INDIAN OCEAN

PORT HEDLAND

RIDLEY MINES

ORD RANGES MINES

F13 NORTH MINE

GREAT NORTHERN HIGHWAY

GOLDSWORTHY RAILWAY LINE

MT GOLDSWORTHY MINE

MIDNIGHT RIDGE MINE

NIMINGARRA MINES

SUNRISE HILL MINES

SHAY GAP MINES

HEMATITE HILL MINE

CATTLE GORGE MINE

CUNDALINE RIDGE MINE

YARRIE MINES

CALLAWA MINE

Yarrie Mine

NORTH WEST COASTAL HIGHWAY

MARBLE BAR ROAD

GREAT NORTHERN HIGHWAY

MT NEWMAN RAILWAY LINE

MARBLE BAR

NULLAGINE

Yandi/BHPB Mine

Mining Area C Mine

Orebody 23 & 25 Mines

Mt Whaleback Mine

Jimblebar Mine

NEWMAN

715,000

815,000

7,740,000

7,640,000

7,540,000

7,440,000

0 10 20 30 40 50

Kilometres

Map Grid: MGA94 Zone 50
Datum: GDA 94

Legend

- BHPBIO Closed Mine
- BHPBIO Operational Mine
- Major Iron Ore Mine
- Railway
- Major Road
- Minor Road

LOCALITY

NO	DATE	REVISION	DES BY	DRN BY	CHK BY	APPD DES/ CON	BHPBIO	DATE
A	24/04 2008	Initial issue to client		MWE	IRJ			

By approving revisions, the Designer/Contractor confirms that the Design Changes are in accordance with SEP 58

DRAWING STATUS APPROVAL

	SIGNED	DATE	REV
PRELIMINARY ONLY			
QUOTATION ONLY			
CONSTRUCTION MAY PROCEED			
CONSTRUCTION MAY PROCEED EXCEPT AS NOTED			
REVISE AND RESUBMIT			

BHPBIO TO COMPLETE

REVIEWER TO COMPLETE

THIS DRAWING HAS BEEN REVIEWED FOR GENERAL COMPLIANCE WITH THE REQUIREMENTS OF THE CONTRACT AND IS ISSUED FOR STATUS APPROVAL

COMPANY	
NAME	
SIGNED	
DATE	

DESIGNER/CONTRACTOR TO COMPLETE

COMPANY	SKM
DESIGNED BY	
DRAWN BY	MWE
CHECKED BY	IRJ
DESIGN & SAFETY APPROVED BY	
DATE APPROVED	

SCALE

REFER SEP 40 FOR PREPARATION OF DRAWINGS

A1

DRG. NO. WV03352 ■ G ■ 052/A

MAP OF GOLDSWORTHY RAILWAY LINE PILBARA

BHP Billiton Iron Ore Pty Ltd

A.B.N. 46 008 700 981

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COMMONWEALTH OF AUSTRALIA

Trade Practices Act 1974

IN THE AUSTRALIAN COMPETITION TRIBUNAL

File No 5 of 2006

RE: **APPLICATION FOR REVIEW OF THE DEEMED DECISION BY THE COMMONWEALTH TREASURER OF 23 MAY 2006 UNDER SECTION 44H(9) OF THE TRADE PRACTICES ACT 1974 (CTH) IN RELATION TO THE APPLICATION FOR DECLARATION OF SERVICES PROVIDED BY THE MOUNT NEWMAN RAILWAY LINE**

BY: **FORTESCUE METALS GROUP LIMITED**

Applicant

AFFIDAVIT OF MICHAEL VAN DE WORP

AFFIRMED ON 14 DECEMBER 2007

Filed on behalf of BHP Billiton Iron Ore Pty Ltd and BHP Billiton Minerals Pty Ltd by:
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On 14 December 2007, I, **MICHAEL VAN DE WORP** of Wilson Street, Port Hedland, in the State of Western Australia, solemnly and sincerely declare and affirm:

1. I am the Manager of Rail Operations for BHP Billiton Iron Ore's (**BHPBIO**) Pilbara operations. I was appointed to this position on 29 October 2006. In this role I am responsible for, or engaged in:

   (a) the daily operation of BHPBIO's rail system which involves delivery of empty trains to the mines and loaded trains to the port as required within BHPBIO's overall business supply chain. This incorporates track maintenance, signalling, train control, coordination of work crews (train controllers, port, yard and mainline workers including train drivers and maintenance crew) and maintenance of locomotives and rolling stock.

   (b) short term, medium term and strategic long term planning for rail operations;

   (c) the development of new operating philosophies;

   (d) the design and implementation of operating systems such as the Rail Transport System (**RTS**) (which is the train control system that allows BHPBIO to remotely control train movements and allows drivers on the trains to operate safely) and the Rail Operating System (**ROS**) (which gathers and reports railroad performance information and will replace the existing Rail Road Operating System (**RROPS**)) for the rail operations as BHPBIO's rail systems expands and develops. The RTS and ROS will ultimately allow BHPBIO, should it so decide, to control trains remotely (without the need for drivers); and

   (e) decisions as to capital expenditure on systems, infrastructure, locomotives and rolling stock.

2. Previously, I was in charge of operations and maintenance of BHPBIO's operations at Finucane Island.

3. I have worked for BHPBIO for approximately 12 years in a number of roles. On commencing my employment with BHPBIO, I was originally involved in the installation of the automated train collision avoidance system, known as Automatic Train Protection (**ATP**), on BHPBIO's locomotives. I subsequently was appointed as Superintendent of Signals and Communications in charge of the technical aspects of signalling communications and control.

4. Following this I became Rail Operations Superintendent when rail operations were combined with the Signals and Communications department. While in this role I oversaw the implementation of operation of trains by a single driver, replacing the previous system which involved having two drivers per train. Fundamental to this was the introduction of the ATP system and the adoption of a new system on the Goldsworthy line which gave similar protections without the need for physical

signals. During this time I also took a leading role in changing the industrial relations arrangements for train drivers from award based to individual workplace agreements (referred to as WPA) for the majority of the drivers. This resulted in greater engagement of the train driver workforce and greater flexibility and productivity for BHPBIO.

5. In 1999 I was appointed Manager Technical for Railroad, dealing with matters such as train automation and the delivery of the rail research program, before moving to a technical managerial role in Public Affairs and Environment, engaged in managing dust and environmental issues. As Manager for Public Affairs and Environment, I oversaw the development and implementation of the "Five Year Dust Management Program". Annexed to this affidavit and marked "**VDW-1**" is a description of this program. I am currently BHPBIO's Registered Manager for Railroad (a statutory position under the *Mines Safety and Inspection Act 1994* (WA)).

6. Through my employment with BHPBIO I have gained extensive experience in BHPBIO's rail operations. The matters dealt with in this affidavit are based on the knowledge and experience that I gained through the various positions that I have held with BHPBIO.

7. I was previously employed in a consulting role at ELRAIL based in Brisbane which provided engineering services in relation to electrical rail systems, power and communications. After ELRAIL, I moved to Ampcontrol SWG, where I became general manager. Ampcontrol SWG supplies electrical equipment and systems to the rail and mining industries in Australia and overseas. Following that, I worked for Goninan (based in Newcastle), where I oversaw an international bid for a complete urban rail system for Tehran in Iran. In this role I was also involved in negotiating and delivering various rolling stock contracts in Australia which included locomotives, passenger cars (such as Tangara double-decker suburban carriages, common in Sydney) and ore cars.

8. In addition, I worked for New Zealand Rail whilst qualifying as an electrical engineer at the University of Canterbury, Christchurch, New Zealand. During this time I worked in the major offices of New Zealand Rail, located in Dunedin, Auckland, Christchurch and Wellington on signals and communications. Later I worked in various site offices as a site manager on the major project of electrification of the North Island main trunk railroad. I graduated with a Bachelor of Electrical Engineering (Hons) in 1979 and completed a Masters of Electrical Engineering in 1980.

OVERVIEW

9. In this affidavit I deal with the following train and railroad issues:

   (a) to give some background, I provide a brief outline of BHPBIO's railroad and operations in the Pilbara, before going on to describe BHPBIO's present railroad operations, with reference to aspects such as:

(i) the current operational methodology adopted by BHPBIO;

(ii) the personnel involved in operations;

(iii) train control;

(iv) the specification of the rail used;

(v) maintenance (both in relation to the track, signalling and rolling stock); and

(vi) train failures;

(b) discuss issues relating to railroad planning. In this regard, I explain the planning process and highlight the manner in which railroad operations are integrated with BHPBIO's mining and port operations;

(c) discuss the theoretical capability of the railroad and the practical, sustainable capacity of the railroad. I explain how the integrated nature of rail operations introduces variability into running the railroad and the consequential need for a high degree of operational flexibility in railroad operations to enable BHPBIO to conduct the operations in a manner to best suit overall system performance (which involves meeting the needs of the port and the various mines). I also briefly examine the recent performance of the railroad in relation to its budgeted capacity; and

(d) the impact that third party access may have on the operation of the railroad.

BHPBIO'S RAILROAD IN THE PILBARA

Outline

10. BHPBIO operates two heavy haul railroad lines to Port Hedland in the Pilbara region of Western Australia. With a nominal distance of 1435 mm between the inner sides of the rails, the lines are classified as standard gauge.

11. The first of these rail lines runs approximately 420 km from Whaleback mine in the Newman mining area, traversing the Chichester mountain range before terminating at Nelson Point in Port Hedland (**Newman mainline**). Based on my discussions with other railroad operators that have visited BHPBIO's railroad operations, I believe that the Newman mainline operates some of the heaviest axle loads in the world with targeted average loaded axle loads of between 36 and 37 tonnes. (By comparison, the Alice Springs to Darwin line completed in 2003 operates axle loads of 23 tonnes.)

12. The second rail line runs approximately 203 km from the Yarrie rail head to the east of Port Hedland, to Finucane Island at Port Hedland (**Goldsworthy line**). The Newman mainline and Goldsworthy line intersect with one another at a point approximately 14 km along the Newman mainline, south of Nelson Point in Port Hedland (**the Goldsworthy Junction**). Both railway lines are, for the most part, single lines with spur lines to the various mines. The only double tracked portion of the rail line at this time is on the Newman mainline from just south of Goldsworthy Junction to Nelson Point. The single lines also have small sections of double track called passing tracks which allow for trains moving in opposite directions on the single track to pass one another.

13. Since May 2005, as a result of the phased implementation of BHPBIO's expansion project known as Rapid Growth Project 2 (**RGP2**) and the commencement of operation of a new train unloader at Finucane Island (referred to as car dumper 4), the previous operational separation between the Mt Newman and Goldsworthy lines has fallen away with trains from the Newman mainline running onto the Goldsworthy line at the Goldsworthy Junction to deliver ore to BHPBIO's Finucane Island port facilities. Previously, trains on the Newman mainline only delivered ore to Nelson Point unloading facilities in Port Hedland. In addition, a small quantity of ore from the Goldsworthy mining areas is transported up the Newman mainline to Nelson Point from the Goldsworthy Junction.

14. Inclusive of marshalling yards, branch lines, spurs and loading loops at mining areas, unloading loops and sidings, BHPBIO's train system operates over roughly 1,000 km of track. Annexed and marked "**VDW-2**" is a map showing the location of the rail lines.

15. BHPBIO currently operates a fleet of roughly 90 diesel electric locomotives and 4,000 ore cars of various design on the Newman mainline and Goldsworthy lines. All ore cars used by BHPBIO are configured for use in a train unloader referred to as a car dumper, which clamps the base of the ore car and rotates the entire ore car in order to unload ore.

16. BHPBIO assembles trains by coupling a fixed number of ore cars together and then coupling the ore cars to a set of locomotives (usually two locomotives). Each set of ore cars is referred to as a "rake", with rakes on the Newman mainline generally comprising 106 ore cars. No fixed number of ore cars is used on the Goldsworthy rail line; with a rake varying from 38 to 106 ore cars. More than one rake may be attached to a train, though rakes are always separated by a set of locomotives.

17. This arrangement of locomotives and rakes means that power and braking is distributed throughout the train, instead of initiating only at the front, as would occur if all the locomotives were attached to the front of the train (referred to as "head-end" power). In particular, the tractive effort of the set of locomotives attached to a train is spread over the length of the train (tractive effort describes the ability of the locomotive to apply force to the rail and is determined by adhesion and the torque that the locomotive can apply). The distribution of the locomotives along the length of the train in this

manner also ensures that when the train's brakes are applied, the signal to apply the brakes, which originates from the locomotives simultaneously, is propagated from the sets locomotives spread along the length of the train. This ensures more even distribution of braking force along the length of the train. BHPBIO's trains make use of pneumatic brakes, and the signal to control braking is effected by lowering the air pressure in a pipe which runs the length of the train. This is normally initiated from the locomotives where air is exhausted to lower the air pressure. Each ore car is fitted with a control system which detects the reduced air pressure in this pipe and accordingly applies the ore car's brakes.

18. A loaded rake consisting of 106 ore cars is matched to the average tractive effort generated by two standard locomotives (BHPBIO's present standard locomotive is a General Electric Dash 8) to ensure that the loaded train will still be able to traverse the steepest grade on the line (referred to as the ruling grade) without falling below the minimum speed of 12 km/h, without failing.

19. Locomotives and rakes are coupled together to form trains that are dispatched from Port Hedland to train loadout stations located within the following mining areas operated by BHPBIO:

(a) Newman mining area (including Orebodies 23 and 25, Orebody 18 and Wheelara);

(b) Yandi mining area;

(c) Area C mining area; and

(d) Yarrie and Nimingarra on the Goldsworthy line.

20. Trains to the Newman, Yandi and Area C mining areas travel along the Newman mainline (which has spurs leading to the Yandi and Area C mining areas). Trains to the Goldsworthy mining area run along the Goldsworthy line.

21. In Port Hedland BHPBIO has the following railroad infrastructure at:

(a) Nelson Point BHPBIO has three train unloaders (referred to as **car dumpers**) with three rail loops, marshalling yards, rail support infrastructure such as locomotive refuelling equipment, locomotive and ore car workshops and rail maintenance facilities. In addition, BHPBIO's train control facilities and communication terminals are located in Nelson Point;

(b) Finucane Island, BHPBIO has a train unloader with a rail loop; and

(c) Boodarie siding, on the Goldsworthy line, BHPBIO has infrastructure for refuelling and servicing locomotives.

22. Rail personnel are also stationed at Redmont (roughly midway between Port Hedland and the mining areas on the Newman mainline between the Spring and Garden sidings), Yandi and Newman mining areas. These rail camps are a base for drivers as well as track maintenance staff.

23. BHPBIO has approximately 260 employees in Rail Operations. This number includes over 170 train drivers. Overall, BHPBIO has over 420 employees in Rail Operations and Rail Maintenance.

24. The table below indicates the approximate numbers of train drivers and supervisors at each location.

Table 1: Train Drivers

Location	**BHPBIO employed train drivers**
Newman	Seven drivers/coordinators and one supervisor
Port Hedland	115 drivers
Redmont	48 drivers and four supervisors
Yandi	Two drivers

25. All train movements are managed from the Centralised Traffic Control centre (**CTC**) at Port Hedland. BHPBIO's train control systems (**RTS**) control train movements, ensure safe separation between trains and warn about unsafe conditions.

26. There are three layers to the train control system:

(a) an electronic interlocked signalling system (which prevents two trains from entering the same portion of track) distributed along the track in wayside cabinets (powered by solar technology). This system is failsafe (which is an engineering term describing the fact that any failure will result in the system reverting to a safe condition) and can be manually operated locally from the wayside cabinets if necessary, but is normally operated by the remote control train system in CTC;

(b) a remote train control system which sits on top of the electronic interlocked control system and is composed of specialised computer hardware and digital communications. The remote train control system allows train controllers to remotely monitor and remotely control the signalling and movements of trains and rail vehicles; and

(c) wayside asset protection equipment which monitors passing trains for problems such as overheated wheels and bearings, dragging equipment and wheel impacts, as well as weighing the individual wheels of ore cars and locomotives as they pass (in order to monitor unevenly loaded or overloaded ore cars).

27. These train control systems are supplemented by Automatic Train Protection (**ATP**). ATP is a failsafe microprocessor controlled collision avoidance system which receives information through cab signals sent electrically through the rails (cab signals describe the specific types of signals overlaid on the track circuit which can be decoded by the locomotive and received in the locomotive's cab). ATP is composed of three key elements:

(a) a train location system, which involves the interaction of hardware located on board locomotives and equipment mounted adjacent to the track (referred to as the wayside);

(b) signal detection equipment consisting of hardware located in signalling equipment on the wayside; and

(c) microprocessors on board locomotives which monitor the train's location, speed and braking distance. The microprocessors also monitor whether the train has authority to proceed from the signalling system.

28. ATP continuously monitors each train's speed, direction and location on the Newman mainline or Goldsworthy line on board that train. Radio frequency tags in the track measure train location. ATP takes into account the length, mass, position (and related track gradient) and speed of an individual train and calculates a braking curve for it (which essentially plots the required time and distance to stop, relative to the train's speed). ATP also monitors the permissions that have been given to each individual train from CTC via the inter-locking signal system and uses this information to calculate the target speed and consequent braking distance for the train under operating circumstances and advises the driver of time to act and target speed.

