

# Safety Share: Heavy Vehicle and Light Vehicle Segregation



# Context

- **Light vehicles and mobile equipment don't mix. Across industry, history repeats itself with near misses and fatalities associated with light vehicles and mobile equipment coming together for a variety of reasons - driver distraction, limited visibility, fatigue, environmental conditions and so on.**
- **Implementing physical controls that provide a higher level of protection to employees has been a challenge.**
- **This presentation has been developed to share BHP Billiton Mitsubishi Alliance's (BMA) approach to minimize mining vehicle interactions by segregating heavy vehicle (HV) and light vehicle (LV) activity, with a view to improving safety in the industry.**

## Multiple fatality incident: Haul truck interaction with light vehicle



On September 27, 2014 at 07:20 hours at the Grassberg Mine, (Freeport-McMoran Indonesia) a Caterpillar 785 haul truck collided with a shift change light vehicle. The incident resulted in four fatalities and two serious lost time injuries.

# Incident Causes

**The Grassberg incident demonstrates a number of causes of mining vehicle interactions:**

- Inadequate segregation of HV and LV vehicles (sharing of roads)
- Poor design of road intersections (multiple HV-LV conflict points)
- Vehicle design (restricts driver's field of vision)
- Distraction

**There are many other factors:**

- Inclement weather (dust, rain, fog)
- Driver fatigue
- Mechanical failures
- Wet roads
- And more.

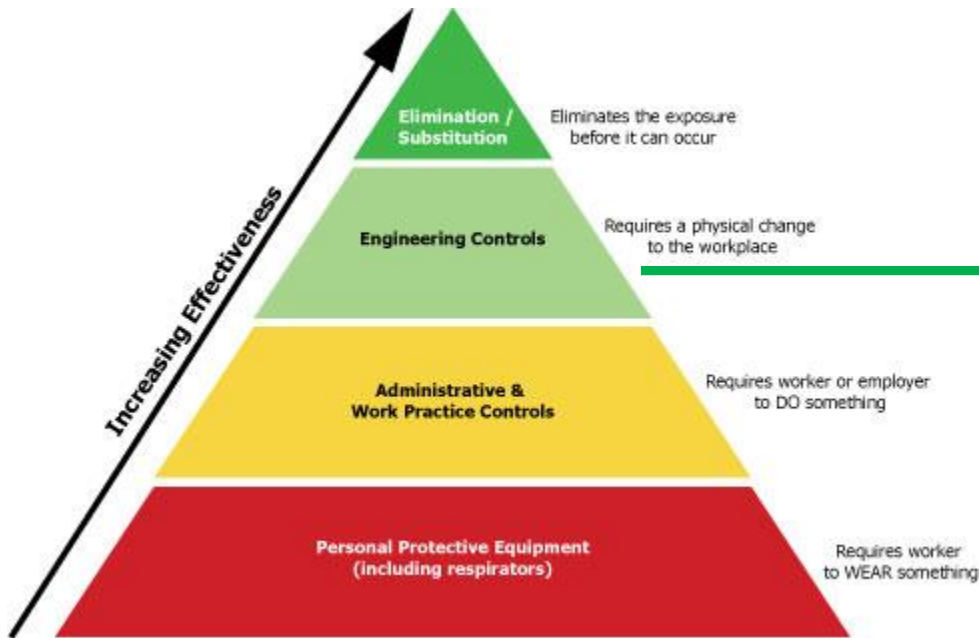


Source: <http://libguides.scu.edu.au/c.php?g=356711&p=2406583>

# Focus: Improving control effectiveness

**BMA utilizes a systematic approach to preventing HV and LV interactions.**

- This system incorporates a broad range of measures from all levels of the hierarchy of controls.
- To more effectively manage this risk, BMA has sought to reduce interactions by implementing engineering controls to segregate LV and HV.



