

Appendix 13.1-B Preconstruction Risk Register for the Tenas Project

Category, Causes, and Consequences					Controls		RISK RANKING				Residual Risk
Loss Type Category	Sub-Category	Description	Causes	Impacts or Consequences	Existing Controls	Control Effectiveness	Impact Category	Probability	Consequence	Ranking	Mitigation/Action Plan
Impact on Reputation/Social/Community	Rail/Loadout	rail loadout location - community impact	loadout near town	community impact, stakeholders, delays	communication, open house, education, location of stockpiles, and size of stockpiles, dust management agents added to coal	effective	Capital / Opex	Unlikely	Moderate	Moderate	open house preparation, 3d visual model, set up mine working group, transparent compliants procedures, site tours to show, adding water and agent sprayers at Rail Infrastructure, build building last resort
Business Interruption/Material Damage	Rail/Loadout	Rail car availability	Cannot reach agreement.	would need to change design, increase cost, potential delay	meeting with CN, contacting rail car providers for cost design criteria,		Capital	Likely	Minor	Moderate	Meeting with CN and potentially Conuma, will carry cost of third party rail cars in feasibility study
Business Interruption/Material Damage	Water	snow & drainage in rail cut	climate		field program to identify water sources, secondary back up sources will be costed in feasibility		Capital	Likely	Minor	Moderate	run-off to sed pond 1:10 event
Environmental Impact	Water	Water supply constrained	Limited ground water supply in the area	Affect surface water flow, not enough water, unacceptable impact,			Legal/Reg.	Possible	Moderate	Significant	Complete field program, Review options after field program, determine water balance, meet with AER,
Environmental Impact	Water	Water quality - selenium	Selenium in waste rock	Cost - water treatment plant	testing program underway		Capital	Unlikely	Major	Significant	continue study & develop plan, further test work
Business Interruption/Material Damage	CHPP	seasonal wet product handling	climate - winter freezing,	wet product, material handling problems (Frozen lumps),	design criteria,		Technical	Almost Certain	Insignificant	Moderate	ensure design addresses wet coal issues, conduct technical review, ue of the loader
Business Interruption/Material Damage	CHPP	Water quality - process water	poor water quality used in process	impact steel structures - life of structures, chemical use, process performance	preliminary water quality data		Capital	Unlikely	Minor	Low	Identify water quality requirements for processing operation, additional field program,
Environmental Impact	CHPP	Tailings Filter	filter doesn't work as expected creating a high moisture fine rock product,	High moisture coal & freezing issues	have preformed investigation on filters, sample being tested and results received		Technical	Unlikely	Minor	Low	follow up on test results, possible on-site reviews
Business Interruption/Material Damage	Customers	coal quality	possible coal quality not suitable for market (ie. Level of coking coal),	NPV not suitable, coal quality affects mining sequence,	on-going test work in laboratories, joint venture partner		Technical	Unlikely	Major	Significant	complete test work, incorporate into geological model, next year's drill program, site based quality system. Option of selling into thermal domestic and export markets
Business Interruption/Material Damage	CHPP	Proximity of infrastructure to mine blasting	infrastructure too close to blasting,	damage to infrastructure from fly rock,	proper blast design & evacuation procedures		Capital	Unlikely	Moderate	Moderate	lower powder factor, proper stemming material, blast delays, pit starts further away from plant in initial years to gather knowledge, depth of rock in pit is deeper than conventional pits
Legal & Regulatory	Other	Inconsistencies in basis of estimate	different companies providing input to estimate.	Inconsistent basis of estimate, cost	All companies wil provide basis of estimate and will align all groups		Capital	Possible	Moderate	Significant	conduct a gap workshop
Business Interruption/Material Damage	Other	impact of other operators in the area	other operators in the area	cost	Shift rotation, closeness to town, having some positions located in town. 10% contingency in capex values		Capital / Opex	Possible	Moderate	Significant	gather information, complete sensitivity analysis on labour
Business Interruption/Material Damage	Other	operability/maintenability review of project - required	project optimization may have gone too far	plant/infrastructure may not be adequate/realistic	experience of team personel, major infrastructure based on actual operations		Technical	Possible	Moderate	Significant	formal review, peer analysis, additional capital
Business Interruption/Material Damage	Rail/Loadout	earthworks for rail loop	limited data, footprint constraints	cost	limited data		Capital	Possible	Moderate	Significant	perform drilling and test pits along track alignment