29. If the driver of a particular train fails to respond accurately to a signal to slow down, the ATP system assesses the difference between the required breaking speed curve of the train and the actual braking speed curve. ATP responds by sounding a warning, and if the driver does not respond, ATP applies the brakes. If the driver still does not respond, ATP will take further action to stop the train. The ATP failsafe system has allowed BHPBIO to move from two drivers per train to a system where all trains are controlled by a single driver. If a driver became incapacitated, the train will stop safely.

30. BHPBIO's train control systems and ATP have the result that the incidence of unsafe conditions or events on BHPBIO's railroad is greatly reduced. Though it is unlikely, it is still possible through a combination of errors for dangerous or unsafe incidents to occur.

31. BHPBIO's rail operations operate in harsh conditions:

(a) track temperatures can be as high as 70°C and as low as -3°C;

(b) extremely dry conditions, interspersed with short, but severe, electrical storms and cyclones;

(c) gradients of as much as 0.55% against loaded trains and 1.5% against empty trains (which are extremely steep grades for heavy haul trains); and

(d) train loads with gross train weight of as much as 99,000 tonnes.

32. Over time, BHPBIO has invested considerable resources in researching, developing and refining its rail operations. As a result, BHPBIO has applied advanced technology to a number of different aspects of its rail operations, such as ongoing ore car wheel and bearing monitoring, the use of specific rail and wheel interface profiles and the use of instrumented ore cars which monitor track conditions in real time under actual service axle load conditions. This technology has been integrated with BHPBIO's systems.

Overview of present operational methodology

33. From an operational perspective, BHPBIO's railroad is operated in a highly integrated manner with the other components of BHPBIO's production, processing and logistics operations.

34. Unlike the majority of multi-user railroad operations, BHPBIO's trains do not run to a fixed schedule, but are operated on a flexible basis depending on variable demand for different products at the port, the need to remove ore from mine loading areas, which may have limited capacity to stockpile product, and operational events such as planned track maintenance or the failure of equipment. In other words, trains are directed to the mines by train controllers and logistics schedulers as required to maximise overall system efficiency and meet the demand for products at the port. There is no fixed pattern of total train movement.

35. Because of the importance of pursuing overall system efficiency, that is, getting six different products from eight separate mine loadouts in the correct volumes (and, in the case of blended products, in the correct proportions and correct sequence) to the port for direct shipping, blending or stockpiling, BHPBIO has sought to ensure that its railroad can operate in a manner that provides a large degree of flexibility to cater for variability in mining operations, port operations, ship arrivals, customer requirements and equipment reliability.

36. Accordingly, unlike the majority of railroad operators, BHPBIO has not sought to operate its railroad in a manner that principally seeks to minimise operating costs. Instead, in seeking to maximise production tonnage and take advantage of any additional tonnage that may be produced, BHPBIO's approach has been to prioritise overall system capacity by increasing flexibility rather than prioritise costs in relation to issues such as the availability of railroad personnel, track

maintenance crews and fuel costs. In other words, BHPBIO will on many occasions choose not pursue the most cost effective solution if this would lead to a loss of overall system capacity.

37. BHPBIO's changing operational methodology, and the factors that affect the choice of methodology, are dealt with in greater detail at paragraphs 202 and 203 below.

Train operations

38. Given its volume of rolling stock and locomotives, BHPBIO generally has 24 to 26 trains operating in both directions on the Newman mainline over the course of a 24 hour period (on non-shutdown days). As BHPBIO's rail system has to be responsive to variable demand based on shipping and mining requirements, the number of trains operating over a 24 hour period can vary significantly. There are rarely less than 22 trains or more than 30 trains operating on the Newman mainline over the course of a 24 hour period. Locomotives and rolling stock that are not on the mainline may be located at one of the mine sites, Boodarie siding, in the Nelson Point marshalling yard, or at BHPBIO's maintenance facilities located at Nelson Point.

(The Goldsworthy line is effectively a low volume operation at present with not more than one train operating on a daily basis.)

39. In addition to the trains operating to transport iron ore on the Newman line, BHPBIO also operates fuel trains and service trains (which transport ballast, replacement rail and other maintenance equipment). Fuel and service trains necessarily use pathways and increase the number of train meets on the mainline.

40. To avoid complexity and increase flexibility, BHPBIO also chooses to use road trains (at greater expense) to transport fuel and maintenance equipment by road to Area C and Yandi, rather than make use of its railroad. In the past, BHPBIO transported fuel to these mining sites by way of separate fuel trains. In particular, BHPBIO is spending several million dollars to expand its fuel farm at Port Hedland which will give it the option of expanding its use of road trains for moving fuel to these mining areas.

41. With the integration of the operation of the Newman and Goldsworthy lines, empty ore cars and locomotives are assembled to form rakes at either Boodarie siding on the Goldsworthy line (if the ore wagons have been unloaded at Finucane Island) or the Nelson Point marshalling yard (if the ore wagons have been unloaded at Nelson Point). Rakes are then coupled together to make up

trains at Nelson Point marshalling yard. Alternatively if rakes from Finucane Island and Nelson Point are to be dispatched together, rakes are coupled together to form trains at Bing siding approximately 17 kilometres south of Nelson Point, just south of the Goldsworthy Junction.

42. Once a train is assembled, the driver will be provided with the current speed restriction sheet which indicates the specific sections of track where trains must travel at reduced speeds compared with the normal permissible speeds. Speed restrictions are determined by maintenance personnel depending on the condition of various portions of the track. A copy of a speed restriction sheet, dated 29 August 2007 is annexed and marked "**VDW-3**".

43. From the speed restriction sheet the driver is warned that it is unsafe to exceed a speed of 45 km/h on the stretch of mainline track from a point 176.5 km south from Nelson Point to a point 182.8 km south of Nelson Point (distances on the Newman mainline are measured by reference to a point in the Nelson Point yard in Port Hedland). Generally, trains will travel at 75 km/h, though a loaded train may travel as slow as 12 km/h on a steep gradient. Trains also have to slow down or stop to negotiate meets with trains travelling in the opposite direction or following another train travelling in the same direction. Loaded trains slow to 35 km/h when traversing a switch. A switch (or set of points) is a major junction on straight rail designed to divert the train to an alternate track from the straight rail.

44. Based on average operational speeds, the following table provides an indication of the time taken to travel from Port Hedland to the end of the spurs that lead to the various mine loading points:

END CONFIDENTIAL C

45. Trains travelling to Newman proceed to Jimblebar Junction close to the Newman mining area. The train is then split into individual rakes. In accordance with the 72 hour rail sequence (which is

described in further detail below) the rakes, drawn by a set of locomotives, then proceed to the relevant mining area. Accordingly, depending on the blending requirements and product quality produced by the mine that day, the individual rakes will be dispatched to Whaleback, or one of the satellite mines located at Orebody 18, Orebodies 23 and 25 or Wheelara.

46. At Area C and Yandi, BHPBIO does not currently split rakes apart, with the entire train usually loaded at a single mine loadout. As tonnages increase, this may change in the future.

47. The table below shows the loading areas and arrangements for each mine.

*Control limits are the upper and lower limits established by statistical analysis of the range of ordinary operational variations (as opposed to external outliers associated with a specific event). On occasion, these limits are significantly exceeded due to external events.

END CONFIDENTIAL C

48. A "loadout tunnel" (used by BHPBIO at Yandi 1, Yandi 2, Whaleback and Orebody 18) involves ore being fed by chute from a stockpile located above the "tunnel". The train moves through the tunnel, beneath the chute, while it is being loaded. The loadout tunnel can be designed as:

(a) a continuous loading system (such as those located at Yandi 1, Yandi 2 and Orebody 18, where ore cars move at a constant speed through the tunnel); or

(b) a static loading system (such as Whaleback, where up to 13 ore cars are loaded at one time, before the rake in the tunnel is moved forward by 13 cars), where the number of loading chutes in a loading tunnel corresponds to the number of ore cars which may be loaded at one time.

49. The loading system at Whaleback is faster (because up to 13 cars are loaded at once) though unlike Yandi, the ore is frequently not loaded evenly into the cars but is dumped off-centre longitudinally so that there is a relatively uneven axle load distribution. This variance in loading has the result that BHPBIO has to reduce the tonnage loaded into each ore car at Whaleback to ensure that ore cars are not overloaded or that uneven loading of ore cars is not excessive (BHPBIO monitors and manages this problem by weighing all ore cars wheels after loading). The loading equipment automatically shuts off between ore cars to avoid spillage.

50. Other loading methods used by BHPBIO include the use of a loading bin situated above each ore car and fed by reclaimer, apron feeders or front end loader (Area C and Orebodies 23 and 25, though a front end loader usually pre-loads each ore car before it reaches the loading bin at Orebodies 23 and 25), or directly loading each ore car using a front end loader (Wheelara).

51. The principal benefit of loadout tunnels is that they allow ore to be loaded at a faster rate than either using loading bins or loading ore cars using a front end loader. The tunnels which employ continuous loading also assist BHPBIO to manage axle loads and uneven loading by reducing loading variability.

52. The data relating to loading times in the table above (apart from Yarrie) is compiled from information recorded over a period of not less than 10 months. Copies of the underlying graphs are annexed and marked "**VDW-4 CONFIDENTIAL C – VDW-12 CONFIDENTIAL C**". This data reflects the significant loading time variability that the railroad needs to cope with.

53. Events and issues which result in increased loading time variability include:

(a) the tonnage of ore in the live stockpile area. For example, the loading rate at Yandi is affected by the tonnage of ore that is in the cone which constitutes the live loading stockpile. As this tonnage diminishes, the gravity effect of the ore above pressing down reduces and the loading rate slows;

(b) the physical size, the chemical composition and the variability of the moisture content in the fines product has the result that fines can build up in loading chutes and gradually clog the loading aperture. If this happens, the loading rate (which at some mines sites can be as high as 5000 tonnes/hour or roughly 1.4 tonnes/second) will result in ore spilling over the loading infrastructure necessitating clean up and the clearing out of the loading chute;

(c) product changes between lumps and fines which requires the loading infrastructure to be cleaned to avoid contamination of either fines product in lump or lumps product in a rake of fines. This is important as lumps in a load of fines could have severe consequences for a customer's sintering equipment. Similarly, customers pay a premium for lumps and will be displeased if excessive fines are included in a shipment of lump product;

(d) the requirement of the reclaiming equipment at Area C to move to a new bench (or level of a stockpile) or new stockpile to continue loading;

(e) manual loading of product by front end loader at Orebodies 23 and 25 and Wheelara. This process is inherently variable depending on the number and bucket capacity of front end loaders available, the number of buckets per ore car, the distance from the stockpile to the ore cars and the productivity of different front end loader drivers;

(f) a breakdown in the loading equipment; and

(g) the correction or removal of overloaded or unevenly loaded ore cars, prior to the rake entering the mainline.

54. A further complication that arises in relation to trains collecting product from the Newman mining area is the fact that two and three rake trains sent to Newman will be delayed in returning if there is a delay in loading one of the rakes at one of the satellite mines. Since trains going to Newman are frequently split into separate rakes to collect product from the various satellite mines and Whaleback, the train cannot return to the port until the various rakes have been reassembled at Jimblebar Junction. This compounds the complication of differential travelling times to each mine loading area and increases the risk of delay.

55. As indicated above, BHPBIO uses a number of different types of loading methods at the various mine sites based on historical infrastructure configurations. There are some upgrades currently being made to loading infrastructure. Train loadout tunnels will be installed at Wheelara and

Whaleback (although Whaleback will not be fitted with a tunnel – its configuration will be similar to that at Yandi 2 in that it will have a tunnel with two sets of two chutes, with each set having a live stockpile cone above it) and Area C will be upgraded to be fed by dual reclaimers.

56. Once the rakes are loaded, the train is reassembled and departs the mining area for Port Hedland. Depending on the ore that has been loaded, the train will proceed to either car dumper 1, 2 or 3 located at Nelson Point (where ore from all of the mining areas can be unloaded), or car dumper 4 located at Finucane Island (if the ore comes from the Yandi or Area C mining areas).

57. On arrival at the relevant car dumper at Nelson Point, the locomotives are usually uncoupled from the loaded rakes if there is a queue in front of the car dumper (if there is no queue, the mainline locomotives will take the rakes to the car dumper). A compressor car is attached to the rake to provide compressed air to operate the brakes on the ore cars (a compressor car is simply a wagon that has been fitted with an air compressor and diesel engine allowing it to provide air pressure for the operation of the ore car's brakes). In addition, a spacer car is also coupled with the compressor car to the back of the rake. The compressor car and spacer car are required on car dumpers 2 and 3, so that the hydraulic pusher arm that moves the ore cars through the car dumper has a purchase point to push the final loaded ore cars through the car dumper (the hydraulic arm is located before the car dumper and cannot push the final two wagons into the dumper). Car dumper 1 has been configured with a hydraulic arm on either end of the dumper, one to push and one to pull, so that BHPBIO can ultimately eliminate the use of spacer cars on this car dumper.

58. The train needs to be accurately positioned to allow the car dumper wheel locks to take control of the rake movement. This is referred to as "spotting" the rake at the dumper. Spotting allows the car dumper arm to engage in the rake. Once spotted, the car dumper has control of the rake and the rake is handed to the port operations car dumper operator for the duration of the dumping. The tolerances involved in spotting are in the order of 25-50 mm. Spotting is a highly precise exercise with 13,000 tonnes of ore loaded into a rake controlled by a single locomotive that is fitted with brakes which are not designed for accuracy of final stopping position (air brakes fitted to the rake have differential stopping distances depending on many factors, that is, for the same application of brakes from the locomotive, different rakes will stop in different positions). It therefore needs to be done carefully at low speed. Should the train move under locomotive power, while the ore cars are being rotated, the car dumper would be severely damaged and unable to operate for some time.

59. The rake is then indexed through the car dumper by the hydraulic arm which aligns the cars relative to the rotary tipping mechanism. Depending on the specific car dumper, either two or three ore cars are fed into the car dumper at a time, which rotates them for unloading. Car dumper 2 is capable of dumping three cars at a time, whilst the other car dumpers are only capable of dumping two cars at a time. The ore cars are fitted with couplings which rotate and allow the ore cars comprising a rake to remain coupled during unloading operations.

60. The table below sets out the dumping duration for each of the car dumpers. The graphs containing the underlying data in the table are annexed and marked **"VDW-13CONFIDENTIAL C – VDW-16 CONFIDENTIAL C".**

END CONFIDENTIAL C

61. As with loading times, it is apparent from this data that the time taken to dump each rake of ore cars varies considerably. Factors which contribute toward this variability include:

(a) equipment variability. For example, the different stackers fed by the car dumpers have different stacking rates. Some of the older stackers have slower rates than the car dumpers requiring the car dumper to be operated more slowly;

(b) equipment interaction. In a number of instances, stackers and reclaimers for shiploading operate off common infrastructure in the Nelson Point yard. Accordingly, there can be difficulties in moving a stacker into position next to a stockpile if a reclaimer is in the way;

(c) possible equipment failure. The stockpile yards are complex with large number of interrelated components required to transport ore from the car dumpers to a stockpile. For example, there are roughly 90 separate possible failure points between car dumper 2 and the stockpile on one of the routes to stacking.

Nelson Point

62. Locomotives which have delivered the loaded rake to the car dumpers at Nelson Point proceed to the locomotive preparation facility at Nelson Point.

63. On completion of dumping at Nelson Point, ore cars are transported to the departure yard after the compressor and spacer cars are cut off, and a set of mainline locomotives is attached to each rake.

64. Usually, prior to dumping, each rake is inspected (referred to as "knocking") for defects to ensure it is in running condition. Any defective ore cars are cut out of the rake after dumping. Depending on where the defective ore cars are located in the rake and the number of ore cars, it can take up to several hours to remove them.

65. Rakes and sets of locomotives are assembled into trains which depart Nelson Point. As required, additional rakes of empty ore cars that have been dumped at Finucane Island, together with locomotives that have been serviced at Boodarie, will be attached to the train at Bing (these operations are discussed below). Usually a different driver who has recently started their shift will take over the locomotives (regardless of the size of a train, all trains are controlled by one driver) and the cycle of collecting ore from the mines is then repeated as the train departs for the mining areas.

Finucane Island

66. A set of locomotives and a loaded rake of ore cars delivering product to car dumper 4 at Finucane Island is split from the train after it arrives from the mining areas at Bing. The locomotives then take the loaded rake along the Goldsworthy line to Boodarie where the mainline locomotives are separated and sent for servicing and refuelling at the Boodarie locomotive preparation facilities. The loaded rake has a spreader car and a shunt locomotive coupled to the front of it. A spreader car is required to facilitate the operation of the car dumper indexing arm at Finucane Island which is mounted after the car dumper and pulls, rather than pushes, the rake of loaded cars through the dumper.

67. The shunt locomotive departs Boodarie and takes the spreader car and loaded rake further along the Goldsworthy line to a point just before the unloading loop where it waits until the car dumper has finished unloading the rake ahead. The shunt locomotive then takes the loaded rake into the car dumper for spotting to allow dumping to begin. The spotting process is a similarly complex and critical task as with the Nelson Point yard (described above). The shunt locomotive remains attached to the rake during the dumping process to supply the compressed air required to operate the ore cars' brakes.

