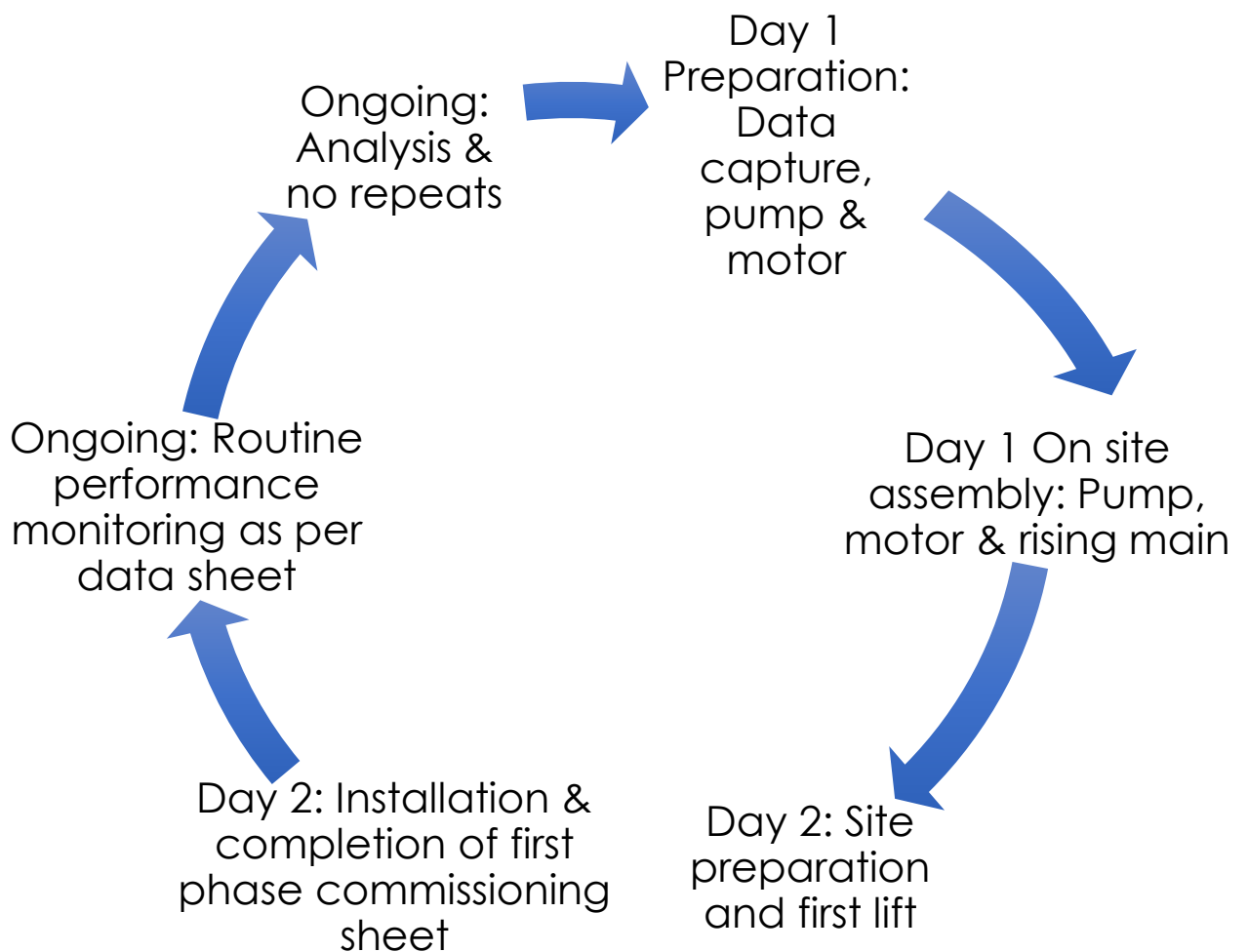


Dewatering System

Borehole Checklists

The check lists detailed in this document form an integral part of the Standard Operating Procedure (SOP) for the borehole section of the dewatering system at Frontier mine. The primary purpose of the lists is to guide role players, at all levels, through the process of installing, operating, monitoring and maintaining of the ground water pumping system.

Detailed below is a model that shows the overall process of the SOP. The check lists will be detailed under each of the processes shown in the model.



Day 1

1. Preparation: Data capture - pump and motor

Pump end

Date	
Pump model number	
All nuts present and tight	
Boreline adaptor fitted	
Pump to motor flange clean & undamaged	
Lead shields fitted correctly	
Strainer fitted correctly	
Coupling fitted to pump and in good condition	
Coupling (motor shaft cavity) greased	
Serial number: (also to be engraved on flange of last stage casing)	
Measure shaft height (flange to coupling thrust disc)	