Business Interruption/Material Damage	Site Access	access road profile information	cannot reconcile survey data to expectations	cost for cut & fill	Lidar data is available, ground survey spot checks completed		Capital	Rare	Moderate	Moderate	investigate latest data, depending on result, may recommend further surveys, walk the road with civil engineer
Business Interruption/Material Damage	CHPP	site arrangement not fixed	design evolving	delay, cost	working on optimized design		Delay	Possible	Minor	Moderate	Develop GA, water management plan, mine plan,
Business Interruption/Material Damage	Rail/Loadout	Terms of Agreement & design sign-off with CN for rail connection and FEL loading	Cannot reach agreement.	would need to change design, increase cost, potential delay	on-going communication with CN, Telkwa owns the rail loop both operation and loading, scale on rail, loader bucket scales		Capital	Unlikely	Major	Significant	Ensure meeting with CN occurs early & update risk status, Regular communication
Business Interruption/Material Damage	CHPP	Chinese mobile crushing plant may not meet operating hours	Low cost equipment	delay, cost	Site QA/QC of company by Sedgman personnel,		Delay	Possible	Moderate	Significant	ensure alternate vendor and equipment is understood, buy considerable spares, conduct field visit of operating equipment
Business Interruption/Material Damage	Rail/Loadout	Relocation of Loader to TLO	Unable to complete timely transport	delay, cost	Ensure contract with 3rd party loader in town in place. Have purchase of another loader in year 27, ensure cost for lowboy in feasibility		Delay	Possible	Minor	Moderate	
Business Interruption/Material Damage	Rail/Loadout	TLO manpower	Insufficient hours allocated to train loading and/or stockpiling	delay, cost	Currently using 500 tonne per hour for loader, and 12 hours per train for stockpiling		Delay	Likely	Minor	Moderate	Put in staking capital in year 3 for TLO, continue to investigate alternative options
Impact on Reputation/Social/Community	Other	Coal quality testwork	Lab no longer on site	quality, price	Lab manned on dayshift, acceptable equipment		Delay	Unlikely	Catastrophic	Significant	Need to flush out quality control plan
Business Interruption/Material Damage	Rail/Loadout	Seasonal product trucking	Climate - freezing in winter, rain, fog	delay, cost	Have included 15 days for weather, will round up to the nearest whole truck to provide additional capacity. Using 65 tonne payload versus 70 tonne rated payload		Production	Unlikely	Moderate	Moderate	Investigate 3rd party truck company for poor weather conditions, 3rd party grader, use conservative haul cycle times, additional truck?
Business Interruption/Material Damage	CHPP	Chinese Equipment	Increased maintenance costs and parts availability		QA/QC in China during manufacturing, ensure part compatability with North American spares		Production Opex	Possible	Minor	Moderate	
Business Interruption/Material Damage	CHPP	CHPP Construction	Climate impact on construction schedule		Construction planned for warmer months		Capital	Possible	Major	Significant	Winter cost identified, winter execution plan to be developed if this looks like it will be a likley outcome
Business Interruption/Material Damage	CHPP	Yield Loss	Process equipment does not perform to expectations		Coal test work, plant equipment specification		Opex	Possible	Major	Significant	Conduct additional testwork on coal
Business Interruption/Material Damage	CHPP	Screenbowl Centrifuge	Chinese screenbowl centrifuge has not been commonly used in N.A. market	not meeting expected life cycle	Cost for North American one is ? Should we use this as a line item		Capital / Opex	Possible	Minor	Moderate	
Business Interruption/Material Damage	CHPP	Flotation Cell	Lack of long-term operating data on Flotation Cell	lower yield	Again what is cost for alternative?		Opex	Unlikely	Minor	Low	
Business Interruption/Material Damage	Rail/Loadout	rail loadout location - cost input	rail loadout near town	Incresed capital cost, dust suppression systems, covered stockpiles	communication, open house, education, costing of dust suppression and covered building options		Capital	Possible	Moderate	Significant	Include cost and design in sensitivity analysis and mention in risk section of feasibility
Business Interruption/Material Damage	CHPP	Product moisture is higher at site then plan, concern at port	Process equipment does not perform to expectations, coal spends longer in stockpiles, inherent moisture is greater than 1%	Penalties from customers, worse case cannot ship	coal testing, plant equipment specifications, blending at port		Capital	Possible	Moderate	Significant	Can cover stockpile at site on clean side to reduce moisture from weather, additional drying technologies
Business Interruption/Material Damage	Other	Mining delivers a dirtier coal than anticipated	Operator experience, geology faulting, equipment limitations	Lower yield, reduced throughput	Design window for plant, using lower end for annual production		Capital / Opex	Possible	Major	Significant	Work with equipment suppliers on coal recovery, training, coal recovery procedures, dayshift only coal recovery?