68. On completion of dumping, the shunt locomotive returns with the spreader car and empty ore cars to Boodarie where the spreader car and shunt locomotive are cut off and a fresh set of mainline locomotives attached. Thereafter, the empty ore cars and mainline locomotives travel along the Goldsworthy line to Bing to be attached to other rakes and sets of locomotives from Nelson Point for dispatch to the mining areas to collect the next train load of product.

24 hour rail operations

69. BHPBIO's rail operations are continuous operations and run 24 hours a day, every day of the year. The main impetus for BHPBIO's 24 hour rail operations is to maximise tonnage of ore shipped. For the Newman mainline, any stoppages or disruption of operations equates to tonnage of iron ore that is "lost", that is, tonnage that cannot be made up for. Apart from events such as cyclones and severe equipment failures, the Newman mainline is only withdrawn from operation for a limited amount of time on a monthly basis for maintenance purposes (this is discussed in greater detail below). During these periods loading and unloading activities, train maintenance and the assembly of trains will continue where possible so that mainline operations can resume as soon as the line is available (frequently, large items such as car dumpers will have their maintenance performed to coincide with the closure of the mainline). Rail operations also cease if a significant fault in the head of the rail on the mainline is detected, which could cause derailment. Such a fault is termed a Category 1 defect, which indicates that it requires immediate repair.

Rail personnel

70. In terms of BHPBIO's operating practices, train crews will normally only work a shift of 12 hours. Under normal circumstances, without special permission, BHPBIO policy limits shifts to a maximum of 14 hours. BHPBIO currently employs over 170 locomotive drivers on the Newman and Goldsworthy rail lines, with those drivers capable of being rostered onto either rail line. BHPBIO has, however, recently started to implement staffing arrangements where crews are dedicated to yard work.

71. Train drivers are rostered at different places in order to provide BHPBIO with greater operational flexibility. Presently, train drivers are rostered at Nelson Point, Boodarie siding, Redmont, Yandi and Newman,

72. On signing on for duty, if a driver is not needed immediately for taking a train to one of the mining areas, the driver will be assigned to shunting duties in the marshalling yard where rakes are assembled and ore cars are rotated out for maintenance. A driver may also be sent to assist another driver if there is a problem with a train on the mainline. Depending on shift arrangements, drivers may need to be relieved on track by handing over trains to other drivers.

73. BHPBIO has recently stationed drivers at Redmont to:

(a) better manage residential train drivers' ability to be at home at the end of their shift; and

(b) ensure flexibility of destination for trains south of Redmont.

74. An additional complexity to BHPBIO's staffing arrangements and rail operations is BHPBIO's wish to coordinate driver change overs. Change overs describe the swapping of drivers mid-track where the drivers of an empty train and a loaded train both stop their trains beside each other and swap trains, then return in the direction they came from. This allows residential drivers to predict where they will be at the end of their shift and enjoy a better quality of life. The location of these change overs varies depending on a number of factors (for example the origin of the loaded train, the running time of both trains and the location of the passing track).

Train control

75. Train movements are monitored and controlled from CTC in Nelson Point. One of the most critical aspects of train control is to ensure that there is adequate separation between trains operating on the railroad. Train separation is based on signal locations which govern segments of the track. The length of each segment, or track section, is based on the safe braking distance of a train (plus a reasonable safety margin).

76. To ensure safe operations, track sections (which are electrically insulated portions of track not longer than 15 km, called track circuits) may only be occupied by one train at a time. The solid wheels and axle assemblies of a train conduct a low powered electric current from one rail to the other (effectively shorting the electric circuit), which enables the control system to detect the presence of a train on a track circuit. Accordingly, the failsafe interlocking circuit locally detects where a train is and sends this track circuit detection to the remotely located control system at CTC. The control system at CTC indicates that a segment of the track is occupied by a train. Based on the time that it takes a train to traverse a particular segment of track and the location of the nearest siding, train controllers can then manage train meets and allocate priority to trains.

START CONFIDENTIAL C

END CONFIDENTIAL C

78. Implementation of new train policies can be achieved relatively quickly by BHPBIO. The example above of the change in policy to run empty trains to Yandi on a "drum beat" was implemented within two to three weeks. There has been a range of operating philosophies and guidelines adopted by BHPBIO over time as BHPBIO constantly evolves its operating systems to safely extract maximum tonnages. These operating philosophies must also be able to take account of variable demand for products at the port, which is dictated by ship arrivals.

79. Flexibility is also required in order to deal with unplanned maintenance and equipment failure events. Flexibility in system operation is the lifeblood of BHPBIO rail operations. Flexibility is required for optimal performance ion the current operating environment and is necessary to allow for changes to operating philosophies in order to maximise future system performance.

80. Train controllers are also aware that moving a loaded train onto passing track, which generally has a higher degree of track curvature, will result in far higher track wear, particularly on the moving switch equipment. If a track meet involves an unloaded train and another train, such as a maintenance train, train controllers will allocate priority to whichever train will result in the least overall system delay. The train that has not been allocated priority will be directed to a passing track where it will wait for the priority train to pass before continuing its journey.

81. BHPBIO's train control operations are staffed by one scheduler (who is involved in forward planning and determining the operational capacity of the system), two supervisors working 12 hour shifts and 27 train controllers. These train control personnel oversee three separate train control boards which are large computer monitors displaying the locations of all trains along a section of track (including sidings and the port yards). The train control boards display the movements of trains in real time and indicate train meets. BHPBIO presently has three train control boards that manage train movements, namely:

(a) on the Goldsworthy line from the Goldsworthy mining area to car dumper 4 at Finucane Island, together with train movements south of Jimblebar Junction on the Newman mainline (this covers all train movements between Whaleback and the satellite mines in the Newman mining area, namely Orebody 18, Orebodies 23 and 25 and Wheelara);

(b) on the Newman mainline from 26 km south of Nelson Point to Jimblebar Junction (this includes the spur lines to Yandi and Mining Area C); and

(c) in the Nelson Point yard, which includes car dumpers 1, 2 and 3 and extends to a point 26 km south of Nelson Point.

82. BHPBIO plans to change this control system to make use of four boards in view of the present heavy workload on controllers who manage safety critical tasks such as train separation, the movement of track gangs engaged in maintenance and the movement of maintenance vehicles on the track. This change is expected to take place in early 2008. The four boards will oversee the following areas:

(a) the Newman mainline from 26 km south of Nelson Point to a point midway between Gidgi and Cowra sidings (which is just north of the spur line to Yandi and Area C);

(b) the Newman mainline from the point midway between Gidgi and Cowra sidings to all mines, the Goldsworthy line to Nimingarra/Yarrie;

(c) in the Nelson Point yard, which includes Car dumpers 1, 2 and 3; and

(d) the northern portion of the Newman mainline from a point 26 km south of the Nelson Point, yard arrival and Car dumper 4.

83. Train controllers are involved in managing rail operations, which largely flow from the 72 hour rail sequence prepared by BHPBIO's Integrated Planning group. The 72 hour rail sequence (which is dealt with in greater detail below under Rail Planning), describes the document setting out the number and sequence of trains that are required to supply customer orders with products that are stockpiled at the port, as well as the additional type and sequence of ores that will have to be transported to the port by rail. The 72 hour rail sequence accordingly takes into account factors such as the order and timing of ships arriving at the port, stockpile capacity and whether an order requires blended product from a stockpile or direct shipping ore (**DSO**). DSO refers to iron ore (from Area C and Yandi) which does not need to be blended by way of chevron ply extension stacking[1] at the port because it is already separated into lumps and fines for separate transport and can be loaded directly to a ship from the train unloader (as and when required). DSO product undergoes further inherent blending in the hold of the ship as it is loaded (where inherent blending describes the blending or mixing of ore which occurs consequentially as part of a loading and handling process, rather than a specific step in the production process where ore is deliberately blended). Ore from Orebodies 23 and 25 is also prepared as a DSO product, but generally still requires stockpile blending at the port.

[1] This dedicated blending process involves sequential piling of product from rakes into a stockpile longitudinally and then reclaiming it by sweeping the reclaimer across these longitudinal elements on a face at the end of a stockpile to ensure that the longitudinal elements are evenly blended during recovery.

84. Consequently, the 72 hour rail sequence allocates the number of rakes that have to be loaded with product from each of the mines. Though the 72 hour rail sequence seldom occurs as planned, it provides the framework within which rail operations are planned. In addition to the 72 hour rail sequence, train controllers also seek to satisfy daily operating priorities which include:

(a) maximising daily tonnage;

(b) ensuring that empty trains arrive at Yandi within a range of expected times (to clear the stockpiles at the loadouts);

(c) maintaining a queue of loaded ore cars in front of a specific car dumper to maximise unloading rates; and

(d) allowing maintenance gangs access to the track to perform maintenance tasks.

85. Based on the planned product tonnages set out in the 72 hour rail sequence, train controllers prepare a paper train control graph, which plots distance from the port against time over a 25 hour period to evaluate the interaction of trains running simultaneously and, accordingly, allow train controllers to consider train paths and allocate train priority. On these plans, the train controllers plot the intended train movements in advance in pencil in order to optimise train meets. Each train controller will plan a different forward time frame depending on factors such as prevailing train traffic, particular train movements, track maintenance, their past experience and own preferences.

86. The train control graphs reflect the cycle time required to leave the port, travel to a particular mine, load ore, return to the port and unload (and allow for a measure of delay).

87. Train control charts reflecting actual, rather than planned train movements, are then generated progressively as events unfold with train movements recorded on a master train control graph covering a 25 hour period (with an hour overlap between successive train control graphs). There is often a dramatic difference between the actual and the planned train movements. Under this system of train control, train control graphs serve as a planning and reviewing tool, with BHPBIO enjoying only limited ability to control in advance train movements (since train controllers respond to events in a reactive manner as they unfold on the railroad).

88. To illustrate how train activities are recorded, as well as the impact on trains caused by delays, two train control graphs are annexed and marked "**VDW-17 CONFIDENTIAL C**" and "**VDW-18 CONFIDENTIAL C**".

89. "**VDW-17 CONFIDENTIAL C**" is a train control graph depicting train movements on 28 February 2007. The diagonal lines that move downward from the left indicate the progress of trains travelling

north from the mining areas along the Newman mainline toward Port Hedland. The diagonal lines that move upward to the right indicate the progress of trains travelling south from Port Hedland to the mining areas. The various sidings on the Newman mainline between Port Hedland and the mining areas are listed on the left hand side of the document. The axis at the base of the document plots time over a 25 hour period (which allows successive charts to have 1 hour overlap with one another), with hourly intervals broken into 10 minute increments. The chart in the lower right hand corner lists the 14 trains carrying ore that were plotted over the course of the 25 hour period. Trains transporting fuel (in both small and large tankers), ballast, steel (usually replacement rail) and maintenance equipment are listed in the top right hand corner. The train graph is useful in graphically depicting how various trains and activities on the Newman mainline interact with one another. The separation between trains travelling in the same direction and the manner in which train meets are planned can be observed.

90. In this particular graph the system indicated "track occupation" in relation to a portion of track on the single line track section between the Gillam and Tabba passing tracks, just north of Gillam siding (or 88.96 to 94 km south of Nelson Point) from 23h00 to roughly 01h10. BHPBIO's signal system is designed to operate in a fail safe manner, where fail safe, as described above, describes the underlying philosophy that any system or component failure should result in the system defaulting to a safe position. In this case, the "track occupation" indicated by the system alerted the train controller that there was a problem with the track circuit in question because the train graph did not indicate that there was a train in this area. Track occupation should normally only occur when a train enters the track section. The "track occupation" prevents the train controller from clearing signals until the problem with the track circuit has been identified and resolved.

91. Events that would trigger a "track occupation" indication (without a train in the section) include a broken rail, damage to signalling equipment as a result of a lightning strike, the inundation of the track by heavy rain, or the movement of a bulldozer across a level crossing. (BHPBIO's railroad is situated in an area prone to lightning activity and short, but intense, rain storms.)

92. In this instance, the train controller dispatched a HiRail (which is a vehicle, such as a Toyota Landcruiser, which has been adapted to drive along rail tracks) to visually check the integrity of the rail and confirm that it was safe for trains to proceed. Two movements of a HiRail vehicle on the track are indicated on the graph by means of a green line. HiRails are not detected by the track circuits of the signalling system. Therefore, train controllers need to manage and protect the movement of a HiRail from any other traffic and must manually indicate on the graph the location and movement of a HiRail. Having inspected the rail, train 2668 was authorised to proceed.

93. As the system still indicated a "track occupation", it was necessary to re-inspect the rail before train 2078, which had been waiting in the Tabba passing track, was permitted to proceed on the Newman mainline toward the mining areas.

94. The horizontal lines on the train chart indicate stationary trains that have been delayed as a result of the "track occupation" indicated by the train control system. The graph also indicates the subsequent impact on train operations with delays affecting eight trains in total. The graph usefully depicts the manner in which a single problem can result in delays that cascade through the rail system, the absence of any fixed pattern of train activity and the flexibility required by BHPBIO to reschedule trains as events unfold on the rail system.

95. **"VDW-18 CONFIDENTIAL C"** is a train chart depicting train movements on 28 April 2007. The format is consistent with the train graph of 28 February 2007, described above. This particular graph also shows the successive delays that are caused as a result of a single incident. In this instance, there was a problem with track maintenance equipment which resulted in the track between Hesta and Shaw being blocked from just after 16h00 to almost 20h00. As can be seen from the train graph, the blockage of the Newman mainline for slightly less than 4 hours affected eight trains which were all delayed for differing periods of time.

96. As stated above, the train control graph is a very dynamic document that reflects ongoing developments and changes that occur on the railroad. It does not "govern" train movements.

97. BHPBIO has recently implemented a new Siemens train control system, which replaced the previous Westinghouse based mainline train control system. It has been necessary to customise the train control system to:

(a) interface with the field equipment used by BHPBIO;

(b) account for the specific geography of BHPBIO's rail system; and

(c) provide an interface that has an acceptable look and feel to BHPBIO.

98. BHPBIO is also in the process of replacing the GEC train control system that controlled the Port Hedland marshalling yard with the Siemens system. As a consequence of the different operational requirements between mainline track (where, amongst other roles, control systems operate to prevent collisions) and marshalling yards (where rakes and trains are assembled and all train movements occur at much lower speeds) BHPBIO has previously operated separate train control systems for these track elements. However, as BHPBIO's rail system has been upgraded and the volume of ore transported on it has grown, it has become necessary to optimise and integrate all elements of the rail system, including train control.

Rail specifications

99. BHPBIO's railway is largely constructed with sections of head hardened rail that weighs 68 kg/m, which have been continuously welded together to eliminate any gaps in the head of the rail. The railhead is ground to a specific profile which complements the wheel profile used on BHPBIO's rolling stock.

START CONFIDENTIAL C

END CONFIDENTIAL C

101. The use of head hardened rail, alloys and, most recently, heavier rail, in certain portions of the track is all driven by the need to deal with high axle loads and extend rail life where possible. In addition to the type of rail used, rail life is influenced by wear from passing rail traffic and the maintenance of the surface condition of the head of the rail by grinding. Grinding maintains the correct rail profile and also removes surface defects.

102. Over time, BHPBIO has significantly improved the quality of rail welds and the detection and management of rail defects. BHPBIO classifies rail defects into three different categories according to their severity:

(a) category 1 indicates a serious crack or break in the rail which requires immediate repair (usually this is achieved by cutting out the affected portion of track and replacing it, which requires that the track be cut and welded in two places). A category 1 defect is likely to result in traffic disruptions;

(b) category 2 requires that the identified rail defect be monitored on a regular basis and, possibly, that the defect be scheduled to be repaired when the rail line is withdrawn from service for planned maintenance. A category 2 defect is likely to result in the imposition of speed restrictions over a portion of track; and

(c) category 3 requires that the defect be observed on a long term basis to ascertain whether it deteriorates further. A category 3 defect may result in the imposition of speed restrictions over a portion of track.

103. An example of a category 1 incident requiring urgent unplanned maintenance occurred in 1999 when a supporting pier collapsed on a mainline bridge. This caused a section of the bridge to collapse. To maintain railing, BHPBIO removed the affected piers and filled out the gap in the bridge with thousands of cubic meters of soil and rocks (effectively shortening the bridge). To do this, BHPBIO mobilised equipment from its mining operations which took a week to shift the material into place. Subsequently, it took three months to repair and replace the affected section of bridge. This incident is an example of the high priority that BHPBIO places on maintaining production during the course of maintenance activities.

104. Apart from the force applied to the rail as trains pass over the track, significant stress is placed on the rail, and correspondingly the rail welds joining the continuous track. This occurs due to thermal contraction and expansion of the rail as a result of extreme changes in the rail temperature which, as mentioned earlier, can vary from -3°C to 70 °C in the Pilbara region depending upon seasonal climatic conditions. As a consequence of exposure to this wide temperature range, the long sections of continuously welded track either shrink or expand introducing significant tensile or compressive forces that respectively can result in fracture or buckling of the track. Accordingly, when welding in sections of new track, BHPBIO endeavours to perform this maintenance at a neutral ambient temperature of approximately 40°C to avoid introducing additional stresses. This limits the times of day when rail welding can be performed. Furthermore, the window within which rail welding can take place will also differ depending on the season.

