



Traffic Management - Middelburg Colliery

MOSH Opencast T&M Team Visit

Chamber of Mines Initiative

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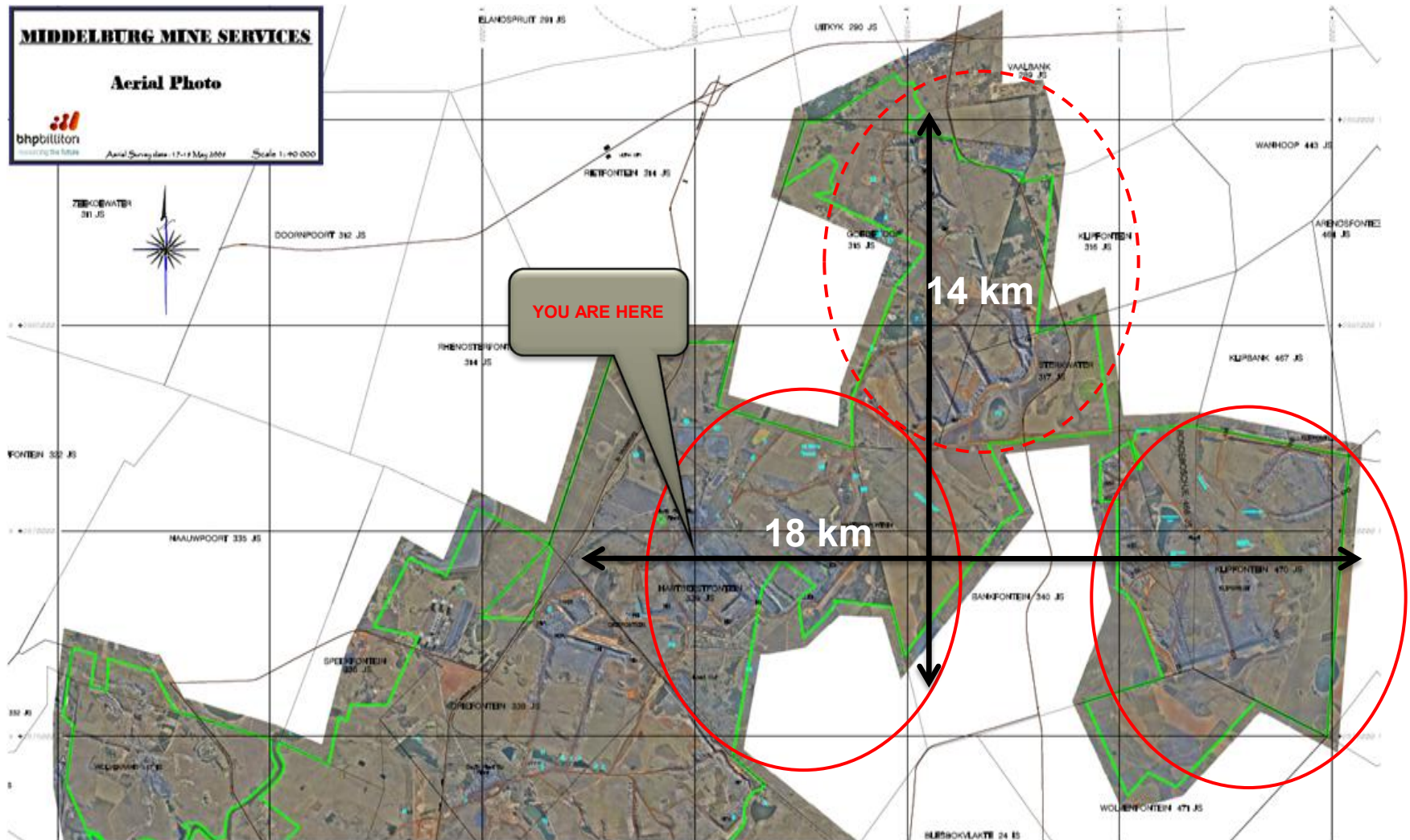
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Locality



Site Plan



Colliery Overview

Middelburg Colliery is part of BHP Billiton Energy Coal SA (BECSA). It is an opencast operation:

- Huge geographical areas, mining power station and export coal
- 650 employees including contractors
- Life of Mine is about 20 years

Primary Production Fleet comprises:

- Draglines (2 x 1570W Bucyrus with 63M³ bucket)
- Overburden drills (4 x PV275)
- Rigid Haul trucks (9 x CAT 785)
- Front End Loaders (2 x CAT994F and 1 x 993K)
- Dozers (5 x CAT D11T)

Earthmoving Profile:

- Overburden – 28 million BCM's per annum
- Average ROM is 6 million tons per annum