## Vehicle Segregation (Engineering)

- Minimize the road distances shared by heavy and light vehicles
- Reduce the number of potential conflict points at road intersections

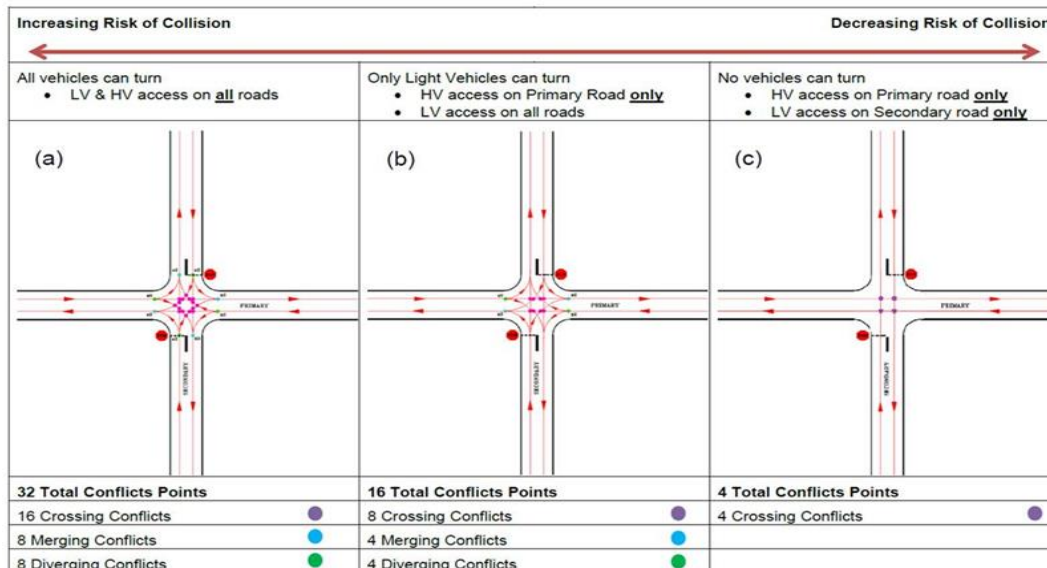
The Hierarchy of Controls

# Solution



## Vehicle Segregation (Risk Elimination)

- Create LV only and HV only roads physically segregated by berms
- Minimize the road distances shared by heavy and light vehicles
- Prioritise highest risk areas
- Identifying the short term fixes vs strategic areas for implementing traffic segregation
- Integrate separated roads into strategic mine design (specified requirement of road construction standard)



