

Greater Hume Council




Critical Control Points and Standard Operating Procedures

Culcairn and Villages Water Supply Systems

March 2020



Greater
Hume
Council

Document Control		Critical Control Points & Standard Operating Procedures  Greater Hume Council			
Rev No	Date	Revision Details	Author	Reviewer	Approver
DRAFT	14 February 2014	-	Yasas Siriwardene	Glenn Fernandes	-
FINAL	24 June 2015	Adopted			Council
2.0	15 November 2016	Following DWMS review in Oct 16, rationalising the CCPs	Tasleem Hasan	Tom Plunkett	Tom Plunkett
3.0	27 August 2018	Added SOP for cross contamination prevention. CCP – deleted that adjustment level breach should be recorded in the water quality incident report.	Glen Luscombe	Tasleem Hasan	Tom Plunkett
4.0	24 March 2020	Reservoirs made CCPs. Bore 2 flushing SOP added to document. Drop test SOP taken out – not possible to do it now with new pump. SOP on chemical quality management added. Slight reformatting of Summary page. Changed to Arial 11 font.	Tasleem Hasan	Tom Plunkett	Tom Plunkett

The original DWMS was prepared by NSW Public Works with support from NSW Health.

The DWMS was comprehensively reviewed in October 2016 through a review workshop and version 2.0 was prepared by: Viridis Consultants Pty Ltd [www.viridis.net.au], with support from NSW Health.

Summary

This document includes the critical control point (CCP) procedures and standard operating procedures (SOPs) for Culcairn and Village schemes.

This document should be reviewed every 2 years (next review March 2022).

1. Critical Control Points (CCPs)

- CCP 1 Culcairn Scheme – Primary Disinfection
- CCP 2 All Schemes – Reservoirs

2. Standard Operating Procedures – Culcairn Scheme

- S01 Daily Inspections
- S02 Topping up sodium hypochlorite tank
- S03 Adjustment of sodium hypochlorite dose
- S04 Hypochlorite dosing pump instruction sheets
- S05 Testing sodium hypochlorite strength
- S06 Setting Gordon St Reservoir setpoints
- S07 Culcairn WTP DDA Dosing Pump Calibration
- S08 Culcairn WTP DDA Dosing Pump Bypass
- S09 Culcairn WTP Adjustment of Dosing Rate During Pump Operation
- S10 Culcairn Bore 2 Flushing Procedure (Flushing to Waste)

3. Standard Operating Procedures – Villages Scheme

- S11 Routine inspections
- S12 Calcium hypochlorite dosing at reservoir
- S13 Mains flushing

4. Standard Operating Procedures – Common – All Schemes

- S14 New Mains Commissioning
- S15 Water Mains Repairs
- S16 Chemical Safety and Handling
- S17 Preventing Cross Contamination During Maintenance
- S18 Chemical (Chlorine) Quality Management

1.0 Critical Control Point Procedures for the Schemes

CCP 1 CULCAIRN SCHEME - PRIMARY DISINFECTION

What are the hazards?	Chlorine sensitive pathogens.
What is being measured?	Free residual
Where/How is it measured?	Grab sample from sample tap from relift pump discharge.
How is it controlled?	Manual adjustment of hypochlorite dose.

Operational Target	Adjustment Limit	Critical Limit
0.5mg/L - 1.5mg/L (free)	<0.5mg/L (free) or >1.5mg/L (free) at Relift Pump discharge	<0.3mg/L (free) or >5mg/L (total) at Relift Pump discharge
Action: <ul style="list-style-type: none"> Continue routine operations and monitoring. 	Action: <0.5mg/L at Relift Pump discharge <ul style="list-style-type: none"> Re-test immediately to confirm result. Check chlorine level and dosing pump performance with drop test. Install spare pump if required. Check dosing lines for leaks and blockages. Check reticulation system residuals at dead end and system extremity. If residual is >0.2mg/L in retic, undertake no further action. If residual is <0.2mg/L in retic, inform Overseer (0458 058 389). Overseer will then adjust hypochlorite dose according to procedure. Flush relevant section of mains and retest. Action: >1.5mg/L at Relift Pump discharge <ul style="list-style-type: none"> Re-test immediately to confirm result. Check dosing pump performance with drop test. Check reticulation system residuals at dead end and system extremity. If reticulation system Free chlorine is >1.5mg/L, inform Overseer, check hypochlorite batch strength and adjust hypochlorite dosing rate according to strength. Check dosing pump. 	<ul style="list-style-type: none"> Re-test immediately to confirm result. Contact Overseer (0458 058 389) and notify Manager (0427 480 915). Manager or Overseer to contact local Public Health Unit (02 6080 8900) as soon as possible to inform about the breach and actions being undertaken (fill in water quality incident report). Undertake all actions under Adjustment Limit. If free chlorine is still <0.3mg/L, and reservoir level is below 70%, manually dose hypochlorite into Storage Tank to meet operational target. Consult SOP to determine manual dose quantity. Retest for chlorine residual after 1h. Consider plant shutdown if issue is not fixed. Contact PHU again with results and outcome after corrective actions have been applied on the day. <p>Fill in the water quality incident report, which is part of the drinking water quality incident and emergency response plan.</p>

CCP 2 ALL SCHEMES - RESERVOIRS

Description	Explanation of Detailed In-house Reservoir Inspection
To be carried out by	Operators
Frequency	6 monthly

- Inspections are undertaken by the Manager or Overseer or water operators, as available, for all drinking water service reservoirs managed by GHC.
- Undertake reservoir inspections on a 6 monthly basis (routine), and following a major storm event (incidental).
- Fill out the reservoir inspection checklist during the inspection (see next page).
- Inspections are undertaken from ground level, walking around the reservoir and relevant place on top from where the roof/hatches can be inspected, where possible. Use a drone if possible.
- Provide the filled in checklist to the Manager as records.
- Report any urgent issues or problems, which need to be resolved, to the Manager within 24 hours of completing the inspection. For critical limit breach, the PHU should be contacted as soon as possible (within 24 hours).
- Corrective actions:

ALERT – Corrective Actions	CRITICAL – Corrective Actions
<ul style="list-style-type: none"> • Repair asset • If possible, take immediate action to rectify breach • If unable to immediately repair, report breach to Manager • Undertake testing of chlorine residual and consider micro test • Manually dose reservoir or increase dosing at the plant and retest chlorine residual • Review current security measures and procedures • Maintain records as relevant 	<ul style="list-style-type: none"> • Isolate reservoir, if possible • Remove source of contamination and/or repair asset • Repeat corrective actions from alert level • Bring reservoir into service with the approval of the Manager • For long repair times, increase operational monitoring frequency • Review current security measures and procedures • Fill in the Water quality incident reporting form. • The Manager must inform and consult with: NSW Health PHU (and DPIE Inspector) • Consider need to issue a boil water alert in consultation with the PHU.

See following page for the checklist:

Reservoir Inspection Checklist

Frequency: Weekly – visual, 6-monthly – using this checklist (and incidental e.g. following major storm)

If any question (Q) is marked “**Yes**” it means follow up action needs to be undertaken, the Manager should be contacted within 24 hours of the inspection.

TARGET	ALERT	CRITICAL
No Breach	Site or reservoir condition poor. “Yes” for Q2 – Q11.	Evidence of entry and contamination. “Yes” for Q1. Contact PHU asap.

