

Traffic flow analysis risk assessment (TMM risk) 20 October 2024



BLACK ROCK MINE OPERATIONS

Area: NCH3, NCH2, Gloria, Process: All underground Responsible Employee: Date: 20-Oct-24

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			lden	tification				Asses	ssmen	nt	Control	Ass	essment		Risk Reduction Pla	an		
Risk No:	тим Туре	Routine / Non- Routine	Risk Name (Activity)	Risk Exposure	Hazard / Aspect	Event / Impact (Activity / consequence)	Risk Category	Severity level	Probability level	Pure Risk	Existing Control Measures	Severity level	Residual Risk	Resuk - action	Suggested controls to reduce the risk further, whenever necessary.	Severity level	Potential reduction due to further action/s suggested.	Applicable legal or other requirements
1	Dump truck: Epiroc, Caterpillar (all models)	R	Pre-start check, functional brake testing, compliance brake testing, tramming empty, tramming fully loaded, loading, dumping into tips, refuelling, tyre changing, routine maintenance, breakdowns, towing, safe parking, fail to safe events, fire on machine, linident management, emergencies, operator fatigue. Travelling on decline.	- V.P with pedestrian caught in articulation - causing single fatality or permanent total disabilities V.P causing injury to pedestrian while tramming V.P causing injury to pedestrian when loading or dumping at tip V.P causing injury to pedestrian in workshop V.P causing injury while performing maintenance (caught in bucket) LoC on dealine V.V. during breakdown in high interaction risk area V.E while dumping and tramming.	See TMM type hazard in worksheets 1.	Single fatality or permanent total disabilities	s	4 5	5 2	20 F	See worksheet 3 TMM register for safety devices ritted to TMM. CPS level 7 and 8 Vehicle Detection System VDS) fitted. Checklist in place. Training and licensing of operators in place. Training and licensing of operators in place. Machine operation and maintenance in accordance with Epirco operations and maintenance manuals. Traffic management plan in place. (including RCAP) TAMM MCOP in place. Supervision in place. Supervision in place. The modification of the place of protect tip operator. Tip worksion rome in place to protect tip operator. Tip worksion rome in place. Bin up alarm and interfock. Safe walkways and crossings Travelling in decline procedure in place. Safe park procedure in place.	4	1 16	For all operation purposes effective warning, auto retard and auto stopping of TMM for pedestrians, CPS must be installed. Safe park to include articulation lock. Beacons or inclinometer to limit gear to second gear and use of retarder on decline. V-V crawl. Crawl speed is 3 km/hr. (note: Caterpliat machines may not be able to crawl at Sawfir and only crawl at 5 km/hr). Speed in workshop to be controlled by beacons to crawl at 5 km/hr. Speed in workshop to be controlled by beacons to crawl speed. "I for a fine filling. CPS error is a "No-Go". Firaking system testing is critical to resuring safe at sopping of machine. "TMM must act as a beacon when stopped in "unsfafe area". Effective isolation zones to avoid nuisance alarms to be installed.		4 3	12	See BRMO - CAS Project - Definitions, Abbreviations and References Standard - 3 December 2023 rev 0 - specifically Section 8 References.
2	Dump truck: Epiroc MT42 BEV	R	Pre-start check, *functional brake testing, compliance brake testing, tramming empty, tramming fully loaded, loading, dumping into tips, battery changing, tyre changing, routine maintenance, breakdowns, towing, safe parking, fail to safe events, fire on machine, incident management, emergencies, operator fatigue. Travelling on decline.	- V-P with pedestrian caught in articulation - causing single fatality or permanent total disabilities V-P causing injury to pedestrian while tramming, - V-P causing injury to pedestrian when loading or dumping at tip V-P causing injury to pedestrian when changing batteries, - V-P causing injury to pedestrian in workshop, - V-P causing injury to pedestrian in workshop, - V-V causing injury while performing maintenance (caught in bucket) V-O decline - V-V dwing tramming V-V while loading V-V dwing breakdown in high interaction risk area V-E while dumping and tramming Note: Battery fire is high risk for entire shaft and may cause multiple fatalities. The impact of CAS on batteries has not been determined and therefore must be subject to a separate risk assessment.	See TMM type hazard in worksheets 1	Single fatality or permanent total disabilities	s	4 5	5 2	20 · · · · · · · · · · · · · · · · · · ·	See worksheet 3 TMM register for safety devices titled to TMM. CPS level 7 and 8 Vehicle Detection System VVS) fitted. Checkist in place. Training and licensing of operators in place. Tyre changing SOP in place. Tyre changing SOP in place. Additive operations and maintenance in accordance with Epirco operations and maintenance manuals. Traffer management plan in place. (including RCPA) Top Color in place. Supervision in place. Supervision in place. Planned Task Observation. The workload come in place to protect tip operator. TMM lighting standard in place. Bla up aliam and interlock Selete walkways and crossings Travelling in decline procedure in place (note: active register) and crossings. Selete walkways and crossings Travelling in decline procedure in place (note: active register) exister in place. Bet park procedure in place. Bet park procedure in place. Bet park procedure in place. Emergency management procedures in place.	4	: 16	For all operation purposes effective warning, auto retard and auto stopping of TMM for pedestrians, CPS must be installed. Safe park to include arciucilation lock. Safe park to pinculae arciucilation lock. Beacons or inclinometer to limit gear to second gear and use of retarder on decline. V-V-crawl. Crawl speed is 3 km/hr. Maximum speed is 14 km/hr. Speed in workshop to be controlled by beacons to crawl speed. Isolation zones for attendant at tips and battery changing bay. CPS error is a "No-Go". Braking system testing is critical to resuring safe stopping of machine. TMM must act as a beacon when stopped in "unsfafe area". Effective isolation zones to avoid nuisance alarms to be installed.	TMM must be fitted with CPS effective warning, auto retard and auto stop. (level 9) Traffic flow and hot spot analysis to determine current controls are aligned with risk assessment.	4 3	12	- See BRMO - CAS Project - Definitions, Abbreviations and References Standard - 3 December 2023 rev 0 - specifically Section 8 References.



