BRISBANE CITY COUNCIL
BRISBANE WATER

Australia Trade Coast Sewer Project
SP299 - Viola Place Pump Station
Operation & Maintenance Manual
Contract No. BW30137-02/03

Volume No. 4 Contents

BRISBANE CITY COUNCIL
Brisbane Water
Viola Place P/S SP299 Australia Trade Coast Sewer Project

BCC Contract No. BW30137-02/03

Viola Place Pump Station SP299

Revision Control

Revision Number	Date	Amendment Details	Responsible Officer
Version 0.00	5 April 2006	Draft Manual Issued	Stuart Cowhig
Version 1.00	28 April 2006	Manual Issued	Stuart Cowhig

BRISBANE CITY COUNCIL
Brisbane Water
Viola Place P/S SP299 Australia Trade Coast Sewer Project

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SECTION 2

Brisbane City

Brisbane Water

BRISBANE WATER

Network Control Systems

FUNTIONAL SPECIFICATION

SP299 Viola Place

Sewage Pumping Station

Submersible 2 Pumps With VSD

Document Signoff

Approval

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Supervising Elec. Eng *Engineering Design Services*	Alan Mooney	Recommend		
Supervising Elec. Eng *Engineering Design Services*	Henri Lai	Concur		
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Manager *Mechanical And Electrical Services*	Michael Greene	Concur		
Project Manager	Andrew Banik	Approve		

Distribution

Name	Role	Section

Revision Control

Revision Number	Date	Amendment Details	Responsible Officer
Version 0.00	11/11/2004	Original Draft – Developed from Leightons SP300 Revised Functional Spec – Version 3	Alex Witthoft
Version 0.04	29/11/2004	Added Comments by Malcolm Barrett	Alex Witthoft
Version 0.05	10/05/2005	Updated to reflect changes made to Serpentine Rd Spec (up to Version 0.30)	Alex Witthoft
Version 0.10	11/05/2005	Issued for External Review by Leightons	Alex Witthoft

Document Consultation

Please review the attached document and add your comments where necessary. To ensure that the process is kept within reasonable timeframes, it would be appreciated if you could return this document by the **Requested Return Date** listed below.

Project Sponsor: Andrew Bannik Officer Code: PM13BW Location: T.C.B. Level 2

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Document Administrator: Alan Mooney Officer Code: SEEPSBW Location: T.C.B. Level 2

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0.04	Peter Sherriff	Cullen Ave	29/11/04	06/12/04	06/12/04	Y	Y
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0.04	Alan Mooney	T.C.B. 2	29/11/04	06/12/04	06/12/04	Y	Y
0.04	Peter Casey	T.C.B. 2	29/11/04	06/12/04	06/12/04	Y	Y
0.04	Henri Lai	T.C.B. 2	29/11/04	06/12/04	06/12/04	Y	Y
0.05	Reg McGirr	T.C.B. 2	11/05/05	11/05/05	11/05/05	Y	Y

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Definitions

IDTS	Integrated Departmental Telemetry System
RTU	Remote Telemetry Unit
SCADA	Supervisory Control And Data Acquisition
MAHD	Metres above Australia Height Datum

1 INTRODUCTION

This document contains the site specific details and describes the non standard functional requirements for control, monitoring and telemetry at sewage pump station SP299 at Viola Place. The functional requirements described in the document are in addition to the standard functionality detailed in "SPSV3 SEWAGE PUMPING STATION SUBMERSIBLE 3 PUMPS WITH VFD" [1].

The standard specification was written for a 3 pump station, of which only 2 pumps are allowed to run at any given time. The functionality for SP299 Viola Place is identical, except that SP299 only has 2 pumps, both of which can run simultaneously into the DN1370 main and single pump into the DN1840 main.

The site specific details and the non standard functional requirements in this document were derived from the functional specification written by Leighton Contractors Pty Ltd "SP299 FUNCTIONAL SPECIFICATION REV 1" [2].