HSEC Strategy & Focus

Guiding Principles

BHPB GLDs

BHPB Charter values

BHPB Operating Model

EC Letter of Intent

Enabling Environment Set by Leadership

Right people



Right tools and equipment



Right procedures and systems



Sufficient time, support and leadership



Right choices by individuals and teams

Key Focus Areas

Health

Reduce Occupational Exposures

Manage Fatigue

Safety

Eliminate Multiple Fatalities

Eliminate Single Fatalities

Drive Behavioural Intervention

Environment

Effectively manage water

Rehabilitate disturbed areas

Improve energy efficiency and reduce emissions

Community

Establish effective relationships with stakeholders & deliver valued community investment programs

Objective

ZERO HARM &

SUSTAINABILITY

Mining Process – Strip, Drill and Blast

Topsoil Stripping

- Fleet - Excavator and ADT's, moving 1.3m BCM's annually



Drilling and Blasting

- Fleet – 4 Pit Viper drills, use about 15 000 tons and travel 700 km annually



Mining Process – Exposure & Extraction

Coal Exposure

- Fleet of BE1570 Draglines and Dozers, moving about 24m BCM's annually



Coal Extraction

- Fleet of CAT Loaders (994/993) with CAT 785 RHT's, move about 6m tons of coal annually



GLD requirements – Vehicles & Mobile Equipment

Vehicles and [mobile equipment](#) must be selected, equipped, operated and maintained in a way that is safe and protects personnel from harm.

- Implement an authorised ([Appendix 1](#)) Traffic Management Plan ([Appendix 2](#)).
- Require all new BHP Billiton owned or leased light vehicles (excluding light vehicles dedicated and modified for underground use) to have a 5 Star New Car Assessment Programme (NCAP) safety rating ([Appendix 2](#)).
- Prohibit installation of [aftermarket](#) equipment to 5 Star NCAP vehicles (other than special purpose light vehicles such as hi-rails and ambulances) except where necessary to meet the requirements of [Appendix 2](#) for visibility and communications equipment.
- Transition all light vehicles to a 5 Star NCAP safety rating by 01 Jan 2016 and, during the transition period, meet [Appendix 3](#) requirements.
- Provide surface passenger transport with only forward or rear facing passenger seating incorporating 3-point seat belts.
- Protect occupants of vehicles, [mobile equipment](#) and other road users, including pedestrians, from the risks of dropped objects and moving loads.
- Provide safe access and egress, including consideration of emergency egress, from [mobile equipment](#).
- Select [mobile equipment](#) and vehicles appropriate for the cargo carried and manage the loading in a way to mitigate spillage during transport.
- Identify and manage at-risk driving behaviour by drivers of company-owned and all site vehicles, including [mobile equipment](#).
- Prohibit the use of mobile phones by drivers, including hands-free applications, unless the vehicle or [mobile equipment](#) is stopped at a safe location.
- Undertake daily documented inspection of [mobile equipment](#) and registered heavy vehicles, and take appropriate action if defects are identified.
- Mitigate risks to personnel from the hazards of remote-controlled [mobile equipment](#).
- Mitigate risks from loading, unloading, towing and recovering [mobile equipment](#).
- Mitigate risks from storing, handling and maintenance of tyres.

GLD requirements – Traffic Management

Develop and implement a Traffic Management Plan which establishes site road engineering and vehicle operating standards for surface and underground [Operations](#). The Traffic Management Plan must establish criteria for:

- site road network, traffic flow, intersection design and vehicle selection which minimises the risk for all site road users;
- keeping the number of light vehicles on site as low as practicable;
- minimising interactions between pedestrians and vehicles, and heavy and light vehicles, with physical separation provided wherever practicable, including safe parking area design and parking protocols;
- colouring, marking and equipping vehicles and [mobile equipment](#) for adequate visibility and easy identification at a safe distance by other vehicles, [mobile equipment](#) and pedestrians;
- roads to be built with adequate delineation and protection from roadside and overhead hazards;
- management of road maintenance, including hazards arising from dust and over-watering;
- selection of road traffic signs and road markings consistent with the standards set by the national or state authorities in the country of operation. Where such standards do not exist, or are not suitable, the site must select an appropriate standard from the European Union, North America, Australia, South Africa or Chile;
- traffic safety procedures that at least include:
 - right of way rules at site intersections;
 - site overtaking and vehicle interaction protocols;
 - site speed limits and how they will be enforced;
 - the minimum safe distance to be maintained between site vehicles and [mobile equipment](#);
 - control of access to, and egress from, restricted areas, including a process for ensuring the number of light vehicles in a restricted area is kept to the absolute minimum needed for effective [Operations](#);
 - communication equipment requirements and communication protocols;
 - work-related use of company-provided vehicles off site, including the identification and management of high-risk road journeys.
- training and competency requirements for:
 - road safety awareness including defensive driving techniques;
 - permits to operate/drive including site drivers' licences based on specific site rules, vehicle type, operating standards and risks;
 - [employees](#) and [contractors](#) performing design and engineering of road networks, traffic flow and traffic engineering.