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			lden	tification				Assess	smen	nt	Control	Ass	essment		Risk Reduction Pla	in		
Risk No:	ТММ Туре	Routine / Non- Routine	Risk Name (Activity)	Risk Exposure	Hazard / Aspect	Event / Impact (Activity / consequence)	Risk Category	Severity level	<u>≥</u> 8	Pure Risk	Existing control Measures	5 7	Residual Risk	Result - action	Suggested controls to reduce the risk further, whonever necessary.	Severity level	Potential reduction due to further	Applicable legal or other requirements
3	LHD: Epiroc Scooptram ST14	R	Pre-start check, functional brake testing, compliance brake testing, tramming with empty scoop, tramming with empty scoop, lading and loading into dump trucks, dumping into tips, refluelling, tyre changing, routine maintenance, breakdowns, towing, safe parking, fall to safe events, fire on machine, incident management, emergencies, operator fatigue, Travelling on decline.	- V-P with pedestrian caught in articulation - causing single fatality or permanent total disabilities V-P causing injury to pedestrian while retruelling V-P causing injury to pedestrian while retruelling V-P causing injury to pedestrian while operating in miling cycle - crushed against wall or under scoop etc V-P causing injury to pedestrian when loading or dumping at tip V-P causing injury to pedestrian in workshop V-P causing injury to pedestrian while changing tyre or wheel, - V-P causing injury to pedestrian while changing tyre or wheel V-P causing injury to pedestrian while changing tyre or wheel V-V causing injury to pedestrian while changing tyre or wheel V-V causing injury to pedestrian while changing tyre or wheel V-V causing injury to pedestrian while changing tyre or wheel V-V causing injury to pedestrian while changing tyre or wheel V-V causing injury to pedestrian while changing tyre or wheel V-V causing injury to pedestrian while changing tyre or wheel V-V causing injury to pedestrian while changing tyre or wheel V-V causing injury to pedestrian while changing tyre or wheel.	See TMM type hazard in worksheets 1.	Single fatality or permanent total disabilities	s	4 5	2	20 R	See worksheet 3 TMM register for safety devices fitted to TMM. CPS level 7 and 8 Vehicle Detection System (VDS) fitted. Checklist in place. Training and licensing of operators in place. Tyre changing SOP in place. Machine operation and maintenance in accordance with Epirco operations and maintenance in accordance with Epirco operations and maintenance manuals. Traffic management plan in place. (including RCAP) TMM MCOP in place. Supervision in place. Planned Task Observation. LHD operating procedures in place. Tip exclusion zone in place to protect tip operator. TifM lighting standard in place. Reflective strips, reflective overalls. Safe walkways and crossings Travelling in decline procedure in place. Safe park procedure in place.		: 16	For all operation purposes effective warning, auto retard and auto stopping of TMM for pedestrians, CPS must be installed. Safe park to include articulation and bown book. Beacons or inclinometer to limit gear to first gear on decline. V-V crawl. Crawl speed is 3 km/hr. Maximum speed is 10 km/hr (second gear). Speed in workshop to be controlled by beacons bo crawl speed. Isolation zones for attendant at tips and fuel filling. CPS error is a "No-Go". TMM must act as a beacon when stopped in "unsafe area". TMM must act as a beacon when stopped in "unsafe area". Effective isolation zones to avoid nuisance alarms to be installed.	TMM must be fitted with CPS effective warning, auto retard and auto stop. (level 9) Traffic flow and hot spot analysis to determine current controls are aligned with risk assessment.	4 3	12	- See BRMO - CAS Project - Definitions, Abbreviations and References Standard - 3 December 2023 rev 0 - specifically Section 8 References.