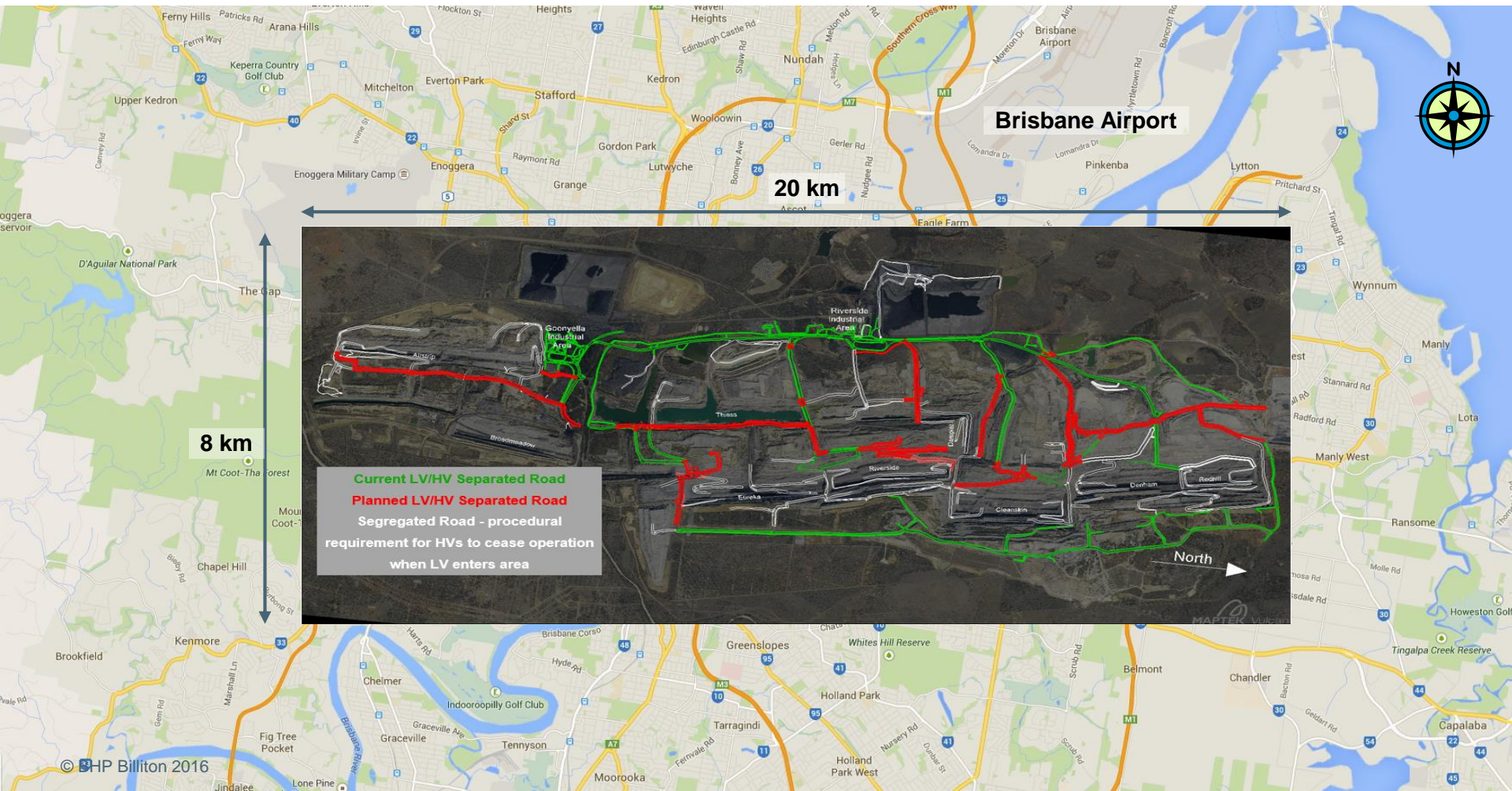
## Intersection Design (Risk Engineering)

- The highest risk areas are intersections
- By implementing segregated roads where LV roads cross over HV roads, the intersection design prevents LVs and HVs from turning across each other, thereby significantly reducing this risk
- At these intersections the potential number of conflict points is reduced from 32 to 4