105. BHPBIO's track currently contains both aluminothermic welds and flashbutt welds. Aluminothermic welds are created through a high temperature controlled chemical reaction between two adjoining sections of rail. Due to the high loads and wide temperature range that BHPBIO's track is exposed to, BHPBIO has found that the heat affected portions of track on either side of aluminothermic welds are more prone to failure than other sections of track. Accordingly, BHPBIO has sought to gradually replace aluminothermic welds on the track with flashbutt welds (though aluminothermic welds may still be used in certain areas where BHPBIO is unable to use flashbutt welds). Flashbutt welding is a process which uses a direct current source to fuse the ends of two pieces of rail together forming one continuous length, without the need for "filler" material. BHPBIO has a fixed plant for flashbutt welding standard lengths of rail (of approximately 25 m) into long stretches of rail (with lengths of approximately 400 m). BHPBIO has also invested in mobile flashbutt welding equipment mounted in HiRail trucks that can be moved to the required site and weld rail in situ (including joining these long sections of rail).

106. The flashbutt welding process utilises metal from the joining sections of rail to make the weld. This however, results in metallurgical and physical changes to this metal which is softer than the original. It is still vastly superior to other forms of welding that are subject to metallurgical impurities and inclusions, which are generally weak areas and become the genesis of cracks that ultimately

cause weld failures. Flashbutt welds do not have these inclusions and impurities and therefore have far fewer failures.

107. For these reasons, BHPBIO makes use of mobile flashbutt welding wherever possible. Very few other railroads make use of mobile flashbutt welding in this manner due to its high cost and the fact that their rail is subject to lower stress as a result of lower axle loads.

Track maintenance

108. One of the most significant operational constraints on BHPBIO's railroad is the condition of its track infrastructure. It is important that BHPBIO is able to perform ongoing maintenance to maintain the integrity and safety of its track infrastructure.

START CONFIDENTIAL C

END CONFIDENTIAL C

111. Track maintenance includes tasks such as rail replacement, grinding rail to maintain the correct rail profile, sleeper replacement, the alignment of the rails to maintain the correct geometric relationship between the rails (referred to as maintaining the gauge), the adjustment of the top of the rail to ensure smooth track without any sudden bumps and the evening out of tangent and curves, both horizontally and vertically (by lifting the track and packing the ballast, referred to as tamping, lifting and lining), visual inspection of the track and ultrasonic inspection of the track to detect subsurface defects.

112. The difficulty raised by track maintenance is the need to obtain access to the track for track crews and/or large heavy track-mounted equipment to perform various maintenance tasks. This frequently involves moving equipment on the track to the stretch where maintenance is required as well as isolating that stretch of track while the maintenance is carried out. Accordingly, in managing railroad operations, BHPBIO must allocate sufficient time for maintenance to be carried out. This time is usually referred to as a 'maintenance window' if it occurs while other operations continue. In addition, BHPBIO also schedules shutdowns of the railroad when major maintenances tasks are undertaken.

113. The amount of track maintenance required is related to the tonnage of ore carried on the track infrastructure. Maintenance requirements increase as the number of trains and tonnage of ore

carried on the railroad increases. The relationship between increased tonnage and increased maintenance is not linear (that is, not directly proportionate) as increasing the number of trains and tonnage carried reduces track capability in a compounding manner. Put simply for example, a twofold increase in tonnage may increase by more than double the track maintenance required. One of the reasons for this is that at lower tonnages, sidings will be used less frequently (as there are less train meets) and therefore maintenance requirements for these sidings are reduced. In addition, as the number of train movements on the railroad increases, it has the effect of reducing the time that can be allocated for maintenance windows, while increasing the need for maintenance windows to undertake necessary maintenance.

114. Consequently, BHPBIO has to balance the need to undertake maintenance with ongoing operational demands on the rail system.

115. As the volume of iron ore transported on the rail system has increased dramatically over the past few years, BHPBIO has sought to minimise the proportion of time that is required for maintenance. However, it is difficult to reduce the time taken to perform maintenance tasks such as welding. In addition, undertaking maintenance frequently requires additional train movements on the rail system as trains loaded with rail (for new or replacement track) and ballast deliver their cargo to track gangs. Certain track maintenance equipment, such as tampers, regulators and grinders, can only be moved on the track to wherever it is needed. These train and track equipment movements limit the number of trains that can operate on the rail line.

116. Apart from additional train movements required for maintenance purposes, the fact that maintenance equipment and trains carrying either rail or ballast may remain stationary while performing tasks or being unloaded, results in passing loops (or, in some instances, portions of the mainline) being occupied. The effect of occupying a passing loop is to effectively double the crossing time between trains travelling in opposite directions as trains have to traverse two sections before a train can run in the opposite direction. As indicated by the train graphs above, these types of delays will have a cascading effect through the system with successive trains experiencing delays.

117. To minimise the impact of track maintenance, a number of routine maintenance tasks are performed on an opportune basis between train movements.

118. BHPBIO has also invested in advanced technology to reduce maintenance downtime (and thus increase production) and minimise the chance of catastrophic failure. Examples of this technology are:

(a) the close management of the rail and wheel interface;

(b) weekly ultrasonic testing of the rail to detect subsurface defects;

(c) the use of improved welding technology; and

(d) signalling. The remote wayside locations which house the vital interlocking equipment every few kilometres alongside the track are not connected to each other with multi-core cables (as is the usual practice). In addition, they are not connected to a common power cable because they are solar powered. This arrangement eliminates a source of a high number of failures by limiting the damage that lightning would otherwise cause. If the wayside locations were connected with cables, they would be exposed to lightning strikes which would destroy the cables and prevent the signalling from operating. In addition, such cables would transmit high voltage surges from lightning strikes into the wayside remote locations and destroy the sensitive electronic equipment inside.

119. Track maintenance tasks are usually categorised into those tasks performed during shutdowns and opportune maintenance. Opportune maintenance tasks are those routine maintenance tasks that are undertaken every day. However, these works are undertaken opportunistically, in the sense that they are fitted in between train movements, when the opportunity presents itself, in order to maximise production and avoid reducing tonnage throughput. Generally, these tasks are described as "as traffic permits". During unplanned disruptions, BHPBIO will also perform unplanned maintenance where possible.

BHPBIO's fleet of maintenance equipment

120. BHPBIO has invested in a fleet of maintenance equipment, set out in the table below:

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Maintenance crews

121. BHPBIO employs teams of track gangs to perform maintenance to its track. The size and composition of track gangs varies depending on the complexity and location of the required maintenance.

122. BHPBIO has approximately 115 BHPBIO track maintenance employees and also employs contractors (with approximately 25-30 staff depending on operational requirements) to undertake maintenance work such as rail grinding, operating tamping machines, re-railing and replacing sleepers.

123. Maintenance track gangs are located at Port Hedland, Redmont (a rail camp approximately half way along the mainline between Port Hedland and Newman) and at Newman. This is because BHPBIO requires maintenance personnel to respond quickly to any event on the rail such as a derailment, and provide an initial assessment. Contractors are used when a derailment requires specific equipment such as front end loaders, cranes or dozers to remove ore cars from the track for example.

124. Practically, track gangs (made up of between two to 12 persons depending on the task) will have a list of daily maintenance tasks and will move to a section of track where such tasks need to be performed. The track gang will then ask the train controller for a "maintenance window" to access the track. Depending on operational demand, the track gang may:

(a) get an opportunity to perform the required maintenance;

(b) wait for an opportunity to perform the maintenance; or

(c) move to another area where a maintenance window can be created.

125. As a consequence of having to fit maintenance tasks in where possible, it may take a track gang 12 hours to perform two or three hours of work. I estimate that the opportune approach to maintenance necessitated by the high production demands on the rail system results in only 25% effective utilisation of such track gangs.

126. BHPBIO is looking at implementing 2 three hour maintenance shut downs (for certain portions of track) scheduled per day, where car dumping at the port allows. BHPBIO has undertaken 2 two hour shut downs a month to assist with the replacement of rail sections in the past.

127. Planned maintenance, which is undertaken in the monthly 12 hour shutdown includes the following tasks:

(a) the replacement of a large number of sleepers (many of the sleepers on the Newman mainline have already been replaced with concrete sleepers);

(b) major replacement of rail sections. This is an ongoing process due to the fact that the rail ultimately gets worn down from the passage of trains and grinding process (with increased wear on curved sections of track). BHPBIO only replaces rail sections once it is worn to the point that it no longer has sufficient structural strength and lacks the capability to support the required loads;

(c) ballast cleaning. Ballast, consisting of naturally interlocking and sizegraded gravel, which supports the Newman mainline has become fouled with small particles of sand and dust over the past 40 years. These small particles prevent the ballast functioning properly with the result that the ballast's structural strength can be compromised. This needs to remedied by removing the ballast from under the track, cleaning the ballast (by removing all small particles) and replacing it under the track (which also involves supplementing the old ballast with new ballast where required). BHPBIO has, however, been unable to schedule a programme of ballast cleaning at this time, due to the heavy traffic of the Newman mainline;

(d) switch change-outs, where the curved switch blade is replaced or the entire switch is cut out of the track and replaced;

(e) repair or replacement of culverts. As a consequence of very heavy water flows from cyclones, culverts can be damaged or even washed away. Replacement of a culvert requires the track to be cut and removed, the damaged culvert removed and replaced and the track replaced; and

(f) replacement of aluminothermic welds and replace or repair category 2 and 3 track damage.

128. Opportune routine maintenance includes the following tasks:

(a) rail welding. Broken or deteriorating pieces of rail are cut out of the track and new pieces of rail are welded in;

(b) rail inspection and testing. Much of the rail is inspected using HiRail. A HiRail is driven along the track to check the height of the rail and related rail infrastructure such as signals, points and level crossings which are inspected for any obvious defects. Problems such as loose rail bolts are tightened. In addition, ultrasonic testing is performed to assess whether there are any defects that are not visible to the naked eye. If major defects are found, it may be necessary to impose speed restrictions over a portion of track until repairs can be effected;

(c) sleeper replacements. A series of broken or damaged sleepers are replaced by lifting the rail to insert new sleepers. Individual sleepers, however, may be replaced without lifting the rail, referred to as spot replacement;

(d) rail grinding. BHPBIO maintains tight control over the wheel and rail interface on its rail system in order to prolong track and wheel life, ensure safe operation and operate heavy axle loads. This involves grinding straight rail and the inner and outer rails of curves to pre-determined specifications to closely control the contact patch between the wheels of ore cars and locomotives and the railhead. Straight and curved track are ground in accordance with a schedule which accounts for the gross tonnage that has been transported over a particular section;

(e) machine and hand tamping, which involves maintaining the geometry of the track, which can become misaligned as the rail is twisted or sleepers subside over time. This involves lifting the rail and sleepers in order to repack the ballast which is underneath and supports the sleepers. Fingers from mechanised tamping equipment grip, shake and compress the ballast and ensure that the rails are at the same height and the correct line;

(f) the use of regulators which repack supporting ballast to ensure that the ballast profile does not subside over time. A regulator is a track-mounted machine which runs along the rail and uses blades and other instruments to gather the ballast and make it a uniform, sustainable shape;

(g) switch maintenance, which involves welding and repair to those switch components which are subject to greater than normal wear; and

(h) signalling maintenance. This can include changing electrical leads and lamps, repairing or replacing insulated rail joints (this is required where, as a result of heavy loads, the rail has deformed in a flowing manner and interferes with the electrical insulation of separate track sections), checking the integrity of track circuits, checking and adjusting the tolerances on switch locking and detection equipment (which are in the order of 2 and 3 mm respectively), replacing the insulated joints on switches, checking the solar power circuits, checking the telemetry signals back to the CTC, confirming the validity of the electronic system software and downloading updated data.

129. As tonnage levels railed increase, the frequency of grinding must also increase. The amount of rail grinding required is not in a linear relationship with tonnage. If tonnage railed increases, the amount of grinding required increases dramatically. This relationship is illustrated by the table below which shows that roughly doubling tonnage results in the need to perform more than three times as much grinding.

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Ultrasonic rail inspection

130. Ultrasonic inspections are performed weekly over the complete length of track by a contractor. Ultrasonic rail inspection is conducted by HiRail vehicles, which travel along the rail at 20-30 km/h.

131. Current traffic congestion on the rail line (requiring HiRail vehicles to move to sidings or to move off the rail to allow for the passage of trains) means that it currently takes approximately four to five days for the HiRail vehicles to inspect the rail from Port Hedland to Whaleback on the Newman line. Previously, when there was less traffic on the line, it would only take two days for a HiRail vehicle to make the journey from port to mine.

Maintenance windows

132. Arranging to perform opportune maintenance may involve revising train movements at short notice in order to create adequate maintenance windows. Maintenance windows need to provide sufficient time to allow for:

(a) moving maintenance equipment to a position to undertake the maintenance;

(b) carrying out the required maintenance tasks; and

(c) moving the maintenance equipment off the mainline to allow trains through (usually this involves moving the equipment to a siding off the mainline).

133. Depending on the task, the maintenance work may not be able to be completed in a single window of opportunity. If this occurs, a speed restriction (which has the effect of reducing the dynamic load applied to the track) may need to be imposed on the stretch of track until the maintenance is completed. Some maintenance tasks such as welding, also require that no trains pass over the stretch of track for up to two hours after the completion of the work.

Effective maintenance

134. The efficient operation of BHPBIO's business requires an ongoing balance of the competing needs of the individual mine, rail and port components of the business. The opportunistic manner in which many track maintenance tasks are performed enables BHPBIO to minimise the disruptive effect that maintenance would otherwise have on the overall business. For example, the failure of equipment at a mine loadout may provide an opportunity to perform track maintenance to the spur line leading to that particular mine.

135. BHPBIO also strives to ensure that the railroad operations are conducted in an efficient manner which results in the least amount of wear to the track. For example, BHPBIO generally tries to manage train meets to ensure that loaded trains returning to Port Hedland have priority over unloaded trains which are travelling to mining areas (subject to the requirement to have Yandi trains arrive on time discussed above). Apart from the fact that a loaded train will take longer and cost more to stop (as discussed above), the movement of a loaded train onto a passing track results in far higher wear to the passing track which will generally have a greater degree of curvature (in these cases, a loaded train may be stopped on the mainline with the unloaded train passing it on the passing siding). In addition, as wheels on an axle on a train are fixed and rotate at the same speed (unlike a car which has a differential), tight curves on a track result in one or other of the wheels slipping and grinding the track. When an ore car is loaded, this grinding effect increases. To illustrate how dramatically the rate of wear can increase, it is worth noting that the blades of switches (a switch blade is the curved tapering portion of track that can move to direct traffic onto a passing track) which direct trains from the mainline onto the passing loop can experience such significant wear from the passage of loaded trains that they will require replacement within three weeks if used on a regular basis (each switch blade that may be required to be replaced costs roughly $20,000). In addition, the passage of loaded trains over a switch will gradually move the switch out of alignment, with the result that it will require tamping on a regular basis.

136. Apart from conducting maintenance operations in an efficient manner, with minimal impact on rail operations as discussed above, BHPBIO has also invested in technology to reduce the maintenance required (and increase the throughput of tonnage) on its railroad by:

(a) undertaking ultrasonic monitoring of the rail line to detect subsurface defects in the rail;

(b) researching, developing, implementing and maintaining a wheel rail interface which reduces the amount of track wear;

(c) installing micro-processor based interlocking systems with vital links that do not make use of electro-mechanical relays that require maintenance (where vital link is a defined

signalling term referring to a failsafe connection between two distributed interlocking systems);

(d) purchasing advanced wheel flaw detection systems such as the wheel impact monitor which is mounted in track and measures the load imparted by every wheel under full load conditions. This wayside equipment helps prevent worn or damaged wheels from damaging the track;

(e) making use of advanced multi-stage lightning protection;

(f) investing in mechanised equipment to eliminate as much manual work as possible;

(g) developing instrumented ore cars to direct maintenance to areas that need the most attention by detecting track performance under live axle loads;

(h) utilising underfloor lathes which can re-profile locomotive wheels whilst still attached to the locomotive, which assists in maintaining the wheel rail interface within tight limits;

(i) the application of light emitting diodes (**LED**) signal systems, which do not use traditional light bulbs and have a greater component life;

(j) replacing wooden and steel sleepers with concrete sleepers which can withstand greater axle loads and maintain track geometry better; and

(k) making use of multiple motors at switches to increase reliability and integrity by removing reliance on mechanical remote operation.

137. Effective track maintenance plays an essential role in ensuring that BHPBIO is able to maximise the tonnage produced by its overall production system. Disruptions to railroad operations caused by worn or damaged track have the potential to result in significant lost production.

138. While it is generally more expensive for BHPBIO to have maintenance crews working on an opportune basis as opposed to planned shutdowns where maintenance time is scheduled, the benefit is that opportune maintenance does not detract from system capacity and tonnages railed.