Drinking water scheme: _____

Inspection Date: _____

Reservoir Name: _____

Inspected by: _____

Questions	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Comments
1. Is there evidence of birds or vermin or unauthorised human entry into the reservoir (e.g. feathers, nest etc)?			
2. Is there any access or entry point for birds, animals, vermin and windborne contaminants, including at overflow pipes?			
3. Is it possible for rainwater to enter the reservoir (via leaking roof, holes in reservoir walls or gaps around the opening on the roof)?			
4. Is the roof not properly drained and can enable the roof run-off to enter the reservoir?			
5. Are the inspection hatches open and not locked?			
6. Is there any sign of vandalism and unauthorised access to the reservoir site or the reservoir?			
7. Are the reservoir roofs or walls showing signs of vegetation growth that could penetrate or compromise the structure?			
8. Are there visible holes and cracks in the reservoir roof, walls, foundation which can compromise structural integrity?			
9. Are the water level controls damaged or malfunctioning?			
10. Are the scour and stormwater drain outlet flaps blocked or obstructed?			
11. Any additional issues or observations that should be noted?			

Follow up required by Manager:

☐ Yes

☐ No

Actions to be taken: (include in Improvement Plan for monitoring if timeframe is >6 months)

2.0 SOPs Culcairn Water Supply

S01 DAILY INSPECTIONS - CULCAIRN

Description	Daily inspection activities
To be carried out by	Operator
Frequency	Daily, weekly

Culcairn WTP:

- Calibrate pH meter every Monday morning.
- Collect and record readings in logsheet: pump runtime, pump starts, daily flows, bore levels, any chemicals replenished (daily). If there are less than two full drums of hypochlorite in the shed, then obtain more from the depot and store them in the shed. Check switchboards for data logs and faults.
- Take samples from sample tap in plant room, downstream of pumps. Test for: pH, turbidity, free and total chlorine - daily.
- Weekly – take sample from the bore, test for pH and turbidity.
- Check chlorine storage. Check for leaks. Top up sodium hypochlorite if required and record chemical volume added.
- Visual inspection of assets.
- If needed, carryout housekeeping tasks: e.g. mow grass.

Reticulation System (twice a week, on a Monday and Thursday. If its a public holiday, the following activities are to be carried-out on the next working day):

- Collect pH, turbidity test meters from Culcairn WTP.
- Take a grab sample from the relevant sample point, as per Monitoring Site Sheet, and a grab sample from the reservoirs (location closest to reservoirs where there is no tap at the reservoir) - test for pH, turbidity, free and total chlorine.
- Take a second grab sample from the relevant sample point (not reservoir points) for microbiological testing and deliver to head office at Culcairn before 11.00am.
- Perform housekeeping tasks at the two town reservoirs if required: mow grass.

S02 TOPPING UP SODIUM HYPOCHLORITE TANK - CULCAIRN

Description	Topping up sodium hypochlorite tank
To be carried out by	Operator
Frequency	As required.

- Check level of solution in sodium hypochlorite tank, appropriate for summer or winter (summer and winter storage levels are marked on the tank).
- Put on PPE: apron, gloves, goggles.
- Use decanting pump located in the shed to transfer liquid from drums.
- Insert pump stem into drum opening, with hose into hypochlorite tank. Then adjust pumping rate by adjusting dial on pump and hold trigger open to start pumping.
- When drum is emptied, stop pump. Use a second drum if required.
- Keep filling until the summer or winter levels (as marked on the tank) are reached.
- Once complete, clean pump by inserting it into bucket of cold water to rinse. Run water through the pump to clean it. Store pump in shed.
- Manually empty the remnants in the drum into the tank.
- Take-off PPE and store in shed, and place next to pump.

S03 ADJUSTMENT OF SODIUM HYPOCHLORITE DOSE - CULCAIRN

Description	Adjustment of dosing rate from the dosing system.
To be carried out by	Operator
Frequency	As required.

- Test free chlorine residual
- Determine the dosage required: (target – test result).
- Hypochlorite pump flowrate = (Dosage Required * Bore Pump Flowrate) / (Solution Strength)
 - For example, with a target of 1mg/L, test result of 0.5mg/L, bore water flowrate of 30L/s, and sodium hypochlorite solution strength of 12.5% w/v.

$$\text{Dosage required} = 1 - 0.5 = 0.5\text{mg/L}$$

$$\text{Hypochlorite pump flowrate} = (0.5\text{mg/L} * 30 \text{ L/s}) / (125\text{g/L}) = 0.12 \text{ mL/s}$$

$$\text{Hypochlorite pump flowrate} = 0.12 * 3.6 = 0.3 \text{ L/h}$$

S04 HYPOCHLORITE DOSING PUMP INSTRUCTION SHEETS - CULCAIRN

Description	Instruction sheets for calibration, reboot, setting 4-20mA control signals, and hotkeys.
To be carried out by	Operator
Frequency	As required.

See following pages:



DDI (TrueDos) Cheat Sheet No. 1

Setting 4-20mA scale.

To adjust the pump output in the 4-20mA mode it is necessary to set the pump minimum at 4mA and maximum at 20mA, ie the flow rate that the pump will deliver at 4mA and 20mA. Once this is done the pump will deliver the entered maximum at 20mA, will stop at 4mA and be linear in between. *(The pump can also be set to operate between a given range of mA's to do this you must adjust the mA value's in steps 4 & 6.)*

Below we detail how to set the pump output for 4-20mA.

- 1 Press the *Stop/Start* button to stop the pump.
- 2 Press and hold the *Menu/Info* button until you see *C:111*
- 3 Release the *Menu/Info* button.
- 4 Press the *Menu/Info* button until you see *L: 4.0mA*
- 5 Press the *Stop/Start* button. You will see *0.000 l/h*. This is the volume the pump will dose at 4mA. Adjust, if required, using the *Up* button.
- 6 Press the *Stop/Start* button. You will see *H: 20.0 mA*.
- 7 Press the *Stop/Start* button. You will see a number. This is the volume the pump will deliver at 20mA. Adjust, if required, using the *Up* or *Down* button.
- 8 Press the *Start/Stop* button. (You should now be returned to the main menu and the mode that the pump was in when you stopped it.)
- 9 Make sure that your pump is now in Analog 4-20mA mode. If not, press the *Menu/Info* button until the display shows *Analog* and *4-20mA*.

Alternate method for changing pump output in relation to incoming 4-20mA signal whilst pump is running.

To change the flow rate of a pump in relation to the incoming mA signal whilst pump is running press and hold the *up* button for 5 seconds, analogue and 0-20 or 4-20mA will now flash. Use the *up* or *down* buttons to increase or decrease the flow rate in relation to the present mA signal.

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DDI (TrueDos) Cheat Sheet No.2

Calibrations

DDI standard. (No integral calibration system fitted)

1. Run the dosing pump in *Manual* mode by pressing *Stop/Start* button until system pressure is steady and constant. If no pressure gauge is fitted to system, run for a sufficient time until chemical has reached the point of injection/discharge. If a pressure-loading valve is fitted in the discharge line, ensure chemical has reached and passed this valve.
The Calibration should only be done after the above has been achieved.
2. Press *Stop/Start* button to stop the pump.
3. Press and hold the *Menu/Info* button until you see *C:111*. Release the *Menu/Info* button.
4. Press the *Menu/Info* button once. You should see *OFF* and *CAL*
5. Press the *Up* button to turn on *CAL*. You will see *ON* and *CAL*
6. Press the *Stop/Start* button to start the calibration.
7. Run pump until either the required number of strokes, or the required volume of chemical has been reached. Press *Stop/Start* button. (The pump will now display the number of strokes, max 200, that it has completed)
8. Press the *Stop/Start* button and enter dosed quantity ie the volume delivered from the calibration cylinder or collected in the measuring cylinder by pushing either the *Up* or *Down* button.
9. Press the *Stop/Start* button to return to *Manual* mode.
10. Press *Up* button to view calibration in L/hr. All further settings will be based on this calibrated figure.
11. Press the *Menu/Info* button to return to either the *Contact* or *Analog 4-20mA* mode.
12. Press *Stop/Start* to run the pump or to put the pump in standby mode.