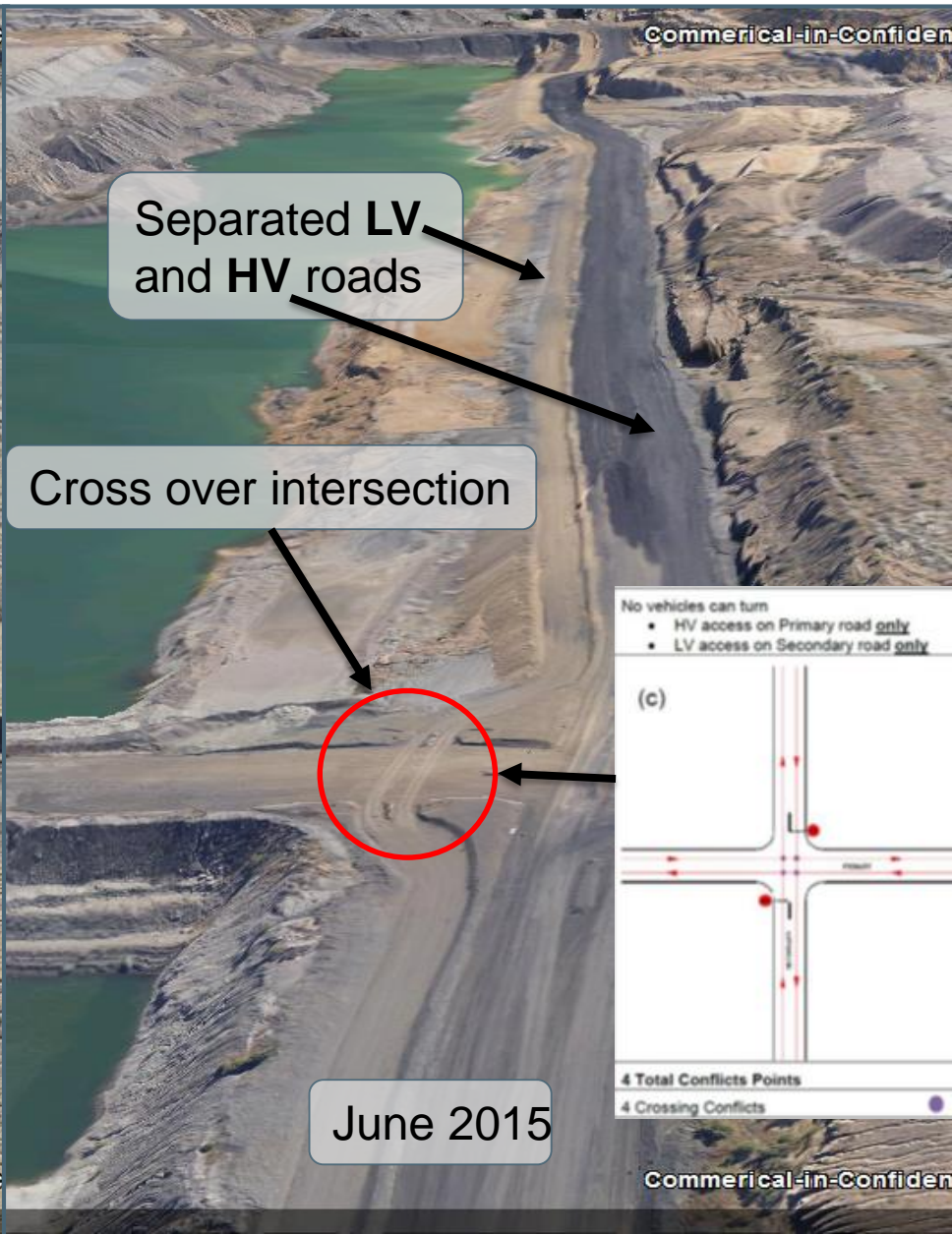