Rolling stock maintenance

139. Apart from the array of wayside asset protection equipment, such as hot wheel and hot box detectors, which aids in identifying faults in rolling stock in real time, BHPBIO also maintains its ore cars and locomotives in accordance with predetermined schedules at its ore car and locomotive repair workshops.

140. BHPBIO has expended considerable resources in equipping these workshops, located in Nelson Point, with sophisticated repair and maintenance equipment, such as a portal lathe and automated underfloor lathe (which can machine the wheels on a locomotive or ore car without the need to remove the wheels) and skilled personnel.

141. Ore cars are removed from operational use for servicing after 300 trips between the port and mining areas (this equates to roughly 240,000 km). During servicing, brakes, wheels and bearings are checked and, if necessary replaced. BHPBIO also uses information gathered from its wayside monitoring equipment to isolate faults and identify particular components on specific ore cars that may need repair or replacement. For example, long term trend analysis from the data provided by the hot wheel and hot box detectors is used to assist in deciding when the bogies on a specific ore car should be replaced. Similarly, information from BHPBIO's flat wheel detecting equipment is used to monitor and trigger the replacement or refurbishment of ore car suspension springs and wheel sets.

142. To reduce the weight of an empty ore car and thereby increase the capacity of the loaded ore car, BHPBIO has also relatively recently moved to making use of high grade stainless steel for the construction of the frames and bodies of its ore cars.

143. Similarly BHPBIO's locomotive workshop performs the following maintenance tasks in relation to its locomotive fleet:

(a) after 26,000 MWh the 16 cylinder diesel engines on the locomotives and the alternators are overhauled. This equates to approximately 1,000,000 km of track use (BHPBIO's locomotives all make use of a diesel electric drive system, which uses a large diesel engine to drive an alternator that in turn provides current to electric traction motors through electronic control systems which vary the current, voltage and frequency where applicable. The electric traction motors are mounted on each of the axles and provide the power and torque that turns the locomotive's wheels);

(b) fault logs are checked and any issues attended to;

(c) electric traction motors are checked and overhauled if necessary (the cumulative nameplate rating of the six sets of traction motors exceeds that of the diesel engine – consequently, if a traction motor fails a locomotive will generally still be able to provide its rated tractive effort);

(d) valve gear is checked and overhauled where necessary;

(e) turbo chargers are inspected and overhauled if necessary;

(f) lubrication and cooling systems are checked; and

(g) batteries are checked and replaced where necessary.

Train failures

144. A train failure describes a situation where rail operations are interrupted or delayed due to a fault or problem with rolling stock. Instances of more common train failures include:

(a) locomotive failures (where some component on a locomotive fails that prevents it from operating normally);

(b) a sticking brake on an ore car;

(c) a loss of compressed air to a train with the result that all ore car brakes are applied;

(d) an overheating bearing on an ore car (which may require the ore car be removed from a train);

(e) coupler failure where a coupler connecting two ore cars breaks and the train is separated;

(f) loss of communications to the distributed power system that allows the driver in the lead locomotive to remotely control the other locomotives in the train (locotrol). This failure results in the brakes being applied; and

(g) ATP calibration error. ATP will apply the brakes if it determines that its internal map does not correspond with the geographic location of the locomotive according to a number of measuring systems on the locomotive.

145. Depending on the location of the train at the time of the failure, either rail crew or track maintenance staff (which could be a track gang or a track inspector) will assist the train driver to identify the fault and determine the best course of action. Crews attending to a train failure take on average less than an hour to get to the breakdown (depending on the breakdown site, crews generally take no longer than two hours to reach a train).

146. Meanwhile, the driver identifies whether a certain type of fault has occurred (such as a hot bearing or hot wheel). If the driver cannot identify the problem, he or she will seek assistance to fault find. Depending on the problem, the driver may be able to remedy the problem, so that the train may continue onto a siding, where the maintenance crew rechecks the train. If the driver cannot remedy the problem and the train is unable to continue to a siding under its own power, either other locomotives travelling on the track must be detached from their train and diverted to assist the

defective train or the train must remain where it is until maintenance crews arrive and are able to repair it.

147. Accordingly, train failures usually result in one of three outcomes:

(a) the train is able to proceed at reduced or low speed to a passing track or siding;

(b) the fault is identified and action is taken to mitigate its effect with the result that the train can continue. Examples of such train failures would be an overheating bearing, requiring that an ore car be detached from the train and moved to a dead end siding or back track (back tracks are used to store failed trains and maintenance equipment which are protected from trains operating on the mainline), or a mechanical fault, such as failed turbocharger, on a locomotive which prevents the locomotive from developing sufficient tractive effort to move a train up a gradient; or

(c) the fault requires immediate action, with the train unable to move until technical assistance is provided. A seized bearing on an ore car, coupler failure, a brake shoe welded to a wheel or a loss of air resulting in the application of the brakes on all ore cars are all examples of problems that will require external assistance to move a train from the mainline.

148. All of these outcomes usually result in substantial lost production tonnage. In addition to the direct loss of daily production from the affected train, the delay or disruption of other trains will result in additional losses.

149. One of the most serious forms of train failure is a derailment. A derailment can be caused by events such as an undetected overheated bearing, which results in the wheel unscrewing from the axle, or a track defect.

150. Derailments can result in extensive damage to the track. In May 2000, a major derailment occurred which destroyed approximately 4 km of track. Again, a derailment in 2005 destroyed 6 km of track. Recently, the derailment of a single ore car destroyed the clips fastening the rail to the sleepers over a stretch of 8 km of track.

151. It is worth noting that BHPBIO's rolling stock makes use of approximately 30,000 bearings. The failure of a single bearing can result in significant loss. An example of a bearing failure with significant consequences was an ore car which derailed at a set of points at Yandi junction due to a failed bearing in February 2007.

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153. Train failures on a single line track can cause delays to all other trains travelling both to and from the port. As BHPBIO's rail system is fully integrated with its mining and port activities as part of its production process, any breakdown slows the entire system. This may lead to, amongst other things, reduced production levels and the incurring of additional demurrage charges in respect of ships waiting for loading. When a locomotive has to be diverted to assist a defective train, further disruptions occur.

154. BHPBIO maintains a record of daily train failures and delays. A copy of the reports for the period 16 July 2007 to 22 July 2007 is annexed and marked "**VDW-19 CONFIDENTIAL C**". From these reports it can be observed that:

(a) a single failure results in a large number of consequent delays to other trains because of the single line nature of the train system. For example, the report for 16 July 2007 shows that train separation of train 0152LD due to a broken knuckle resulted in consequent delays to four other trains which had to wait for a combined total period of 610 minutes while the separated train was repaired;

(b) another significant reason for track delays is locomotive failures. Examples of locomotive failures that appear on the report include the failure of a speedometer, turbocharger, or alarm on a locomotive necessitating the shutting down of the locomotive and the failure of the distributed power system on a locomotive;

(c) BHPBIO's rail operations are subject to external interference from the public from time to time. On 20 July 2007, a mobile portable toilet was left in the path of oncoming trains at a level crossing where the rail line intersects a public road. This required train number 200AMT to perform an emergency stop to avoid colliding with the trailer, which then had to be removed from the line resulting in a delay of 85 minutes.

155. Even shifting a defective train into a siding slows the entire process as it limits BHPBIO's ability to manage train meets while the defective train is repaired.

156. BHPBIO's train system is a closed system with a fixed number of ore cars and locomotives and any delay or disruption to the railing of ore has a ripple effect which takes up to 72 hours to work through the system. This ripple effect of disruption further compounds the system loss and is difficult to identify and measure the ultimate costs and tonnage losses of consequential delays.

RAIL PLANNING

157. Operational rail planning is assisted by BHPBIO's Integrated Planning group. The 72 hour rail sequence document is "owned" by the Integrated Planning group. In other words, logistics scheduling specialists in Integrated Planning are responsible for the preparation of the 72 hour rail sequence document on the basis of:

(a) product orders;

(b) ship arrivals;

(c) mine capability; and

(d) rail capability.

158. The 72 hour rail sequence accordingly indicates train sequence and train departure times. The 72 hour rail sequence is revised as events unfold and several versions of it are subsequently distributed during the course of the day. A copy of the first version of the 72 hour rail sequence for the period 27 April to 30 April 2007 is annexed and marked "**VDW-20 CONFIDENTIAL C**".

159. As events develop on the rail system, such as system delays due to equipment faults or urgent maintenance, train controllers usually provide updated forecasts to the Integrated Planning group which are then communicated to the various mines. The Integrated Planning group adjusts train sequences and departure times and, with the assistance of the train controllers, allocates priorities. For example, if there is a fault with Car dumper 2 at Nelson Point, which usually loads product from the Newman Joint Venture mines, and there are three or four trains en route to the Newman mining

area, it will make sense to redirect some or all of the trains to alternative mining areas, provided that there is sufficient loading capacity and product available. Similarly, if there is a problem with mine production or loadout facilities at a particular mine, trains will be directed to other mines.

160. To facilitate this coordination, there is a daily conference call involving Integrated Planning, mines, port and generally either the Rail Operations planner or the Superintendent for the mainline and myself from Rail Operations at 7.45 am. This call is critical to the smooth daily operation and integration of BHPBIO's mine, rail and ports. It is conducted on the basis of:

(a) a high level of cooperation between the personnel from Integrated Planning, mines, rail and port operations. This high level of cooperation has been fostered over time as BHPBIO has moved toward a more integrated approach;

(b) aligned incentives across all participating personnel to increase BHPBIO's overall production tonnage. For example, rail operations will agree to assist a particular mine to ramp down stockpiles in anticipation of a maintenance shutdown of its loadout/s even though this may compromise the railroad's production level on a given day. This requires reciprocal trust that all participants have BHPBIO's overall best interests at heart (there are no competing interests as there might be if there were separate companies with different commercial objectives);

(c) previous experience in operating BHPBIO's integrated operations. It has taken time to develop the expertise and level of understanding across business areas to operate BHPBIO's mine, rail and port operations in a truly integrated fashion; and

(d) the authority of all participants to make immediate decisions in the overall interests of BHPBIO's business.

161. At 7.00am, prior to the daily call with Integrated Planning, mines, rail and port, I usually produce a document indicating the location and activities of trains on the rail system. A copy of one of these documents, dated 19 July 2007, is annexed and marked "**VDW-21 CONFIDENTIAL C**". I examine this document to get a sense of current train movements, the number of trains that will be operating during the course of the day and check whether there are any issues that have to be followed up on; for example, if a loaded rake has waited for an extended period before being dumped and returned to the departure yard.

162. In addition to the Integrated Planning conference call, there is a daily meeting of port personnel called by the port manager at 7.00 am to discuss the 48 hour port plan, which deals specifically with port planning and performance. On occasion I attend this meeting, as does the Integrated Planning manager.

163. Similarly, after the 7:45 am conference call, a dedicated internal Rail Operations meeting is held to discuss performance against plan, any delays, forthcoming maintenance and future planning.

164. The Integrated Planning group also prepares a six week plan which considers planning over a longer period on a less operational level. The six week plan provides a daily schedule of co-ordinated interaction between the mine, rail and port and includes:

(a) how many train movements there will be to each destination (the number of ore cars, in rakes of 106 cars is recorded);

(b) planned maintenance activities (such as, for example, a 12 hour maintenance shutdown of Car dumper 2); and

(c) the respective proportions of run of mine production (**ROM**), which still requires stockpiling and blending at the port, and DSO that will be produced and shipped.

165. Integrated Planning coordinates a weekly meeting at 10.00 am every Thursday to update the rolling six week plan. The six week plan looks at upcoming shipping demand and, consequently, the required production volumes from the mining areas, the volume of material stockpiled at each mine site and the volume of ore that will have to be transported on the rail system. The planning process takes account of the fact that BHPBIO's present integrated production process operates on a hybrid basis with the Yandi mining area "pushing" product to the port (due to limited stockpile area) while the port "pulls" product from Area C and the Newman mining areas. A sample copy of an agenda of the weekly meeting is annexed and marked "**VDW-22 CONFIDENTIAL C**". A copy of the six week plan for the week commencing 28 April 2007 is annexed and marked "**VDW-23 CONFIDENTIAL C**".

166. The Superintendent, Product Scheduling in BHPBIO's Integrated Planning Product Scheduling group also prepares a monthly plan in the context of a forward looking three month time frame, from the six week plan, which provides rail systems capability on a daily basis. This plan indicates all of the planned and routine maintenance that will take place during the course of the month. Usually planned maintenance will involve withdrawing the Newman mainline from service for one 12 hour shut down, as well as two additional two hour shut downs during the course of the month. As Manager, Rail Operations, I sign off that the proposed volume of ore to be transported on the rail system in the monthly plan is achievable.

167. Rail Operations also feeds through any operational issues on a daily basis to Integrated Planning to facilitate the preparation and updating of the monthly plan.

168. In addition, Rail Operations provides more detailed technical data about rail operations which is used to update the parameters used in the dynamic system model developed and maintained by

The Simulation Group (**TSG**), which is also used principally for capacity expansion modelling and also by Integrated Planning to predict and analyse the capacity and performance of BHPBIO's rail system. Examples of this kind of data include:

(a) updated travel time data over each of the track sections derived from train graphs prepared by BHPBIO's train controllers tracking train movements;

(b) railroad operating system data from the RROPS, which records information such as the movement of ore cars through the rail system; and

(c) train running data downloaded from BHPBIO's locomotives, which is analysed and sent on to TSG. This data is retrieved from the onboard data logging systems fitted to both BHPBIO's GE and EMD locomotives. The GE locomotives are fitted with data logging equipment which collects pulse logs (which is a record of all driver actions) and information from the locomotives' ATP system, while the EMD locomotives are fitted with Intelitrain data logging equipment.

169. At a higher level, Integrated Planning also prepares a document referred to as the One Plan which provides tonnage forecasts for the upcoming two years. To facilitate this process, Integrated Planning maintains detailed spreadsheets that include customer orders, stockpile levels and the railing volumes required to meet the demand. The quarterly element of the One Plan feeds down to the more detailed operational plans discussed above.

170. This entire planning process is based on the philosophy that planning assists the various elements of BHPBIO's business to allocate resources to the short term constraint in the system, sometimes at the expense of other elements. This approach gives the best overall system efficiency but does not seek to optimise individual components of the system which are not the constraint. In this way, planning does not act as a limitation to daily operations, which retain flexibility to change and respond as events unfold.

CAPABILITY AND CAPACITY OF BHPBIO'S RAIL SYSTEM

171. In assessing the capability or capacity of BHPBIO's rail system it is necessary to distinguish between the notional or theoretical capability of the rail system and the practical capacity of the rail system. Though these terms may be used interchangeably, the approach adopted within BHPBIO's railroad operations is to distinguish between two separate concepts:

(a) **Notional capability** simply describes the maximum number of trains that can be operated on the rail line for a short period; and

(b) **Practical capacity** of the rail line considers the sustainable tonnage that may be transported on the rail system and takes into account issues such as the need to maintain the rail line, the operational time lost to weather and train failures and end effects that have an impact on the operation of the rail system (where end effects describes those events and activities at either end of the rail line that constrain BHPBIO's railroad operations, such as loading, unloading, assembling and inspecting trains).

172. To better understand the difference between notional capability and practical capacity, I deal with the factors which affect these two different measures of the capacity of the rail line below.

Notional capability of BHPBIO's rail line

173. The notional capability of BHPBIO's single track rail line can be estimated by calculating the maximum number of trains that can run over the stretch of single track that takes the longest time to traverse (otherwise referred to as the ruling sectional time). In undertaking this calculation, it is necessary to take account of the critical physical characteristics of the trains operated on the track. In particular, it is important to assess:

(a) the type and condition of the locomotives and rolling stock, as this affects overall track speed; and

(b) the number, length and weight of the trains being operated, as these factors affect travel times.

174. In the case of BHPBIO's Newman mainline, the ruling sectional time is the stretch of single track between Hesta and Shaw which is a distance of 14 kilometres. This stretch of track traverses the Chichester Ranges with a gradient of up to 0.55% for a loaded train, which results in train speeds of approximately 18 km/h on the final section of the grade. This is referred to as the "balance speed" as the tractive effort of the locomotives and the weight of the train are matched or "balanced" at this speed. The speed of the train remains steady for the remainder of the constant gradient section. The higher entry speed to this grade and the balance speed of 18 km/h result in trains taking approximately 35 – 40 minutes to traverse this portion of the track. If a window of 40 minutes is provided to allow opposing trains to enter a siding, provide safe separation and take account of the fact that trains need to pass in the other direction, BHPBIO could even in theory operate no more than 36 a day. This means that it is theoretically possible for the line to accommodate an absolute maximum of 36 train paths per day (ignoring all practical issues, such as maintenance and the movement of work trains discussed in greater detail below).

Practical capacity of BHPBIO's rail line

175. This information is, however, of little practical use. In assessing the practical and sustainable capacity of the rail system it is necessary to account for all of the practical constraints that limit the capacity of the railroad.