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DDI Plus 3 (D70) Calibration. (For pumps fitted with integral calibration system)

1. Ensure valve below calibration tube is open before starting this calibration.
2. Run dosing pump in *Manual* mode until system pressure is steady and constant. If no pressure gauge is fitted to system, run for sufficient time until chemical has reached point of injection/discharge. If pressure-loading valve is fitted in discharge line, ensure chemical has reached and passed this valve.
3. When system is constant pressure, close valve until liquid in calibration tube has dosed down below zero mark.
4. Press *Stop/Start* button to stop pump.
5. Open valve carefully and refill tube until liquid reaches exactly zero.
6. Press the *Menu/Info* button until you see *C:111*
7. Release the *Menu/Info* key.
8. Press the *Menu/Info* key once. You should see *OFF* and *CAL*
9. Press *Up* button to turn on *CAL*. You should see *ON*.
10. Press *Stop/Start* button to start calibration.
11. Dose the exact quantity in the calibration tube (3 or 10 mL depending on pump model). Press *Stop/Start* button to stop pump. (The pump will now display the number of strokes that it has completed)
12. Press the *Stop/Start* button and enter dosed quantity i.e. the volume of the calibration cylinder using either the *Up* or *Down* buttons.
13. Press the *Stop/Start* button to return to *Manual* mode.
14. Press *Up* button to view calibration in L/Hr. All further settings will be based on this calibrated figure.
15. Press the *Menu/Info* button to return to either *Contact* or *Analog 4-20mA*



DDI (TrueDos) Cheat Sheet No. 3

Resetting to Default Settings (Reboot)

You can reset the first and second level menus to the default settings when the power supply is connected.

Note

The service level settings (pump type, unit of display for the dosing flow, input and output settings) and the values for the total dosing capacity and operating hours counter remain as they are.

1. Turn off pump and disconnected from the mains power.
2. Simultaneously press the "Down" and "Up" keys and hold them down.
3. Switch on the power supply.
4. "boot" appears in the display.
5. Release the "Down" and "Up" keys.

The settings in the first and second function levels are reset to the default settings.

The pump is now reset.

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DDI (TrueDos) Cheat Sheet No. 4

Hotkeys

You can view and alter some settings in the TrueDos menu whilst the pump is running via the use of 'Hotkeys'. These buttons are located on the front operation panel. The following gives an example of some of the commonly used 'Hotkey' functions.

1. To set the pump to maximum speed for assistance in priming press and hold the *Stop/Start* button. Whilst depressed the pump will operate at full speed, upon release the pump will return to its previous rate.
2. To view the total amount of chemical pumped with pump running press the *menu* button once. To reset counter hold *menu* button for 5 seconds.
3. For pumps fitted with flow/pressure sensor or TrueDos 222 to view the instantaneous operating pressure press the *menu* button twice while pump is running.
4. To view incoming mA signal whilst pump is running in analogue mode press the *down* button.
5. To change the flow rate of a pump in relation to the incoming mA signal whilst pump is running press and hold the *up* button for 5 seconds, analogue and 0-20 or 4-20mA will now flash. Use the *up* or *down* buttons to increase or decrease the flow rate in relation to the present mA signal.

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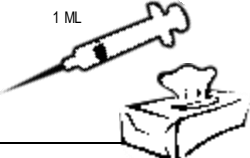
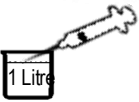
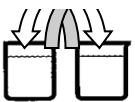
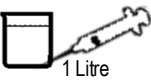
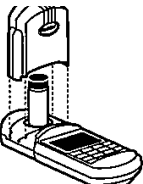
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S05 TESTING SODIUM HYPOCHLORITE STRENGTH - CULCAIRN

Description	Testing sodium hypochlorite strength
To be carried out by	Operator
Frequency	As required.

See following page:

Measuring free chlorine concentration in hypochlorite solution

1.	Collect a small amount of sodium hypochlorite solution from the dosing tank into a beaker	
2.	Draw up 1ml into a 1ml disposable syringe and wipe around the outside of the syringe with tissue paper to remove any liquid present.	
3.	Add the contents of the syringe to water and make up to 1 litre in a measuring cylinder	
4.	Mix the contents in the cylinder by pouring back and forth into a beaker	
5.	Take up 10ml diluted solution into a syringe and add to water to a volume of 1 litre	
6.	Measure the free chlorine concentration in the final solution	

Notes

- Assuming a free chlorine concentration of 12.5% (125 grams per litre) in the undiluted hypochlorite solution, the first dilution step will result in a solution strength of 0.125 grams per litre or 125mg/L. The second dilution reduces the concentration 100 fold to 1.25mg/L.
- Hypochlorite is available from the suppliers normally at a strength of approximately 12.5% and this should be checked at the time of delivery.
- Any decrease in concentration over time on storage can be measured as described above. The dose rate into the treated water should then be adjusted upwards to ensure the desired free chlorine in the final water is achieved.

S06 SETTING GORDON ST RESERVOIR SETPOINTS - CULCAIRN

Description	Explanation of how to set the Gordon Street reservoir setpoints
To be carried out by	Operator
Frequency	As required.

See following page:

CULCAIRN WATER TREATMENT PLANT

As of 12/08/2013

Bore Pump, Relift Pump and Dump Valve Procedures

Sequence	Display Reading	Accumulated Time Elapsed min/sec	Time Elapsed
Gordon St Reservoir calling for water	70%		
Relift Pump starts		0	0
Bore Pump starts		5	5 min
Dump valve starts to open		7.15	2.15 min/sec
Dump valve fully opened		7.40	25 sec
Dump valve starts to close		14.00	6.20 min/sec
Dump valve fully closed		14.25	25 sec
Relift pump stops once Gordon St Reservoir is full	100%	Approximately 90-95 minutes to fill depends on demand	30 L/sec x 7min = 12600 litres bore water dumped for each start-up

Culcairn Water Supply Reservoir Level Gordon St Reservoir

Water Level	Water Level Below Full Level in Metres	Percentage Level	Comments as of 12/5/2018	
Depth in metres 0 - 6.8		0-100%		
6.80	Full	100 %	TWL Current Stop Pump 100%	Relay 2
6.70	0.1 m	98.5 %		
6.60	0.2 m	97.0 %		
6.50	0.3 m	95.6 %		
6.40	0.4 m	94.1 %		
6.30	0.5 m	92.6 %		
6.20	0.6 m	91.1 %		
6.10	0.7 m	89.7 %		
6.00	0.8 m	88.2 %		
5.90	0.9 m	86.7 %		
5.80	1.0 m	85.3 %		
5.70	1.1 m	83.8 %		
5.60	1.2 m	82.3 %		
5.50	1.3 m	80.9 %		
5.45	1.35 m	80 %		
5.40	1.4 m	79.4 %		
5.30	1.5 m	77.9 %		
5.20	1.6 m	76.4 %		
5.10	1.7 m	75.0 %		
5.00	1.8 m	73.5 %		
4.90	1.9 m	72.0 %		
4.80	2.0 m	70.6 %		
4.75	2.05 m	70.0 %	BWL Current Start Pump 70%	Relay 1
4.70	2.1 m	69.1 %		
4.60	2.2 m	67.6 %		
4.50	2.3 m	66.2 %		
4.40	2.4 m	64.7 %		
4.30	2.5 m	63.2 %		
4.20	2.6 m	61.7 %		
4.10	2.7 m	60.3 %		
4.00	2.8 m	58.8 %		
3.80	3.0 m	55.9 %		
3.60	3.2 m	52.9 %		
3.40	3.4 m	50.0 %		
3.20	3.6 m	47.0 %		
3.00	3.8 m	44.1 %		
2.80	4.0 m	41.2 %		
2.60	4.2 m	38.2 %		
2.40	4.4 m	35.3 %		
2.20	4.6 m	32.3 %		
2.00	4.8 m	29.4 %		
1.80	5.0 m	26.5 %		
1.60	5.2 m	23.5 %		
1.40	5.4 m	20.6 %		
1.20	5.6 m	17.6 %		
1.00	5.8 m	14.7 %		
0.80	6.0 m	11.8 %		
0.60	6.2 m	8.8 %		
0.40	6.4 m	5.9 %		
0.20	6.6 m	2.9 %		
0.00	6.8 m	0 %		

To fill reservoirs approx. 100-120 min

12 to 16 hrs for reservoirs to drop 2.1 m

see notes below

PR DISPLAY UNIT




Comments To adjust levels to start and stop Relift Pump adjust PR display as per instructions below

Relay 1 Start Pump -To alter set points **▲** or **▼** button → F/set relay 1 (**Start Pump**) -ok- 70% - alter set point with **▲▼** then ok.

Relay 2 Stop Pump -To alter set points **▲** or **▼** button → F/set relay 2 (**Stop Pump**) -ok- 100% - alter set point with **▲▼** then ok.

Culcairn WTP Proposed Communication.xls – For 70% empty as the Start setpoint

Culcairn Water Supply Reservoir Level Gordon St Reservoir

	Water Level	Water Level Below Full Level in Metres	Percentage Level		
	Depth in metres 0 - 6.		0-100%	Comment as of 6/7/2012	
147	6.80	Full	100 %	TWL Current Stop Pump 100%	Relay 2
147	6.70	0.1 m	98.5 %		To fill reservoirs approx. 60 to 65min
147	6.60	0.2 m	97.0 %		
147	6.50	0.3 m	95.6 %		
147	6.40	0.4 m	94.1 %		
147	6.30	0.5 m	92.6 %		
147	6.20	0.6 m	91.1 %		
147	6.10	0.7 m	89.7 %		
147	6.00	0.8 m	88.2 %		
147	5.90	0.9 m	86.7 %		
147	5.80	1.0 m	85.3 %		
147	5.70	1.1 m	83.8 %		5.5 to 6 hrs for reservoirs to drop 1.35 m
147	5.60	1.2 m	82.3 %		
147	5.50	1.3 m	80.9 %		
147	5.45	1.35 m	80 %	BWL Current Start Pump 80%	Relay 1
147	5.40	1.4 m	79.4 %		see notes below
147	5.30	1.5 m	77.9 %		
147	5.20	1.6 m	76.4 %		
147	5.10	1.7 m	75.0 %		
147	5.00	1.8 m	73.5 %		
147	4.90	1.9 m	72.0 %		
147	4.80	2.0 m	70.6 %		
147	4.70	2.1 m	69.1 %		
147	4.60	2.2 m	67.6 %		
147	4.50	2.3 m	66.2 %		
147	4.40	2.4 m	64.7 %		PR DISPLAY UNIT
147	4.30	2.5 m	63.2 %		
147	4.20	2.6 m	61.7 %		
147	4.10	2.7 m	60.3 %		
147	4.00	2.8 m	58.8 %		
147	3.80	3.0 m	55.9 %		
147	3.60	3.2 m	52.9 %		
147	3.40	3.4 m	50.0 %		
147	3.20	3.6 m	47.0 %		
147	3.00	3.8 m	44.1 %		
147	2.80	4.0 m	41.2 %		
147	2.60	4.2 m	38.2 %		
147	2.40	4.4 m	35.3 %		
147	2.20	4.6 m	32.3 %		
147	2.00	4.8 m	29.4 %		
147	1.80	5.0 m	26.5 %		
147	1.60	5.2 m	23.5 %		
147	1.40	5.4 m	20.6 %		
147	1.20	5.6 m	17.6 %		
147	1.00	5.8 m	14.7 %		
147	0.80	6.0 m	11.8 %		
147	0.60	6.2 m	8.8 %		
147	0.40	6.4 m	5.9 %		
147	0.20	6.6 m	2.9 %		
147	0.00	6.8 m	0 %		

Comments To adjust levels to start and stop Relift Pump adjust PR display as per instructions below

Relay 1 Start Pump -To alter set points **▲** or **▼** button → F/set relay 1 (**Start Pump**) -ok- 80% - alter set point with **▲▼** then ok.

Relay 2 Stop Pump -To alter set points **▲** or **▼** button → F/set relay 2 (**Stop Pump**) -ok- 100% - alter set point with **▲▼** then ok.

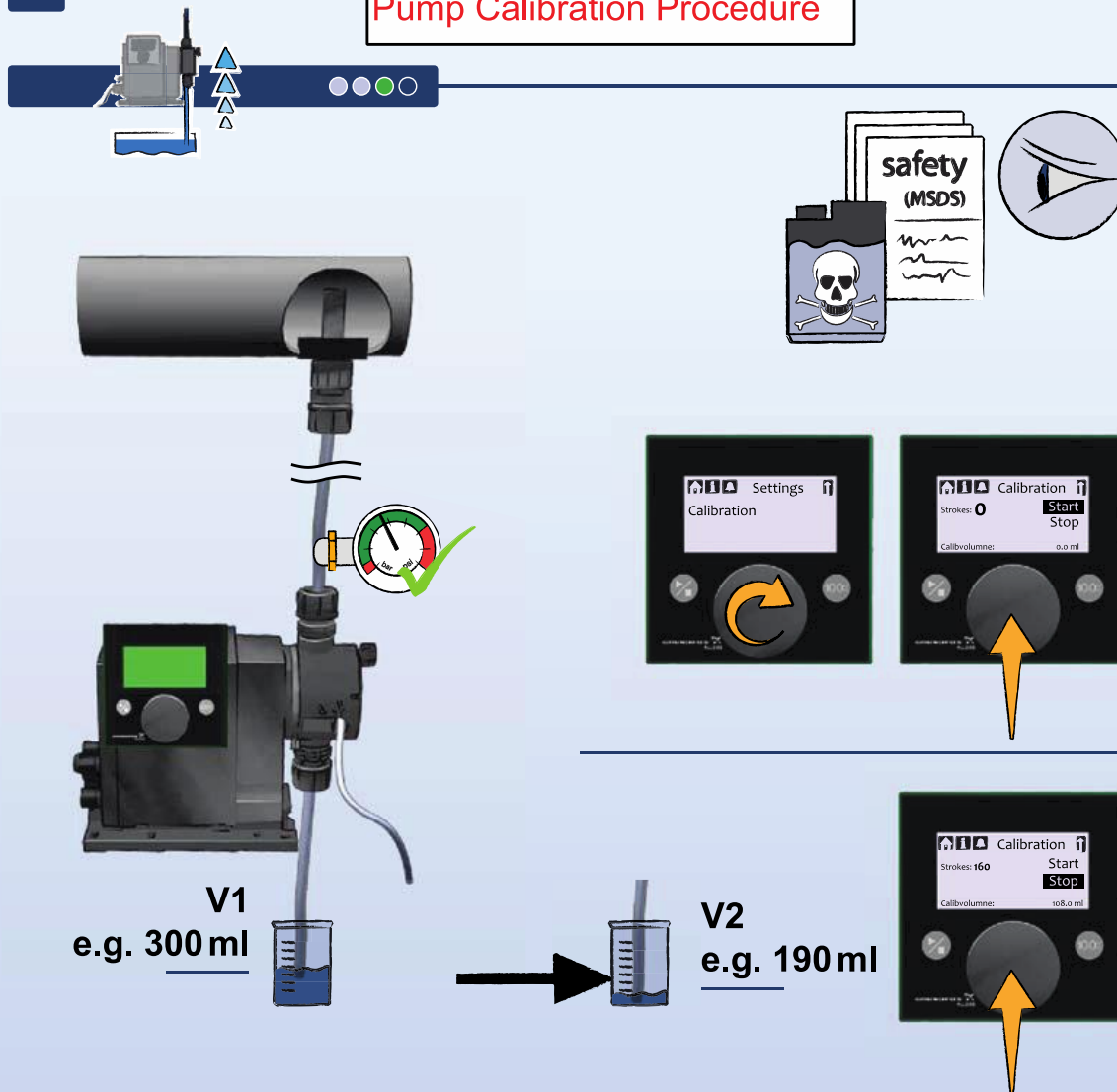
Culcairn WTP Proposed Communication.xls – For 80% empty as the Start setpoint

