehabilitation works are to be undertaken, from the current method of "truck and shovel", to a method known as "dozer push", whereby a smaller volume of coal is removed from the batter in order to achieve the desired profile, and overburden from above the coal is utilised as a covering material (with the result that a smaller volume of additional overburden needs to be brought onto the location of the works).

229 This method is expected to be more cost effective, and is capable of being implemented in a shorter timeframe, enabling the acceleration of progressive rehabilitation works in certain parts of the Mine, during its operational phase.

230 Upon any future approval of the Further WPV Application, GDFSAE proposes to revise its rehabilitation liability estimate to take account of the revised rehabilitation methods and schedule.

Other matters that may assist the Board in its inquiries in relation to Terms of Reference 8 – 10

Implementation by GDFSAE of recommendations from the 2014 Hazelwood Mine Fire Inquiry

231 Since the time of the first Hazelwood Mine Fire Inquiry, GDFSAE has invested significant resources in implementing the extensive affirmations of GDFSAE, and relevant recommendations of the *2014 Hazelwood Mine Fire Inquiry Report*.

232 Key achievements in this regard include:

(a) reviewing and updating Hazelwood's fire related plans and policies in order to provide for:

(i) pre-established emergency command structures on Extreme Fire Danger days;

(ii) more personnel and contractors rostered on for dedicated fire protection duties

on Severe and Extreme Fire Danger Days; and

(iii) systems for progressively wetting down operating and worked out areas of the Mine on Severe and Extreme Fire Danger days to reduce fire risk;

(b) delivering enhanced training to Hazelwood's emergency command personnel, including onsite emergency simulation exercises, with the involvement of external emergency services agencies;

(c) improved communication networks with the CFA and other emergency service agencies;

(d) increasing the reliability of power supply to the mine via a range of engineering works including the duplication of certain electrical lines, installation of additional switching capacity, and the replacement of wooden poles;

(e) upgrading signage within the mine to assist in orientating external emergency services agencies;

(f) installing two portable trailer-mounted Forward Looking Infra-red Radar ("**FLIR"**) cameras within the Mine to help identify any hot-spots; and

(g) completing a further 10 hectares of mine rehabilitation works on the mine's Northern Batters.

233 These activities are relevant from the perspective of fire risk management, and residual fire risk, at the Mine.

234 The effectiveness of Hazelwood's revised fire and emergency policies and procedures was demonstrated on 6 October 2015, when Hazelwood faced a day of unseasonably high fire danger. Leading up to that day, Hazelwood personnel had been working with CFA District 27 operations to monitor and suppress a hotspot which had been identified within the Mine, as part of routine operations.

235 The forecast for high temperatures, coupled with a cool change involving high winds, triggered a precautionary management process in and around the mine, including in the hot spot area, pursuant to an internal designation of Extreme Fire Danger.

236 Ongoing wetting down of the area, coupled with mobilisation of appropriate fire suppression equipment and additional resources, including a manned Emergency Command Centre, ensured that the day passed without incident.

237 The implementation of the extensive affirmations of GDF SUEZ Australian Energy, and relevant recommendations of the 2014 Hazelwood Mine Fire Inquiry Report has been assessed by the Mine Fire Implementation Monitor, Mr Neil Comrie AO. GDFSAE understands that Mr Comrie's report was provided to the State of Victoria (through the Secretary of the Department of Premier and Cabinet) on 30 October 2015.

German study tour – Mine rehabilitation

238 In September 2015, I undertook a tour of a number of lignite (brown coal) mines in Germany, which were in the process of being progressively or finally rehabilitated by mine operators and/or responsible government agencies.

239 The mines in question were Garzweiler mine, Hambach mine, Inden mine, Culmitzsch tailings pond, Lichtenberg mine, Mucheln mine (now Lake Geiseltal) and the Profen mine.

240 Each of these mines were at varying points on the rehabilitation pathway, however in certain cases, they were nearing full rehabilitation and currently being used for a range of purposes including boating, parks, recreation, forestry, cropping, housing, wineries and restaurants.

241 My trip was facilitated by RWE Technology International GmbH, and throughout the course of my trip, I met with senior managers of the mines, and government agency representatives.

242 My key observations and learnings from my time in Germany, which are applicable to the rehabilitation of the Mine (and the Latrobe Valley coal mines more generally), are as follows:

(a) while traditionally, the Latrobe Valley mines were perceived within the local mining industry as being unique given the geology of the Latrobe Valley, local climatic and geotechnical conditions, and the size of the mining operations, there are mines in Germany that have very similar features, so similar rehabilitation techniques and challenges may apply;

(b) over the past 25 - 30 years, significant resources have been applied within Germany to mine rehabilitation, across hundreds of mines. As a result, there are many case studies, success stories and learnings that are available to be drawn upon by the Latrobe Valley mine operators in further planning and implementing final rehabilitation works. Further, there is a large pool of German mine operators, engineers, consultants and government officials that have highly valuable skills and experience;

(c) the starting point for mine rehabilitation planning in Germany is determining the physical features of a safe and stable design for the remnant mine void (including any requirement for a full or partial lake, due to aquifer/groundwater conditions). Potential future land uses, and community aspirations in relation to future land uses, are then considered through the prism of the necessary physical features of the mine;

(d) as is the case in the planning final rehabilitation of the Latrobe Valley mines, in Germany, the key driving factors in determining the final landform of a rehabilitated mine include:

(i) the size (depth and perimeter) of the remnant void left from the mining operations (which is itself, largely a by-product of the strip ratio between coal and overburden);

(ii) any requirement for an in-pit lake, in order to balance hydrostatic pressures once aquifer rebound from the cessation of any dewatering operations is taken into account;

(iii) safe and stable batter profiles; and

(iv) necessary hydrogeological and geotechnical equipment (e.g. horizontal bores to manage groundwater levels in batters ('pit slope dewatering')).

(e) the final rehabilitation concept for Hazelwood, i.e. of a partial lake within the remnant mine void, with 'sloped down' batters surrounding the lake, is a common model for successful mine rehabilitation in Germany (albeit, in certain cases, with a coal seam which is not as deep);

(f) I perceived that there was a strong focus upon identifying, and drawing upon, all available regional surface water (e.g. in proximate rivers and other waterways), in order to fill the mine pit void as quickly and completely as possible. I understand that it is not uncommon for rivers to be entirely diverted into mines, or for major earth or civil engineering works to be conducted in the catchment surrounding a mine, in order for rainwater runoff to be diverted into the mine;

(g) the rapid filling of the mine void with water to form a lake is seen as an effective means of managing geotechnical stability throughout the final rehabilitation process; and

(h) there is a strong focus on educating and involving local communities with respect to the planned physical features of a mine – both throughout its operational phase, and following final rehabilitation.

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JAMES ANTHONY FAITHFUL

Date: