

4. QE Low Lift

The Queen Elizabeth Power Station Low Lift Pumping System (usually called the QE Low Lift) draws water from the South Saskatchewan River and supplies the base load for WTP raw water demand. It is the primary system for supplying raw water to the WTP.



Figure 4-1 A QE Low Lift Pump

4.1 Safety

- Hard hats and safety boots are required in this area.
- Lock Out/Tag Out (LOTO) required when working on equipment.
- Confined Space Entry procedures apply (safety harness, fall arrest and air monitoring equipment required when descending and ascending in the wet well)
- Hearing protection is required inside the QE Pumphouse Building.

4.2 Area and Process Description

The QE Low Lift system includes a concrete pier intake, a pump well, a rotating screen, a sand pump, a siphon system and two raw water transfer pumps, located in and around SaskPower's QE Power Station pumphouse. Electrical equipment for this area is housed in a City-owned MCC building situated north of the pumphouse.

Security Notes

- § Access to the QE Pumphouse requires a SaskPower security access code and notification of WTP operation staff.
- § Access to the MCC Building requires notification of WTP operation staff.

4.2.1 Intakes

The QE Low Lift obtains raw water from the South Saskatchewan River via one of three concrete pier intakes in the river at the Queen Elizabeth Power Station. The intake openings are located below the river water surface and have trash bars across the opening to prevent large objects (logs, trees, etc) from entering the intake. The intake opening is situated mid-way between the surface and river bed to avoid taking in bottom materials or materials floating on the surface (oil, etc).



Figure 4-2 QE Low Lift Intake Structures

4.2.2 Wells and Gates

Each intake feeds two wells. Water destined for the WTP is pumped from Well 6 (north-most well). The system includes two manual gates. One gate is used to bypass the intake and bring water directly into the well in the event of a low well level because of a plugged intake line. The other isolates the pump well from the intake to facilitate cleaning and maintenance of the well.



Figure 4-3 QE Low Lift Manual Gates

4.2.3 Siphon

Using the Siphon, warm water from the QE Power Plant discharge can be added to the pump well. This enables the WTP to obtain warm water in the winter months to supply the WTP process.

4.2.4 Screen

The Screen removes wood and debris from the raw water, and prevent fish from entering the pumping well. The Screen is fitted with a trough that collects flushed material and discharges it back to the river.



Figure 4-4 QE Low Lift Traveling Screen

4.2.5 Sand Pump

The Sand Pump is a submersible Flygt pump that removes sand from the outer pump well and returns it to the river. It is located before the screens where the intake enters the pump well, on the unscreened side of the well.

4.2.6 Transfer Pumps

Two pumps, QELL-P1 and QELL-P2, transfer the raw water to the WTP.



Figure 4-5 QE Pumps

4.2.7 Piping and Valving

Raw water is transferred from the pumps to the WTP via a 60-inch (1524 mm) pipeline running between the river and the adjacent roadway. An automatic air release is located at high point in this line, accessible through a manhole just north of the railway bridge. A drain point to drain the line is located midway between QE Pumphouse and WTP. During the winter, lower flow rates allow sand to settle in the pipeline. Valving located between the WTP Screen Building and the WTP Low Lift Building enables water to be diverted to the river. WTP personnel flush the lines by pumping at higher than normal flow rates to scour sand from the line. Outfall discharges into the river near the Low Lift Building.

4.2.8 QE Low Lift Equipment List

Quantity	Equipment/Description
1	Pier-style intake structure and related piping to feed the travelling screens (owned by Sask Power)
1	182 ML/day vertical pump (QELL-P1) This pump features variable speed capability, set by a controller output signal from the WTP computer control system and HMI.
1	91 ML/day vertical pump (QELL-P2) This pump has only two operational modes: on or off. It does not provide variable speed control.
1	Remotely controlled travelling water screen (QELL-SC1) with 10 mm ² openings
1	Screen washing jet pump (QELL-JP1)
1	Six-inch (152 mm) submersible sand pump (QELL-SP1) in the outer well to manage sand loadings
1	Siphon (QELL-SI1) to draw water from the QE Power Plant warm water discharge line into the pump well
1	Pipeline air release system
1	60 inch (1524 mm) steel pipeline (with drain valve and discharge piping midway between QE and WTP)
1	Purge valve and discharge piping located at the WTP
1	Cooling water supply to both pumps
1	MCC Building which houses all the related electrical switchgear
1	Local compressed air system
1	Compressor
1	PLC (QE PLC) with data connection to WTP via modem on leased telephone line
1	Air dryer
1	Uninterruptible Power Supply