SP299 is a sewage pump station incorporating two variable speed driven 110 kW submersible pumps operating in a duty/standby arrangement. SP299 is located on the south east side of Viola Place, Eagle Farm, near the junction with Terminal Drive. (access via terminal drive).

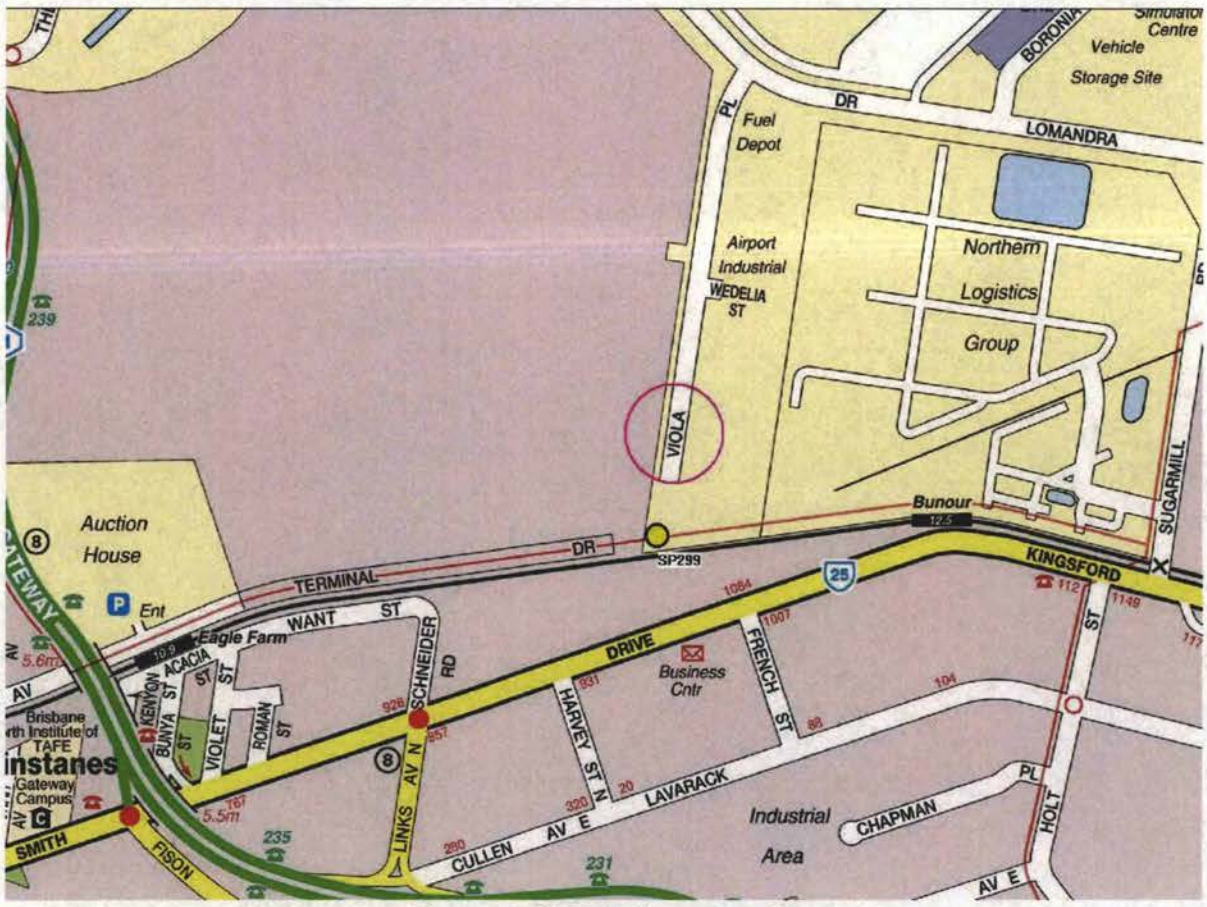

Figure 1: SP299 Location Map

1.1 General Process Description

SP299 Viola Place will service the redevelopment of the Trade Coast Central site, which is owned by the Brisbane City Council. SP299 was constructed well in advance of the Trade Coast Central development and hence needs to operate for extended periods of time under low inflow conditions.