4	LHD: Epiroc ST 14 BEV	R	Pre-start check, - functional brake testing, - compliance brake testing, - tramming mpty, - tramming mpty, - tramming fully loaded, - loading, - dumping into tips, - battery changing, - tyre changing, - tyre changing, - troutine maintenance, breakdowns, - towing, - safe parking, - fall to safe events, - fire on machine, - incident management, - emergencies, - cperator fatigue Travelling on decline.	- V-P with pedestrian caught in articulation - causing single fatality or permanent total disabilities V-P causing injury to pedestrian while transming V-P causing injury to pedestrian while changing battery V-P causing injury to pedestrian while operating in mining cycle - crushed against wail or under scoop etc V-P causing injury to pedestrian when loading or dumping at U-P causing injury to pedestrian in workshop V-P causing injury to pedestrian while changing tyer or wheel V-P causing injury to pedestrian while changing tyer or wheel V-P causing injury to pedestrian while changing tyer or wheel V-P causing injury to pedestrian while changing tyer or wheel V-P causing injury to pedestrian while changing tyer or wheel V-V causing injury to pedestrian while changing very causing very causin		Single fatality or permanent total disabilities	s	4 5	5 2	fii	See worksheet 3 TMM register for safety devices fitted to TMM. CPS level 7 and 8 Vehicle Detection System (VDS) fitted. Checklist in place. Training and loensing of operators in place. Tyre changing SOP in place. Traffic management plan in place. (including RCAP) Traffic management plan in place. (including RCAP) TMM MCOP in place. Planned Task Observation. Tip exclusion zone in place to protect tip operator. TMM lighting standard in place. Planned Task Observation. Tip with the place in place. Safe walkways and crossings Travelling in decline procedure in place. Battery change procedure in place only service brakes on decline. This must be risk assessed) Emergency management procedures in place.		16	For all operation purposes effective warning, auto retard and auto stopping of TMM for pedestrians, CPS must be installed. Safe park to include articulation lock. Baecans or inclinometer to limit gear to second gear and use of retarder on decline. V-V crawl. Crawl speed is 3 km/hr. Maximum speed is 14 km/hr. Speed in workshop to be controlled by beacons to crawl speed. Isolation zones for attendant at tips and fuel filling. CPS error is a "No-Go". Braking system testing is critical to ensuring safe stopping of machine. TMM must act as a beacon when stopped in "usnfae area". Effective isolation zones to avoid nuisance alarms to be installed.	TMM must be fitted with CPS effective warning, auto retard and auto stop. (level 9) Traffic flow and hot spot analysis to determine current controls are aligned with risk assessment.	4 3	12	See BRMO - CAS Project - Definitions, Abbreviations and References Standard - 3 December 2023 rev 0 - specifically Section 8 References.





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			lden	tification			-	Assess	smen	nt	Control	Asse	essment		Risk Reduction Pla	an		
Risk No:	ТММ Туре	Routine / Non- Routine	Risk Name (Activity)	Risk Exposure	Hazard / Aspect	Event / Impact (Activity / consequence)	Risk Category	Severity level Probability level	doi: 0	Pure Risk	Existing Control Messures	Severity level Probability level	Residual Risk	Result - action	Suggested controls to reduce the risk further, whonever necessary.	Severity level Probability level	Potential reduction due to further action/s suggested.	Applicable legal or other requirements
5	Drills Epiroc - all types (double boom 282)	R	Pre-start check, *functional brake testing, compliance brake testing, compliance brake testing, tramming with boom in incorrect position. tramming with boom in correct position but trying to access incline in spoor or slippery road conditions (sliding back), loading and beading into dump trucks, dumping into tips, refuelling, lye changing, voutine maintenance, routine maintenance, safe parking, fail to safe events, fire on machine, incident management, emergencies, operator fatigue. Travelling on decline.	V-P with pedestrian caught in articulation - causing single fatality or permanent total disabilities 'V-P with pedestrian caught in drill rotation while drilling. 'V-P with pedestrian crushed against side wall by drill attachment - causing single facility or permanent total disability. 'V-P causing injury to pedestrian while tranming, (particularly around corners). V-P causing injury to pedestrian while tranming, with soon in incorrect position. V-P causing injury to pedestrian while tranming or thorning up a incline with road in slippery condition (drill sliding) and crushing pedestrian against wall) 'V-P causing injury to pedestrian in workshop, 'V-P causing injury to pedestrian in workshop, 'V-P causing injury to pedestrian in v-V-V while tranming. 'V-V while tranming. 'V-V while tranming. 'V-V while tranming. 'V-V during breakdown in high interaction frisk area. 'Noise impact on hearing during drilling and or tranming.	See TMM type hazard in worksheets 1.	Single fatality or permanent total disabilities	S	4 5	2	s ((((((((((((((((((((((((((((((((((((All drilling installation is controlled from behind the support jacks of the machine. See worksheel 3 TMM register for safety devices fitted to TMM. CPS level 7 and 8 Vehicle Detection System (VDS) fitted. Drill head change procedure in place. Checklist in place. Training and licensing of operators in place. Machine operation and maintenance in accordance with Epitoro operations and maintenance manuals. Traffic management plan in place. (including RCAP) Flamed Task Observation. TMM IMCOP in place. Felfective strips, reflective overalls. Safe validways and crossings Travelling in decline procedure in place. Safe past procedure in place in protection Note: Drill fitted with pedestrain defection devices that prevent the pedestrain being entangled in drill rotation or movement—stop machine hydraulics automatically should pedestrain walk into "danger zone" while drilling. This must be verified.	4 3	12	For all operation purposes effective warning CPS must be installed. (Level 7 & 8) Safe park to include articulation and boom lock. Crawl speed is 3 km/hr. Maximum speed is >12,5 km/hr (to be verified). Speed in workshop to be crawl speed. CPS error is a "No-Go". Braking system testing is critical to ensuring safe stopping of machine. TMM must act as a beacon when stopped in "unsafe area". Effective isolation zones to avoid nuisance alarms to be installed.	- TMM must be fitted with CPS effective warning, level 7 and level 8 only: - Note: Should drill not be fitted with pedestrian detection devices that prevent the pedestrian being entangled in dir Incistor or movement - slop models in high pedestrian being entangled processing the production of the pedestrian being and pedestrian being - TMM must be fitted with CPS effective warning, autored and and uso stop, (level 9) - must be risk assessed for control confirmation as many such incidents have occurred in SAMI incidents have occurred in SAMI - Traffic flow and hot spot analysis to determine current controls are aligned with risk assessment.	4 2	8	See BRMO - CAS Project - Definitions, Abbreviations and References Standard - 3 December 2023 rev 0 - specifically Section 8 References.
