BOOYCO
ELECTRONICS

Introduction

- Booyco Electronics, a South African company and market leader in the field of Collision Prevention Systems since 2006
  - ✓ Installed > 6,000 PDS systems for vehicles –
    across all mining methods on surface and u/g, coal (IS) and hardrock
  - ✓ Equipped > 56,000 personnel with tags mainly underground

- Have worked with EMESRT/ICMM committees and are aligned to their guidelines.
- Our focus and investment in R&D, has been based on the guidelines, documents, and discussions that have evolved from industry.
- Was the first PDS supplier that conducted several of these VDG tests, both for surface and underground defined scenarios.

❑ Booyco Electronics subscribes to –
- ❑ **#MYBOOYCO (Commitment to Saving lives)**
- ❑ ISO 9001:2015 (Quality system)
- ❑ ISO 14001:2015 (Environmental)
- ❑ ISO 45001: 2018 (SHEQ)

❖ Global technology collaboration partners: Comms International, Ramjack, RTC, TecWise, Wenco

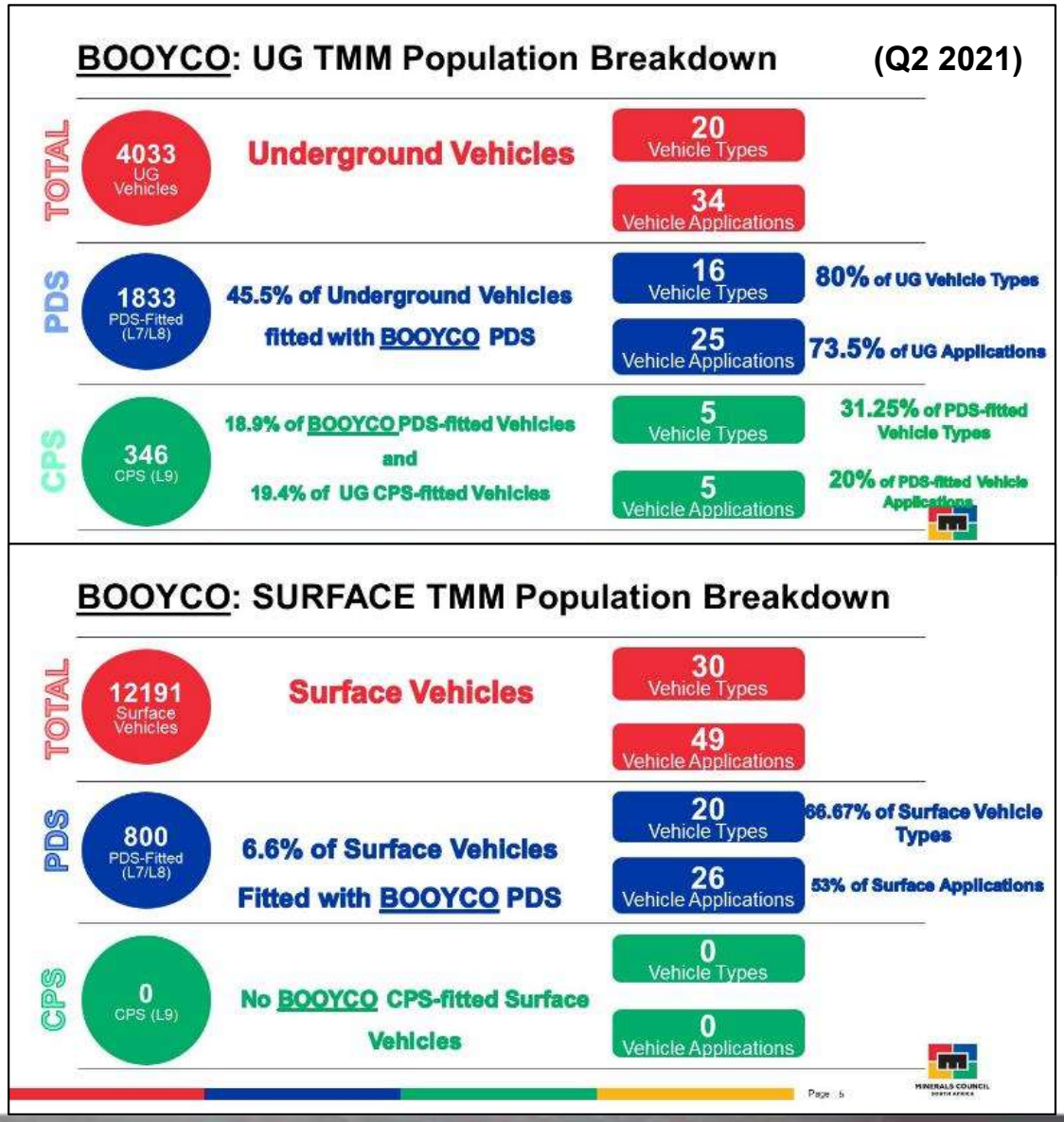
❖ https://www.booyco-electronics.co.za/

Current Booyco installations in SA

- **Underground Level 9 (PUE1)** -
  - ✓ Booyco's first diesel tractor at Tavistock Colliery (2010)
  - ✓ Various Platinum mines
  - ✓ Various Coal mines
    - ✓ Electrical machines as per MHSA (RSA)