Motor

Motor diameter	6"/150mm	8"/200 mm	10"/250 mm	12"/300 mm
Measure motor shaft height	mm			
Measure Axial play on shaft	mm			
Shaft rotates by hand	Yes	No		
Filling solution to specification	Yes	No		
Filling solution topped up	Yes	No		
Motor (pump connecting flange) clean. NO PAINT, RUST OR FOREIGN MATERIAL.	Yes	No		
Diaphragm depth measured	mm			
Motor shell condition	Good	Bad		
Leaks (filling solution from motor)	Top	Bottom	None	
Serial number				
Condition of motor lead out cables	New	Good	Damaged: NB NO INSULATION TAPE	
Winding resistance	U (mOhms)	V (mOhms)	W (mOhms)	
Insulation resistance	U MOhms	V MOhms	W MOhms	

Vertical assembly of pump and motor – On site

Pump end placed in crate or horizontal cradle. Secure with blocks (in crate) or Boreline straps (in cradle).	
Motor placed in reinforced crate or original crate as received from Original Equipment Manufacturer (OEM).	
Pump, motor & vertical cradle(s) loaded onto truck.	
Housekeeping container (rubbish bin) & tools loaded.	
Arrival at site: Co-ordination of activities and housekeeping. Team leader to determine best and most safe position for offloading and assembly of pump and motor.	
Offload vertical cradle(s). Remove motor from crate and securely clamp in vertical cradle.	
Motor shaft clean & lightly greased	
Lift pump end and fit to motor. Use only stainless steel bolts and nuts to secure the two. NUTS TO BE TIGHTENED EVENLY TO ENSURE ACCURATE ALIGNMENT OF PUMP & MOTOR.	
Motor leads are left out of the lead shields. Jointing of the cables is completed. Joints to be left for 24 hours to set.	
Pump discharge head removed and fitted to rising main.	
Riser pipe laid out	
Cable(s) laid out and inspected	
Cable(s) attached to riser per spec	
Dipper tube unrolled without kinks and crimps, ready for installation with riser pipe.	
Control cables, if fitted, to be rolled out and attached to rising main pipe.	
Additional security for the equipment to be arranged.	

Day 2

Site preparation and first lift

Housekeeping routines and safety presentation completed.	
Motor leads reinstalled in lead shields	
Cables and leads attached to riser	
First lift with discharge head only. Lowered onto pump which is still clamped in the vertical cradle.	
Discharge head fitted to the pumps and nuts tightened evenly. Ensure that OEM "O" ring is fitted. DO NOT USE SILICONE SEALER AS THIS CREATES A GAP BETWEEN THE MATING FACES.	
Pump unit lifted out of vertical cradle. Check: No tension on leads or cables, no snag points on cables and leads.	

Pump unit ready for installation.

Installation and First Phase Commissioning

Sufficient cable "looping" to prevent tension & rubbing on casing		
Cables checked for damage while lowering	All OK	Slight scuffs Damaged
Dipper tube attached and no kinks or crimps found	OK	Replaced
Insulation resistance reading: pump +/- 10m under water	MOhms	
Insulation resistance reading	After 50m _____ MOhms	
Insulation resistance reading	After 100m _____ MOhms	
Insulation resistance reading	After 150m _____ MOhms	
Final insulation reading	_____ MOhms	
Pressure gauge and vacuum breaker assembly fitted		

First Phase Commissioning Data

Borehole reference details															
	Date	Time	Completed by	Water level	Discharge pressure	Motor speed	Total hours	Total m ³ pumped	Insulation resistance	Volts			Current		
										Phase1	Phase2	Phase3	Phase1	Phase2	Phase3
Pre-start															
Startup									n/a						
+30mins									n/a						
+2 hrs									n/a						
+24 hrs									n/a						

Removal

All procedures completed as per Preparation for Transport and First Lift up to "House-keeping routines completed.		
Pressure gauge and vacuum breaker assembly(ies) removed		
Lay-down of riser pipe planned and indicated to the team.		
Cables disconnected from VSD		
Lift to be done slowly and cable and dipper tube condition inspected for damage by two members of the team.		
All cable straps to be undone and placed in bin		
All cable ties to be cut with side cutters and placed in bin		
Photos taken of any fault conditions		
Pump <i>and</i> motor marked with permanent pen	Date removed _____ Borehole no. _____ Motor serial no. _____ Pump serial no. _____	
Pump unit secured in vertical cradle and riser pipe removed. DO NOT REMOVE PUMP DISCHARGE HEAD.		
Pump and motor separated, cables cut immediately ABOVE the cable joint		
Pump lowered to horizontal position & placed in mobile cradle. Motor placed in reinforced crate.		
Cables checked for damage or water ingress	Cables or leads: OK Damaged Contain water	
Removed pump transported to workshop and repair process initiated by planner within 24 hours.		

Unit placed in vertical position and pump and motor separated. Preliminary checks completed.	
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Pump & motor removed from:			On (date):			Completed by:			Date unit was installed:			Months operating:					
Date	Motor serial	kW	Shaft condition	Coupling condition	Flange condition	Thrust housing	Shaft height	Diaphragm depth	Fill solution	Leads	Meg Ohms	Pump serial	Model	Shaft height	Top bearing	Strainer	Scrap/repair

All records analyzed and data collated into a single document	
Document tabled at “No Repeats” meeting and preliminary findings put forward.	
Short-term and longer-term remedial actions agreed on and responsibility for implementation allocated	