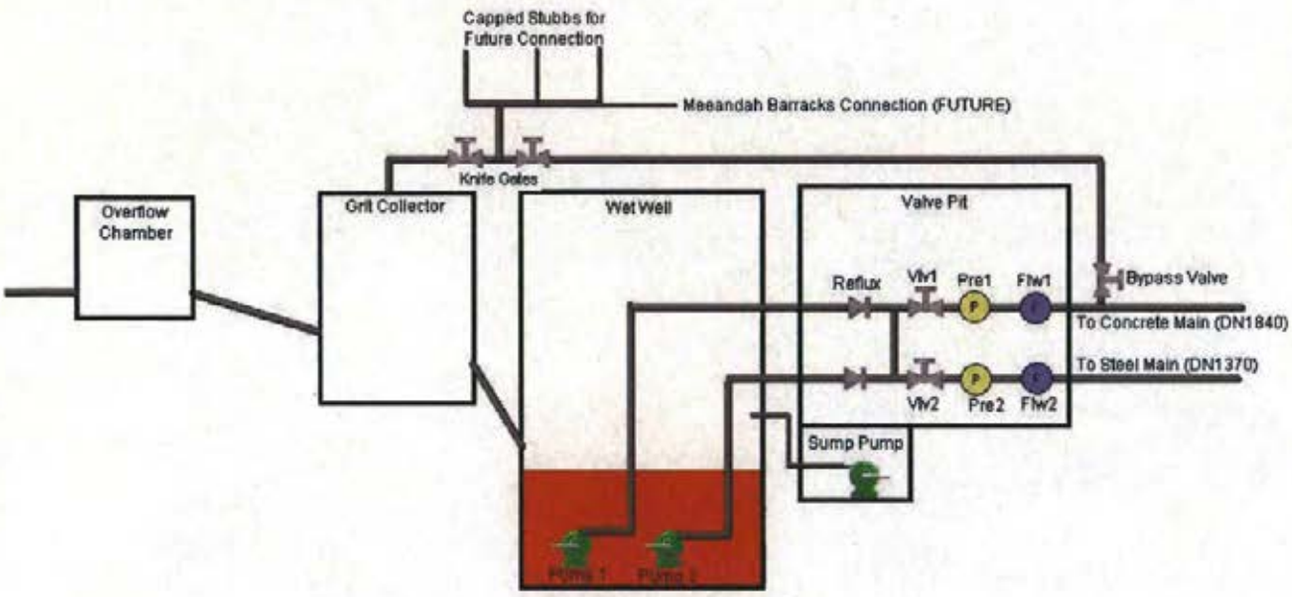

Figure 2: SP299 Process and Instrumentation Overview

SP299 is designed to discharge into one of two 'Eagle Farm to Luggage Point' rising mains

1. Low pressure DN1840 concrete rising main
2. Higher pressure DN1370 steel rising main.

The Eagle Farm Pump Station (EFPS) actually consists of two pump stations:

1. EFPS#1, which has three 2000 kW pumps in a two duty/one standby arrangement; and
2. EFPS#2, which has two 1850 kW pumps in a duty/standby arrangement.

Both EFPS#1 and EFPS#2 use variable speed pumps and hence the sewage flow in each rising main is variable.

During dry weather, EFPS#1 is normally used in conjunction with the DN1370 main. Under this operating arrangement, EFPS#1 can deliver a maximum of around 4200 L/s through the DN1370 main to the Luggage Point WWTP.

During wet weather events, EFPS#1 is normally used in conjunction with the DN1370 main, and EFPS#2 is brought online to assist, in conjunction with the DN1840 ma in. Under this operating arrangement, the EFPS can deliver a maximum of around 8000 L/s through both mains to the WWTP.