5	Roof bolter: Epiroc - Cabletec SL - Boltec 235 H	R	Pre-start check, functional brake testing, compliance brake testing, tramming, Changing drill in operation, Drilling and bolling, Prye changing or maintenance, Refuelling, Tyre changing or maintenance, Breakdowns, Facutine maintenance, Breakdowns, Facutine maintenance, Fall to safe events, Fall	- V-P with pedestrian caught in articulation - causing single fatality or permanent total disabilities. - V-P with pedestrian caught in drill rotation while drilling. - V-P destartian crushed against side wall by drill attachment - causing single facility or permanent total disability. - V-P causing injury to pedestrian while tramming. - V-P causing injury to pedestrian while tramming, destarticularly around corners) - V-P causing injury to pedestrian in workshop. - V-P causing injury while performing maintenance (caught in drill attachment or articulation). - V-V while tramming. - V-V while tramming. - V-V dwile drilling. - V-V during breakdown in high interaction risk area. - Noise impact on hearing during drilling and or tramming. - V-P causing injury to pedestrian while changing drills or bolt attachments. - V-P causing injury to pedestrian while changing drills or bolt attachments.	See TMM type hazard in worksheet 1.	Single fatality or permanent total disabilities	s	4 3	1	12 ann	All drilling and bolt installation is controlled from behind the support jacks of the machine. See worksheet 6 TMM register for safety devices fitted to TMM. CPS level 7 and 8 Vehicle Detection System (VDS) fitted. Checkist in place. Training and loonesing of operators in place. Tyre changing SOP in place. Tyre changing SOP in place. Training and loonesing of operators in place. Training and loonesing of operators in place. Traffic management plan in place. Traffic management plan in place. TIMM MCOP in place. Supervision in place. Planned Task Osbervation. TIMM lighting standard in place. Tasflic make size, reflective overalls. Safe walkways and crossings Travelling in decline procedure in place. Safe park procedure in place in protection	4 3	12	For all operation purposes effective warning GPS must be installed. (Level 7 & 8) Safe park to include articulation and boom look. Crawl speed is 3 km/hr. Maximum speed is 10 km/hr (second gear). Speed in workshop to be crawl speed. Speed in workshop to be crawl speed. GPS error is a *No-Go*. Braking system testing is critical to ensuring safe stopping of machine. *TMM must act as a beacon when stopped in "unsafe area". Effective isolation zones to avoid nuisance alarms to be installed.	Although the current risk is low,	4 2	8	See BRMO - CAS Project - Definitions, Abbreviations and References Standard - 3 December 2023 rev 0 - specifically Section 8 References.



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BLACK ROCK MINE OPERATIONS

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Area:	NCH3, NCH2, Gloria,	Process:	All underground	Responsible	Date:	20-Oct-24

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			Ident	tification			As	ssessi	ment	Control	Ass	essment		Risk Reduction Pla	in		
Risk No:	тим Туре	Routine / Non- Routine	Risk Name (Activity)	Risk Exposure	Hazard / Aspect	Event / Impact (Activity / consequence)	Risk Category	Severity level Probability level	Pure Risk	Existing Control Measures	Severity level	Residual Risk	Result - action	Suggested controls to reduce the risk further, whenever necessary.	Severity level	Potential reduction due to further	Applicable logal or other requirements
4	LDV: Toyota Land cruiser Single cab	R	Pre-start check, *functional brake testing, compliance brake testing, tramming, tramming, transporting passengers, transporting load. Refuelling, Tyre changing or maintenance, Routine maintenance, Breakdowns, Towing, Safe parking, Fail to safe events, Fire on machine, Incident management, Emergencies, Operator fatigue. Travelling on decline.	- V.P when pedestrian approaches operator to speak with operator V.P with pedestrian cushed when TMM skids into side wall V.P causing injury to pedestrian while tramming, - V.P causing injury to pedestrian in workshop, - V.P causing injury while performing maintenance (caught in fork attachment or articulation) I.Co on decline. (due to too much service brake application and or to high a speed) - V.V while tramming V.V during breakdown in high interaction risk area.	See TMM type hazard in worksheet 1.	Injuries that require time off work / loss time injury / RWC (Restricted work case) - No permanent disabilities	S	2 4	8	See worksheet 6 TMM register for safety devices fitted to TMM. CPS level 7 and 8 Vehicle Detection System (VDS) fitted. Checklist in place. Training and idensing of operators in place. Tyric changing 50° in place. Wachine operation and maintenance in accordance with Toyota operations and maintenance manuals. Traffic management plan in place. (including RCAP) TMM MCOP in place. Supervision in place. Planned Task Observation. TMM lighting standard in place. Reflective strips, reflective overalls. Safe walkways and crossings. Travelling in decline procedure in place.	2 3	3 6	For all operation purposes effective warning CPS must be installed. (Level 7 & 0) Crawl speed is 3 km/hr. Maximum speed is 14 km/hr (second gear). (TMM to be fitted with speed ilmitation device) immation device) workshop to be crawl speed. CPS error is a "No-Go". SPERIOR system testing is critical to ensuring safe stopping of machine. TMM must act as a beacon when stopped in "unsafe area". Effective isolation zones to avoid nuisance alarms to be installed.		2 2	4	• See BRMO - CAS Project - Definitions, Abbrevisions and References Standard - 3 December 2023 rev 0 - specifically Section 8 References.