S07 CULCAIRN WTP DDA DOSING PUMP CALIBRATION

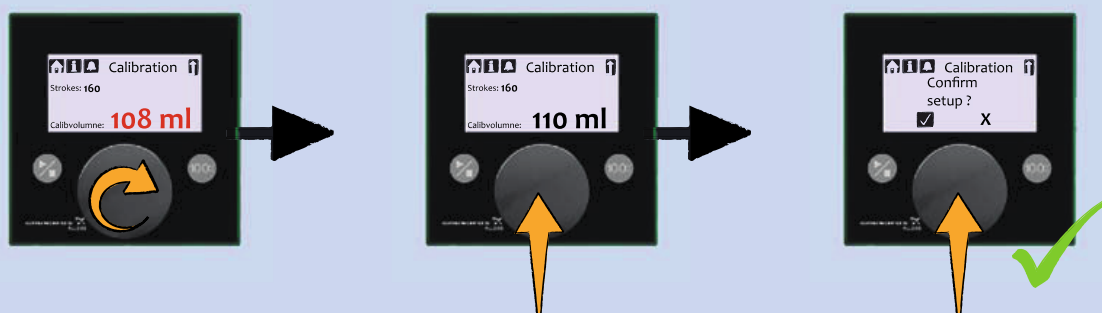
Description	Explanation of Culcairn WTP DDA Dosing Pump Calibration
To be carried out by	Operator
Frequency	As required.

See following page:

18

Culcairn WTP DDA Dosing Pump Calibration Procedure

V1 - V2
e.g. 300 - 190 ml = 110 ml



be think innovate

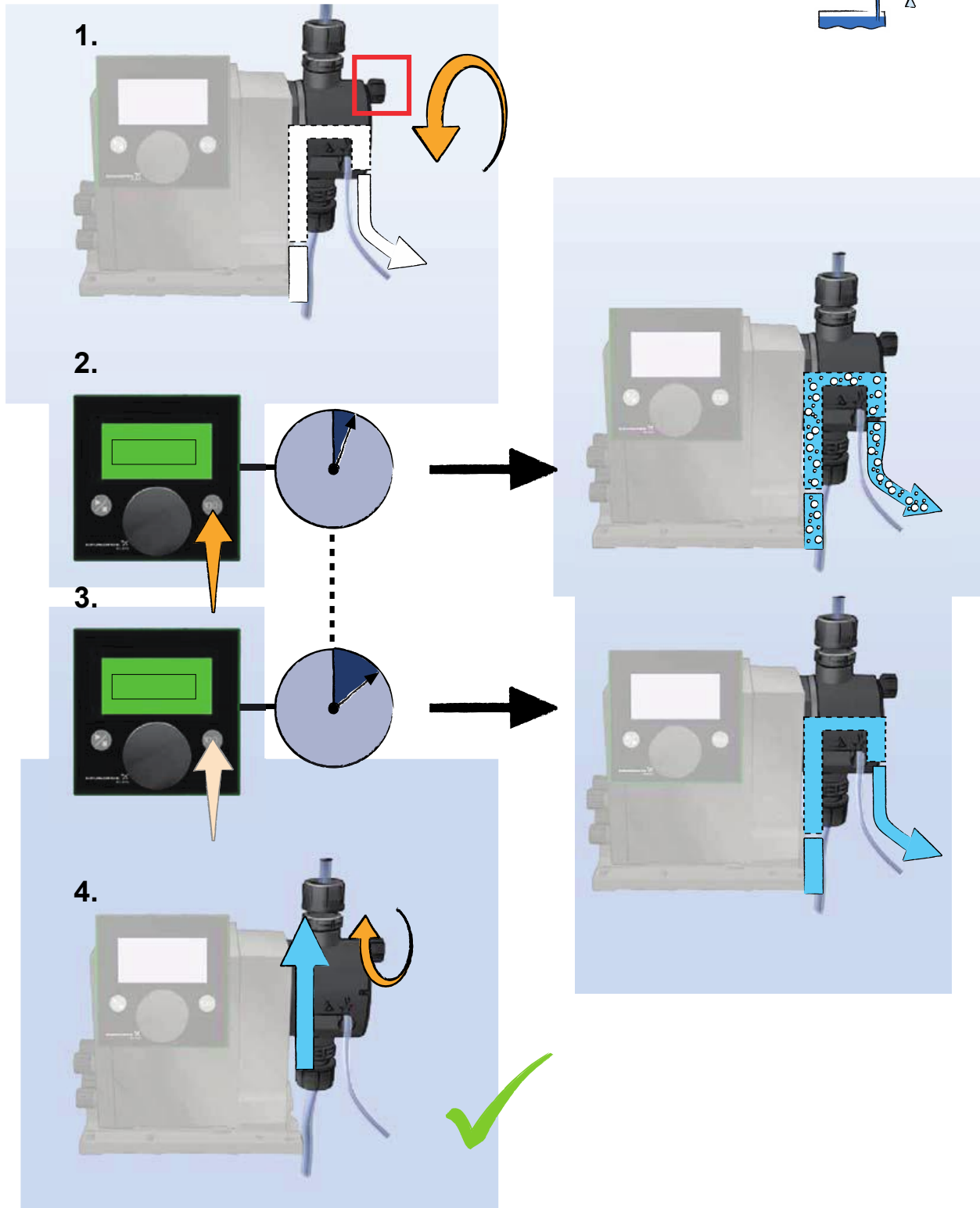
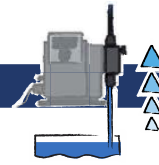
S08 CULCAIRN WTP DDA DOSING PUMP BYPASS

Description	Explanation of Culcairn WTP DDA Dosing Pump Bypass
To be carried out by	Operator
Frequency	As required

See following page:



Culcairn WTP DDA Dosing Pump Bypass Procedure



S09 CULCAIRN WTP ADJUSTMENT OF DOSING RATE DURING PUMP OPERATION

Description	Explanation of Culcairn WTP adjustment of dosing rate during pump operation
To be carried out by	Operator
Frequency	As required.