If the steel rising main DN1370 is offline (for maintenance) then EFPS#2 is operated in conjunction with the DN1840 main. Under this operating arrangement, the operator at Eagle Farm runs EFPS#2 in manual mode to ensure that the pressure remains within acceptable limits.

As SP299 Viola Place is required to deliver sewage directly into the existing rising mains, its duty head is a strong function of the residual head in the selected discharge main. The maximum and minimum pump duties for SP299 are presented in the table below.

Main in Use	EFPS Flow (L/s)	SP299 Flow (L/s)	SP299 Head (m)
DN1370	4200	104	54.2
	0	104	11.6
DN1840	3800	104	19.6
	0	104	11.6

SP299 Viola Place has been designed to operate predominantly with the steel rising main and the pumps and drives have been sized accordingly. If this steel rising main is not in service (as determined by the Eagle Farm pump station operators), then SP299 can utilise the concrete rising main provided that certain limitations are adhered to.

The main two limitations are limiting the station to only run one pump and to restrict the pump running to a maximum speed of 33Hz. Limiting the speed of the drive limits the flow and head pressure to the figures shown in the table below. The limiting of the speed will limit the flow and the head pressure to the limits listed below. These limits will have alarms configured to alert both the Eagle Farm control room and IDTS master station.

Main in Use	Maximum Pumps to Run	Maximum Speed (Hz)	Maximum Flow (l/s)	Maximum Head Pressure (m)
DN1370	2	55.0	Unlimited	Unlimited
DN1840	1	30.0	104	10.0

2 EQUIPMENT INSTALLED

2.1 Standard Equipment

SP299 Viola Place pump station has the following standard equipment installed. The functionality for the control, monitoring and alarming for these items is fully described in the standard functional specification.

Pumps	Two Hidrostal H05K submersible pumps with 110 kW four pole electric motors are installed in the wet well. Each pump is fitted with moisture probes in the oil chamber and thermistors in the stator windings.
Pump Starters	Two Danfoss VLT8000 Variable Frequency Drives (VFDs) are installed in the pump station switchboard. The VFDs will also provide soft starting functionality.
Flow meters	Two direct buried DN300 ABB Magmaster electromagnetic flowmeters are installed in the DN315 PE100 discharge mains downstream of the valve chamber. The flowmeter will be used in the flow control algorithm (PID Loop) to control the speed of the pumps.
Level Sensors	One Vega hydrostatic level transmitter and one Multitrode level probe are installed in the wet well.
Pressure Transmitters	Two Vega D84 pressure transmitters are installed on the discharge pipe work in the valve chamber.

2.2 Non Standard Equipment

SP299 Viola Place pump station has the following non standard equipment installed. The functionality for the control, monitoring and telemetry for is described in the following sections as these items is NOT described in the standard specification.

Emergency Generator	One Stamford/John Deere 300 kVA diesel powered backup generator is installed on a slab adjacent to the valve chamber. The generator includes its own GE FANUC PLC mounted in a dedicated control panel inside the generator housing.
Actuated Valves	Two DN250 Keystone Figure 951 knifegate valves with 415V Rotork actuators are installed in the discharge pipework in the valve chamber.

2.2.1 Emergency Generator

The emergency generator is designed to the standard functionality as described by "DIESEL STANDBY GENERATOR LOCAL CONTROL PANEL FUNCTIONAL DESCRIPTION". [3] The generator is supplied with the PLC fully configured and loaded with the standard program. The RTU (Logica MD3311) will programmed with the standard interface program that will provide the monitoring, control and telemetry to the IDTS master station.

2.2.2 Actuated Valves

The two actuated knife gate valves are used to control which rising main the station will pump into. The functionality of these valves is detailed in the Control Philosophy section.

2.3 Provision for Future Non-Standard Equipment

Although the project has made civil provision for the following future equipment, no PLC or RTU code has been developed

- Dosing Pump

Any future project to install the above equipment will provide funding for the functional specification and programming of the control, monitoring and telemetry.