12	Scaler: Aard, Bell	R	Pre-start check, functional brake testing, compliance brake testing, tramming tramming with boom extension in unsafe position descaling, cleaning face area after descaling, cleaning face area after descaling, refuelling, tyre changing, routine maintenance, breakdowns, towing, safe parking, fail to safe events, fire on machine, incident management, emergencies, operator fatigue. Travelling on decline.	- V.P with pedestrian struck by tool - causing single fatality or permanent total disabilities V.P with pedestrian struck by wheels during rotation on own axis or rapid turning V.P causing injury to pedestrian while tramming V.P causing injury to pedestrian while refueiling V.P causing injury to pedestrian while operating in mining cycle - crushed against wall etc V.P causing injury to pedestrian while operating in mining cycle - crushed against wall etc V.P causing injury to pedestrian while changing tyre or wheel V.P causing injury to pedestrian while changing tyre or wheel V.P causing injury while performing maintenance V.V dwille tramming V.V dwille tramming V.V dwille tramming (rapid turning and poor visibility).	See TMM type hazard in worksheet 1.	Single fatality or permanent total disabilities	S 4	4 5	20	See worksheet 3 TMM register for safety devices fitted to TMM. OPS level 7 and 8 Vehicle Detection System (VDS) fitted. Checklest in place. Training and licensing of operators in place. Tool head changing SOP in place. Tye changing SOP in place. Machine operation and maintenance in accordance with Aard and Beil operations and maintenance manuals. Traffic management plan in place. (including RCAP) TMM MCOP in place. Supervision in place. Planned Task Observation. LHD operating procedures in place. Tip exclusion zone in place to protect tip operator. TMM lighting standard in place. Reflective strips, reflective overalls. Safe walkways and crossings Travelling in decline procedure in place. Safe park procedure in place.	4 4	4 16	For all operation purposes effective warning, auto retard and auto stopping of TMM for pedestrians, CPS must be installed. Safe park to include articulation and boom bock. Beacons or inclinometer to limit gear to first gear on decline. V-V-Crawl. Crawl speed is 3 km/hr. Maximum speed is 10 km/hr (second gear). Speed in workshop to be controlled by beacons to crawl speed. Isolation zones for attendant at tips and fuel filling. CPS error is a "No-Go". Straking system testing is critical to ensuring safe stopping of machine. TMM must act as a beacon when stopped in "unsafe area". Effective isolation zones to avoid nuisance alarms to be installed.	• TMM must be fitted with CPS effective version, sub-retard and auto-	4 3	12	See BRMO - CAS Project - Definitions, Abbreviations and References Standard - 3 December 2023 rev 0 - specifically Section 8 References.