- **Surface Level 9 (PUE1 & 2)** -
  - ✓ Richards Bay Coal Terminal

- **Under roof Level 9 (PUE2)** -
  - ✓ Forklifts at distribution centre

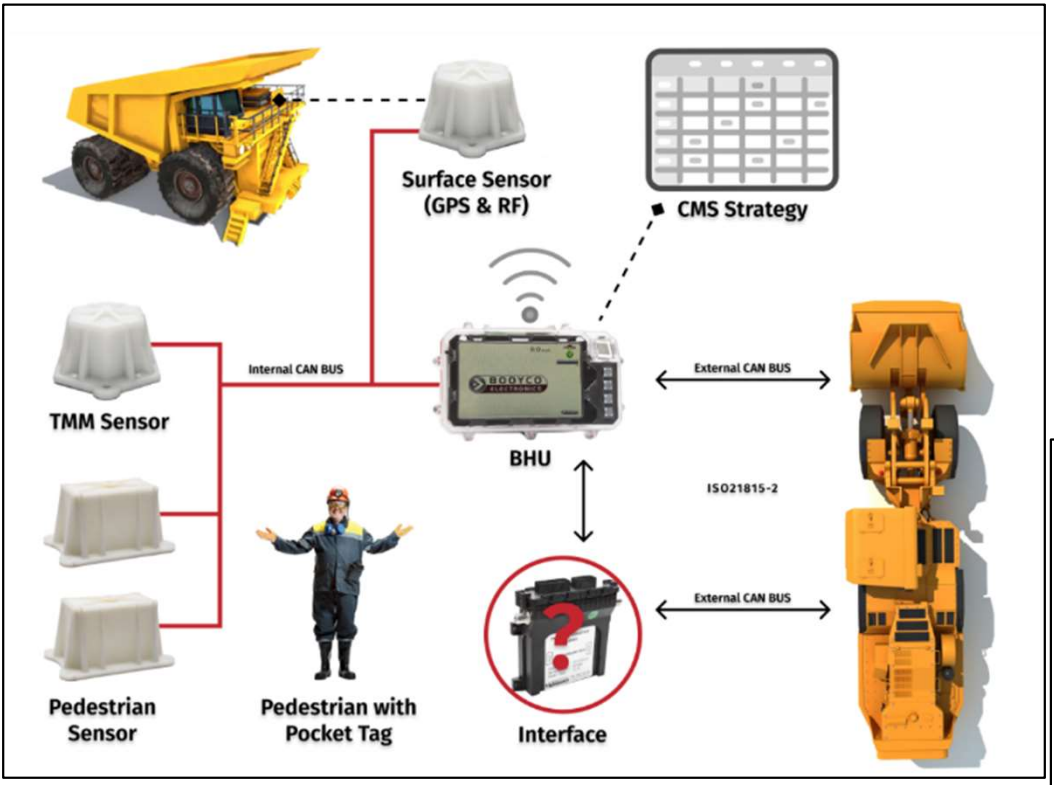


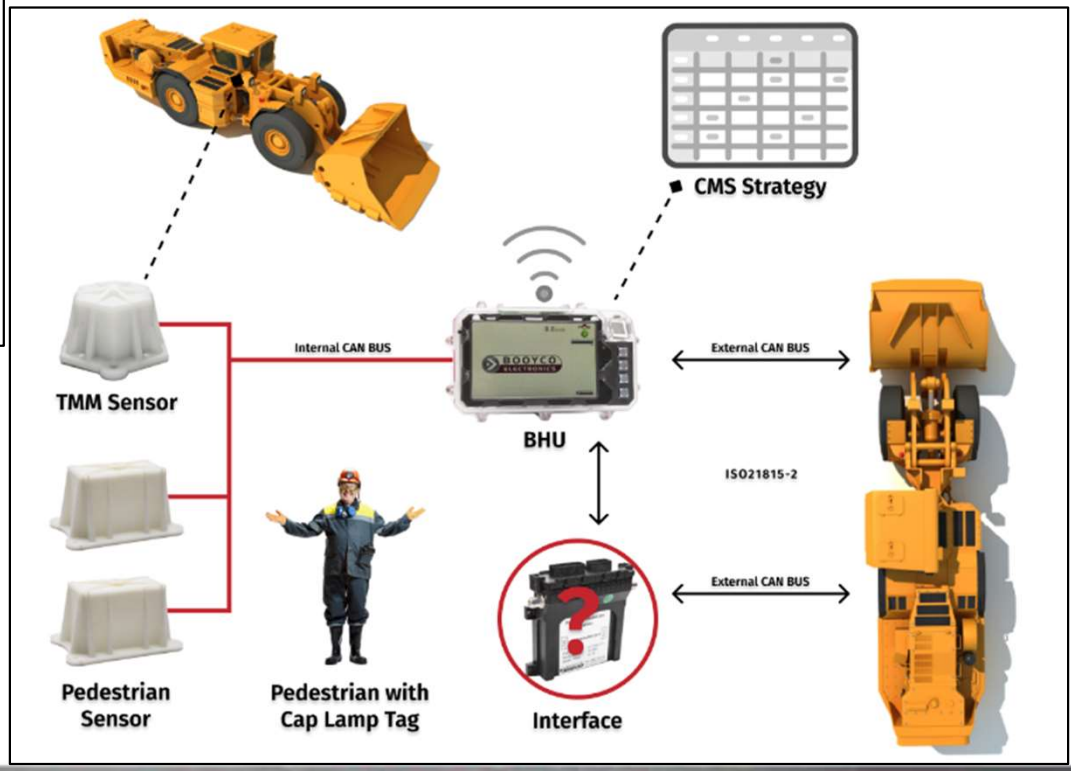
The Booyco Integrated Solution

3. Operating Procedures	Check list via the BHU (Booyco Host Unit)
4. Authority to Operate	Biometrics via the BHU
5. Fitness to Operate	Scheduled Fatigue breaks via the BHU