4.2.9 QE Low Lift Pump and Drive Types


Pump	Pump Type	Drive	Vacuum/ Current	Capacity * (ML/day)	Generator Supplied	Speed Control
P1	Vertical line-shaft turbine	Electric motor	20 A to 98 A	182	No	Variable
P2	Vertical line-shaft turbine	Electric motor	20 A to 80 A	91	No	Fixed
* With age and use actual individual pump capacities may decrease over time.						
Total Pumping Capacity: approximately 180 ML/day**						
** The Total Pumping Capacity cannot be found by simply adding individual pump capacities. Because of back pressure created with multiple pumps feeding a common header and back pressure caused by operating Sand Separators, the total of individual pump rates may not be attained.						

4.3 Controls

The QE Low Lift System includes Local and Remote controls for starting and stopping pumps, screens, the sand pump and the siphon.


4.3.1 Local Controls

Local controls for the QE Low Lift include a local panel for QE pumps, Screen, Sand Pumps and Siphon. If QE Low Lift equipment must be operated locally, the controls are typically operated by maintenance personnel.



The as-built configuration of this panel has not been completely verified. This panel should only be operated by maintenance personnel.

QELL-P1 & P2 Pumps, SI1 Siphon, SC1 Screen and SP1 Sand Pump

Equipment Number	Description	Control	Additional Info	
QELL-P1	Pump	<ul style="list-style-type: none"> ↪ Start pushbutton ↪ Stop pushbutton ↪ Discharge valve On/Off/Auto selector switch 	↪ Controls are located in the QE Low Lift Building	
QELL-P2	Pump	<ul style="list-style-type: none"> ↪ Start pushbutton ↪ Stop pushbutton ↪ Discharge valve On/Off/Auto selector switch 		
QELL-SI1	Siphon	<ul style="list-style-type: none"> ↪ Start push button ↪ Stop push button ↪ Tele Control (Remote/Local) On/Off selector switch ↪ Siphon Pump On/Off selector switch ↪ Reset 		
QELL-SC1	Screen	<ul style="list-style-type: none"> ↪ Start push button ↪ Stop push button ↪ Hand/Off/Auto selector switch 		
QELL-SP1	Sand Pump	<ul style="list-style-type: none"> ↪ Start push button ↪ Stop push button ↪ Hand/Off/Auto selector switch 		

4.3.2 Remote Controls

The QE Low Lift system is controlled remotely from the QE Low Lift window on the HMI. Control room computers communicate with the QE PLC via a modem link. The QE PLC monitors and controls the QE Low Lift equipment.

QE Low Lift Window

To monitor and control QE Low Lift equipment, open the QE Low Lift window of the HMI by clicking the **QE** button on the main button bar at the bottom of any HMI window.

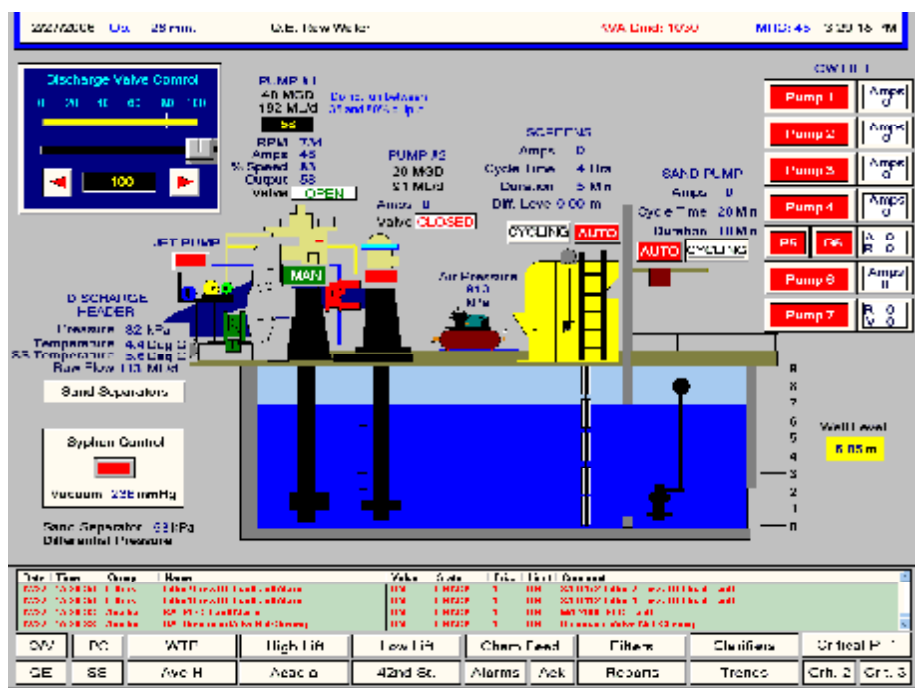


Figure 4-6 QE Raw Water Window

QE Low Lift Window Indicators and Controls

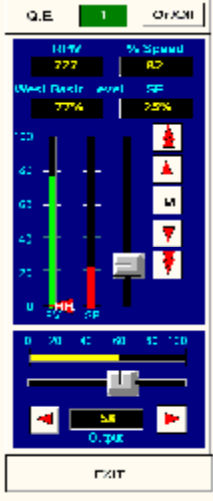
The following table lists status indications and data that can be monitored, as well as control actions that can be performed, or accessed, from the QE Low Lift window.

Graphic Element	Indicators	Controls
Well	Well Level (m)	none
Pump QELL-P1	On/Off Status, Auto/Manual status, RPM, % Output, Amps	Click to open QELL-P1 popup window to Start, Stop, adjust manual output (Configurable for Auto or Manual but Auto not used)
Pump QELL-P2	On/Off status, Amps	Click to open QELL-P2 popup window to: Start and Stop

Graphic Element	Indicators	Controls
Screen QELL-SC1	On/Off status, Auto/Man status, Cycle Time (hrs), Duration Time (min), Differential Level (m), Cycling status, Amps	Click to open QELL-SC1 popup window to: Start, Stop, set to Auto or Manual, Cycle Time and Duration Time
Jet Pump QELL-JP1	On/Off status	Starts automatically when the Screen cycles to clean the screen.
Sand Pump QELL-SP1	On/Off status, Auto/Manual status, Cycle Time (min), Duration Time (min), Cycling status, Amps	Click to open QELL-SP1 popup window to: Start, Stop, set to Auto or Manual, Cycle Time and Duration Time
Siphon QELL-SI1	On/Off Status, Vacuum (mmHg)	Click to open QELL-SI1 popup window to Start or Stop
Discharge Valve Control Box	Valve Opening (%)	Control not used
Sand Separator Button	None	Click to open Sand Separator window
Discharge Header	Pressure (kPa), Temperature (°C), Raw Flow (ML/day)	none
Elements from other areas (see related section for more information)		
WTP Low Lift Pumps (ref: Ch.6 WTP Low Lift)	On/Off status, WTLL-P1 through 6: Amps WTLL-P5: RPM, Electric (P5) or Diesel (D5) status WTLL-P7: RPM, Vacuum, Natural Gas	Click to open WTLL pump popup windows to control as per Section 6
Sand Separators (ref: Ch. 7 Sand Separators)	Differential Pressure (kPa), Temperature (°C)	none

QELL-P1 Popup Window

Raw water intake flow is accomplished by adjusting the speed of QELL-P1. This pump can be started, stopped and speed adjusted from the QELL-P1 popup window, which is opened by clicking the QELL-P1 graphic on the QE Low Lift window.

	Indicators	<ul style="list-style-type: none"> - Two-colour Status indicator showing the pump number – Green = Running, Red = Not Running - Two Chlorine Contact Basin Level indicators (digital and bar graph) - Two pump speed digital displays: <ul style="list-style-type: none"> - RPM - % full scale: (Pump speed at 0% = 560 RPM, at 100% = 820 RPM) - Two setpoint (SP) indicators (digital and bar graph) – display the Controller SP at which the Chlorine Contact Basin level is maintained if running in Auto mode - Two controller Output indicators (digital and bar graph) – loop output signal sent to speed controller
	Controls	<ul style="list-style-type: none"> - On/Off button - Start and Stop the pump - Two Output Controls (slider and right/left arrows) – enables operator to adjust the output in Manual mode - Auto/Manual button – selects Auto or Manual mode of operation - EXIT button – closes the popup window

Starting QELL-P1 (in Manual)

QELL-P1 is started by clicking the **On/Off** button on the popup window. When the pump is off the status indication (with the pump number on it) is red. When the pump is on the pump number button is green.

QELL-P1 Interlocks (Trips and Permissives)

For QELL-P1 to start:

- Adequate cooling water pressure must be available (indicating cooling water flow).
- The well level must be above the Low-Low Well Level alarm limit.
- The System Air Pressure must be greater than 480 kPa.

If these permissives have not been met, a red letter P appears to the left of the **On/Off** button and the pump cannot start. The P disappears when the level is above this alarm point.

If the pump fails to start or trips, a Pump Trip Condition alarm occurs and a red letter T appears alongside the **On/Off** button. The trip generates an alarm describing the cause of the trip.

Note

A restart should not be attempted on a unit that has tripped unless it is an emergency situation. A trip condition should be investigated by maintenance staff.

Speed Control in Manual

The controller output sets the speed (and hence the pumping rate) of QELL-P1. The output signal can be adjusted by:

- dragging the slide bar to the position that results in the desired value (shown in the Output display)
- clicking and holding the up or down output arrow until the desired value is shown in the Output display



Figure 4-7 Manual Output Control

Stopping QELL-P1

When stopping QELL-P1, the speed controller output is gradually decreased until the % Speed and Output readings indicate 0. Then the pump is stopped by clicking the **On/Off** button.

QELL-P2 Popup Window

QELL-P2 does not have variable speed capability. The only operational modes are On and Off. QELL-P2 is started or stopped from the QELL-P2 popup window, which is opened by clicking the QELL-P2 pump graphic on the QE Low Lift window.



Figure 4-8 QELL-P2 Popup Window

Starting QELL-P2

QELL-P2 is started by clicking the **On/Off** button. When the pump is off the status indication (with the pump number on it) is red. When the pump is running the pump number button is green.

QELL-P2 Interlocks

For QELL-P2 to start:

- Adequate cooling water pressure must be available (indicating cooling water flow).
- The well level must be above the Low-Low Well Level alarm limit.
- The System Air Pressure must be greater than 480 kPa

If these permissives have not been met, a red letter P appears to the left of the **On/Off** button and the pump cannot start. The P disappears when the level is above this alarm point.

If the pump has failed to start or trips, a Pump Trip Condition alarm occurs and a red letter T appears beside the **On/Off** button. The trip generates an alarm describing the cause of the trip.

Note

*A restart should not be attempted on a unit that has tripped unless it is an emergency situation.
A trip condition should be investigated by maintenance staff.*


Stopping QELL-P2

QELL-P2 is stopped by opening the QELL-P2 popup window and clicking the **On/Off** button.

QE Low Lift Screen (QELL-SC1) Popup Window

The QE Low Lift Screen removes solid materials that pass through the intake trash bars.

QELL-SC1 can be started, stopped and cycle times/durations adjusted from the QE Screens popup window. This popup window is opened by clicking the Screens graphic on the QE Low Lift window.

	Indicators	→ Two-colour Status indicator – Green = Running, Red = Not Running
		→ Motor amps – electrical current being drawn by the motor operating the Screens
		→ Cycling indicator – indicates when the Screens are in the process of their cycle
		→ Two Duration displays (digital and bar graph) – display number of minutes configured for the duration of the Screen cycle
		→ Cycle Time Remaining (digital) -the time remaining before the next cycle is initiated. In Auto mode this value counts down from the Cycle Time value
Controls	→ On/Off button - Start and Stop the Screens	
	→ Arrow buttons – adjust the Duration and Cycle times	
	→ Auto/Manual button – selects Auto or Manual mode of Screen operation	
	→ EXIT button – closes the popup window	

Auto and Manual Screen Operation

QELL-SC1 can operate in Auto or Manual modes.