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Risk No:	ТММ Туре	Routine / Non- Routine	Risk Name (Activity)	Risk Exposure	Hazard / Aspect	Event / Impact (Activity / consequence)	Risk Category	Severity level	Probability level	Pure Risk	Existing Control Measures	Severity level	Residual Risk	Result - action	Suggested controls to reduce the risk further, whenever necessary.	Severity level	Potential reduction due to further action/s suggested.	Applicable legal or other requirements
13	Grader CAT 120G	R	- 'Pre-start check, - 'functional brake testing, - compliance brake testing, - cleaning roads, - tramming, - leveling road surfacs and scraping rocks to side, - refueling, - refueling, - routine maintenance, - breakdowns, - towing, - t	- V.P with pedestrian while scraping roads V.P causing injury to pedestrian while tranming V.P causing injury to pedestrian while transiting V.P causing injury to pedestrian while prefuelling V.P causing injury to pedestrian when scraping at tip V.P causing injury to pedestrian when scraping at tip V.P causing injury to pedestrian while changing tyre or wheel, - V.P causing injury to pedestrian while changing tyre or wheel, - V.P causing injury to pedestrian while changing tyre or wheel, - V.P causing injury to pedestrian while changing tyre or wheel, - V.P causing injury to pedestrian while changing tyre or wheel, - V.P causing injury to pedestrian while changing tyre or wheel, - V.P causing injury to pedestrian while changing tyre or wheel, - V.P causing injury to pedestrian while changing tyre or wheel, - V.P causing injury to pedestrian while changing tyre or wheel, - V.P causing injury to pedestrian while changing tyre or wheel, - V.P causing injury to pedestrian while changing tyre or wheel, - V.P causing injury to pedestrian while changing tyre or wheel, - V.P causing injury to pedestrian while changing tyre or wheel, - V.P causing injury to pedestrian while changing tyre or wheel, - V.P causing injury to pedestrian while changing tyre or wheel, - V.P causing injury to pedestrian while changing tyre or wheel, - V.P causing injury to pedestrian while changing tyre or wheel, - V.P causing injury to pedestrian while changing tyre or wheel, - V.P causing injury to pedestrian while changing tyre or wheel, - V.P causing injury to pedestrian while changing tyre or wheel, - V.P causing injury to pedestrian while changing tyre or wheel, - V.P causing injury to pedestrian while changing tyre or wheel, - V.P causing injury to pedestrian while changing tyre or wheel, - V.P causing injury to pedestrian while changing tyre or wheel, - V.P causing injury tyre or wheel, - V.P causing injury tyre pedestrian while changing tyre or wheel, - V.P causing injury to pedestrian while changing tyre or wheel, -	See TMM type hazard in worksheets 1.	Single fatality or permanent total disabilities	S	4 5	5	20	- See worksheet 3 TMM register for safety devices fitted to TMM CPS level 7 and 8 Vehicle Detection System (VDS) fitted CPS level 7 and 8 Vehicle Detection System (VDS) fitted Checklist in jace Training and licensing of operators in place Training and licensing of operators in place Machine operation and maintenance in accordance with Caterplilar operations and maintenance manuals Traffic management plan in place. (including RCAP) - Traffic management plan in place Supervision in place Supervision in place Supervision in place Tip exocurrent place to protect tip operator (when cleaning at tips) - Tip sevice in place Safe walkways and crossings - Travelling in decline procedure in place Safe park procedure in place.	4 4	4 16	For all operation purposes effective warning, auto retard and auto stopping of TMM for pedestrains, CPS must be installed. Safe park to includescarper in lowered position. Beacons or inclinometer to limit gear to first gear on decline. V-V crank. Crawl speed is 3 km/hr. Maximum speed is 16 km/hr (fourth gear in both forward and reverse). Speed in workshop to be controlled by beacons to crawl speed. Is obtained to present the speed in the spe	TMM must be fitted with CPS effective warning, auto retard and auto stop, (level 9) Traffic flow and hot spot analysis to determine current controls are aligned with risk assessment.	4 3	12	See BRMO - CAS Project - Definitions, Abbreviations and References Standard - 3 December 2023 rev 0 - specifically Section 8 References.
14	Dozer: Epiroc ST1030 wheel dozer	R	- 'Pre-start check, - functional brake testing, - compliance brake testing, - tramming with empty scoop, - tramming with fully loaded scoop, - loading and loading into dump trucks, - dumping into tips, - refuelling, - trye changing, - routine maintenance, - breakdowns, - towing, - stowing, - stowing, - stowing, - side parking, - si	- V-P with pedestrian caught in articulation causing single fatality or permanent total disabilities V-P causing injury to pedestrian while tramming V-P causing injury to pedestrian while refuelling V-P causing injury to pedestrian while operating in mining cycle - crushed against wall or under scoop etc, - V-P causing injury to pedestrian when dozing at tip V-P causing injury to pedestrian when dozing at tip V-P causing injury to pedestrian when dozing at tip V-P causing injury to pedestrian when changing tyre or wheel, - V-P causing injury while performing maintenance (caught in scoop) V-V while loading V-V while loading V-V while loading and tramming V-V ewhile loading and tramming.	See TMM type hazard in worksheets 1.	Single fatality or permanent total disabilities	s	4 5	5	20	See worksheet 3 TMM register for safety devices fitted to TMM. CPS level 7 and 8 Vehicle Detection System (VDS) fitted. Checklist in place. Training and licensing of operators in place. Training and licensing of operators in place. Training and licensing of operators in place. Machine operation and maintenance in accordance with Epirco operations and maintenance manuals. Traffic management plan in place. (including RCAP) RCAP) Flamed Task Observation. LHD operating procedures in place. Tip exclusion zone in place to protect tip operator. TMM lighting standard in place. Safe walkways and crossings Travelling in decline procedure in place. Safe park procedure in place.	4 4	4 16	For all operation purposes effective warning, auto retard and auto stopping of TMM for pedestrains, CPS must be installed. Safe park to include articulation and boom lock. Safe park to include articulation and boom lock. Very crawl. Crawl spear on decline. Very crawl. Crawl speed is 3 km/hr. Maximum speed is 10 km/hr (second geat). Speed in workshop to be controlled by beacons to crawl speed. Speed in workshop to be controlled by beacons to crawl speed. Speed in workshop to be controlled by the speed in workshop to be controlled by the speed. Find the filling. CPS error is a "No-Go". Finding safe stopping of machine. TMM must act as a beacon when stopped in "unsafe area". Effective isolation zones to avoid nuisance alarms to be installed.	TMM must be fitted with CPS freeling warning outperford and outperford.	4 3	12	See BRMO - CAS Project - Definitions, Abbreviations and References Standard - 3 December 2023 rev 0 - specifically Section 8 References.