6. Operating Compliance	Over speeding, warning and logging via BHU
7. Operator Awareness	Alert the operator via BHU
8. Advisory Controls	The BHU can issue advisory instruction to react (slow down or stop)
9. Intervention Controls	BHU sends a signal to Slow or Stop the vehicle according to ISO21815-2 (2021)

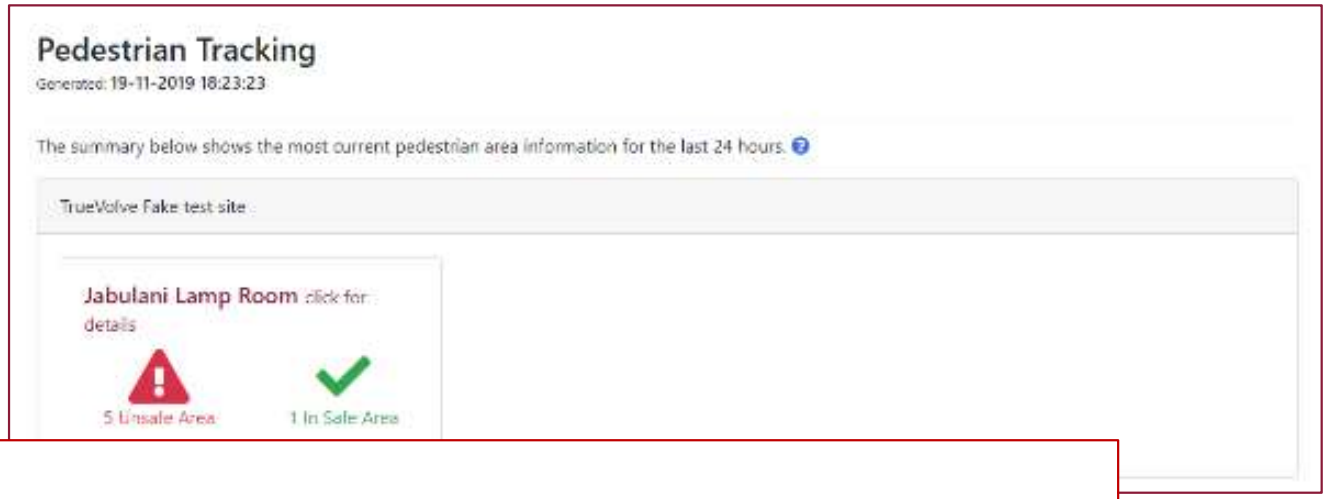
Real Time Monitoring, Data logging, Software driven functionality