2.3.1 Dosing Pumps

Provision was made for two chemical dosing pumps (nominally Alldos 0.09 kW) to be installed adjacent to the dosing slab. Provision was made for VFDs for these pumps to be installed in a dedicated control panel adjacent to the pumps.

2.3.2 Activated Carbon Scrubber

Provision was made for one activated carbon odour scrubber (nominally RKR Engineering Airclenz) to be installed adjacent to the wet well. Provision was made for the starter and controls for the activated carbon unit to be installed in a dedicated control panel adjacent to the scrubber.

3 CONTROL PHILOSOPHY

The station will operate according to the control philosophy detailed in the standard functional specification (SPSV3). The only modification is to the duty rotation algorithm, which will now control only two pumps instead of three. The number of pumps allowed to run remains the same (2) and the initialisation block will be configured with the site specific set points listed in the tables in the next sections.

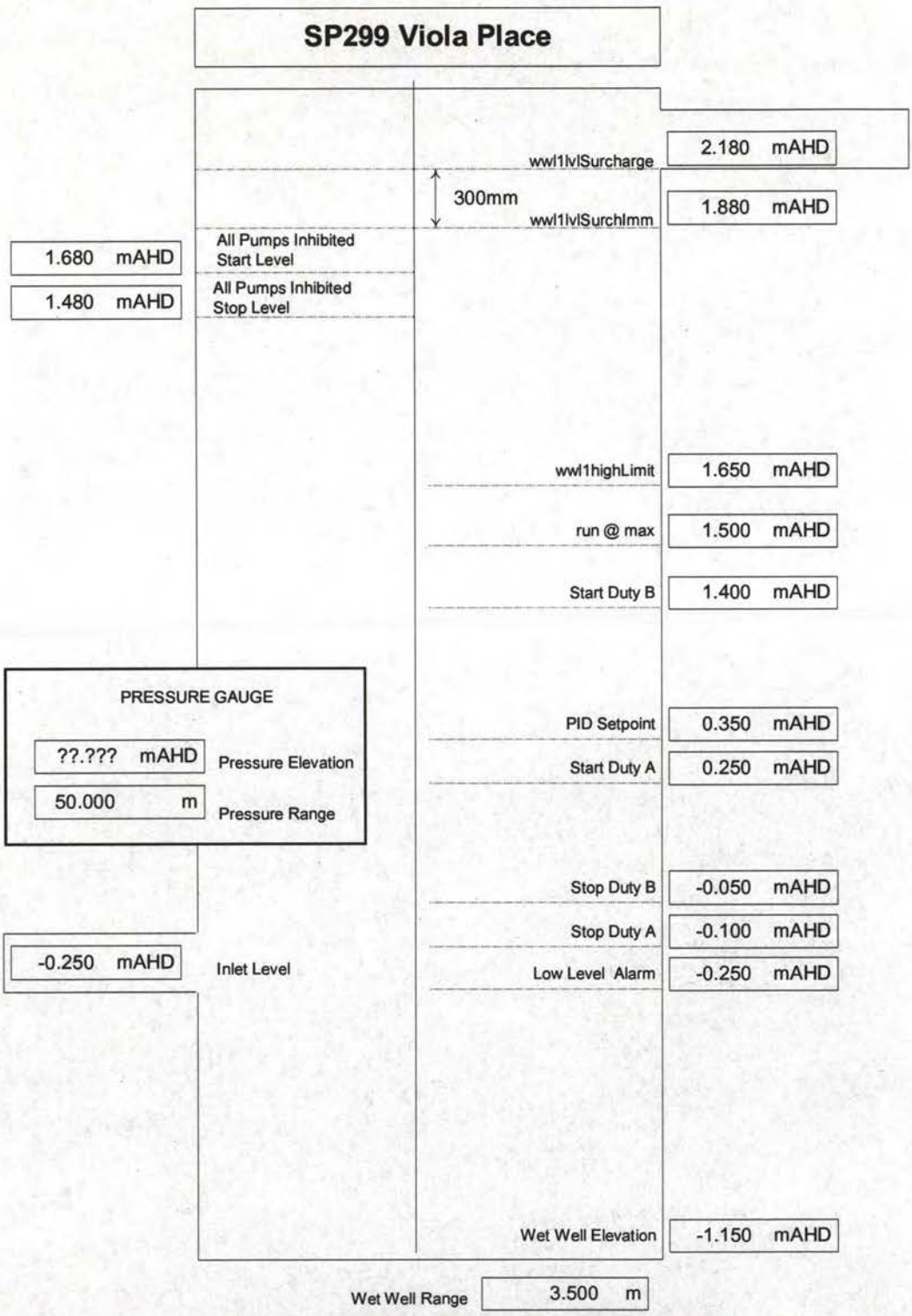

Figure 3: SP299 Station Level Set Points

SOME LEVELS MAY CHANGE ACCORDING TO COMMISSIONING FIGURES

3.1 Site Specific Values

Table 1: Site Specific Constants defined in the PLC

Tag Name	Description	Type	Value	Units
Sewerage Pumping Station				
Stn01grSurchPumpingTime	Surcharge pumping duration [3]	Integer		Sec
Delivery flow				
Flw01txRange	Delivery flow – Range	Real		l/s
Stn01grMinFlow1Pmp	Delivery flow – Minimum flow	Real	45	l/s
Stn01grMaxFlow1Pmp	Delivery flow – Maximum flow – 1 Pump	Real	104	l/s