Legal & Regulatory	Electrical	Failure to obtain right of way for 25kV line	Unknown gov't requirements, likely environmental	Delay line construction, delay startup	Title search		Delay	Rare	Major	Moderate	Title search completed, two owners Telkwa Coal Ltd, and Kerr's
Business Interruption/Material Damage	Electrical	BC Hydro unable to supply required load	Load exceeds substation or line ratings	Load curtailment while BC Hydro upgrades	Coordinate with BCH, System Modelling, approval granted for load from BC hydro, actual site load lower than requested		Capital	Rare	Major	Moderate	Coordinate with BCH, System Modelling
Business Interruption/Material Damage	Electrical	Can't start large motors - flicker problem	Large motor draw causes lights to flicker for other customers on the line	Install soft starts on large motors, start up procedure to avoid all large motors starting at once	Coordinate with BCH, System Modelling		Technical	Possible	Moderate	Significant	Coordinate with BCH, System Modelling, investigate further control on crusher and thickener

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Business Interruption/Material Damage	Electrical	Harmonics problems requiring filters	Large VFDs cause currents and voltages to exceed BC Hydro limits	Install harmonic filter banks	Coordinate with BCH, System Modelling		Technical	Unlikely	Moderate	Moderate	Coordinate with BCH, System Modelling, have price for installing these and have left space in ehouse for them if need be
Business Interruption/Material Damage	Electrical	Excessive voltage drop	Electrical load at plant causes 25kV line voltage to drop	Install capacitor banks and/or change taps on main transformer	Coordinate with BCH, System Modelling		Technical	Unlikely	Moderate	Moderate	Coordinate with BCH, System Modelling, have left space for these, we have price tracked
Business Interruption/Material Damage	Electrical	Excessive outages on 25kV line - tree contact	Right of Way not wide enough	Power outages	Wide Right of Way - Danger Tree Removal as per regulatory requirements, included money for maintenance, and it is short powerline		Technical	Unlikely	Minor	Low	Wide Right of Way - Danger Tree Removal, ongoing inspections during operations
Business Interruption/Material Damage	Electrical	Fault currents too high	Equipment underrated for available fault current	Upgrade equipment	System Modelling		Technical	Unlikely	Minor	Low	System Modelling
Business Interruption/Material Damage	Electrical	Transformer/e-House exposed	Lack of physical barriers	Possible damage/outage	Physical barriers, signage,		Capital	Unlikely	Moderate	Moderate	Additional Physical barriers
Business Interruption/Material Damage	Electrical	Outages on 25 kV line - vehicle contact	Lack of physical barriers	Possible damage/outage	Placement of poles to avoid contact		Capital	Rare	Moderate	Moderate	Additional review of pole placements and speed limits
Business Interruption/Material Damage	Electrical	Outages on 25 kV line - slope stability	Possible slope movement for existing route	Possible damage/outage	Pole placement, route location		Capital	Unlikely	Major	Significant	Additional routing alternatives
Business Interruption/Material Damage	Rail/Loadout	CN lack of service	manpower, engine requirements	Unpredictable train schedules	on going meetings with CN, get contract in place Q3, 2019		Opex	Possible	Minor	Moderate	Contract take or pay minimum production rates, with service commitments and costs associated with them
Business Interruption/Material Damage	Rail/Loadout	lack of contractor resources	work projects at the time	Delay to project, increased cost	prequalify contractors by end of Q4, 2019 for rail		Capital	Possible	Major	Significant	Sign contracts a season ahead for committed resources, ensured material supply and early start
Business Interruption/Material Damage	Rail/Loadout	CN lack of service	manpower, engine requirements	Unpredictable train schedules	on going meetings with CN, get contract in place Q3, 2019, low rail requirements, stockpiles		Delay	Likely	Minor	Moderate	Stockpile area to store production ; short term car leases for additional trains
Environmental Impact	Rail/Loadout	Influence of coal stockpiles and sediment on groundwater	coal stockpiles and sediment	regulatory and reputation	SRK, and construction design specs		Delay	Possible	Minor	Moderate	
Business Interruption/Material Damage	Rail/Loadout	Loaders come into contact with trains	loader operatered loadout for trains	Damage to rail cars and delays to loading	Barrier to loaders, operators training, additional rail cars rented and bad order track		Capital	Possible	Minor	Moderate	Collision avoidance system, cameras and mirrors to assist with loading function