Traffic flow analysis risk assessment (TMM risk) 20 October 2024



BLACK ROCK MINE OPERATIONS

Area:	NCH3, NCH2, Gloria,	Process:	All underground	Responsible Employee:	Date:	20-Oct-24
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			lden	tification			Asses	ssme	ent	Control	Ass	essment		Risk Reduction Pla	n		
Risk No:	ТММ Туре	Routine / Non- Routine	Risk Name (Activity)	Risk Exposure	Hazard / Aspect	Event / Impact (Activity / consequence)	Risk Category Severity level	Probability level	Pure Risk	Existing Control Measures	Severity level	i i	Result - action	Suggested controls to reduce the risk further, whenever necessary.	Severity level Probability level	Potential reduction due to further action/s suggested.	Applicable legal or other requirements
15	UV: 1) Aard UV 80 lube 2) Aard UV 80 emulsion 3) Fermel CaryMkIII RORO 4) Fermel Cassette Carrier 5) Fermel Cassette Carrier 5) Fermel KyCab Flat Crane 7) Toyota tC plus crane 8) Aard Lube und 1) Fermel Maw KyCab Jampot 10) Fermel Maw KyCab Jampot 11) Fermel Jameric Man Lift 11) Fermel Jameric Man Lift 13) Fermel Jameric Aman Lift 13) Fermel SyCab Stad load Bin 14) Aard UV 20 water bowser 15) Aard SECO diesel tanker 16) Aard UN 80 scissor lift 17) Fermel UV 80 Liberator 18) Bird	R	Pre-start check, functional brake testing, compliance brake testing, tramming with various attachments and fittings, working or performing various functions thorughout mine. loading and unloading various items, dust suppression, reflueling other vehicles, ernulsion loading and pumping, scriscor lift and lifting operations, passenger transport, refluelling, lyve changing, routine maintenance, loading and pumping, safe parking, safe parking, fall to safe events, fire on machine, lenicident management, emergencies, operator fatigue. Travelling on decline. Note: see note in sheet 1 about various operations.	- V-P with pedestrian caught in articulation - causing single failality or permanent total disabilities disabilities with the causing injury to pedestrian while tramming V-P causing injury to pedestrian while refuelling V-P causing injury to pedestrian while operating in mining cycle - crushed against wall or under scoop etc V-P causing injury to pedestrian when at tip or in parking are coop etc V-P causing injury to pedestrian when at tip or in parking are coop etc V-P causing injury to pedestrian when have considered to the coop of th	See TMM type hazard in worksheets .	Single fatality or permanent total disabilities	S 4 5	55	20	Sae worksheet 3 TMM register for safety devices filted to TMM. CPS level 7 and 8 Vehicle Detection System (VDS) filted. Checklist in place. Training and licensing of operators in place. Type changing SQP in place. Machine operation and maintenance in accordance with various OEMs operations and maintenance manuals. Traffic management plan in place. (including RCAP) Traffic management plan in place. (including RCAP) Planned Task Observation. UV operating procedures in place. Tip exclusion zone in place to protect tip operator. Tim Mighting standard in place. Safe walkways and crossings Travelling in decline procedure in place. Safe park procedure in place.	4 4	: 16	For all operation purposes effective warning, auto retard and auto stopping of TMM for pedestrians, CPS must be installed. Safe park to include articulation. Beacons or inclinometer to limit gear to first gear on decline. V-V crawl. Crawl speed is 3 km/hr. Maximum speed is 16 km/hr (third gear). Speed in workshop to be controlled by beacons to crawl speed. Isolation zones for attendant at tips and fuel filling. CPS error is a "No-Go". STRaking system testing is critical to ensuring safe stopping of machine. TMM must act as a beacon when stopped in "unsafe area". Effective isolation zones to avoid nuisance alarms to be installed.	- TMM must be fitted with CPS effective warning, auto retard and auto stop. (level 9) - Traffic flow and hot spot analysis to determine current controls are aligned with risk assessment. Note: his ir recommended that a separate nike assessment is performed for each UV type in the functions it performed. This risk assessment has been completed this way because of the sporoval given by the Sterero in specific performed. This risk assessment has been completed this way because of the sporoval given by the stereor in completed the sporoval given by the stereor in the sporoval given by th	4 3	12	See BRMO - CAS Project - Definitions, Abbreviations and References Standard - 3 December 2023 rev 0 - specifically Section 8 References.