- In Auto mode the PLC turns the Screens on and off based on the Cycle Time and Duration Time.
- In Manual mode, when started, the Screens operate for the Duration Time, and then stop.
- The arrow keys change the Cycle and Duration times and are active in both Auto and Manual.

Automatic Operation

When the Screens are in Auto mode, each time the Cycle Time (in hours) elapses, the Screens turn on and run for the Duration Time (in minutes). When the Screens start, the red status indicator turns green and the motor amps increase to within the normal operating range.

A **CYCLING** button appears beside the screens on the QE Low Lift window when the screens are in Auto and the PLC is controlling the cycle time.

Manual Operation

Screens are started in Manual by clicking the **On/Off** button. The red Status indicator turns green and the Motor Amps increase to the normal operating range. The Screens operate for the Duration time and then stop.

Changing Modes

To switch from Manual mode to Auto mode, turn on the Screens (by clicking the **On/Off** button), then click the **MAN** button, switching it to **AUTO**.

To switch from Auto mode to Manual mode, click the **AUTO** button, switching it to **MAN**.

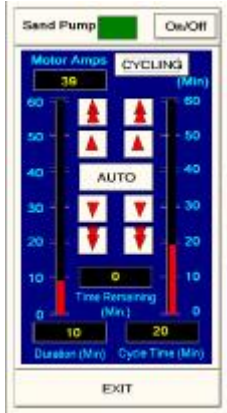
Interlocks

The start permissive for the screens requires that QELL-P1 or QELL-P2 be running. If both pumps are not running a trip condition is generated.

QE Low Lift Sand Pump (QELL-SP1) Popup Window

The QE LL Sand Pump removes sand from the QE outer pump well and returns it to the river.

The QE Low Lift Sand Pump can be started, stopped and cycle times/durations adjusted from the QE Sand Pump popup window. This popup window is opened by clicking the Sand Pump graphic on the QE Low Lift window.

	Indicators	↪ Two-colour Status indicator – Green = Running, Red = Not Running
		↪ Motor amps – electrical current being drawn by the motor operating the Sand Pump
		↪ Cycling indicator – indicates when the Sand Pump is in the process of its cycle
		↪ Two Duration displays (digital and bar graph) – display number of minutes configured for the duration of the Sand Pump cycle
		↪ Two Cycle Time displays (digital and bar graph) - display number of hours configured for the overall cycle
Controls	↪ Cycle Time Remaining (digital) -the time remaining before the next cycle is initiated. In Auto mode this value counts down from the Cycle Time value	
	↪ On/Off button - Start and Stop the Sand Pump	
	↪ Arrow buttons – adjust the Duration and Cycle times	
	↪ EXIT button – closes the popup window	

Auto and Manual Sand Pump Operation

QELL-SP1 can operate in Auto or Manual.

- In Auto mode the PLC turns the Sand Pump on and off based on the Cycle Time and Duration Time.
- In Manual mode, when started, the Sand Pump operates for the Duration Time, then stops.
- The arrow keys change the Cycle and Duration times and are active in both Auto and

Manual.

Automatic Operation

When the Sand Pump is in Auto mode it operates for the Duration Time (in minutes) each time the Cycle Time (in hours) has elapsed. When the Sand Pump starts, the red status indicator turns green and the motor amps increase to within the normal operating range.

A **CYCLING** button appears beside the screens on the QE Low Lift window when the screens are in Auto and the PLC is controlling the cycle time.

Manual Operation

The Sand Pump is started in Manual by clicking the **On/Off** button. The red Status indicator turns green and the Motor Amps increase to the normal operating range. The Sand Pump operates for the Duration time and then stops.

Changing Modes

- To switch from Manual mode to Auto mode
 - § Turn on the Sand Pump (by clicking the **On/Off** button)
 - § Click the **MAN** button, switching it to **AUTO**.
- To switch from Auto mode to Manual mode, click the **AUTO** button, switching it to **MAN**.