Integrated CXS product overview





BEAMS - Overview



Reports

Previous page | Report list

Report : Uploads per Site (3-Month view) | Toggle report parameters | Pinned

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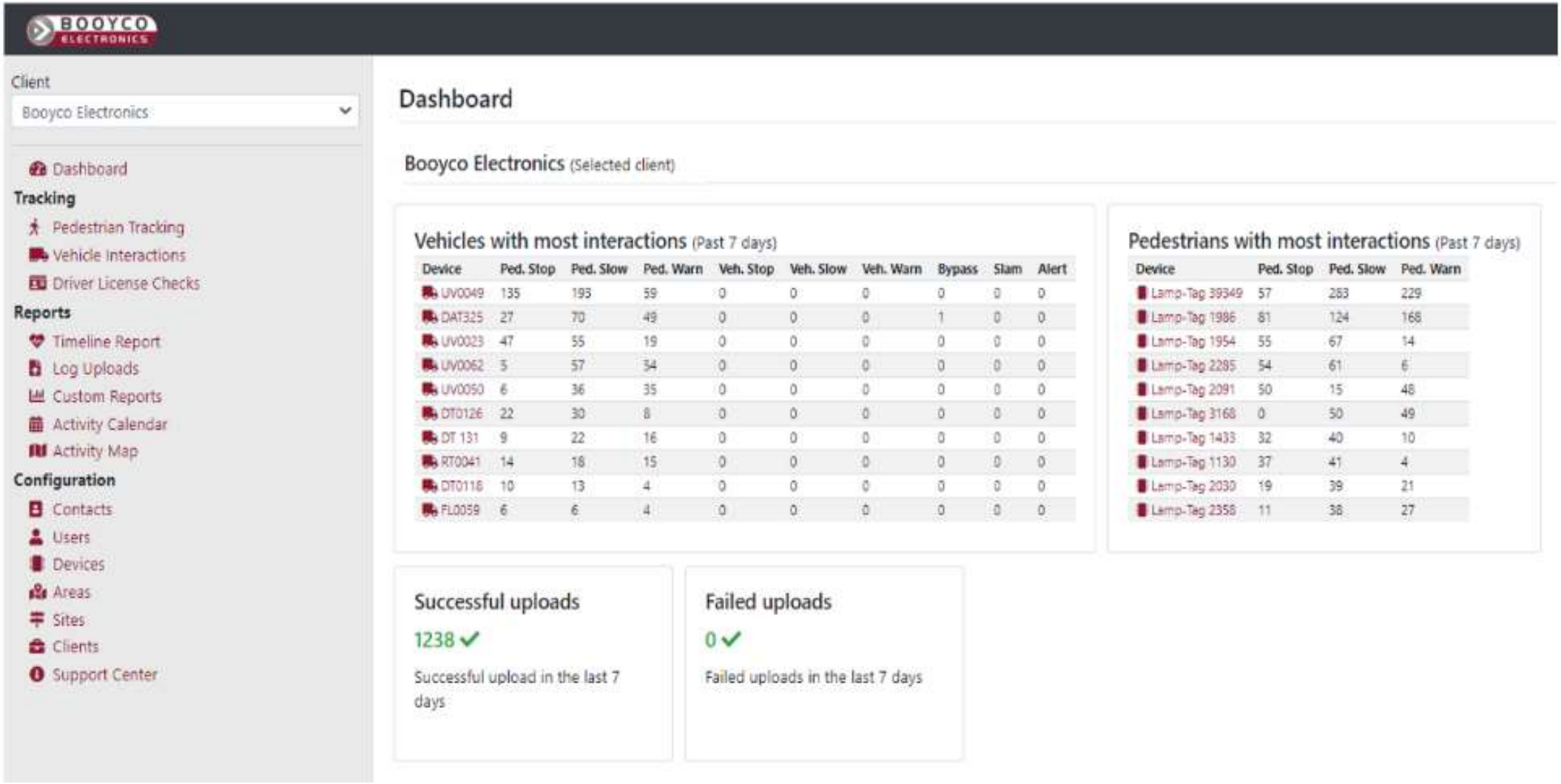
Search:

Site Name	Number of Vehicles on Site	Vehicles that uploaded 3 months ago	Vehicles that uploaded 2 months ago	Vehicles that uploaded last month	Vehicles that uploaded this month so far	Vehicles uploaded this month out of total	Fulfillment this month (%)
Booyco Bio Test	15	0	1	4	1	1 of 15	6.6667
Booyco Production	39	0	0	16	15	15 of 39	38.4615
Booyco Toets	16	0	3	1	0	0 of 16	0.0000
TrueVolve Fake	9	0	0	0	0	0 of 9	0.0000
Truevolve Test	1	0	0	1	1	1 of 1	100.0000

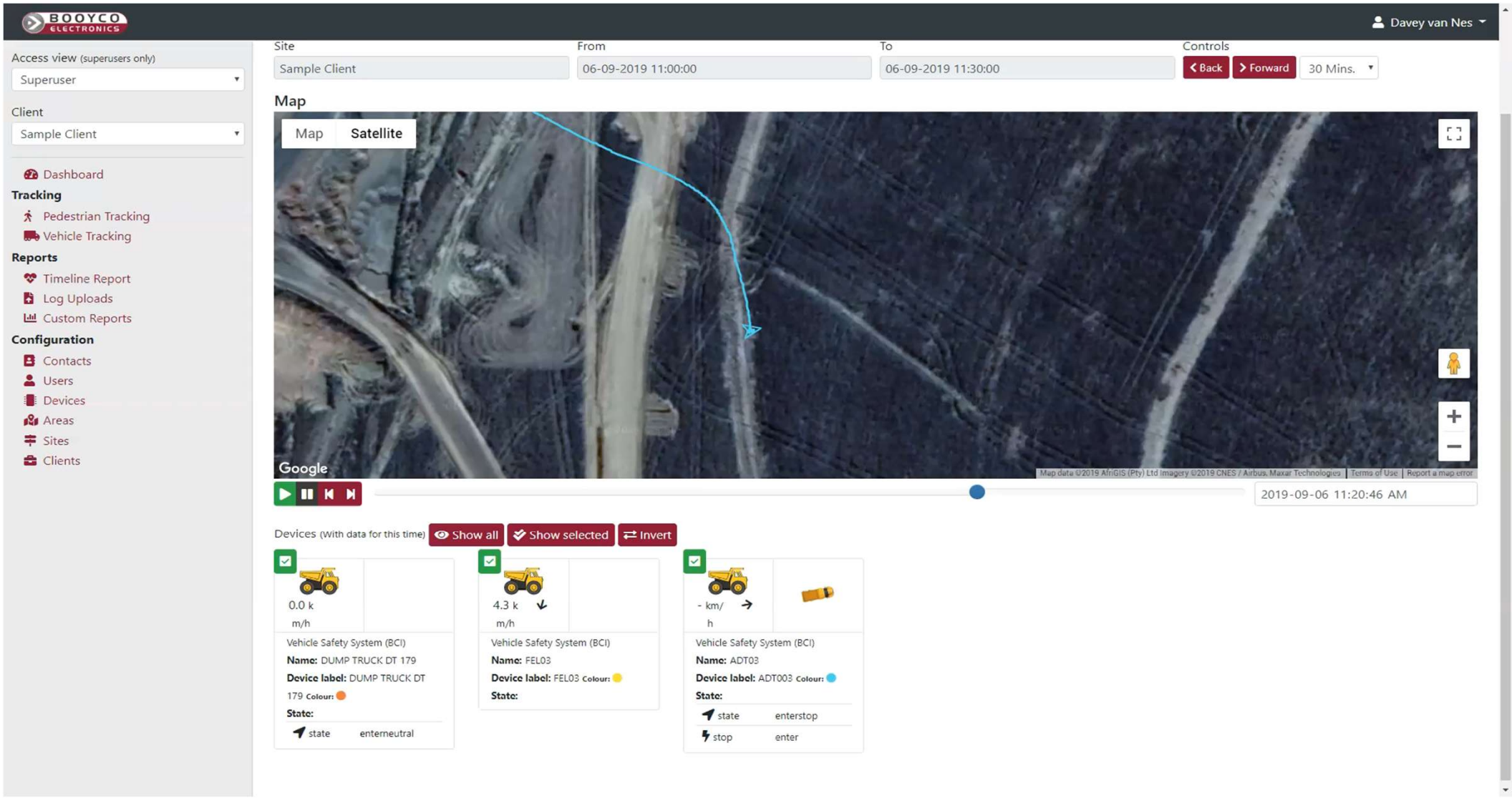
Showing 1 to 5 of 5 entries

Previous 1 Next

BEAMS – Dashboard



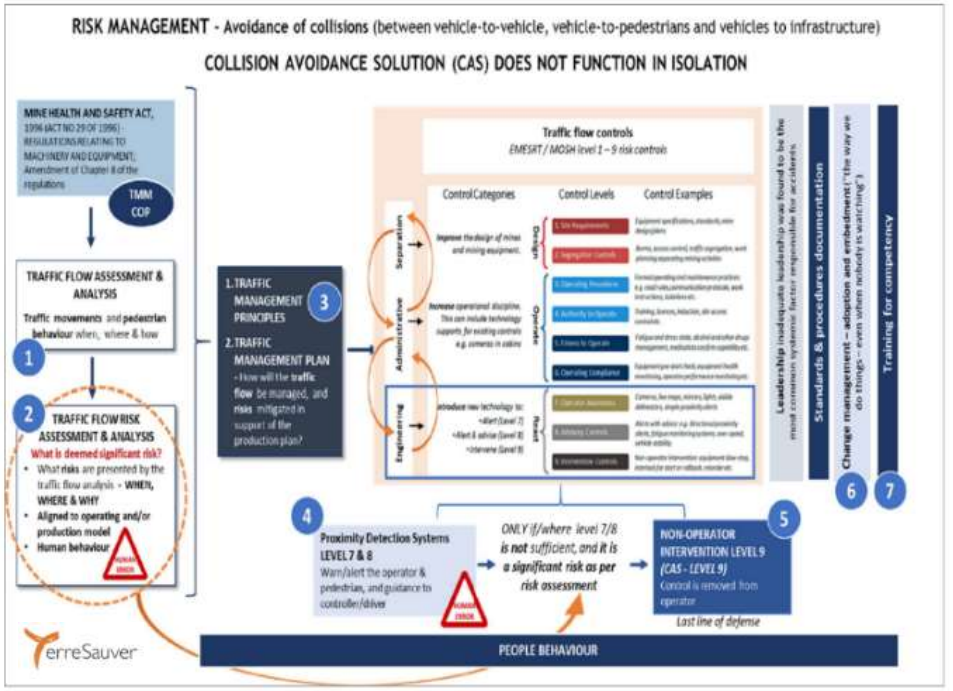
BEAMS - Overview



Implementing Collision Management Scope

Challenges related to successful implementation:

- Understanding operational RA and what requires Level9?
- Clearly defined Scope of Works
- Comprehensive Stakeholder education on overall solution
- Understanding PDS technology, including limitations
- Understanding different OEM capabilities