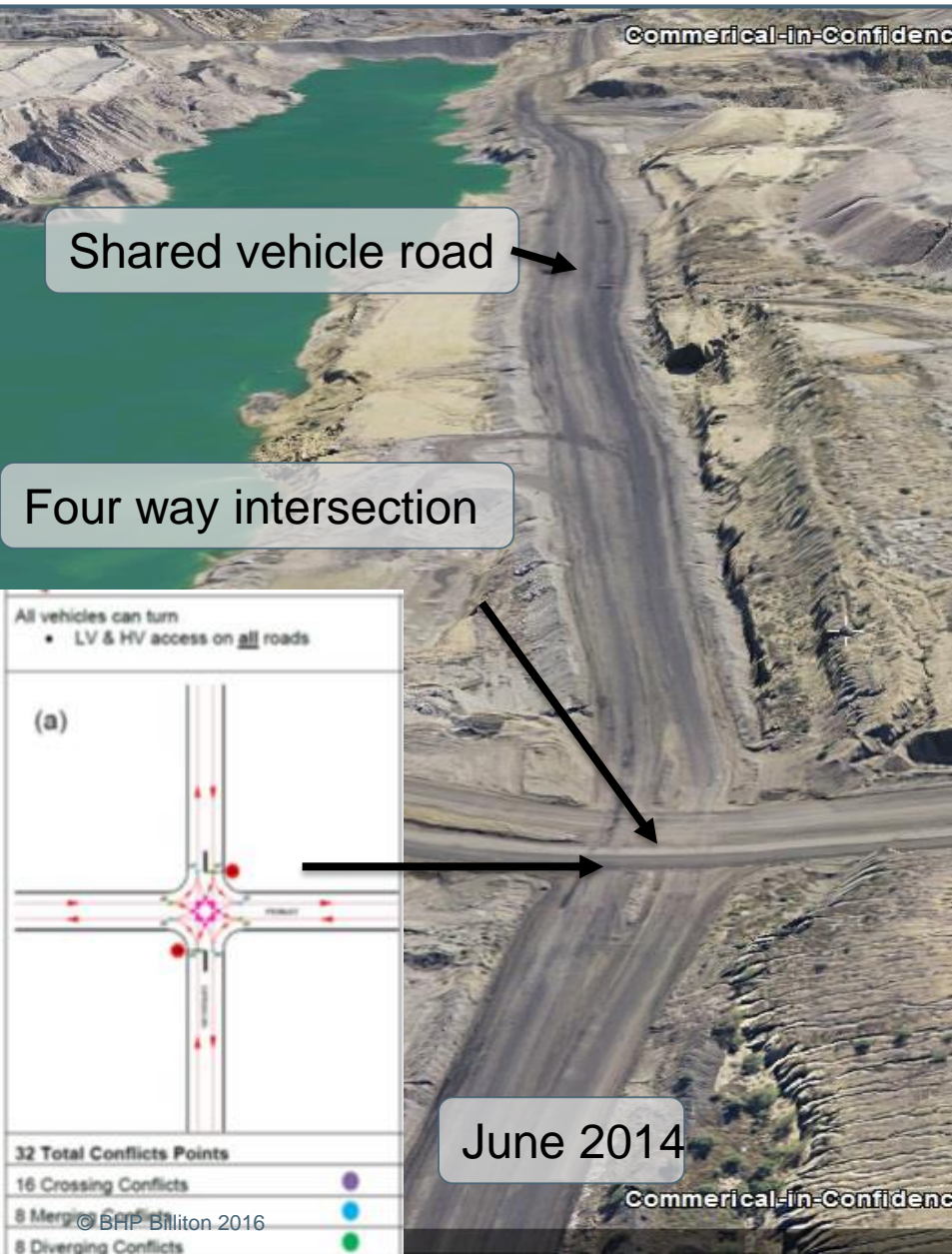
# Example: Goonyella Riverside Mine