Business Interruption/Material Damage	Rail/Loadout	Trains overloaded	loader operated system	Rail cars turned back by CN, derailments	Plan to have scale at mine, bucket scales for loaders, cameras and load review		Capital	Possible	Minor	Moderate	load measuring systems
Business Interruption/Material Damage	Rail/Loadout	CN fails to perform signal work in a timely manner for start-up	Long lead time and overburdened CN internal resources	Potential delay to service	on going meetings with CN, get contract in place Q3, 2019		Delay	Likely	Minor	Moderate	Early commitment to CN for the work - 10-12 month lead time; CN could service the track as an additional switch temporarily
Business Interruption/Material Damage	Rail/Loadout	CN fails to install turnout in a timely manner for start-up	Long lead time and overburdened CN internal resources	Potential delay to service	on going meetings with CN, get contract in place Q3, 2019		Delay	Likely	Minor	Moderate	Early commitment to CN for the work - 6-8 month lead time; contractor can install swithc if CN not available but CN supplies the material
Business Interruption/Material Damage	Mining	Seam too steep to accommodate planned wedge mining	Natural circumstance not anticipated due to insufficient advance drilling	Re-configuration of ming approach possibly delaying waste and subsequent coal production	Exploration drilling	dependent on drill hole spacing and local variations and structural geology	Production	Possible	Moderate	Significant	Supplement exploration holes with additional holes as needed to confirm seam locations and dips
Business Interruption/Material Damage	Mining	Fault displaces seam so as to disrupt wedge mining	Natural circumstance not anticipated due to insufficient advance drilling	Re-configuration of mining approach possibly delaying waste and subsequent coal production	Exploration drilling	dependent on drill hole spacing and local variations and structural geology	Production	Possible	Moderate	Significant	Supplement exploration holes with additional holes as needed to confirm seam locations and dips
Business Interruption/Material Damage	Mining	Overburden material handling difficulties due to trafficability and "stickiness" issues	High proportion of overburden, including clays, in the material movements of the mine	Poor dump surface conditions causing reduced productivity. Unintended backhaul of sticky material in truck box	Do not excavate the PAG cells during spring break up; dump in shallower lifts to facilitate drying of material, use of specialized liners and box designs for liners	Dependent on weather conditions throughout the year and clay content of overburden material	Production	Likely	Minor	Moderate	Further restrictions on times of mining overburden, particularly in the PAG cells
Resource & Reserve	Mining	Dilution and coal loss - not as anticipated due to limitations of equipment and operators	Equipment or operators unable to achieve design factors. Blasting through C-seam is a concern	Increased dilution displaces coal in the plant feed reducing clean coal. Coal loss also reduces clean coal	Selection of excavators to do all mining including coal cleaning and recovery	Dependent on operator skill	Production	Possible	Moderate	Significant	Consider at least one excavator having a straight blade bucket. Consider one dozer having a straight blade
Resource & Reserve	Mining	Dilution and coal loss - not as anticipated due to adverse structural geology	Faults can entrain gouge material or more pervasive rock contaminants into the coal. Introduced complexity can impact coal recovery	Increased dilution displaces coal in the plant feed reducing clean coal. Coal loss also reduces clean coal	Selection of excavators to do all mining including coal cleaning and recovery, field geologists, high precision GPS on excavators	Dependent on operator skill	Production	Possible	Moderate	Significant	Supplement exploration holes with additional holes as needed to confirm seam locations and dips
Impact on Reputation / Social / Community	Customers	Product Quality due to access to limited coal seams	Some phases pit phases may intercept one seam at a time, particularly with the bench-mining phases (Phase 7 & 9). This could limit abilities to adjust coal qualities.	Coal quality may not meet a required specification if dependent on certain seams being available	The bottom-up and top down mining method offers some flexibility to have both C-seam, IU and the 1-seams available at all times. There is also provision for a ROM stockpile (40,000 tonnes) to facilitate blending and the processed stockpiles (1*10,000 tonnes and 2*15,000 tonnes for blending)	Effective	Production	Possible	Minor	Moderate	Consider blending of clean coal, thus requiring stockpiling at the mine or at port