Traffic Management Standards

Roadway design and maintenance standards

Intersections standards

Berm locations and design

Delineators & Signage

Parking - LDV's and Mobile Equipment

Mine Segregation

Overtaking & Safe following distances

Remote / Mobile refuelling procedures

Workshops

Intersections

- Signage

- High Visibility signage
- Intersection ahead sign
- Directional traffic markers



- Intersection spacing to consider

drivers focus shifting from one intersection to the next, speed and braking distances.

- High visibility Delineators

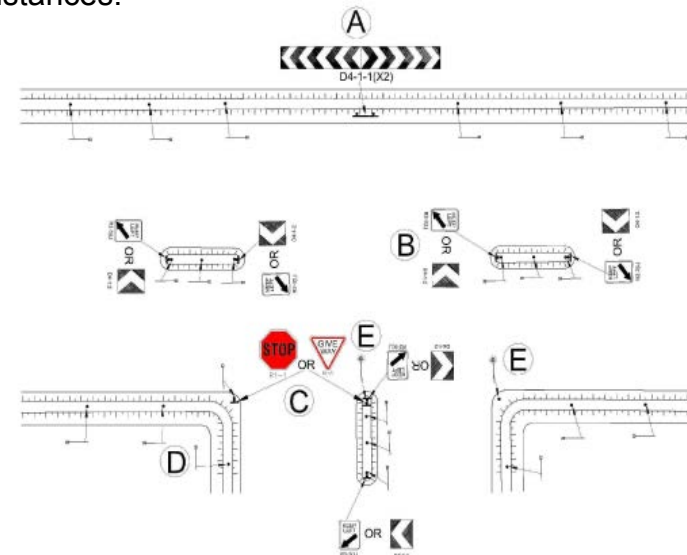
- Centre Bunds

- Delineators
- Height provides suitable visibility for speeds
- Tapered down bunds/ at intersection

- Intersection visibility

- 90 degree intersections
- Level where possible
- Tapered down bunds and removal of other material that impact visibility.
(spoil dumps, vegetation, other structures)

- Intersection inspection /maintenance and survey regime to verify original standards are maintained



Berm locations and design

Locations

- High wall edges
- Where a vehicle is exposed to a drop off of >1.5
- Centre Berms on road curves where a risk of veering to the wrong side of the road exists
- On the advancing side of the high wall to separate drilling and blasting from other vehicles
- Inactive roads and ramps (Berms used to block the entrance)
- Dumps and stockpiles Berms on all faces
- Intersections – see intersection slide.
- Toes of spoil dumps
- Lighting plants

Design

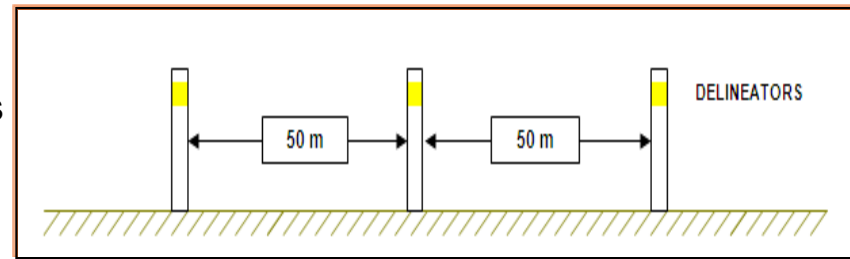
- Minimum $\frac{1}{2}$ height of the largest fleet tyre (Double berms or larger berms where increase risk exists)
 - Box berms along roadways
 - Dump berms parallel to the dumping directions
-
- Road centre berm on second haul roads that are not constructed to main haul road width standards – where an increased risk of collision exists (narrow roads) or rougher roads that can cause material to fall from trucks.