Goonyella Riverside Mine (BMA) recently implemented a safety initiative to segregate heavy and light mining vehicle activity and to improve road intersection design

Size Perspective: GRM has a large mine road network (total >105km) on a large mining area



# Example: Goonyella Riverside Mine



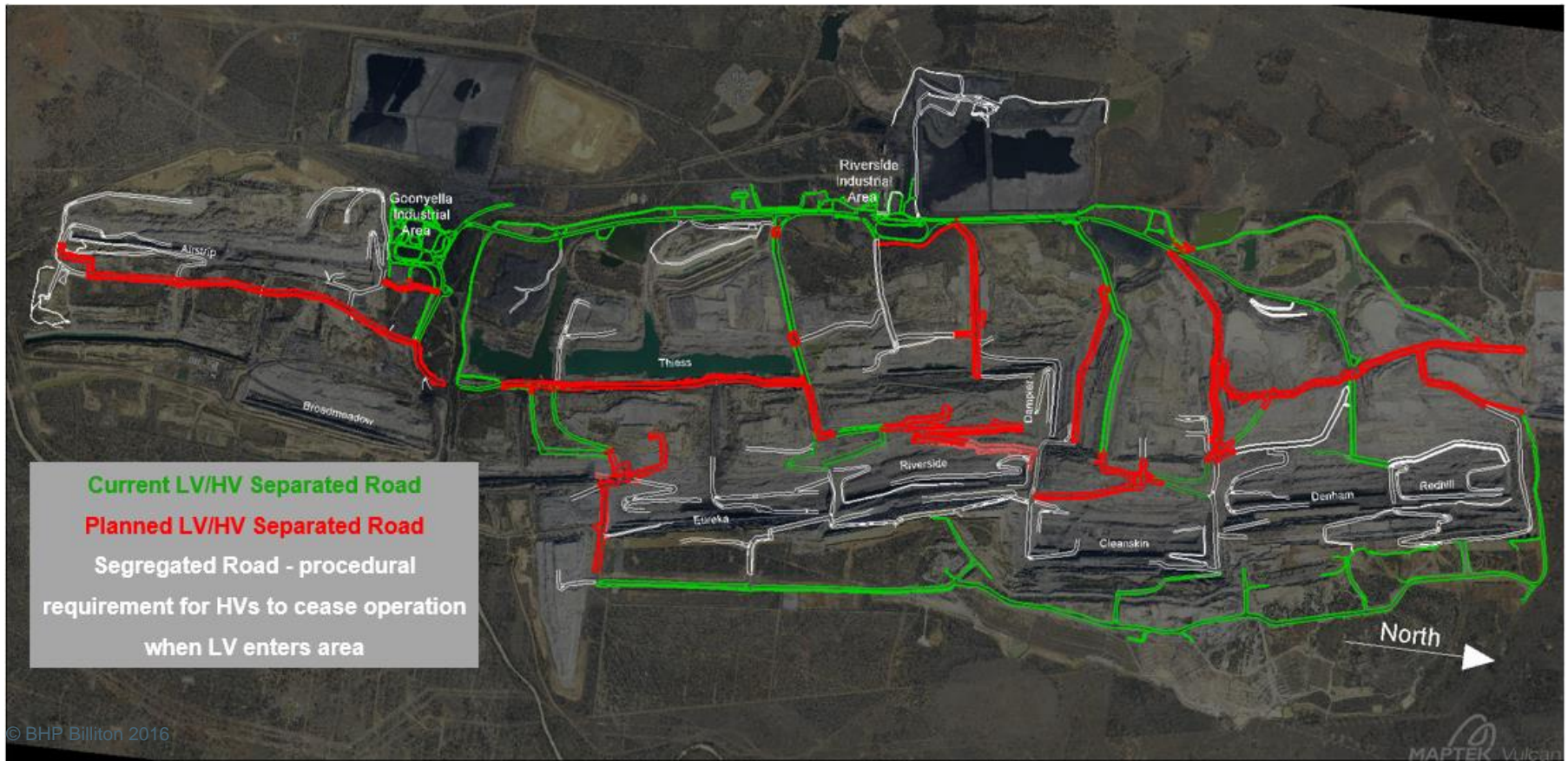
# Example: Goonyella Riverside Mine





# Outcomes

- This new network has decreased the requirement for heavy and light vehicles to share a road by 50%
- The number of intersections where HV and LVs can turn across each other has decreased from seventeen (17) to two (2)
- An increase in mine productivity of the heavy vehicle fleet by reducing haul stoppages from light vehicles entering the active circuits
- Plans are already being implemented to further improve the above outcomes



# Sustainability of controls

## Sustainability of controls

- Maintain existing mine inspection and road maintenance processes
- Implement new technologies when made available



## Improvement Opportunity in progress

- Recent commissioning of two Unmanned Aerial Vehicles (UAV aka Drones) to generate Pit survey data
- Benefits
  - Provide compliance of roads and bund heights
  - Remove surveyors from active pits
  - Surveyors are not required to drive in the pit, further reducing potential vehicle interactions



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