176. In contrast to notional capability, the practical capacity of BHPBIO's single track rail line is measured by the number of train trips undertaken for the purposes of collecting iron ore from BHPBIO's mines and delivering that iron ore to BHPBIO's port facilities which can be achieved by BHPBIO on the rail line on a consistent and sustainable basis over a given period, usually a year. It is the practical capacity of the line with which BHPBIO is concerned, because the primary purpose behind the construction, operation and maintenance of the railroad is the safe shipping of iron ore from Port Hedland.

177. Such a measurement must have regard to the factors described above that determine theoretical capability, as well as a number of additional, frequently interrelated, factors that relate to the operation of rail operations within BHPBIO's iron ore business. Additional factors that constrain the practical capacity of BHPBIO's single track rail line are outlined below.

Track maintenance requirements

178. The need to perform maintenance on the track has both direct and indirect effects on the capacity of the railroad. In a direct sense it results in a section of the mainline being withdrawn for the required time. The timing of the maintenance is also affected by the need to perform welding work at a neutral temperature which in turn determines the time of day that the track gang requires access to the track. If maintenance is to be performed on a siding, it will affect the ruling sectional time by doubling the distance that trains have to travel before reaching the next siding at which track meets can be managed. In an indirect sense, track maintenance also has a ripple effect on train movement on the system with four to five days of train operations indirectly affected by a single 12 hour shutdown as operations are ramped down and ramped up. In other words, congestion effects caused by track maintenance manifest themselves as congestion effects elsewhere on the rail system as the synchronised movement of rolling stock is disturbed.

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In addition, apart from the time required to perform maintenance activities on the rail line, it is also necessary to take into account the movement of trains required for maintenance purposes. Trains moving track maintenance equipment, ballast, rail and sleepers, all need to be accommodated.

The variable requirements in the mining and port operations

179. Variable requirements in the mining and port operations which cause continual variations to train movements, both in terms of planned train movements and the configuration and destination of specific trains. The principal goal of BHPBIO's railroad operations is to serve the requirements of BHPBIO's integrated production process in producing iron ore products for loading onto ships at Port Hedland. Accordingly, rail operations are managed to respond in the most efficient manner to variations that occur within the mining and port operations. Put differently, rail operations, including maintenance requirements, are managed to optimise overall system efficiency rather than merely achieve efficient rail operations. Variability in mining operations is driven in part by the fact that the three major mining areas, Yandi, Newman and Area C, all operate differently:

(a) Yandi has limited stockpile space with the result that it "pushes" product to the port and requires that empty trains arrive within specific timeframes and on a regular basis to avoid product rehandling and in severe instances, shut down of processing facilities at the mine. Empty trains travelling to Yandi receive priority from rail operations as a consequence of the need to remove iron ore from Yandi's limited stockpiles. In this regard, while daily production from Yandi is roughly 130 kt, Yandi has live stockpile space for only 80 kt of fines product (40 kt at both Yandi 1 and Yandi 2) and 20 kt of lump. Production levels from Yandi can also vary with Yandi recently producing approximately an additional 10 kt of iron ore per day. Yandi produces lump and fines products at the mine (frequently referred to as DSO, which can in certain circumstances be loaded directly to ships);

(b) trains collecting product from mines in the Newman mining area have to load ore from Whaleback and the satellite mines in the correct proportions and in the correct sequence in order to ensure that the final blended product is produced at the port. Approximately 42 rakes of ROM iron ore have to be collected in the correct order from Whaleback, Orebody 18, Orebodies 23 and 25 and Wheelara to produce the final blended products in two separate port stockpiles (one for lump and one for fines). Some of the smaller satellite mines also have limited stockpile capacity which requires train arrivals to be carefully co-ordinated with mine production and stockpile levels;

(c) like Yandi, Area C produces lump and fines product at the mine. Area C has greater stockpile capacity at the loading area than Yandi and is better able to handle variation in

rail operations. Area C's train loading equipment does, however, take longer to load a train than Yandi.

180. Apart from the different strategies necessitated by the different manner in which the mines operate, rail operations are also affected by the variability in loading times at each mine site (this is described in more detail at paragraph 47 above). In addition to the supply side variability from the mines, rail operations are also affected by variability in demand and port operations. Aspects of BHPBIO's operations that cause variability in demand are:

(a) BHPBIO usually only has 10 days notice of the arrival of ships. As BHPBIO does not arrange the majority of the shipping, it has little control over ship arrivals. Obviously ship arrival determines product demand with the result that BHPBIO has limited lead time in relation to product demand;

(b) ship loading constraints. Large ore carriers need to have their holds loaded in an incremental fashion to prevent damage to the ship. This is called the hatch loading plan and is dictated by the vessel captain. In addition, the rate of ship loading may be limited by the speed at which the ship can de-ballast (which describes the unloading of the ballast water put on an empty ship to give it stability during its journey by lowering its centre of gravity in the water). In addition, the height of the tide, the percentage of ore loaded and the air draft capability of the ship loader determine how and when BHPBIO can load ore to any particular ship (air draft capability describes the height of the ship loader with maximum luff angle, which is the highest the ship loading boom can be lifted, relative to the height of the ship);

(c) stockpiling constraints. The expansion of BHPBIO's stockyards over time has the result that conveying, processing and stacking equipment may have different feed rates. This may require car dumpers to operate more slowly in order to prevent overloading other material handling and processing equipment.

At any point in time there may be stockpiles that are not fully completed, occupying a footprint which will not be released until the stockpile is fully completed and reclaimed for ship loading. The fact that there are a limited number of stockpile footprints further increases the complexity of the order of product dumping.

(d) a further complexity is the interaction of reclaiming and stacking equipment which may be mounted on the same purpose built rail or working on the same stockpile;

(e) sustained demand for a specific product which requires the "sprinting" of trains. "Sprinting" describes the allocation of additional trains to collect (or "pull") product from a specific mining area. Presently, BHPBIO has only limited ability to "sprint" trains as it does not

have sufficient rolling stock to increase the number of trains travelling to one mining area without affecting the collection of ore from other mining areas. In particular, BHPBIO cannot "sprint" trains at the expense of Yandi, which still requires the regular and timely arrival of trains. Accordingly, to the extent that BHPBIO engages in "sprinting" its trains, it usually involves the diversion of trains from the Newman mining area to Area C when Area C product is in high demand. During this time, port stockpiles are used to balance the demand for Newman products with the result that these stockpiles require replenishment as soon as the "sprint" is complete; and

(f) the need to load ore from Yandi and Area C directly to ships. Direct loading of DSO product onto ships avoids rehandling of ore at the port (since the ore is otherwise stacked and then reclaimed). The simultaneous loading of DSO ore direct to ship from the car dumper along with ore from a stockpile also has a beneficial effect on ship loading rates. To obtain these benefits, BHPBIO plans to increase the direct loading of DSO products to ships to 30% of overall tonnages. This requires the careful synchronisation of train arrivals and subsequent unloading at the port with ship loading activities.

181. An indication of the variability that BHPBIO's railroad has to cope with is provided by the charts showing the number of rakes queued in front of the car dumpers at BHPBIO's port facilities from 16 to 23 July 2007 annexed and marked "**VDW-25**". While the figures ranges from three to 11 rakes, it is also apparent that the average number of rakes shifts between three and seven. As BHPBIO had roughly 31 rakes in service during July 2007, this shows the number of rakes operating on the mainline and other portions of the railroad at any one point varied from 20 to 28.

Train failures and disruptions

183. The increasing number of failures has a significant impact on the practical capacity of the railroad. Generally, each train failure not only disrupts the train affected, but also delays or disrupts other train movements during and after the period during which BHPBIO recovers the failed train.

Practical operating speed

184. Practical operating speed is affected by the maximum speed that rolling stock can travel at, the minimum speed that trains can maintain when traversing gradients and track condition. I deal with each of these below:

(a) maximum speed: BHPBIO has evaluated operating its trains at higher speeds, but has discovered that the heavy duty bogies fitted to its ore cars tend to "hunt" at speeds greater than 75 km/h (when the ore cars are empty). Hunting describes the tendency of the cars to oscillate from side to side. In addition, the suspension on the ore cars, which has been designed to deal with heavy loads, may when loaded reach the extent of its travel at higher speeds resulting in "bottoming out" which applies a large dynamic force through the bogie to the rail. The application of this force to a stretch of rail with a defect in it could break the rail and cause a serious derailment. As a consequence, BHPBIO limits its trains to speeds of less than 75 km/h even though its locomotives can safely exceed this speed;

(b) minimum speed: practical operating speed is also affected by the ability of locomotives to maintain speed up inclines when pulling a loaded train. While the speed of the train on flat track is determined by the locomotive's power, the speed that a train is able to sustain on an incline is determined by the tractive effort that the locomotive is able to exert and the weight of the loaded train (as discussed above, this is critical in determining the "balance speed"). In practice, this results in trains travelling at approximately 18 km/h up the relatively steep grades required to traverse the Chichester Ranges. If a train drops below the minimum speed it is in danger of stalling as the electric traction motors overheat under conditions of high load and poor cooling (cooling effectiveness is related to the speed at which the train travels). The train's onboard control systems detect the high temperatures and automatically start to reduce the current flowing to the electric traction motors with the result that the locomotive reduces power to the traction motors and the train stalls. If a train stalls, it will usually have to wait until the traction motors have cooled before it can move off again; and

(c) track condition: track condition is closely related to the level of maintenance of the track. Degradation of the track through intense usage has the effect that trains need to slow down in order to safely negotiate sections of track with defects such as twisted rails, or irregular top of rails (where both rails dip and rise), and prevent further damage to the track.

Expansions and upgrades to rail infrastructure

185. Over the last few years BHPBIO has engaged in successive expansion projects involving its overall iron ore production system known as Rapid Growth Projects. Each of these expansion projects has involved increasing the capacity of the railroad.

186. BHPBIO is presently commissioning Rapid Growth Project 3 (**RGP3**) which will increase the annual tonnage railed to approximately 130 Mtpa. Subsequently BHPBIO plans to raise the tonnage railed on its system to 155.7 Mtpa with the implementation of Rapid Growth Project 4 (**RGP4**).

187. The aspects of the RGP projects that involve expansions and upgrades to rail infrastructure can cause constraints on the capability of BHPBIO's single track rail line. As with maintenance work, the works associated with expansions and upgrades often require access to tracks and other rail infrastructure for periods of time, preventing or limiting use of the rail by BHPBIO. For example, to integrate a new siding with the mainline, it is necessary to cut the mainline to insert a switch.

Time lost to weather

188. BHPBIO's rail operations are located in the most cyclone prone area of Australia. The cyclone season lasts between four and six months during which an average of five cyclones cross the coast. In addition to cyclones that cross the coast, BHPBIO's operations are also affected by off-shore cyclones that result in closure of the port and tying down of equipment before the winds get too strong to use cranes. Cyclones have a significant effect on BHPBIO's railroad with rail operations having to ramp down, cease activity and then ramp up operations once the cyclone has passed. The ramping down of operations generally starts 24 hours before a cyclone is anticipated with the railroad completely shutdown four hours before the cyclone arrives.

189. Cyclone shutdowns involve activities such as bringing crews back in time for them to be at home before the red alert, locking up boom gates, moving rolling stock into yards and lowering the lights in the yard. Recovery after the passage of a cyclone depends on the severity of damage caused by the cyclone. At best (for example if there is a false alarm with no damage), it will take roughly 30 hours to properly resume rail operations. Prior to recommencing rail operations, BHPBIO dispatches HiRail vehicles to inspect the track and ensure that its integrity has not been compromised (cyclones can result in damage to culverts and wash away of the permanent way under the rails).

190. BHPBIO allows a nominal six days per annum for cyclone stoppages. In my view, this is an optimistic figure as it does not take account of delays resulting from cyclone damage caused by flooding, high winds and lightning strikes to track and signalling equipment. In addition to delays in ramping up rail operations, BHPBIO's supply chain is also affected by the fact that ore carriers

waiting off the coast move to deeper water during cyclone conditions and take some time to return to Port Hedland.

The availability of rolling stock

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Track layout and infrastructure

192. A number of aspects of the track layout and infrastructure will have an impact on the practical capacity of the railroad. These aspects include:

(a) the axle loads that can be safely operated on the track. The axle loads determine the overall tonnage that may be transported in each ore car. Presently, BHPBIO aims to operate axle loads not exceeding 44 tonnes on adjacent pairs of wheels and targets axle loads of between 36 and 37.5 tonnes, though depending on the loading method used, there can be considerable variation around this axle load target;

(b) the curves and gradients on the track. The severity and number of curves and gradients on the track are determined by the terrain that the track traverses. Tight curves may require trains to slow down. Steep gradients on the track, particularly where the gradients are in the direction that loaded trains travel, affect the ability of the train to maintain speed (as discussed above, this affects the minimum speed that the train is able to maintain). The Newman mainline traverses relatively steep gradients through the Chichester Ranges, on the Yandi spur and on the spur leading to Area C;

(c) passing tracks. The length of a passing track determines the ability of a passing track to accommodate trains with multiple rakes – presently BHPBIO's passing tracks have been extended to accommodate trains made up of three rakes. In addition, the types of switches at the entrance and exit of passing tracks determine the speed that a train may enter or exit a passing track. BHPBIO's passing tracks are fitted with medium, rather than high, speed switches (longer high speed switches allow for higher train entry speeds, but are more expensive to install and operate and take up more physical space). Loaded trains need to

slow to 35 km/h to enter a medium speed switch while empty trains can traverse these switches at 45 km/h; and

(d) signal design and spacing. The design and spacing of BHPBIO's signalling system determines the safe separation between trains travelling in the same direction within the same block between sidings and safely separates opposing trains. This system operates without an overlap which provides a higher capacity than a system designed with an overlap. An overlap is the allocation of an empty stretch of track section between limits of train movements imposed by the signalling. This capacity enhancement is only made possible safely through BHPBIO's use of ATP.

Availability of railroad personnel

193. For a period BHPBIO sought to operate its rail operations on a scheduled basis in part to allow for the rostering of drivers. In other words, the availability of drivers to operate trains determined whether trains could be run. In practice, this sometimes had the result that trains would be assembled and ready to depart the port, but could not operate because no driver was available.

194. BHPBIO has moved away from this approach and now employs sufficient train drivers on a flexible basis to ensure that it is not compelled to conduct railroad operations in a manner determined by staffing levels, but rather has the ability to respond to variability introduced by mining operations, demand at the port or disruptions (caused by events such as breakdowns) as required;

Management of railroad operating costs

195. BHPBIO's railroad capacity is also affected by the manner in which it seeks to manage operating costs. The principal example of this is the fuel strategy pursued by BHPBIO. Presently BHPBIO operates its trains at the highest safe speed in order to minimise travelling time and maximise iron ore production.

196. In the past, in conditions of lower demand for iron ore, BHPBIO has sought to reduce this operating cost by adopting a fuel efficient train operating strategy, which involved locomotives travelling at speeds lower than 75 km/h with longer cycle times between the port and mines.

197. Other examples of railroad operating costs that BHPBIO can manage to achieve different outcomes depending on market circumstances are track maintenance and the availability of railroad personnel. Presently, BHPBIO places a premium on totally flexible operations in relation to both track maintenance and staff availability to maximise production levels, even though this increases railroad operating costs.

Practical capacity of Newman mainline

198. The above factors cumulatively determine the maximum number of paths on the train system, where a train path describes the movement of a train from the port to mines and back from the mines to the port.

201. In conjunction with the number of train paths, the tonnage of ore transported on BHPBIO's Newman mainline is also determined by the number of rakes that are dispatched on a daily basis to collect iron ore from the mining areas. In this regard, BHPBIO can vary the overall number of rakes in operation by making use of a mixture of two and three rake trains (with one rake trains also used in certain circumstances).

Operational methodologies

202. The factors listed above also affect the operational methodologies adopted by BHPBIO over time. As BHPBIO's rail system has expanded and developed, BHPBIO has sought to develop and optimise its operational methodology to ensure that practical capability is maximised. In other words, BHPBIO is continuously monitoring the manner in which it operates its rail system to assess whether any changes to operational practice can improve overall system efficiency and production levels.