- Practical project execution
- Engineering vs Mining teams and availability
- Understanding overall project costs, now and in future from both Capital and Operational perspectives



Scenario	PUE	Speed Range (km/h)								Notes
		Reverse				Forward				
		30-55+	10-30	3-10	0-3	0-3	3-10	10-30	30-55+	
L1-Head-on	PUE2	-	7	8	8	9	9	7	-	
L2-Reverse-on	PUE2	-	7	9	9	8	8	7	-	
L3-Backup	PUE2	-	7	9	9	8	8	7	-	
L4-Dovetailing	PUE2	-	7	8	8	9	9	7	-	
L5-Passing Head-on	PUE2	-	7	8	8	8	8	7	-	
L6-Passing Reverse-on	PUE2	-	7	8	8	8	8	7	-	
L7-Overtaking	PUE2	-	7	8	8	8	8	7	-	
L8-Blind Approach	PUE2	-	7	9	9	9	9	7	-	
T1-Merge	PUE2	-	7	8	8	9	9	7	-	
T2-Crossover	PUE2	-	7	8	8	9	9	7	-	
T3-Junction	PUE2	-	7	8	8	9	9	7	-	
T4-Intersection	PUE2	-	7	8	8	9	9	7	-	
O1- Obstacle	PUE3	-	7	7	9	9	7	7	-	
P1-Person (direct)	PUE1	-	-	9	9	9	9	-	-	
P3-Person (indirect)	PUE1	-	-	9	9	9	9	-	-	
V1-Void	PUE3	-	7	7	7	7	7	7	-	
V4-Loss of Control*	PUE4	-	7	7	7	9	9	7	-	
V6-Congested Area	PUE2	-	7	8	9	9	8	7	-	