See following page:

Figure 1- Turn the click wheel clockwise to highlight dosing rate 1.52 l/h



Figure 2- Press the click wheel and highlight  (Analog scaling will be changed)



Figure 3- Turn the click wheel clockwise to increase dosing rate to 2.00 l/h or anti clockwise to decrease dosing.

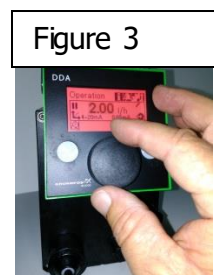
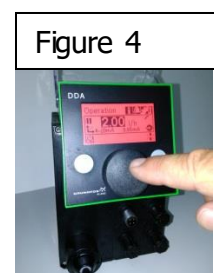


Figure 4- Press the click wheel to save setting (dosing rate l/h). Pump is now back in operation.



S10 CULCAIRN BORE 2 FLUSHING PROCEDURE (FLUSHING TO WASTE)

For this procedure to be carried out the town reservoir is to be full and the plant must be idle i.e. not in use.

Go to the control panel inside the Plant Room.

Read Bore 2 Pump Hours and Starts, and record in diary and on Monthly Log Sheet.

Check GORDON STREET RESERVOIR LEVEL display to ensure it is no less than 80%.



Move switch to OFF position on RELIFT PUMP.



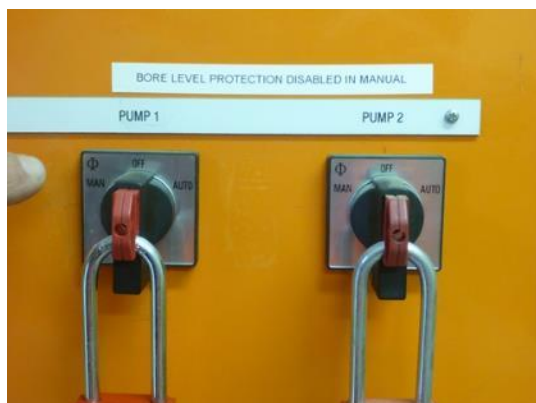
Open double doors below RELIFT PUMP panel. Move aerator circuit breaker switch downwards to OFF position.



Select OFF on FLUSHING SELECTOR switch.



Bore Pump No. 1 – Select OFF position and lock out.



Go to BORE 2 inlet valve at southern side of aerator platform. Place lever in OFF position as per photo.



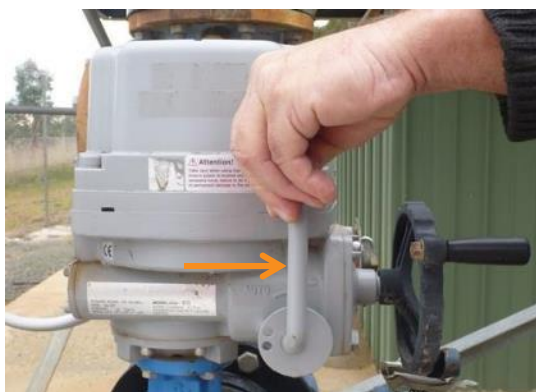
Set outlet valve to position 5.



Valve indicator will be in CLOSE position.



Manually operate dump valve to the OPEN position. Move hand lever to MANUAL position and at the same time turn hand wheel anti-clockwise.



Observe the valve indicator change to the OPEN position.



Return to the Plant Room, remove lock from PUMP 2.



Push red tag in to select MANUAL to start PUMP 2.



As pump starts running, observe AMP meter reading. Bore Pump 2 AMP meter should read 45 AMPS and green light should indicate Bore Pump 2 is running. Run bore for a minimum of 30 minutes.



To check flow, go to wastewater outlet situated on the eastern side of Waterworks Road.

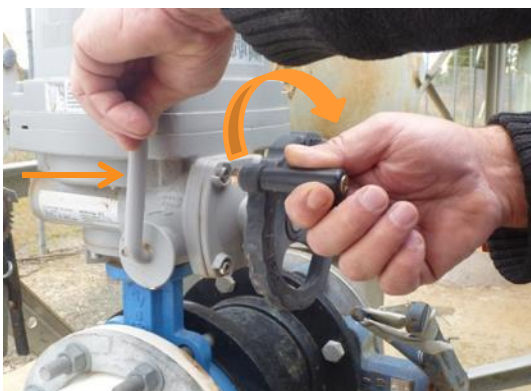


To Turn off Bore No. 2.

Pump 2 – select OFF and lock out



Go back to Bore 2 inlet valve, move hand lever to MANUAL position and at the same time turn hand wheel clockwise and observe valve indicator moving to the CLOSE position.



Outlet valve remains in the No. 5 position. Bore 2 inlet valve remains in CLOSE position and locked out.



Go to Plant Room.

Flushing selector switch to remain in OFF position and locked out.



Remove lock from Bore Pump No. 1 and select AUTO. Move aerator circuit breaker switch upwards to ON position.



Move switch to AUTO on the RELIFT PUMP panel.



Read Bore 2 Pump Hours and Starts and record in diary and on Monthly Log Sheet.

3.0 SOPs Villages Water Supply

S11 ROUTINE INSPECTIONS - VILLAGE SUPPLY

Description	Daily inspections and activities for the Village Water Supply.
To be carried out by	Operators
Frequency	See below

Jindera Pumping Station:

- Record hours run (weekly).
- Change duty cycle over (weekly).
- Grease pumps (monthly) and record in the General Maintenance Logbook.
- Check for vibrations, leaks (weekly).
- Check for security (weekly).
- Take power usage readings (weekly).
- Check pump amps (weekly).
- Check chlorine residuals and pH at sample taps at pumping stations (twice weekly).
- At Site GH01999, take a sample for NSW Health Drinking Water monitoring for chemical testing (every 6 months).
- Record any faults in the General Maintenance Logbook.

Check flow meter reading at Dights Forest Rd and Jindera Gap Reservoir.

Perform housekeeping tasks if required: mow grass.

Jindera Gap Reservoir:

- Free chlorine measurement (twice per week).
- Visual inspection of the site (weekly).
- Check free chlorine residuals (twice per week).

Jindera Reticulation System:

- Test for free & total chlorine, pH, turbidity at Pioneer Park (GH01004) (weekly).
- Collect samples for NSW Health Drinking Water monitoring (monthly) for microbiological testing.

Burrumbuttock Reservoir:

- Free chlorine measurement (twice per week).
- Visual inspection of the site (weekly).
- Check free chlorine residuals (twice per week).
- Visual inspection of reservoir inlet valve. Replace filter on pilot valve weekly.
- Disassemble and inspect valve every 6 months.

Burrumbuttock Reticulation System:

- Test for free & total chlorine, pH, turbidity at Burrumbuttock Hall (GH01002) (weekly).
- Collect samples for NSW Health Drinking Water monitoring (monthly) for microbiological testing.

Big Brock Reservoir:

- Free chlorine measurement (twice per week).
- Visual inspection of the site (weekly).
- Check free chlorine residuals (twice per week).
- Visual inspection of reservoir inlet valve. Replace filter on pilot valve weekly.
- Disassemble and inspect valve every 6 months.

Little Brock Reservoir:

- Free chlorine measurement (twice per week).
- Visual inspection of the site (weekly).
- Check free chlorine residuals (twice per week).
- Visual inspection of reservoir inlet valve. Replace filter on pilot valve weekly.
- Disassemble and inspect valve every 6 months.