Interlocks

- For the Sand Pump to operate, QELL-P1 or QELL-P2 must be running. If both the pumps are not running a trip condition is generated.
- In Auto, the Sand Pump does not run when the Screens are washing. The Sand Pump only runs or cycles during the Off Cycle periods of the Screen system.

Siphon (QELL-SI1) Popup Window

The Siphon draws warm discharge water from the Queen Elizabeth Power Station into the pump well using vacuum created by the siphon pump.

The Siphon can be started and stopped from the Siphon Control popup window. This popup window is opened by clicking the Siphon Control box on the QE Low Lift window.



Figure 4-9 Siphon Control Box on the QE LL Window

The Siphon popup window appears.



Figure 4-10 Siphon Control Popup Window

Starting the Siphon

The Siphon is started by clicking the **On/Off** button. The red Siphon pump motor status indicator turns green and the Vacuum indication in the Siphon box of the QE Low Lift screen starts to increase. After initially started, the Siphon pump motor automatically cycles to maintain a vacuum. The green status indicator appears only when the Siphon pump motor is running. When vacuum has been established and the Siphon pump motor cycles off, the status indicator turns red.

Stopping the Siphon

The Siphon is stopped by breaking the vacuum. Stop the Siphon from running by clicking the **On/Off** button. The Vacuum indication begins to decrease, eventually returning to 0.

4.4 Operation

The section describes the operating goals, techniques and procedures that must be followed to effectively operate the QE Low Lift system.

4.4.1 Operating Goals

The main operational goal for the QE Low Lift is to obtain a continuous and adequate supply of acceptable quality raw water from the South Saskatchewan River. Pumping raw water from the QE Low Lift enables the WTP to obtain water at higher temperatures than would otherwise be available directly from the river. Power plant cooling water is mixed with river water to increase its temperature. Warm water improves the effectiveness and reaction rate of the chemical treatment of water. However, care must be taken since fast changes to water temperatures can cause upsets to the clarifiers. Drastic temperature changes in raw water may cause main breaks in the water distribution system. If the temperature of the QE raw water is too high WTP pumps are operated to add cooler water and maintain a consistent temperature of 10 °C.

The WTP operator uses ongoing information on current plant demand and knowledge of overall WTP operation to anticipate raw water demand and control the intake of raw water as necessary.

Acceptable Operating Parameters

- QELL-P1 should not be operated at speeds where excessive vibration occurs (85% to 95% of full speed).
- QELL-P1 should be the primary operating pump because it enables variable speed control. QELL-P2 can be added to supplement P1 or operated on its own when P1 is out of service.
- Screen lubricants must be of potable water grade.

Critical Control Points

- The setting of the thermostat in the MCC Building must not be readjusted from the current setpoint. (Changing this setting may result in air conditioner freeze up.)
- High MCC Building temperature alarms must be addressed immediately by maintenance staff to prevent pump shut down.
- Pump well water level must be maintained above the low level alarm point.
- Ensure frazil ice does not build up and block the raw water intake and screen.
- High river flow conditions may require continuous operation of the Sand Pump and Screens.
- Warm water from QE must not contain oil or foreign contaminants. This must be checked visually as per the On-Call Protocol Storm Sewer Daily Monitoring schedule.

- Rapid changes in pump speed may result in conditions that could result in water hammer and possibly break pipe lines.

Applicable Government Regulations

- The WTP maintains a current Withdrawal Permit (issued by the Saskatchewan Watershed Authority) to enable pumping from the river.
- Screening is required for water withdrawal. Any bypass of the intake through gates requires regulatory approval.
- Lubricants must not be stored in the QE Low Lift area.

4.4.2 Operating Techniques

The QE Low Lift is the primary source of raw water to the WTP. It is the preferred source of raw water feed to the WTP because of the availability of higher temperature water and its intake is upstream of City of Saskatoon storm water discharge points.

Based on overall finished water demand, which is a function of season, time of day and ambient temperature, the operator must anticipate and adjust raw water pumping to supply the WTP with the necessary volume of raw water.