Case study: Two Rivers Platinum Mine (TRP)

THANK YOU: 

and Andre Heydenrych

Senior Engineer: Operations

- TRP is situated in the southern sector of the eastern limb of the Bushveld Complex, South Africa
- The mining method is a mechanized bord and pillar layout, with full run of mine production from the underground UG2 mine
- Reef production is through a fully mechanized room and pillar stoping method
  - A mining section consists of eight 12m rooms, with pillar sizes increasing with depth below surface
  - In the areas of up to 100m below surface, the pillars are generally 6m x 6m in size
- The UG2 –
  - an average dip of 8 degrees has been recorded from underground mining
  - averages about 120 cm in thickness
  - an ideal mining cut of 185 cm is targeted
- The UG2 chromitite layer is currently being mined for the PGEs, with the Merensky Reef just being engaged at the new Merensky Shaft
- Access to the underground workings is through a main conveyor decline system developed from surface as well a chairlift decline for man transport
- The conveyor/service and chairlift declines have separate surface portal entries

Case study: The TRP/Booyco journey

In order to ensure that this project is a success, this must be a journey and a partnership

	2011	2014 / 2015	2015 / 2016	2017 / 2018	2018	2019	2022 / 2023
CWS Equipment	Installed Type 1 Equipment * Alarm Unit	Upgraded to Type 2 Equipment * Master Controller * Long Display	Implemented L9 on Sandvik's 208 LHD @ North * I/O Interfaces	Tested first Type 3 Equipment * Main Controller + RF * Automotive enclosure		Tested first VDS units * Intelligent VTV Sensor	
PDS Equipment			Developed enhanced display (BCI) * Surface Solution * Compatibility to CWS equipment				
CXS Equipment					Developed CXS equipment with CANBus * Next Generation CPS technology * Single integrated solution	Developed Communication Bridge for integration compatibility and ISO21815:2	Deploy CXS equipment at Merensky Shaft * Upgrade other shafts to from CWS to CXS equipment * Currently in progress 1st Shaft
TRP			Level 9 (PUE1) implementation on Primary fleet of LHDs				

- ✓ Designed CXS Improvements based on learnings:
  - ✓ For pedestrians – A buzzer providing multi-colour changes with different zone interactions
  - ✓ For operator – A display provides more visual information such as the number of pedestrians and type of vehicle (icon display on the screen) during interactions
  - ✓ Fewer components fitted onto the vehicle, less costs and easier maintenance etc.