Brocklesby Reticulation System:

- Test for free & total chlorine, pH, turbidity at Brocklesby Public School (GH01001) (weekly).
- Collect samples for NSW Health Drinking Water monitoring (monthly) for microbiological testing.

Gerogery Reservoir:

- Free chlorine measurement (twice per week).
- Visual inspection of the site (weekly).
- Check free chlorine residuals (twice per week).
- Visual inspection of reservoir inlet valve. Replace filter on pilot valve weekly.
- Disassemble and inspect valve every 6 months.

Gerogery Reticulation System:

- Test for free & total chlorine, pH, turbidity at Gerogery Park (GH01003) (weekly).
- Collect samples for NSW Health Drinking Water monitoring (monthly) for microbiological testing.

S12 CALCIUM HYPOCHLORITE DOSING AT RESERVOIR – VILLAGE SUPPLY

Description	As required dosing of calcium hypochlorite into reservoirs. Applicable to all reservoirs.
To be carried out by	Operator.
Frequency	As required.

- Ensure appropriate PPE is used: harness and gloves.
- Unlock the access to the ladder. Undo the rope attached to the ladder.
- Climbup ladder, let the rope out to hang free.
- Come down and tie rope to esky.
- Ensure testing kit is in your pocket.
- Climb back up and lift the esky.
- Unlock the reservoir hatch.
- Get a water sample from the reservoir. Go down the ladder into reservoir if required to obtain water sample.
- Test for free chlorine residual at the reservoir.

- Determine the dosage required from the following spreadsheet:

Arch HTH and FREXUS cal-hypo required to raise Cl.xls

Quantity of Arch HTH and FREXUS cal-hypo required in a given volume of water to give a desired rise in chlorine			
Volume of water (m ³)	100	Available chlorine (%)	68
Level of desired chlorine raise	1 ppm (mg/l)		
$\text{Cl}_2 \text{ required} = \frac{\text{Required rise in Cl}_2 \text{ level} \times \text{Volume of reservoir in m}^3}{\text{Available chlorine of product (\%)} / 100}$			
Cl ₂ raise	1 ppm (mg/l)		
vol	100 m ³		
Av /Cl ₂	68 %		
147.0588 grammes			
0.147 Kilos			

- Remove the canister from the reservoir. Place appropriate number of tablets (halves if need be) into canister, leaving previously placed tablets within, and replace canister into reservoir.
- Close and lock the hatch.
- Lower the esky down. Ensure no equipment is left at the top of reservoir.
- Descend, undo the rope from esky.
- Climb the ladder, and secure rope to the ladder.
- Lock the access to the ladder.

S13 MAINS FLUSHING – VILLAGE SUPPLY

Description	Mains flushing.
To be carried out by	Operator.
Frequency	As required.

- Clean hydrant as follows, if needed:
 - Clamp the scour key on to the hydrant, open the hydrant to flush the chamber.
 - Stir the chamber occasionally to loosen any dirt.
 - Continue flushing until the water runs clear.
 - Remove scour key.
- Install standpipe to hydrant by clamping. Attach hose to standpipe, if needed, to redirect flow of water.
- Open hydrant gradually and commence flushing.
- If the flushing is due to low chlorine residual, then check the chlorine residual once water is visibly clear. When the free chlorine level exceeds 0.2mg/L and the water is clear, close the hydrant slowly.
- If the flushing is for maintenance and mains breaks, then flush until water is visually clean.
- Remove standpipe and hose.
- Once hydrant is closed, check for leaks.

4.0 SOPs Common – All Schemes

S14 NEW MAINS COMISSIONING – ALL SCHEMES

Description	Putting new mains into service
To be carried out by	Operator.
Frequency	As required.

- Isolate the main.
- Charge and flush the main.
- Isolate for 24h and visually check for leaks.
- If no leaks are observed, connect the water cart to the main via a hydrant at the end of the line.
- Determine the amount of sodium hypochlorite required (see calculation) to be added to water cart.

*Sodium Hypo dosing 4A.xls (A sample for a previous project is provided below.
Comments specific to the project can be added).*

BUNGOWANNAH ROAD MAINS EXTENSION JINDERERA			
DEC 2012.			
SUPER CHLORINATION OF NEW MAINS			
SUPER CHLORINATION OF NEW MAINS			
	Pipe Diameter in metres	Length in metres	Hypo Dose Rate mg/l
	0.15	1200	10
Answer	21.21	KL/Water	
	21206	Litres/Water	
	1.77	Litres/Hypo	
	1767	mls/Hypo	
1 Close stop valve at Southend end of main extension (Opposite Jake Vandorsen property)			
2 Open hydrant at Northern end of main extension.			
3 Mix 1.8 litres of 12.5% Sodium Hypochlorite with 600 litres potable water.(GHSC mobile 600 litre tank & pump trailer)			
4 Inject this mixed Hypo solution by pumping directly into mains through hydrant (location as instructed)			
5 Once you injected the 600 litres into main close hydrant at Northern end of main ext.			
6 Procedure to flush main the next day will be discussed on site.			

- Add required sodium hypochlorite to water cart.
- Open the standpipe or service connection at the other end of the main to bleed the main.
- Start pumping the sodium hypochlorite into the main from the water cart.
- If the water cart empties, open up the stop valve on the main to push the super chlorinated water to the other end of the main.
- Test the water coming out of the other end of the main, until the required level of chlorine is obtained.

- Shut all valves and allow the super chlorinated water to sit for 24h.
- After 24h, flush the main until the chlorine levels reach normal levels in the reticulation system.
- Open up the main to the system.

S15 WATER MAINS REPAIRS – ALL SCHEMES

Description	Procedure to repair water mains
To be carried out by	Operator.
Frequency	As required.

Crack in Water Main:

- Locate crack or breakage with a visual check.
- Undertake traffic and pedestrian management plan as per Council's standard plans.
- Locate other services such as gas, power, telecommunications.
- Organize excavating equipment.
- Determine exact location of break. This is achieved by probing or excavation.
- Check plans to identify valves to be used for isolation.
- Notify any major non-residential customers of supply disruption.
- Excavate around location of break.
- Assess if repair can be carried-out under pressure or if shutdown is required.
- If required, shutdown section of line affected. Communicate when shutdown occurs to the Culcairn office.
- Undertake repair as required by procedures.
- Flush the mains as per the mains flushing procedure.
- Once flushing is complete, open up the main to the system.
- Erect safety barriers around the site and return after a minimum of 24-48h as required.
- Check for leaks and retension as required.
- Backfill and restore site.

Replacement of damaged section of pipe:

- Locate crack or breakage with a visual check.
- Undertake traffic and pedestrian management plan as per Council's standard plans.
- Locate other services such as gas, power, telecommunications/.
- Organize excavating equipment.
- Determine exact location of break. This is achieved by probing or excavation.
- Check plans to identify valves to be used for isolation.
- Notify any major non-residential customers of supply disruption.
- Shutdown section of line affected. Communicate when shutdown occurs to the Culcairn office.
- Excavate around location of break.
- Undertake repair as required by procedures. If AC pipe is being removed, follow safety requirements for AC handling.
- Flush the mains as per the mains flushing procedure,
- Backfill around excavation.
- Once flushing is complete, open up the main to the system.
- Erect safety barriers around the site.

S16 CHEMICAL SAFETY & HANDLING

Description	Procedure for Chemical Safety & Handling
To be carried out by	Operators
Frequency	As required

See following page.