QE Low Lift Pumps (QELL-P1 and QELL-P2)

- WTP operators adjust the raw water feed rate to the WTP based on the water level of the Chlorine Contact Basin. Pump speed is adjusted to ensure water distribution requirements are met and the Chlorine Contact Basin level is maintained as consistently as possible.
- QELL-P1, the primary raw water feed pump, operates in Manual mode. (Automatic speed control of QELL-P1 currently is not operational but is being considered as a possible future option.)
- The controller output signal to QELL-P1 should be changed in increments of less than 10%. This prevents flow surges that may upset the clarifiers, especially during cold water conditions.
- If the plant load exceeds the capacity of QELL-P1, start QELL-P2. To prevent a bump in the system flow, which can cause clarifier upsets, decrease the speed of QELL-P1 before starting QELL-P2. When QELL-P2 has started, set the speed of QELL-P1 as required to reach the required raw water flow.
- When initiating a start up of QELL-P2 when QELL-P1 is not running, the number of Sand Separators in use should be decreased slightly to increase the QE header pressure and reduce the related flow changes to the clarifiers as a result of the start up. Additional Sand Separators can be brought on after the initial start up which serves to more gradually increase the raw water feed to the clarification process.
- If the plant load exceeds the capacity of both pumps, WTP Low Lift must be started.
- QE Low Lift pumps may be used to flush the raw water piping between the QE Station and the WTP Low Lift. When the QE Low Lift pumps are used for this purpose WTP

pumps are also operated to maintain sufficient raw water flow to the WTP.

- If the temperature of the QE raw water is too high run WTP pumps to add cooler water and maintain a consistent temperature of 10 °C.

QE Screen (QELL-SC1)

- The Screen is cleaned by rotating and flushing it periodically using the Jet Pump (QELL-JP1).
- Screen cycle and duration times must be adjusted to address changing raw water conditions.

Note

During early winter conditions screens can become coated with frazil ice, which must be removed by back flushing, otherwise it reduces flow. SaskPower personnel perform the required back flushing procedures. Screens are most susceptible to frazil ice when warm water is not available (rare).

QE Sand Pump (QELL-SP1)

The Sand Pump can be lifted and lowered into different areas of the pump well to facilitate cleaning. Sand Pump cycle and duration times must be adjusted to address changing raw water conditions.

QE Siphon (QELL-SI1)

Typically the Siphon is used to add to QE cooling water to the pump well to increase raw water temperature. It pulls warm discharge water from the power plant into the pump well using vacuum created by the siphon pump. The Siphon is normally used in cold weather conditions to increase raw water temperature. It can also be used in periods of high sand conditions to keep the pump well free of sand.

Other Operating Considerations

QE Valves

Valves that control QE raw water feed to the WTP are located in the QE raw water lines and the Raw Water Crossover Valve Chamber at the WTP. These valves must be configured appropriately for current operating conditions.

For information on operation of QE valves, refer to Raw Water Piping and Valving in the WTP Low Lift section of this manual.

Low Demand

During low demand periods, a controller output setting of 0% to QELL-P1 pump may still generate too much flow. (0% represents the minimum allowable pump speed of 560 RPM.) The flow can be reduced by decreasing the number of operating Sand Separators until the desired flow conditions have been reached.

High Temperature Conditions

The variable speed drive controlling QELL-P1 is temperature sensitive and trips out during high temperature conditions. If the building goes into high temperature alarm, the most likely cause is problems with the air handling unit. Electrical maintenance personnel must be called out to address this problem. (The switchgear controlling QELL-P2 is not adversely affected by temperature in the same way as QELL-P1.)

Throttling Raw Water Flow

Under normal conditions the number of operating Sand Separators is controlled to generate a 50 to 75 kPa pressure drop, which causes flow throttling. As the number of Sand Separators in operation decreases, the pressure drop increases and the flow rate decreases.

4.4.3 Operating Procedures

QELL pumps, screens, sand pump and siphon are typically operated remotely from the HMI. If local operation is required, it is usually done by mechanical personnel.

Operating QELL-P1

Note

QELL-P1 is normally operated in Manual mode.

To start, stop or control the speed of QELL-P1, open its popup window.

Starting

Click the **On/Off** button. The pump status indicator turns green and motor amps start to increase.