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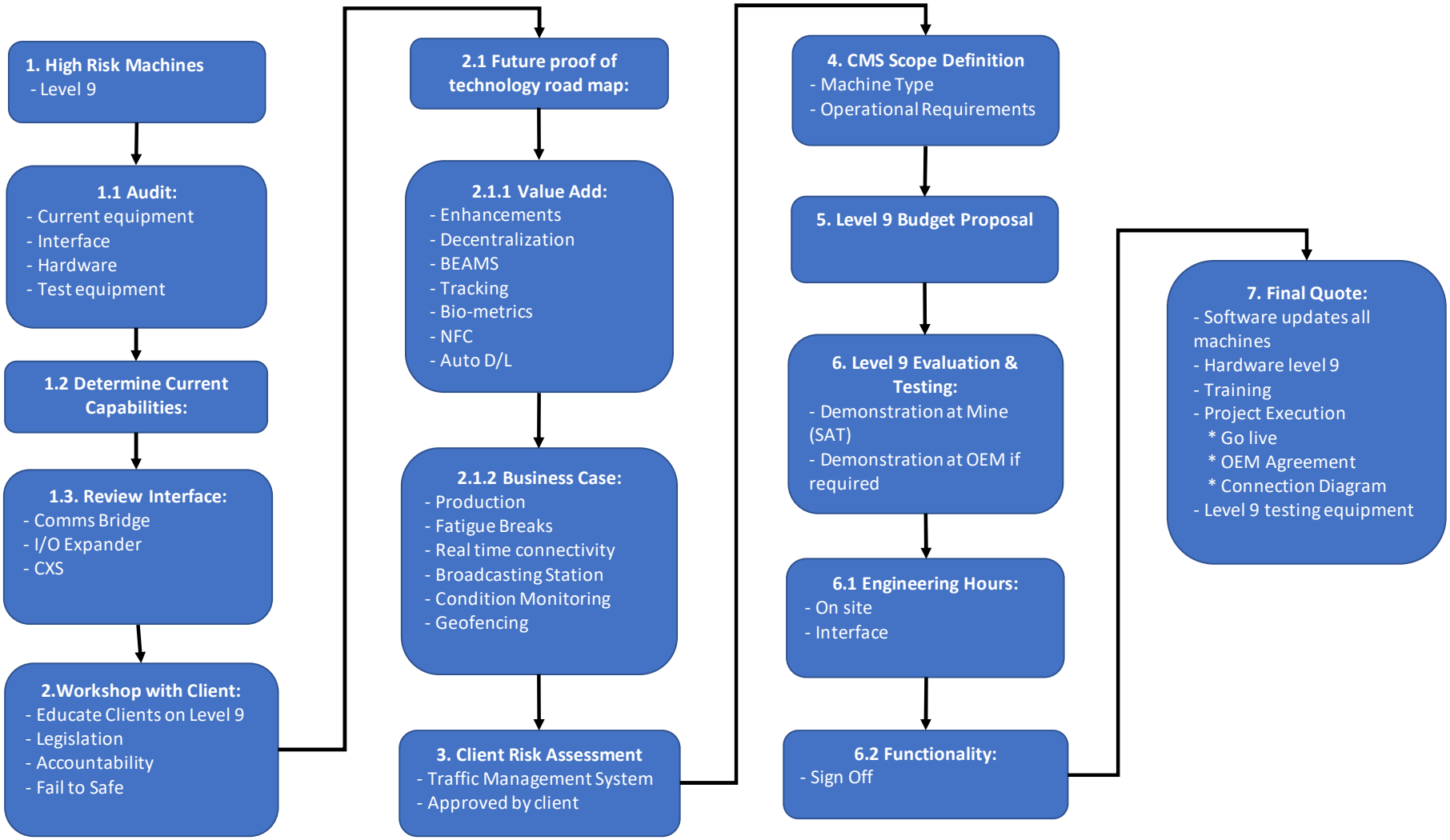
Preparation and Strategy to L9 Implementation

Technology is NOT a 'silver bullet', and requires proper Strategy and change management



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Case study: The TRP/Booyco journey

Learnings and Observations

- Deployment of any PDS system at any level requires -
  - User readiness (operators and pedestrians)
  - Operational experiences and readiness through Level 7/8 deployment
- Change management is a critical component of PDS implementation
- A successful outcome of a PDS implementation is greatly dependant on -
  - Understanding of what PDS is at any level and what it means to people, operations and production
  - the operation's deployment, successful change management and adoption of Level 7/8 systems
- Data collation and assessment of machine and pedestrian actions and interactions (BEAMS) will help with the risk assessment and traffic management workshops
- If possible, roll out on one section/shaft first as sample deployment –
  - As part of change management and training
  - Will demonstrate / confirm functionality
  - Allow for optimization for specific operational requirements
  - Identify potential changes to the scope of works and project plan
- The more thorough the scope of work, the risk assessment and initial preparation time, the better the chances of success are

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Case study: The TRP/Booyco journey

Learnings and Observations – Level 9

- Verification and sign-off of the Scope of Work by all parties
- Engagement with and collaboration of OEMs is crucial, at Merensky, the plan deviated substantially and had an effect on the completion date and costs
- Scope and pre-installation must include
  - What type of interface will be required on what type of vehicles
  - OEM must be involved in the first installation and testing
  - Detail and requirements of the testing and parameters must be clearly defined and signed off
- Machine availability on-site at the agreed times and dates is a major delaying factor
  - Disruption to the project plan and milestones
  - Extensive overtime and fatigue is accrued
  - Recommended to not be initially installed during the regular services
    - Require flexibility for configuration and commissioning
    - Not necessarily enough time with other services providers also working on the machine
- Cold commissioning crucial for optimization of PDS zones and limiting impact on production

Human beings are incredible – TRP workers now generally evade interaction with TMMs

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QUESTIONS?

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