16	Manitou: Telehandlers, forkilfts, cranes, fyre handler. MV T675T, Crane MHT-X 780 T Evolution, 371 MHT 780 Telescopic Handler,	R	Pre-start check functional brake testing, - compliance brake testing, - tramming with various attachments and fittings, - working or performing various functions thorughout mine loading and unloading various items, - litting operations, - refuelling, - tyre changing, - routine maintenance, - breakdowns, - towing, - towing, - safe parking, - fail to safe events, - fire on machine, - incident management, - emergencies, - operator fatigue Travelling on decline Note: see note in sheet 1 about various operations.	V-P with load being dropped onto pedestrian - causing single fatality or permanent total disabilities. V-P causing injury to pedestrian while tramming (particularly if boom is in raised position). V-P causing injury to pedestrian while refuelling. V-P causing injury to pedestrian while refuelling. V-P causing injury to pedestrian while boom or load or between TMM load and other object etc. V-P causing injury to pedestrian when at tyre bay or in parking area. V-P causing injury to pedestrian in workshop. V-P causing injury to pedestrian in workshop. V-P causing injury to pedestrian in workshop. V-P causing injury to pedestrian while changing tree wheel (changing TMM tyre of acting as a tyre handler). V-P causing injury while performing maintenance (caught in boom or in wheel turning). LoC on decline. V-V while loading or unloading. V-V while loading or unloading. V-V while loading or unloading. V-V while loading and tramming or working.	See TMM type hazard in worksheets 1.	Single fatality or permanent total disabilities	S 4 5	55		See worksheet 3 TMM register for safety devices filted to TMM. OPS level 7 and 8 Vehicle Detection System (VDS) filted. Checklist in place. Training and licensing of operators in place. Training soP in place. Machine operation and maintenance in accordance with various OEMs operations and maintenance manuals. Traffic management plan in place. (including RCAP) TMM MCOP in place. Supervision in place. Supervision in place. Hannet Task Observation. Manitou operating procedures in place. TIMI lighting standard in place. TMM lighting standard in place. Safe walkways and crossings Travelling in decline procedure in place. Safe park procedure in place.	4 4	16		-TMM must be fitted with CPS effective warning, auto reptard and auto stop, (level 9) -Traffic flow and hot spot analysis to determine current controls are aligned with risk assessment. Note: its is recommended that a separate risk assessment is performed for each Manlout bye in the functions it performs. This risk assessment is performed been completed this way because of the approval given by the Steerco in 2019 on the list under "UV" as a general type. As a general type. As a general type. The complete of the approval given by the Steerco in 2019 on the list under "UV" as a general type. As a general type, the UV must be level 9 enabled. Should further determination of CAS level be required, the above is recommended. (Manitou has recently provided a risk assessment for MHT 780 which with the seasessment of MHT 780 which was be incorporated into any future risk assessment.) Important note: It may be higher risk to auto stops one Manitous when Manitous when Manitous when Manitous when the steep are carrying a load than for them to be only have auto neard. This must be attered for in the CAS installation.	4 3	12	See BRMO - CAS Project - Definitions, Abbreviations and References Standard - 3 December 2023 rev 0 - specifically Section 8 References.



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	ТММ Туро	Routine / Non- Routine	Risk Name (Activity)	Risk Exposure	Hazard / Aspect	Event / Impact (Activity / consequence)	Risk Category	Severity level	Probability level	Pure Risk	Existing Control Measures	Severity level	Residual Risk	Result - action	Suggested controls to reduce the risk further, whenever necessary.	Severity level	Potential reduction due to further	Applicable logal or other requirements
1	Bobact: Skid steer loader: \$650, \$770, TR50.210	R	Pre-start check, *Unuclinal brake testing, *unuclinal brake testing, *tramming with empty scoop, *tramming with fully loaded scoop, *sading and loading into dump trucks, *dumping into tps, *erthelling, *tyre changing, *tyre changing, *toutine maintenance, *treakdowns, *towing or loading onto a flatbed. *safe parking, *fall to safe events, *fire on machine, *incident management, *emergencies, *operator falsigue. *Travelling on decline.	V-P with pedestrian while scraping roads. V-P causing injury to pedestrian while tramming. V-P causing injury to pedestrian while refuelling. V-P causing injury to pedestrian while operating in mining cycle - drushed against wall etc. V-P causing injury to pedestrian when scraping at the very causing injury to pedestrian when scraping at the very causing injury to pedestrian in workshop. V-P causing injury to pedestrian while changing tyre or wheel. V-P causing injury while performing maintenance. LoC on decline. V-W while scraping. V-W while scraping. V-W during breakdown in high interaction risk area.	See TMM type hazard in worksheets 1.	Injuries that require time off work / loss time injury / RWC (Restricted work case) - No permanent disabilities	s	3	2	6	- See worksheet 3 TMM register for safety devices fitted to TMM. - CPS level 7 and 8 Vehicle Detection System (VDS) fitted. - Checklist in place. - Tyre changing SOP in place. - Tyre changing SOP in place. - Tyre changing SOP in place. - Machine operation and maintenance in accordance with various DEMs operations and maintenance manuals. - Traffic management plan in place. (including RCAP) - TMM MCOP in place. - Planned Task Observation. - Manitou operating procedures in place. - Tip exclusion zone in place to protect tip operator. - Tim Mighting sandard in place. - Reflective strips, reflective overalls. - Safe walkways and crossings - Travelling in decline procedure in place. - Safe park procedure in place.	3 1		Speed in workshop to be crawl speed.	Although the current risk is low, podestrian warning is deemed necessary and therefore the Bocat to be fitted with CPS directive warning and not auto retard and auto stop. Traffic flow and hot spot analysis to determine current controls are within alignment of risk assessment.	2 1	2	- See BRMO - CAS Project - Definitions, Abbreviations and References Standard - 3 December 2023 rev 0 - specifically Section 8 References.
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