Controlling Pump Speed

To increase the speed of the pump, click the right arrow button or drag the horizontal slider to the right.

To decrease the speed of the pump, click the left arrow button or drag the horizontal slider to the left.

The digital display indicates the Output signal value.

Stopping

1. Click the left arrow button, or drag the horizontal slider to the left, on the Output control (bottom of the popup window) to decrease the output to the motor.
2. When the output has been reduced to 0, click the **On/Off** button to turn the pump off.

Operating QELL-P2

To start or stop QELL-P2, open its popup window.

Starting

Click the **On/Off** button to start the pump. The pump status indicator turns green and motor amps start to increase.

Stopping

Click the **On/Off** button to stop the pump. The pump status indicator turns red and motor amps return to 0.

Operating QE Screens (QELL-SC1)

To start, stop or control the cycle/duration times of QELL-SC1, open its popup window.

Manual

Click the **On/Off** button.

- § The QELL-SC1 motor status indicator turns green and motor amps increase to a normal operating range.
- § QELL-SC1 runs for the Duration Time and then turns off automatically.

Auto

1. Click the **On/Off** button. QELL-SC1 starts.
2. Click the **MAN** button. It changes to **AUTO**.
 - § QELL-SC1 runs for the Duration Time each time the Cycle Time has elapsed.
 - § The **CYCLING** button appears on the QELL window.

Operating the QE Sand Pump (QELL-SP1)

To start, stop or control the cycle/duration times of QELL-SP1, open its popup window

Manual

Click the **On/Off** button.

- § The QELL-SP1 motor status indicator turns green and motor amps increase to a normal operating range.
- § QELL-SP1 runs for the Duration Time and then turns off automatically.

Auto

1. Click the **On/Off** button. QELL-SP1 starts.
2. Click the **MAN** button. It changes to **AUTO**.
 - § QELL-SP1 runs for the Duration Time each time the Cycle Time has elapsed.
 - § The **CYCLING** button appears on the QELL window.

Note

In Auto, QELL-SP1 does not run when the Screens are washing. QELL-SP1 only runs or cycles during the Off Cycle periods of the Screen system.

Operating the Siphon (QELL-SI1)

To start or break the vacuum of QELL-SI1, open its popup window

Starting

Click the **On/Off** button.

- § The QELL-SI1 motor status indicator turns green and vacuum starts increasing.
- § When QELL-SI1 vacuum has been established (275 to 300 mmHg), the QELL-SI1 motor cycles off and the status indicator turns red.
- § If the vacuum decreases too much, the QELL-SI1 motor automatically restarts to establish normal operating vacuum (status remains green while a Siphon condition exists).

Breaking Siphon Vacuum

Click the **On/Off** button.

- § Siphon vacuum should start to decrease.
- § If the Siphon motor was running, the status changes from green to red.

Operating Potassium Permanganate Feeds

During normal operations the potassium permanganate feed pump (CFPP-P1 or P2) feeds potassium into the Raw Water Crossover Valve Chamber piping. Manual valving enables potassium permanganate to be fed to points near the upstream side of valves Q4 and RW7.



Figure 4-11 Potassium Permanganate Feed Point Selector Valving in Chemical Feed Building

Notes

- § For more information on potassium permanganate feed points see the Chem Feed section.
- § For details on changing feed points from the QE to LL raw water lines see the SOP WT-CFPP-1081-O Switching Potassium Feed Points.

4.5 Related Standard Operating Procedures

SOP Name	Type	Area	Sub-Area	Number	Sub-Type	Additional Information
QE Pump Check Valve Failures	CRP	WT	QELL	1035	E	
Isolation and Cleaning QE Pump Well	SOP	WT	QELL	1036	M	
QE Operation During High Sand Conditions	SOP	WT	QELL	1037	M	
Draining and Filling the QE Raw Water Line	SOP	WT	QELL	1038	O	
QE Low Lift Pressure Transmitter Failure	SOP	WT	QELL	1039	O	
Purging the QE Raw Water Line	SOP	WT	QE::	1040	O	
QE Low Lift Power Failure	CRP	WT	QELL	1041	O	