203. Examples of the changing operational approaches adopted by BHPBIO over time include:

(a) in the past BHPBIO sought to operate its train system on a scheduled basis. It was planned that trains would depart the port in accordance with a predetermined schedule. In practice, it was frequently found that rakes would not have been unloaded in time to be assembled into departing trains. This had the result that trains would depart for the mining areas at the correct time but with irregular numbers of empty rakes since rakes that were not ready for one train would be added to the following train. The result was that trains would arrive regularly at the various mine sites, but would load variable tonnages depending on the number of empty ore cars available. Ultimately it was decided that this operational methodology introduced too greater degree of variability for the mine sites;

(b) subsequently BHPBIO shifted to a system where it developed schedules that were based around drivers' shifts. In other words, train movements were determined by driver availability (the constraint that this imposed on operations is discussed above). In my view, at this time BHPBIO's mine rail and port operations were not as closely integrated as they there are now, where railroad operations are required and able to respond to variability introduced by mining and port operations. The improved integration of mine, rail and port operations has allowed for greater production tonnages;

(c) in late 2005 it became evident that two of the port car dumpers were being under-utilised, with periods averaging up to four hours a day when the car dumpers were not utilised. BHPBIO sought to ensure that trains were queued before the car dumpers in order to improve car dumper efficiency. BHPBIO's preliminary conclusion was that this could be achieved if the trains were able to depart from the port or mine as soon as they were ready (essentially abandoning the concept of a rail schedule). The essence of this approach was that, while trains would depart the mine and the port as soon as they were able to, they would still adhere to a predetermined sequence in order ensure that grade requirements were achieved. It was proposed that trains would run to a sequence rather than a schedule. This introduced the theory of constraints approach to the whole end-to-end business to the railroad. In other words, constraints on one part of the business were analysed in the context of the overall business to ensure that the overall system operated efficiently rather than each individual component. To improve car dumping efficiency, it was necessary to reduce the amount of time spent unloading each train, which was achieved by ceasing to operate one, two and three rake trains and instead operating two rake trains. To make up the tonnage reduction caused by only running two rake trains, it was necessary to run 14 trips per day, rather than the previous 12 trips per day. Running additional trains per day increased cycle times, because of the increased number of meets on the track. Increased trip times were offset against the reduced loading and unloading times because of shorter trains (while still allowing for necessary planned and opportune maintenance). BHPBIO also undertook extensive planning to determine the necessary changes to crew rosters and crew changeovers in order to enable this approach to be implemented. The revised operational approach resulted in improved car dumper efficiency. However, the limits of this operational approach became apparent as BHPBIO increased production tonnages which manifested in unpredictable train meets on the mainline due to the bunching of "run when ready" trains;

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204. A further new development, which is likely assist BHPBIO in developing the most efficient operational methodology, is the implementation of the Siemens train control system (described briefly above). This system has several phases which add further levels of sophistication to BHPBIO's ability to monitor and control its train system. In particular, BHPBIO intends to shortly implement the component of the new system which will allow for electronic train graphs to be generated. At present, the paper train graphs prepared only record train movements in 10 minute increments. The new electronic graphs will allow for performance on the rail system to be measured in far smaller time increments. These graphs will be an important tool in allowing BHPBIO to better understand and manage operational aspects such as driver performance and the effect of train speed on specific stretches of track. A more accurate record of events that have occurred on the track may also allow for improved optimisation of train operations as parameters will be better understood and BHPBIO may be able to further refine its operations.

205. BHPBIO's overall control of its mine, rail and port systems provide it with the flexibility to continuously examine, operate trials and refine its operational methodology.

Current and future rail capacity

206. In previous years BHPBIO's Newman mainline railroad has achieved the following results relative to budgeted tonnages. It can be seen from the table that the actual tonnages railed have been within 2% of budgeted tonnages:

207. While BHPBIO is reasonably accurate at predicting its annual capacity, it faces substantial uncertainty in predicting daily or weekly capacity.

209. In the circumstances, it is clear that the capacity of BHPBIO's railroad fluctuates on a daily basis relative to anticipated throughput. A single random event, such as a train failure, can cause significant disruptions to railroad operations and tonnage throughput. This fluctuation is also driven

by the daily variability in mine, rail and port operations combined with continued expansion of BHPBIO's overall system.

IMPACT OF THIRD PARTY ACCESS ON BHPBIO'S OPERATIONS

213. In the paragraphs below I discuss the potential impact that third party access to BHPBIO's railroad may have on BHPBIO's railroad operations.

The impact of third party operations on capacity

216. As explained above, in my opinion BHPBIO's rail line is operating at extremely high tonnage levels. These extremely high tonnage levels are achieved through BHPBIO's use of very high axle loads and rail operating system that have been developed to maximise tonnage of ore railed to meet demand at the port. Any disruption to railroad operations is likely to result in a reduction of the tonnage of ore railed.

217. Depending on the manner of railroad operation and the operational efficiency of a third party, third party access may result in:

(a) BHPBIO having to operate fewer trains to accommodate the paths taken up by the third party with a consequent direct loss in production tonnage; or

(b) the overall performance of the rail line being reduced. This will occur if the third party's trains transport a lower tonnage of ore per train, relative to BHPBIO's operations.

218. As BHPBIO is currently intensively using its rail operations to maximise iron ore production, a reduction in the rail capacity available to BHPBIO will result in the loss of tonnage as well as introduce inefficiencies in the operation of its infrastructure. BHPBIO's mine, rail and port operations have high fixed costs and need to operate on a high volume basis in order to recover all available margin.

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220. In addition, any delays on the rail system introduced by a third party will have a consequent effect on BHPBIO's other integrated operations with associated costs. For example, a train failure of a third parties train may result in BHPBIO incurring significant additional demurrage costs if it is unable to deliver a customer's iron ore to port in a timely fashion (particularly where the product is to be loaded directly to ship).

221. Due to the fact that BHPBIO is likely to remain the principal operator of trains on the railroad, the effect of any delay will be asymmetric with BHPBIO exposed to far greater production losses. Any tonnage lost, will have significant revenue implications for BHPBIO: on the basis that BHPBIO is presently shipping approximately 120 Mtpa at an average price of US$50 per tonne, the Newman mainline is an integral component of an integrated logistics chain that produces roughly US$0.5 million per hour.

222. In my view, BHPBIO will not have any additional annual capacity to accommodate a third party as RGP4 is implemented. While maintenance is currently being flexed enormously to fit in between trains, there will be even less maintenance time in the future with the planned tonnage increases on the Newman line. BHPBIO already makes use of road trains to transport fuel to mining areas to reduce demand on its railroad. As BHPBIO moves towards railing 160 Mtpa with its current infrastructure, there is a conflict between production and maintenance requirements with the result that BHPBIO is attempting to undertake some proactive maintenance at this time to compensate for diminishing maintenance opportunities that will result from increased tonnage. BHPBIO is already examining ways of achieving this increased tonnage at an earlier time. The increased tonnages represent a significant challenge for BHPBIO's railroad operations.

The impact of third party operations on flexibility

224. Accommodating a third party's rail operations on the Newman mainline also is likely to remove a significant degree of the operational flexibility that is used by BHPBIO to maximise rail capacity. For example, to facilitate the operation of a third party's train, BHPBIO may have to adopt a less flexible operational methodology, such as a form of fixed schedule for its rail operation or implement decision making matrices which determine priority of a particular party's train when it interacts with other trains on the rail system.

225. These forms of managing train operations may severely constrain BHPBIO's ability to operate its railroad in a flexible manner, thereby reducing system capability. As described above, currently BHPBIO operates its trains in a manner that maximises tonnages railed, within the constraints imposed by rail maintenance, supply and demand variability, the push and the pull operating regimes and various other contingencies such as equipment outages at mine, rail and port.

226. In addition, BHPBIO's overall control of all aspects of its railroad has allowed it to trial new ideas and develop its operational methodology to adapt to the infrastructural and operational constraints of the overall system over time. These trials can vary from small changes to the number of ore cars in a rake, or significant transformations of the overall operational methodology such as the shift from "run when ready" operations to the allocation of distinct pathways to each train. These trials can be arranged at short notice and any changes can be implemented without delay. BHPBIO may have more difficulty arranging trials of different operational methods on its railroad where it also has to offer access to third parties.

227. It is also likely that BHPBIO will have to develop detailed operational rules and audit processes to ensure compliance with those rules to manage all operational aspects of railroad operations, such as fatigue management for personnel. Any changes to these rules would need to be notified to a third party by way of an amendment notice with adequate lead time provided prior to the introduction of new or amended rules. These developments are likely to undermine the relative operational freedom which BHPBIO enjoys at this time. (While BHPBIO has strict safety rules and high standards, rail operations and train controllers have the ability to vary operations and practices on an ongoing basis and regularly do so.)

228. In addition, the presence of a third party with different commercial incentives could undermine the high level of trust built up across different parts of BHPBIO's business based on a common understanding of production goals, teamwork amongst different elements of the mine, rail and port supply chain and the knowledge that sacrifices in one area can lead to improvements in overall system performance. A third party would have different production goals and operational constraints.

229. All of these developments will reduce BHPBIO's operational flexibility and, accordingly, are likely to reduce the rail capability available to BHPBIO because, for the reasons explained above, BHPBIO is able to operate its rail operations in the most efficient manner by adopting a flexible and evolving approach:

(a) on a daily basis, to changing events such as variable supply from mining sites, differing demand for products at port and equipment failures;

(b) on a medium term basis, to operational methodologies which change as BHPBIO's production tonnage increases, new technology is introduced, its equipment is supplemented or replaced and its track and related infrastructure is expanded; and

(c) on a long term basis, adopting the most effective and efficient use of capital in relation to upgrading its infrastructure, rolling stock and control systems, within the context of the overall business.

231. under its current operational methodology, BHPBIO may allocate priority to a train that did not arrive first a junction depending on other operational requirements. For example, BHPBIO may stop a train returning from the Newman mining area, to give preference to a train from either Area C or Yandi which is transporting product that will be loaded directly to a ship, even though the train from Newman arrived first at the Yandi junction. In addition, as discussed above, BHPBIO may allocate priority to an empty train travelling to Yandi, over a loaded train returning to the port. Both these decisions would be made based on maximising overall,

rather than railroad, system performance. If BHPBIO is forced to change its train allocations to a "first in, first served" basis, it would lead to a loss of operational flexibility and consequent loss of system capacity.

(a)

Based on BHPBIO's data, the components to the cycle of travelling to the mine, loading, returning to the port and unloading are roughly shown in the table below.

Table 8:Estimated travel times

Activity	Average time	Range of times
Travel to the vicinity of Mindy Mindy (Figure based on average travelling time from Nelson Point to Weeli siding)	6.0 hours	5.0 to 8.1 hours
Loading of 200 ore cars (Estimate based on doubling the loading time for 106 ore cars by front end loader at Wheelara)	5.76 hours (2 x 2.88 hours)	3.32 to 8.20 hours (based on range experienced by BHPBIO)
Travelling time from the vicinity of Mindy Mindy to port (Estimate based on Weeli siding to Nelson Point travelling time)	7.0 hours	5.1 to 13 hours
Unloading at the port (Estimate based on doubling the unloading time for 106 ore car rakes through Car dumper 4, BHPBIO's fastest car dumper)	3.26 hours (2 x 1.63 hours)	2.20 to 5.72 hours (based on range experienced by BHPBIO)
Travel time to and from BHPBIO's line to FMG unloading facility and time spent in yard (which would include queuing to dump, locomotive service, etc)	5 hours (estimate based on BHPBIO's operations where unloading	1 hour to 10 hours depending on queuing time which, based on BHPBIO operational

Activity	Average time	Range of times
	efficiency is maximised by ensuring queuing in front of the car dumper)	experience, is likely to be highly affected by FMG's port and shiploading operations
Total estimated cycle time	**27.32 hours**	**16.62 to 45.02 hours**

While I appreciate that this estimate is not precise, it is indicative of actual operational times recorded by BHPBIO in practice.

This estimate also does not incorporate additional allowances for:

(i) inspecting trains at the port prior to departure;

(ii) waiting at the siding or at the port for a pathway; and

(iii) adjusting the load or cutting out ore cars that are unevenly or overloaded at the mine;

235. The net result of these concerns is that BHPBIO's present operational flexibility is likely to be compromised.

Maintenance

236. Further costs that are likely to be imposed on BHPBIO by third party access to the rail line relate to increased maintenance.

237. Third party access to the Newman mainline may impose a greater maintenance cost than BHPBIO's use of the rail line. In particular, if a third party does not have the same wheel profile as used by BHPBIO its trains are likely to cause greater wear to the track.

238. Even if a third party adopts the same wheel profile used by BHPBIO (for example, if BHPBIO is compelled to provide its wheel profile to the third party), BHPBIO's track may still be subject to greater wear depending on the ability of the third party to maintain the wheels to the correct profile over time. Sticking brakes, emergency brake applications, hunting ore cars, poor tracking and the passage of ore car wheels over ore deposited on the track can all result in premature wear or damage to the wheel profile.

239. Worn or damaged wheel profiles can result in:

(a) ore cars hunting (or oscillating from side to side), which literally forces the rails apart on straight track; and

(b) the inducing of fault propagation from subsurface defects in the rail and rail welds as excessive forces are transmitted to the track.

240. The effectiveness of the wheel profile is also linked to the specification of the material used to produce the wheel. If a third party applies BHPBIO's wheel profile to wheels made from material with a different specification or with metallurgical or chemical defects, there is increased risk that the correct wheel profile will not be maintained.

241. The effect of the intermingling of ore cars on two different lines may result in heightened wear to the wheel profile and associated track damage.

242. A driver of a third party locomotive may accelerate from a standing start too vigorously with the result that the locomotive loses traction (referred to as wheelslip) and burns the rail (a slipping wheel generates significant localised heat which causes the underlying railhead to deform). Rail burn is likely to require immediate replacement of the damaged railhead to prevent subsequent track failure and derailment. BHPBIO's locomotives are fitted with control systems to prevent wheelslip from occurring.

243. A further cause of increased maintenance costs may arise from vertical force impacts. The vertical force applied to the track is dependent on the axle load transmitted to the track. If trains are not sprung effectively, loaded evenly or overloaded, vertical force impacts are increased. These impacts can result in increased wear, rapid fault propagation and, in extreme circumstances, rail failure resulting in derailment.

244. Identifying the root cause of any rail break (and hence derailment) is extremely difficult, if not impossible.

Operational control impacts

245. Aspects of operations such as the granting of priority to specific trains to meet port demand and the management of competing use of rail by BHPBIO, the third party and BHPBIO's maintenance crews may have to take place in accordance with regulations.

246. This is likely to slow down BHPBIO's decision making process in relation to rail operations. Rapid decision making is particularly critical under aberrant conditions such as derailment, train partings and the continuous expansion of the system with the addition of new equipment.

247. BHPBIO is also seeking, through its more sophisticated train control system, to monitor the performance of its train drivers in order to optimise train movements and better manage travelling time, fuel economy, in-train forces and rail wear (BHPBIO's train drivers presently undergo training on BHPBIO's sophisticated train driver simulator). This initiative requires overall control over all trains on its system. There may be practical difficulties with optimising the movement of third party trains (which may be subject to constraints imposed by the third party's mining and port operations, staff availability, equipment failure and operational approach) as well as monitoring the conduct of third party drivers. A third party's drivers may also not have access to an accurate train diver simulator to learn the layout and characteristics of BHPBIO's Newman mainline.

248. One of BHPBIO's concerns would be how a third party would deal with providing relief crews to the third party's trains as its train drivers near the end of their shift when the trains are located some distance from the port.

Train control

249. Trains operated by a third party would need to be equipped with the same (or similar) two-way radios that BHPBIO's trains carry. These radios are used as a voice radio, and to transmit safety tones. The safety tones occur, for example, when there is a hot box alarm. In this situation a tone would be sent to the driver, via the radio, and an alarm to the control system. The controller would then transmit a voice message to the driver to stop the train. All radio transmissions are picked up by receivers located alongside the track, and transmitted via BHPBIO's microwave link to and from the control room (this system operates similarly to mobile phone transmission and ensures that radio signals are not affected by range or topography). To ensure the operability of the system, a third party's radios would need to be programmed by BHPBIO, using frequencies for which BHPBIO owns the licence.

Safety issues and Automatic Train Protection

250. BHPBIO's control over all operations allows it to manage any ongoing safety issues that may arise. An example of this is the monitoring of large rocks that may be left on the sills of ore cars during loading operations using front end loaders. BHPBIO's concern is that these rocks may fall from the train while it is on the mainline and injure track maintenance crews working alongside the track or the public at level crossings. If BHPBIO becomes aware of any trains that have debris or rocks on their sills, it can raise the matter directly with the mining site involved in the loading of the train. It is not clear how this issue would be satisfactorily resolved with a third party's trains as a third party would have little incentive to report such incidents.

251. Due to its maintenance practices, high standard of driver training, method of operating and protection equipment on the locomotive linked to the signalling, BHPBIO is comfortable that the risk of a runaway train on its railroad is limited (a runaway train describes a train which cannot stop). A runaway train could, however, cause a serious accident if it involves a loaded train returning to port descending the Chichester Ranges. The steep downward gradient in the direction of travel, the lack of any significant intervening upward gradients between the Chichester Ranges and the port and the low friction of BHPBIO's track would have the result that a loaded runaway train would pick up speed and pose a serious threat to BHPBIO's personnel and operations along the track and ultimately at Nelson Point. As BHPBIO will not have control over the maintenance practices of a third party, BHPBIO may be compelled to install derailing equipment on the Newman mainline to mitigate the risk of such an accident occurring with a third party's trains. (Derailing equipment directs a runaway train off the track resulting in the runaway train being derailed, slowed and stopped.)

252. BHPBIO applies restrictions on the speed at which trains can travel based on track conditions. Speed restrictions are usually imposed by track maintenance personnel based on the state of a particular stretch of track. They are recorded by train controllers in the "speed restrictions sheet" (referred to above), which are then provided to train drivers to ensure safe operating speeds of trains. Trains cannot depart from the mine or port unless they are carrying a speed restriction sheet. A copy of prevailing speed restrictions could be faxed to a third party train operator. Speed restrictions are enforced via ATP (though speed restrictions are not subject to failsafe control) through transponders manually laid on the track to delineate both the speed restriction and the point from which the train slow start slowing in either direction. It is not clear, however, how BHPBIO could enforce third party compliance with such speed restrictions.