Economic	Mining	PAG rock characterization to date may have underestimated the amount of PAG rock.	Lack of spatial ABA data	More PAG storage is required than is currently designed. New PAG cell capacity would be required at added cost.	Current ABA data set and PAG cell designs, contingencies built into Management ponds, subsequent management ponds can be constructed larger than current design	TBD	Capital	Unlikely	Moderate	Moderate	Increase the capacity of the PAG cells likely through dam raises
Business Interruption/Material Damage	Mining	PAG cell availability is dependent on the timing of excavation completion and water filling versus need. The risk is that a PAG cell is not available when needed.	More PAG rock encountered than planned; PAG cell excavation delays	In worst case, mining would have to halt until such time that PAG cell capacity is developed. More likely, though the PAG cell imbalance is known ahead of time and PAG cell capacity is increased with dam raises (e.g. North Pond)	Mine Plan and expected PAG generation versus timing of available PAG Cells	TBD	Capital	Possible	Moderate	Significant	Increase the capacity of the PAG cells likely through dam raises
Business Interruption/Material Damage	Mining	PAG cells do not retain water or water egress/evaporation exceeds groundwater inflow	Overburden more permiable than anticipated	Cessation of mining until alternate PAG strategy devised	Dependence on the inherent impervious nature of the largely till-clay overburden, incorporation of liners in design, access to alternate water source, incorporation of covers in design	Effective	Capital	Unlikely	Major	Significant	Active Treatment
Harm to people	Mining	Overall scale instability through the external OVB piles	Over-steepening, constructed to heights greater than design, saturated materials (when placed or after)	Run-out event that could cause harm to people and/or damage to equipment or other mine infrastructure. Disruption to operations.	Shallow design slope, piles not constructed to significant heights, operational and monitoring procedures.		Production	Unlikely	Major	Significant	Routine geotedchnical inspections and reviewm monitoring procedures
Harm to people	Mining	Overall scale instability through the steeper South or East Footwalls	Over-excavation, poor blast practices, unforeseen fault structure, high groundwater pressures	Large scale instability that could cause harm to people and/or equipment. Disruption to operations and loss of economic coal.	Benchd footwall design in higher South footwall, monitoring, wall control blasting planned		Production	Possible	Major	Significant	Selected infill drilling to be extended into the footwall forming rocks to evaluate rock mass ahead of mining. Routine geotedchnical inspections and reviewm monitoring procedures

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Harm to people	Mining	Bench to overall instability along the southern end of the East Footwall	Planar sliding mechanism due to lateral unconfinement of the planned coal seam excavation which is offset adjacent to normal fault. High groundwater pressures behind footwall.	Large scale instability that could cause harm to people and/or equipment. Disruption to operations and loss of economic coal.	Excavation strategy to reduce unconfinement across the entire southern section of the East Footwall (incl. insitu pillars), monitoring and wall control blasting		Production	Possible	Major	Significant	Carry out geotechnical evaluation of the pit slope performance and excavation strategy prior to mining in this area. Monitoring procedures.
Economic	Mining	Significant rock fall hazards from highwall/endwall bench slopes. Requirement for additional wall control blasting	Weak rock mass, over-excavation and limited wall control blasting	Rock fall hazards, increased cost to blasting	Wall control blasting in some areas		Opex	Possible	Minor	Moderate	Review blasting practices and implement monitoring procedures.
Business Interruption/Material Damage	Mining	Filling of Management Ponds have adverse stability impact on Pit Slopes (Overburden and Rock)	High pore pressures behind the slope face or saturation of weak material at toe	Instability into the Management Pond	Overburden slopes in Management Pond designed accordingly. Rock slope assessed and not expected to be sensitive to groundwater in Management Pond area		Production	Possible	Moderate	Significant	Routine geotechnical inspections and review monitoring procedures. Review stability prior to filling.