Delineators & signage

Delineators

- Colour difference between left and right side of roads mounted on berms or road side.
- Intersections – delineator reflectors are a different colour and have a reduced spacing leading up to the intersection
- Delineators are white with coloured reflector
- Delineator spacing – approx 50m and less around curves



Signage

- High visibility road signage
- Primary haul roads and ramp signs 2.4m high by 1.2m wide (symbol can be standard size)
- Where changes in road occur i.e. narrows, change in direction, intersections, dips, etc Signs will be erected to warn the drivers



Parking – LDV's

Mining areas (excavation and dump areas)

- Dedicated parking at all working areas for light vehicles with an outside bund
- Reverse parking / or drive through
- Fundamentally stable, flat ground, hump or ditch etc.
- Separation from SME ops.
- Parking signage



Non mine areas (industrial areas)

- Separate SME from Light vehicles
- Parking area designed so light vehicles are not driving towards pedestrians
- Separate pedestrians from light vehicle movements
- Parking signage

Temporary parking (maintenance activities in the field)

- Delineate parking area
- Single point accountability for establishing temporary parking areas and control of parking (delineation may be work areas signs)
- Parking signage



Mobile equipment parking

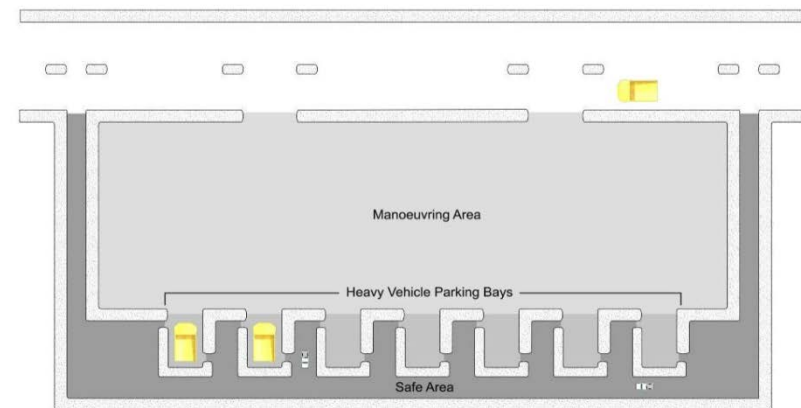
In Field parking

- Isolation of SME & Stop blocks (humps, ditches, against berm)
- Nominated minimum distance between parked trucks
- Segregation of pedestrians and SME during parking
- In pit parking outside berm, ditch / humps or back against a berm down grade
- Establish an exclusion zone for parking equipment from loading area
- LDV are not to be parked in the line of fire of SME. Where maintenance requirements necessitate the need of an LDV to be in close proximity to SME a standard must be established to prevent LDV/SME interaction risks.
- Do not park loaded trucks. Where operationally required separate parked loaded trucks from unloaded trucks. A parked loaded truck is to have the hazard lights on to signify a walk around inspection is not to be performed.
- Parking signage
- SME – Truck park brake interlock to ladder down system



Hard stand (park)

- Segregated from pedestrians and LDV's
- Ditch or humps
- Nominated minimum distance between parked trucks



Mine segregation

- SME to shut down prior to Light vehicle or pedestrians accessing working or tipping faces
- Notification request via positive communications
- Signs to signify no access and safe parking areas established (loading and dumping zones)

Drilling & Blast areas

- Blasting area to be fenced / bunded off to separate pedestrians and equipment
- Drilling areas to be demarcated
- Unique identifiers / delineators to be used to signify different area (drilling vs. blasting)