253. As explained above, BHPBIO uses a safety system called automatic train protection or ATP. Under this system, the track topography is programmed into the computer on board each train, and the computer gives the driver a signal to apply the brakes within a certain period of time. If the driver does not apply the brakes within this time, the system causes the train to reduce speed sufficiently

to take a turnout (switch) or stop to prevent it from running through a red signal. The ATP system also ensures that speed restrictions are adhered to. Currently, BHPBIO's trains are not allowed to leave the depot if their ATP system is not working. If the ATP system fails while a train is on the track, under certain conditions BHPBIO may allow the train to proceed if there are two people on the train (to decrease the risk of missing a signal). This only applies in situations of ATP failure, and is not a substitute for the ATP system.

254. A third party would need to install, configure, operate and maintain the equipment necessary to connect it to the ATP system and follow ATP protocols for its operations. A failure to operate and maintain ATP properly could result in major implications for BHPBIO such as a collision between trains with possible injury, damage to rolling stock, track infrastructure and loss of production.

Breakdowns

255. Breakdowns occur on BHPBIO's railroad on a daily basis.

256. BHPBIO will be adversely affected by breakdowns of a third party's trains. Train breakdowns on a single line track can cause delays to all other trains travelling both to and from the port. Accordingly, if a third party's train was to break down, BHPBIO's production would be delayed until the train could be repaired or moved to a siding. Even if a train may be moved to a passing track, it will still constrain the capacity of the rail system because the distance between passing tracks may be doubled with the result that sectional travelling times for that stretch of track increase, with a consequent reduction in system capacity.

257. Depending on demand at the port the third party may have little incentive to urgently attend to a train broken down on BHPBIO's railroad. In FMG's case, if there is heightened demand for a specific product from FMG's Chichester Ranges mines (due to the arrival or imminent arrival of a large vessel), FMG may be constrained in its response to a breakdown by the fact that its other locomotives are engaged in transporting those products to port.

258. In relation to breakdowns involving BHPBIO's trains, BHPBIO is able to utilise locomotives attached to other trains travelling on the track to assist in moving a train that has broken down. Though this will delay the other train, it is necessary to remove any broken down train from the mainline as soon as possible to ensure that production of the overall system can continue.

259. However, BHPBIO may not necessarily be able to attach a third party's failed train to a BHPBIO locomotive to be pulled to a siding as:

(a) the geometry of the couplers fitted to BHPBIO's locomotives may not be compatible with the couplers fitted to the third party's trains;

(b) the third party's trains may have a different brake system fitted. In this regard, while BHPBIO's trains use pneumatic brakes, I understand that FMG's trains will make use of electro-pneumatic brakes. BHPBIO's locomotives are not fitted with the requisite control mechanism to interface with an electro-pneumatic brake system; and

(c) BHPBIO may lack the ability to control the failed train because the cabling and control systems of the third party's train may not be compatible with BHPBIO's locomotives.

260. If a third party sought to deal with breakdowns on the same basis as BHPBIO, the third party would need either to use BHPBIO's maintenance crews or have its own crews. These crews would have to comply with BHPBIO's standards and would have to attend to a breakdown within a specified time frame.

261. BHPBIO has personnel allocated or "on-call" 24 hours a day, 7 days a week at three separate locations to deal with breakdowns due to the significant lost production costs that may be incurred if a breakdown is not resolved swiftly. This is unusual when compared with other railroad operations where there is little need to deal with breakdowns on an urgent basis. This would be a significant expense for a small operation.

262. The third party's drivers would also need to be trained to detect faults in the same way that BHPBIO drivers are trained, and this training would require enrolment to BHPBIO's training programs and use of the train simulator. If a third party maintained its own breakdown crew, it would need its own HiRail vehicles (and training in relation to them) and access to BHPBIO's access roads.

Research and experimentation leading to technical innovation

263. BHPBIO's control of the rail system has encouraged it to engage in technical research and experimentation to improve the efficiency of its railroad. For example, BHPBIO has been able to cost effectively increase the tonnage of iron ore transported on its railroad by research and development into the interaction between the track and wheels of its trains, which has allowed it to operate higher and higher axle loads over time. The operation of higher axle loads allows a greater tonnage of iron ore to be transported without the purchase of additional rolling stock or the construction of supplementary track.

264. Management of the track and wheel interface requires careful management of both the track surface and the wheels of all rolling stock to ensure that the operation of high axle loads does not result in excessive track wear, track failure, bridge failure, damage to rolling stock or derailments. BHPBIO's operations, rolling stock maintenance and track maintenance departments cooperate on an ongoing basis to maintain and refine the wheel and rail interface. This cooperative approach includes the use of instrumented ore cars by rail operations which allow accurate information on the

state of the track and its performance under loaded conditions to be measured and provided for track maintenance purposes.

265. BHPBIO is presently operating trials with Sperry Rail Service (Sperry Rail Service is a company that specialises in offering rail flaw detection equipment and services) to fit ultrasonic track testing equipment to its locomotives to further improve the monitoring of the condition of the rail and detect any rail faults. The cooperative management of the wheel and rail interface in the areas of railroad operations and track maintenance to achieve continuous improvements may be difficult to achieve if a third party is operating trains on the rail. A third party's rolling stock on the track, which may not be subject to the same controls and may have different operating characteristics, may add considerable complexity to monitoring the track and assessing the reasons for track wear.

266. Apart from the cooperative interaction between rail operations and track maintenance described above, BHPBIO has continuously sought to experiment with and implement improved track metallurgy, sophisticated wayside monitoring equipment (such as the acoustic monitoring of bearings) and revised wheel profiles.

267. BHPBIO may also be restricted in introducing new technology such as automated trains, in circumstances where a third party is reluctant to adopt new technology for cost or other reasons.

Equipment compatibility

268. BHPBIO tests all new equipment that it plans to utilise on its railroad (this is referred to as the test and commissioning phase) to ensure that the equipment is compatible with its systems and other equipment.

269. An example which highlights the importance of this process was the introduction of locomotives with AC traction motors onto the railroad (previously BHPBIO had only made use of locomotives with DC traction motors). In the commissioning process, BHPBIO discovered that the AC traction motors fitted to the locomotives emitted electronic interference which affected the signals conducted through the rails. In particular, it was found that the equipment which detects and measures the speed of an oncoming train to activate level crossings (by emitting signals along the rail and then monitoring the rate of change of frequency and increasing current as a train nears) reacted in an irregular fashion as a consequence of the interference emitted by the new locomotives fitted with AC traction motors.

270. It will accordingly be necessary to test all third party rolling stock to ensure that it:

(a) does not interfere and is compatible with BHPBIO's signalling systems;

(b) does not interfere and is compatible with BHPBIO's safety equipment such as level crossing activation equipment;

(c) does not interfere and is compatible with BHPBIO's wayside monitoring equipment used to detect any potential faults with rolling stock, such as hot bearings, inactive brakes, sticking brakes and wheel flats; and

(d) complies with BHPBIO's rolling stock envelope. That is, the third party's equipment may not protrude beyond certain limits from the side of the track to ensure that it will not collide with signals or any equipment located adjacent to the track.

271. In this regard, FMG's trains with different braking system and radio equipment would have to be checked and, if necessary, reconfigured to comply with BHPBIO's existing equipment.

Change in regulation

272. BHPBIO's railroad is presently regulated under the *Mines Safety and Inspection Act 1994* (WA). The presence of a third party on the railroad will have the effect that the railroad will have to be regulated under the *Rail Safety Act 1998* (WA).

273. Under the *Rail Safety Act*, BHPBIO would have to operate its trains in terms of Australian Standards AS4292. In addition, BHPBIO will have to develop a comprehensive safety case that sets out how all railroad risks are managed. Presently, BHPBIO manages the risks that affect its railroad separately and may choose the manner in which a specific risk is dealt with. The *Rail Safety Act* is directive and has specific requirements in relation to how various risks are managed.

274. The effect of this will be to reduce the operational flexibility that BHPBIO presently enjoys as BHPBIO will be compelled to conduct railroad operations in accordance with written procedures and codes of practices. This greater reliance on written procedures will be less flexible as these procedures may only be amended in accordance with stipulated guidelines.

275. BHPBIO would also be obliged to advise the Regulator of any incidents on its railroad and would be subject to the incident investigation regime prescribed by the Regulator.

Overloading

276. A third party would require equipment for weighing trains to prevent the passage of unevenly or overloaded ore cars from entering the Newman mainline. While a third party's trains may travel over BHPBIO's weighbridge (which is located 28 km south of Nelson Point) allowing BHPBIO to identify whether the third party exceeded the axle load, this would be too late to prevent damage inflicted to the track. BHPBIO would need to monitor a third party's axle loads at the point of entry of the third party's ore cars to the Newman mainline to make sure that they did not exceed the limit.

277. The risk of overloaded or unevenly loaded ore cars is increased when loading is performed using front end loaders (as happens at BHPBIO's Wheelara mine). Front end loaders tend to deposit the ore unevenly, so that each axle bears a different weight. The impact on the rail is worst where there is the greatest variation between the weight borne by each axle. Variation in axle weight increases the dynamic load that is exerted by an ore wagon on the track. Minimising dynamic load is particularly important in relation to ensuring safe operating parameters on BHPBIO's bridges where the dynamic load component has a significant impact on the overall load rating and consequent safe use of the structure. At Wheelara, because the variation per axle is so high, BHPBIO has managed this risk by reducing the mean value of tonnes loaded per ore car to ensure that the maximum axle load does not exceed the allowable limit.

278. BHPBIO's concern with unevenly or overloaded third party ore cars is that BHPBIO is likely to bear both the cost and risk associated with these practices, but would find it difficult to quantify the increased wear or damage to the track that results. A third party would seek to run the maximum axle load at all times in order to improve its own above rail operational efficiency. Accordingly it would be reluctant to reduce tonnes loaded per ore car to deal with high axle load variations.

SUMMARY

279. BHPBIO's railroad operations are conducted in a highly flexible manner to maximise overall system performance, rather than railroad efficiency.

280. Following the implementation of RGP4, BHPBIO will not have any additional railroad capacity.

281. The introduction of third party rail access is likely to:

(a) reduce BHPBIO's tonnage by displacing BHPBIO's trains. In addition, unless a third party's trains are able to transport an equivalent tonnage to any BHPBIO train that is displaced, the overall tonnage transported on the Newman mainline will be decreased. Any disruptions caused by the third party, as a result of breakdowns or poor performance, will further decrease the tonnage that can be transported on the Newman mainline;

(b) reduce flexibility. The need to accommodate a third party's trains will reduce BHPBIO's short term flexibility to cope with variations in mine production, demand from the port and equipment failure. In addition, BHPBIO is unlikely to enjoy the current operational freedom that allows it to trial and, if successful, rapidly adopt new operating methodologies and technology;

(c) impose additional costs. A loss in flexibility is likely to result in less effective management of the variations that affect BHPBIO's railroad and wider business. Apart from the costs

associated with implementing and monitoring detailed operational rules and procedures, a loss in flexibility is likely to result in the transportation of less tonnage of iron ore; and

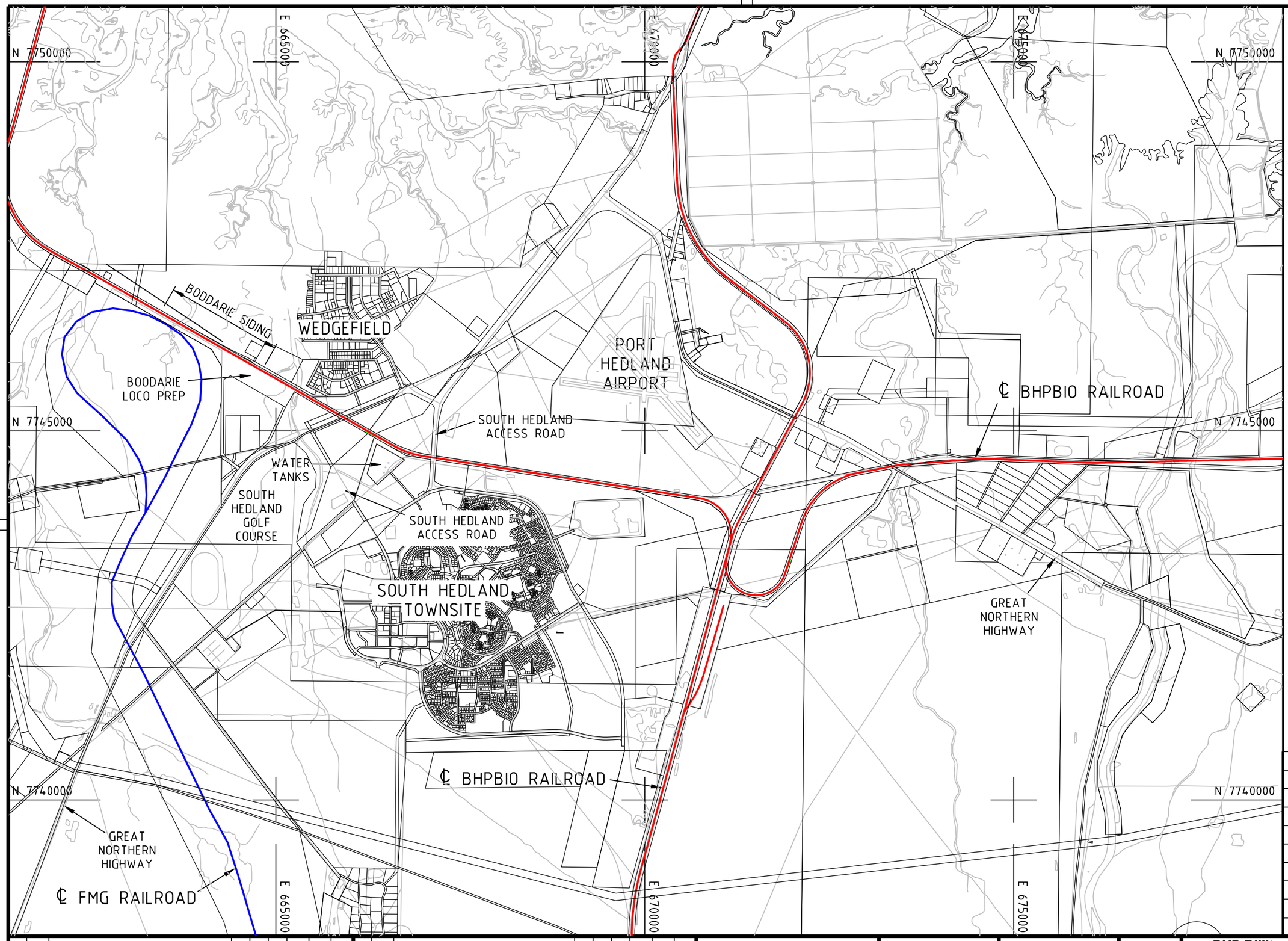
(d) the effects of (b) and (c) above will result in fewer tonnes delivered overall for the railroad (both BHPBIO and third party tonnes). A small percentage loss in capacity of the system equates to a large value of tonnage of lost sales.

AFFIRMED by the said deponent at Port Hedland, in the State of Western Australia, this 14th day of December 2007)

Before me:

Solicitor

JESSICA ANNE ROSE
Blake Dawson
101 Collins Street, Melbourne Vic. 3000
An Australian legal practitioner within the meaning of the Legal Profession Act 2004



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CONTRACT NUMBER OR PURCHASE ORDER NUMBER	
REFERENCE DOCUMENTS	DOC NO

NO	DATE	REVISION	DES BY	DRN BY	CHK BY	APPD DES/ CON	BHPBIO	DATE
		By approving revisions, the Designer/Contractor confirms that the Design Changes are in accordance with SEP 58						

NO	DATE	REVISION	DES BY	DRN BY	CHK BY	APPD DES/ CON	BHPBIO	DATE
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		By approving revisions, the Designer/Contractor confirms that the Design Changes are in accordance with SEP 58						

BHPBIO TO COMPLETE

DRAWING STATUS APPROVAL	SIGNED	DATE	REV
PRELIMINARY ONLY			
QUOTATION ONLY			
CONSTRUCTION MAY PROCEED			
CONSTRUCTION MAY PROCEED EXCEPT AS NOTED			
REVISE AND RESUBMIT			

REVIEWER TO COMPLETE

COMPANY
NAME
SIGNED
DATE

THIS DRAWING HAS BEEN REVIEWED FOR GENERAL COMPLIANCE WITH THE REQUIREMENTS OF THE CONTRACT AND IS ISSUED FOR STATUS APPROVAL

DESIGNER/CONTRACTOR TO COMPLETE

COMPANY CEJV
DESIGNED BY CEJV
DRAWN BY J PESCIA
CHECKED BY
DESIGN & SAFETY APPROVED BY
DATE APPROVED

bhpbilliton

BHP Billiton Iron Ore Pty Ltd ABN 46 008 700 981

RAILROAD
LOCALITY
SOUTH HEDLAND AND SURROUNDING AREAS
EXISTING INFRASTRUCTURE

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