Harm to people	Mining	West Footwall instability during backfilling	Instability due to loading of bench scale undercut or weak rock from NAG waste rock piles	Run-out from an instability event that could cause harm to people and disruption to operations in nearby pit phases	Operational procedures should include interim backfill slopes to be advanced over any undercut/weak rock/poor performing footwall sections		Production	Possible	Major	Significant	Operational procedures, incl. advancing backfills over sensitivity footwall sections for buttressing
Economic	Mining	Higher groundwater pressures behind pit slopes than expected	Natural draw-down not to a level predicted	Possible stability sensitivity and increased monitoring effort. Cost to install vibrating wire piezometers around footwalls	Review of existing monitoring wells.		Opex	Unlikely	Moderate	Moderate	Frequent groundwater monitoring and geotechnical inspections
Environmental Impact	Other	Failure of perimeter dam(s) for Management Ponds	Elevated pore pressures, seismicity, internal erosion, piping, sub-standard construction	Regulatory and reputation, ecological and habitat destruction, cost	Shallower downstream slopes at 3H:1V, Geotechnical stability analyses for perimeter dams, buttresses included for dams		Environmental Impact	Rare	Catastrophic	Significant	Construction QA/QC, on-going monitoring and maintenance
Environmental Impact	Other	Failure of perimeter dam(s) for Tenas Control Pond	Elevated pore pressures, seismicity, internal erosion, piping, sub-standard construction	Regulatory and reputation, ecological and habitat destruction, cost	Shallower downstream slopes at 3H:1V, Geotechnical stability analyses for perimeter dams, operational controls		Environmental Impact	Rare	Major	Moderate	Construction QA/QC, on-going monitoring and maintenance
Environmental Impact	Other	Failure of perimeter dam(s) for Sedimentation Ponds	Elevated pore pressures, seismicity, internal erosion, piping, sub-standard construction	Regulatory and reputation, ecological and habitat destruction, cost	Shallower downstream slopes at 3H:1V, Geotechnical stability analyses for perimeter dams, operational controls		Environmental Impact	Rare	Minor	Low	Construction QA/QC, on-going monitoring and maintenance
Harm to people	Other	Failure of interim dike(s) while operations are excavating the adjacent pag cell	Insitu materials not adequately characterized, slopes over steepened during excavation, seismicity, internal erosion, piping,	Damage to Equipment, harm to person(s), cost	Shallower downstream slopes at 3H:1V, Geotechnical stability analyses for interim dikes		Legal/Reg.	Possible	Major	Significant	Construction QA/QC, on-going monitoring and maintenance
Environmental Impact	Water	Reduction in baseflow	Pit Dewatering	regulatory and reputation	GW and Water Balance Modelling		Delay	Likely	Minor	Moderate	
Business Interruption/Material Damage	Water	Cannot maintain water cover in PAG cell	GW leakage too great	regulatory and reputation	Be overly conservative in water balance modelling; Option for lining PAG Cells		Capital	Possible	Major	Significant	Line PAG Cell
Environmental Impact	Water	Poor WQ seepage via Groundwater	Poor WQ at end pit lake	regulatory and reputation	Pit lake WQ modelling		Capital	Possible	Minor	Moderate	Water Treatment
Environmental Impact	Water	Reduction in water table elevation at private residences	Pit Dewatering	regulatory and reputation	GW Modelling		Delay	Unlikely	Minor	Low	Suppliment private GW users water supply
Environmental Impact	Water	Insufficient water cover for management ponds	High seepage rate from pond Less runoff than predicted Extreme dry year	PAG rock becomes sub-aerial and ARD is generated and metals released	All contact water is conveyed to ponds Pumps to transfer water between management ponds, additional water capture from Gaothorn Creek and Telkwa River if necessary. Line the management ponds, add covers to reduce evaporation, water balance sensitivity conducted to demonstrate in a 10 year dry period we have sufficient water	Some are ineffective some are effective	Capital/Opex	Rare	Major	Moderate	
Environmental Impact	Water	Tenas Pond overtops, water flows to Tenas Creek not Telkwa River	Prolonged pump failure Pit wall slope failure creates wave	Uncontrolled release of impacted water	Spillway	effective	Capital/Opex	Rare	Moderate	Moderate	
Environmental Impact	Water	Prolonged Pump failure	Power outage	Inadequate water cover Too much water overflow	Backup gensets for existing electric pumps purchased and set up Backup Diesel pumps for electric pumps purchased and set up, Backup electric pumps for failures	effective	Capital/Opex	Unlikely	Minor	Low	