General

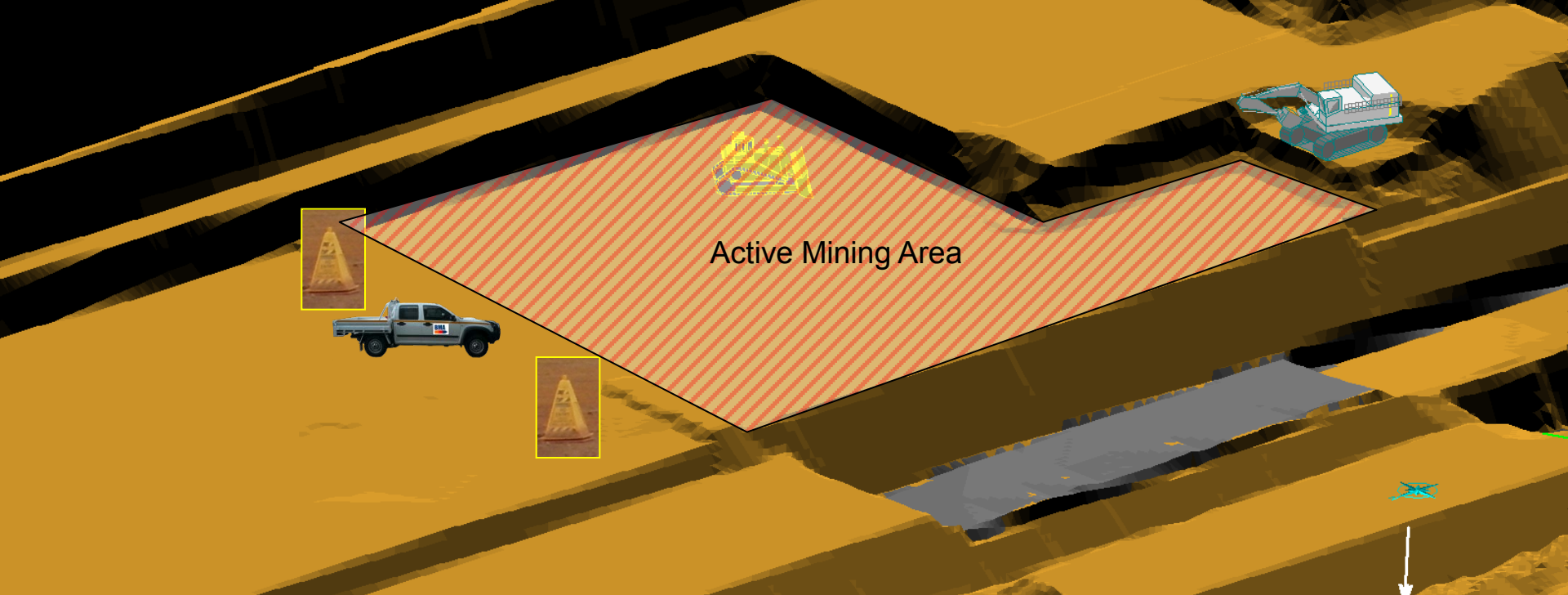
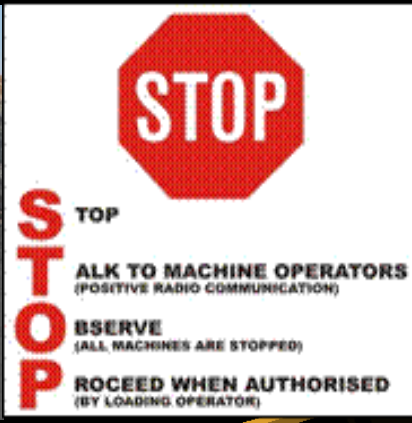
- The concept of “right of way” does not exist. The term in use is to “give way”. There is no “right of way” as it is every driver, operator and pedestrian’s responsibility to give way to avoid a collision
- Traffic must give way to pedestrians at demarcated crossings, and in general in the mine
- No pedestrian or LDV may be closer than 50m to operating SME.
- Prior to approaching, positive communication must be made with the operator, who must stop the equipment and indicate that it is safe to approach
- Pedestrians and LDV’s can approach if there is a hard barrier (i.e. refueling bay)
- Handheld radios compulsory when on foot
- Different colour strobe lights for different speed vehicles e.g. Green trucks - faster moving, purple – slower vehicles, white – escort vehicles

Interaction on Site

- If it is necessary for pedestrians/LV to enter risk area where SME are operating the following applies:
 - ✓ LV's to wait at a stop board demarcating the loading area,
 - ✓ Positive radio communication must be made between driver of LV and operator of each EME and all EME must stop.
 - ✓ Once the vehicle has accessed the area, the minimum parking distance maintained must be 20 m from EME
 - ✓ Operations should only commence once the LDV has left the area

Physical Separation – Light and Heavy Vehicles

- Extraction hauling circuits.
 - ✓ Where possible EME routes must be separated from LDV and HDV routes. Where this is not possible speed must be reduced and the haul roads widened.
 - ✓ All in-pit roads including ramps must be considered out of bounds to all, except with the permission of the respective supervisor.
 - ✓ No LDV or HDV may enter the hauling circuit when stripping overburden with Haulers.
 - ✓ The hauling circuit is therefore out of bounds while burden is hauled.
- In the event of accidental entry by LDVs or HDVs into the hauling circuit. The 785 haulers must stop



Overtaking & safe following distances

- Minimum of 50m following distance using the delineators as a distance guide. (risk assess depending on conditions / speeds / fleet for increased distances)
- Establish a go no go criteria for visibility – adverse weather - fog, blowing snow, dust, rain etc
- Establish process for management of over size equipment on site (e.g. relocating shovel or drill)
- As a general rule, overtaking is not permitted
- Where this is not practical (in the case of long distances, slow moving vehicles, emergencies etc), overtaking procedures apply :
 - No overtaking of any vehicle without achieving **positive communication**
 - Maintenance of a minimum fifty metre separation distance while attempting to contact the vehicle ahead