1. **LABELS:** Ensure the bottle has the correct product in it and correctly labelled. Do not use unlabelled chemicals. Replace any labels which are damaged or illegible.
2. **CORRECT USE OF CHEMICALS:** Always use chemicals as per the instructions on the label, product information sheets, wall charts and on the Material Safety Data Sheet.
3. **READ THE MSDS BEFORE YOU USE ANY CHEMICALS:** Not all the information you need is on the label. It is your responsibility to always know where the chemical register is kept.
4. **CHEMICALS – SAFE HANDLING:** Do not mix chemicals, (it's hazardous and can be counter-productive). Do not "Top Up", (it's hazardous and can lead to cross contamination). Always use a clean empty container. Do not overdose.
5. **RETURN CHEMICALS AFTER USE:** When finished with chemicals, wipe down the bottle and store away safely in chemical cupboard.
6. **ALWAYS WEAR APPROPRIATE PROTECTIVE CLOTHING:** i.e. aprons, gloves, goggles or glasses, safety footwear, masks etc (as per the MSDS).
7. **REPORT ALL SPILLS, ACCIDENTS & ILL EFFECTS:** Ensure Spill Kits are available and easily accessible. Remove spills as per MSDS directions. If unable to contain spills safely, in an **EMERGENCY** dial 000, Police or Fire Brigade.
8. **FIRST AID KIT:** First Aid Kits should be easily accessible.
9. **NEVER STACK CHEMICALS MORE THAN 2 DRUMS HIGH:** Stacking chemical drums and boxes more than 2 high is unsafe. They may fall and cause damage. It is advisable to store powders above liquids.
10. **IF IN DOUBT THROW IT OUT:** If you are not sure of a product, label, etc do not use it. Notify your supervisor so it can be disposed of properly.
11. **OBSERVE SAFE OPERATION OF DISPENSING EQUIPMENT:** Ensure all staff know how to safely operate chemical-dispensing systems.
12. **USE OF CONTAINERS:** Seal containers when not in use. Do not open damaged containers. Return them or seek advice from your supplier.
13. **HYGIENE:** Always wash your hands after using chemicals, (even if gloves were worn).
14. **VENTILATION:** Ensure there is adequate ventilation in the storeroom, plant room, pump shed and when using the chemicals.
15. **SAFETY:** If in doubt as to the correct use of the chemical, **DO NOT USE.**
16. **SMOKING:** Do not smoke anywhere near the chemicals or whilst you are using them.
17. **FOOD SAFETY:** Do not use any chemicals near food.
18. **CORRECT CHEMICAL, CORRECT JOB:** Always use the correct chemicals for each job.
19. **PERSONAL PROTECTIVE EQUIPMENT:** Always use PPE and clean all safety equipment after use.
20. **MOST IMPORTANTLY, USE COMMON SENSE:** Every precaution must be taken when using chemicals to ensure that individual safety and responsibility is optimised.

S17 PREVENTING CROSS CONTAMINATION DURING MAINTENANCE – ALL SCHEMES

Description	Procedure for Prevention of Cross Contamination from Tools used for Drinking Water
To be carried out by	Operators, maintenance staff or contractors conducting works on drinking water assets.
Frequency	Prior to using tools or materials with a cross contamination risk on drinking water assets.

Works undertaken at the water treatment plant or on drinking services for maintenance or repairs requires appropriate hygiene practices in order to prevent contamination which might endanger public health. It is vital that all relevant water personnel take the strictest possible precautions to avoid any contamination when working with drinking water equipment or services and understand how to ensure good hygiene.

General Items

- Review the order of works to see if it is possible to perform drinking water works prior to wastewater works.
- Where possible, use separate tools for drinking water works.

Before Starting Works

- Wash and clean any gear (e.g. boots, clothing) that has come into direct contact with wastewater.
- Disinfect any tool that has been used for wastewater works prior to use on drinking water assets.
- Wash hands with soap and water or hand sanitiser after using toilet facilities or before undertaking works on drinking water assets.
- Inform your Supervisor if you have suffered a notifiable disease. Your General Practitioner (GP) will inform you if you have a notifiable disease.

Disinfecting Tools and Materials

Tools that are used on both drinking water and wastewater assets are the highest risk for cross contamination, however this procedure should be used for all tools and equipment where the prior usage is unknown or high risk.

Method One – Neat Hypochlorite Spray

- Ensure that appropriate PPE is worn.
- Prior to disinfecting, rinse the tool or material in running potable water, removing all dirt and detritus.
- Apply sodium hypochlorite (minimum concentration 5% w/v) using a spray bottle.
- Rinse the tool thoroughly in running potable water, ensuring that all chemical is removed.

Method Two – Soaking in Dilute Hypochlorite

- Ensure that appropriate PPE is worn.
- Prior to disinfecting, rinse the tool or material in running potable water, removing all dirt and detritus.
- Pour sodium hypochlorite (minimum concentration 10% w/v) into a PVC or PP bucket to allow a 40:1 dilution ratio.

Size of Bucket	Minimum Hypochlorite Required (10% w/w)
5L	125mL
10L	250mL
20L	500mL
40L	1000mL

- Leave the tools to soak for five minutes.
- Rinse the tool thoroughly in running potable water, ensuring that all chemical is removed.

Materials

- All materials used for the repair should remain in the sealed condition as provided by the manufacturer and is not uncovered until immediately before use.
- Disinfect pipes and materials before use, if they have not been covered and/or are not clean.
- During transportation, ensure that the pipes/components are properly enclosed or capped to avoid dust/debris from contaminating them.

During the Repair

- As far as possible, undertake the repair work under pressure. If there is a need to isolate the pipe, discuss with the Overseer/Manager Water and Wastewater.
- Use a pump to dewater the repair site as necessary.
- Disinfect or clean pipe and repair components, if required
- Ensure contaminants do not enter the system during the repair.
- Thoroughly flush the system after repairs. Flushing should continue until a free chlorine residual of 0.2 mg/L or higher is obtained.

S18 CHEMICAL (CHLORINE) QUALITY MANAGEMENT

Description	Procedure for quality management of the chlorine chemical used.
To be carried out by	Chemical stores staff
Frequency	As required and stated in the procedure.

Chemicals

- The approved chemical used in the supplies is chlorine: sodium hypochlorite (liquid) and calcium hypochlorite (tablets).
- Chlorine has been checked against the list of chemicals approved in the ADWG (Chapter 8) and is approved for use.
- The tablets used should be unstabilised (i.e. should not contain cyanuric acid as they will be not effective in enclosed tanks).

Suppliers and COA

- The Manager or Overseer approves the chemical contractors to use.
- The contractors are chosen based on chemical quality, price, reputation and reliability.
- All contracted suppliers must comply with the relevant contract documents for water treatment chemicals. They should also provide:
 - a Certificate of Analysis (COA) when the delivery is done, or where agreed prior to the delivery date
 - a Safety Data Sheet (SDS) for all new or modified product supplied.
- The COA and SDS should be retained as records. If possible, provide to the Manager or Overseer for records.

Receiving Chemicals

The delivery point for the chemicals is Council stores. The staff receiving the chemical undertakes inspection, including accepting and checking:

- chemical and quantity against carrier note and council order
- condition of packaging and, if possible, product
- obtain the COA and SDS (if applicable) and file
- direct the carrier on the appropriate unloading location
- ensure there is no cross contamination during unloading
- sign off the carrier's delivery docket.

Non-conforming Product

- If the receiving staff identifies possible non-conforming product, the Manager/Overseer should be notified immediately to decide if the product will be accepted or returned.
- Non-conforming product is not to be used until the Manager has cleared it or provided further instructions.

Stock Rotation

- Stock is to be drawn (used) according to age – oldest is used first.
- Stock rotation is managed by the stores.