Environmental Impact	Water	Sediment ponds ineffective	inadequately designed sediment controls	High TSS water discharged out of compliance	Pumpback system on some ponds Following design guidance, use a contingency of at least 5 times required retention time, Flocculant stations	effective if other pond can receive the water.	Capital/Opex	Unlikely	Minor	Low	Silt curtains, floc dosing station
Environmental Impact	Water	Cannot discharge to Gaothorn Creek	Flow in receiving water is too low to discharge	Accumulate water onsite, uncontrolled discharge	Spillway Diffuser, discharge during non winter months		Capital/Opex	Unlikely	Minor	Low	
Environmental Impact	Water	current climate statistical do not adequately characterize a changing climate	climate change	Insufficient water cover	Climate change included in models which indicates additional water present due to climate change, model sensitivity with 10 year dry to prove water cover is present		Capital/Opex	Unlikely	Moderate	Moderate	
Environmental Impact	Water	dam constructed according to schedule	Economic need to prioritize coal production over pond construction	PAG rock oxidizes and ARD is generated and metals released	mine schedule prioritizes pond excavation, in operations mining can be stopped until sufficient room is available, PAG material has a lag time greater than several years to all operation to catch up	effective	Capital/Opex	Unlikely	Major	Significant	
Environmental Impact	Water	Waste rock becomes acid generating before inundation in Management Pond	Neutralization potential is consumed in waste rock prior to placement in Management Ponds. Acidity continues to be formed from sulfide oxidation.	Management Ponds may become acidic and rock stored under the water cover may oxidize from dissolved ferric iron. Acidic water will need to be treated before it can be discharged from the site	Placement of rock in Management Ponds prior to becoming acidic under 12 months. Kinetic testing shows lag times are greater than 12 months, inpit testing program to identify any potential materials that might go acidic: in less than 12 months	Effective is sufficient water cover placed over PAG rock prior to the onset of acid generation	Capital/Opex	Rare	Major	Moderate	Acid and possible metal treatment of Management Pond water with active treatment

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Environmental Impact	Water	High wall becomes acidic at closure and results in an acidic pit lake	PAG rock from Zone 6 will remain exposed in the pit lake high wall in perpetuity at closure. Acidic drainage for the high wall may result in an acidic pit lake if insufficient alkalinity is available from other sources (e.g., NAG backfill) flowing to the pit. Pit lake will drain to the Management Ponds and could result in the Management Ponds becoming acidic, resulting in acidic discharge from the Project during post-closure.	Water stored on site in the pit lake and Management Ponds may become acidic resulting in acidic discharge from the Project	Plan to cover all pit walls with Non-PAG and/or overburden within 10 years from exposure. Will investigate use of shot crete for walls exposed more than 5 years but less than 10	N/A	Capital/Opex	Unlikely	Moderate	Moderate	Active treatment of acidic drainage during Post-closure
Environmental Impact	Water	More PAG rock is mined than is currently estimated resulting in insufficient PAG storage capacity in the Management Ponds	PAG rock estimates are based on average stratigraphic zone neutralization potential ratios but PAG rock exists in all units. If large quantities of PAG rock from NAG units are encountered, PAG rock may be present in the NAG dumps.	Localized (e.g., hot spot) drainage may occur from NAG dumps. If PAG rock is identified in NAG units through operational monitoring, additional PAG rock, above and beyond what is estimated, may have to be stored in the Management Ponds	Development of a waste rock management plan, including segregation criteria (e.g., sulfide cutoff) that can be used to operationally identify PAG vs. NAG rock from blast holes. Development of additional Managment Ponds could be completed to store additional PAG rock or raising the dam in the existing Management Ponds to flood additional PAG rock. Development of additional contingency space in existing managment ponds had been incorporated into existing designs.	Effective	Capital/Opex	Unlikely	Moderate	Moderate	Tracking program during operations to inform size of East and West Management ponds
Environmental Impact	Water	PAG rock is incorrectly identified as NAG rock and stored in the NAG dump or used in pit backfill	PAG rock in blasts isn't captured in chip samples from blast holes.	PAG rock is placed in NAG Dumps and localized acidic drainage occurs	Rehandling of PAG rock to the Management Ponds, sampling program from drill holes, conservative criteria for identification of PAG material versus Non-PAG	Effective	Capital/Opex	Unlikely	Minor	Low	