Remote / mobile refuelling procedures

- Minimise in field refuelling e.g. use relocatable inpit refuelling stations
- In field equipment to be refuelled must be immobilised prior to the mobile tanker approaching.
- Positive two way communication to be established prior to tanker approaching closer than 50m
- Operator must be out of the cab, operator must be in a mandated safe location
- Physical separation (berm) to be established between operator and mobile refueller (with the exception large drills, excavators / shovels)
- Mobile Refueller gear stick locks to prevent inadvertent engagement of gears while equipment is idling



General Principles

- Assessment of workshop facilities – segregation / bays vs fleet size etc
- Separate LDV / pedestrians and SME both on approach to workshop and within
- Walkways – pedestrian control within and outside access
- Access control – minimise pedestrian access
- Light vehicle parking areas segregated from SME and pedestrians
- Physical handrails within workshop to prevent uncontrolled interactions by restricting access to bays
- Painted floor / work bay areas / demarcated
- Equipment has outgrown workshops – build fit for purpose workshops

EME Workshop Segregation Project - 2012

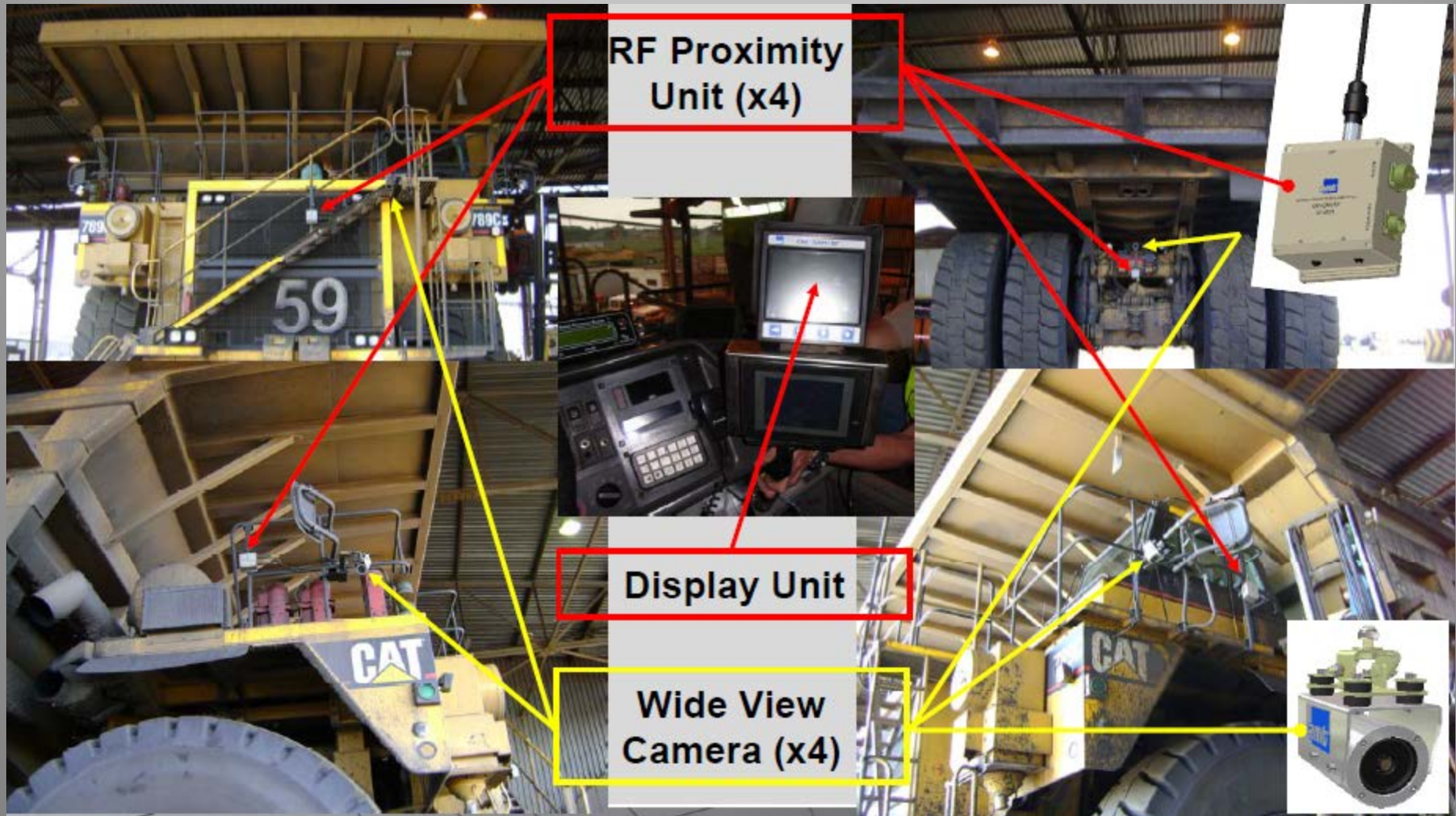


Workshop segregation

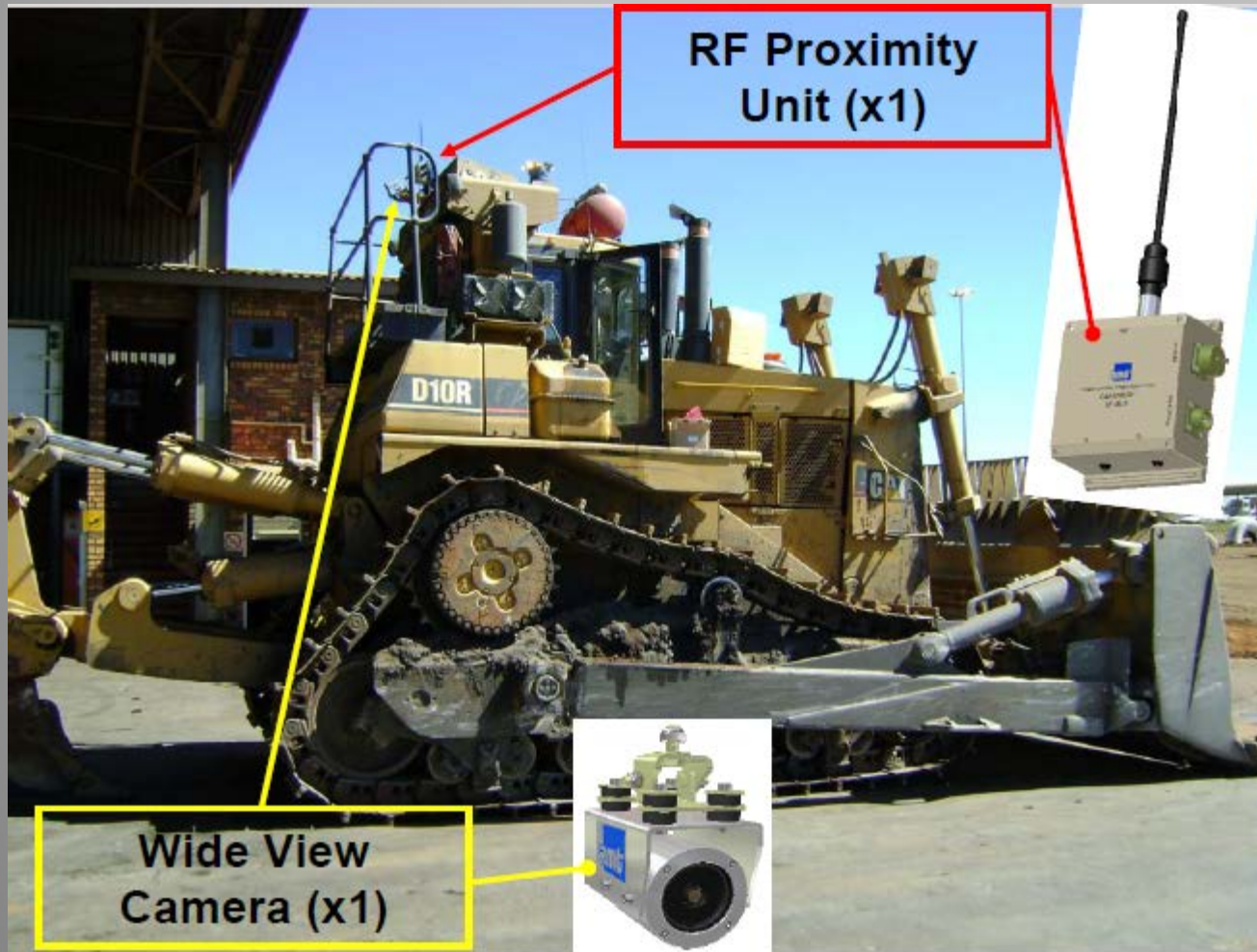


CAS-CAM/RF installation on CAT 785 truck

(4 Cameras, 4 RF's)



CAS-CAM/RF installation on CAT D10 Dozer (1 Camera, 1 RF)



Display Unit



CAS-CAM/RF installation on LDVs (No Camera, 1 RF)



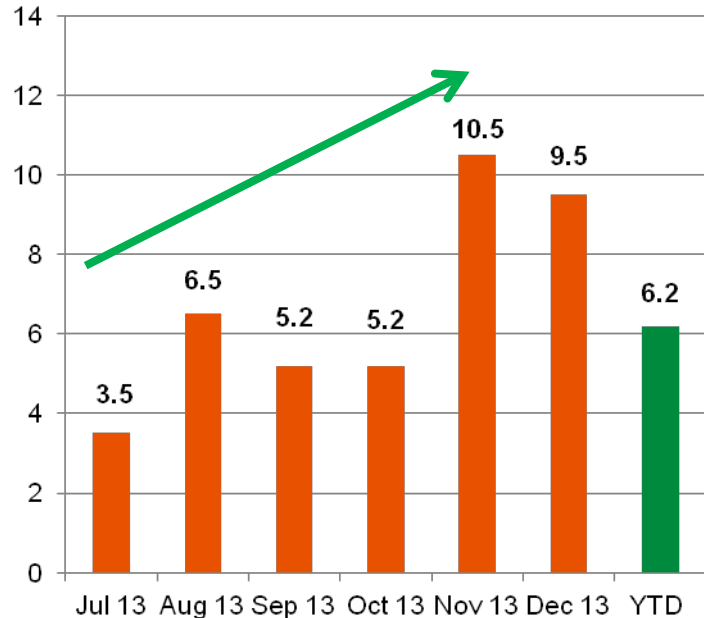
FATIGUE – SEEING MACHINES

- DSS System (Driver State Sensor)
- Installed on all Primary Haul Trucks (CAT 785s)

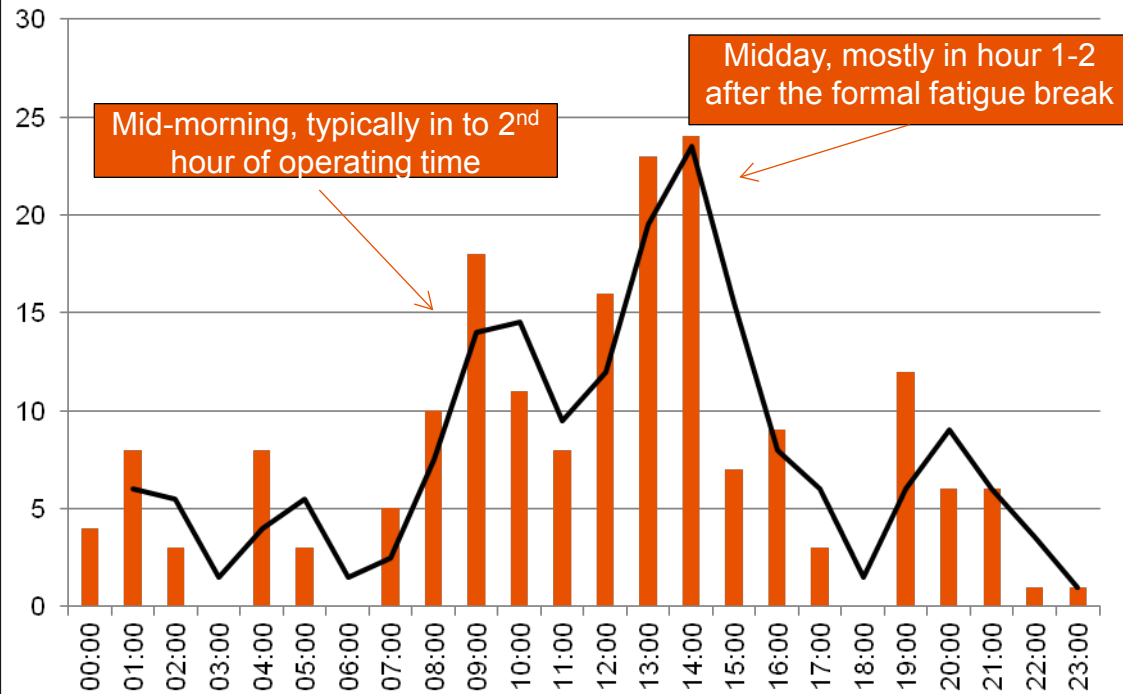


FATIGUE – SEEING MACHINES (DSS)

Haul Truck Fatigue Event rate
(average driving hours/event)



Fatigue events by time of day



Actual
Performance YTD

- Reduction in fatigue event rate following implementation of Control Room & Supervisor event management procedures – requires further focus on refining Supervisor skills in effective fatigue assessment
- Data providing valuable insight into potential improvement areas – e.g. higher fatigue event rates encountered during day shift vs night-shift

Improvement
Opportunities

- Leverage further opportunities from data – e.g. increased focus on individual case management
- Improve maintenance support from Seeing Machines OEM to minimise system down-time
- Re-evaluate 1 hour fatigue break on Dayshift



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resourcing the future