Stn01grMaxFlow2Pmp	Delivery flow – Maximum flow – 2 Pumps	Real	104	l/s
Delivery pressure				
Pre01txRange	Delivery pressure - Range	Real		mmAHD
Pre01txZero	Delivery pressure – Elevation of the transducer	Real		mmAHD
Pump Blockage				
Stn01grPmpBlockFlowKneeSP	Flow blocked limit for flow/level PID control (knee)	Integer		l/s x 100
Stn01grPmpBlockSpeedKneeSP	VFD speed blocked limit for flow/level PID control (knee)	Integer		Hz x 100
Stn01grPmpBlockSpeedMinSP	VFD speed blocked limit for minimum flow PID control	Integer		Hz x 100
Wet well level				
Wwl01txRange	Wet well level range	Integer	3500	mmAHD
Wwl01txSurchImmLevelSP	Wet well surcharge imminent level	Integer	1880	mmAHD
Wwl01grInhStartLevelSP	Wet well inhibit mode start level	Integer	1680	mmAHD
Wwl01grInhStopLevelSP	Wet well inhibit mode stop level	Integer	1480	mmAHD
Wwl01grRunatMaxLvlSP	Wet well run at maximum speed level	Integer	**1500**	mmAHD
Wwl01txDtyBStartLevelSP	Wet well duty B pump start level	Integer	**1400**	mmAHD
Wwl01txPIDLevelSP	Wet well PID set point	Integer	**350**	mmAHD
Wwl01txDtyAStartLevelSP	Wet well duty A pump start level	Integer	250	mmAHD
Wwl01txDtyBStopLevelSP	Wet well duty B pump stop level	Integer	**-50**	mmAHD
Wwl01txDtyAStopLevelSP	Wet well duty A pump stop level	Integer	-100	mmAHD
Wwl01txZero	Wet well empty level (4mA of Probe)	Integer	-1150	mmAHD
Variable Frequency Drive				
Stn01grMinSpeed	Variable Frequency Drive – Minimum Speed (either mode)	Integer	2500	Hz x 100
Stn01grMaxSpeed1	Variable Frequency Drive – Maximum Speed (Mode 1)	Integer	5500	Hz x 100
Stn01grMaxSpeed2	Variable Frequency Drive – Maximum Speed (Mode 2)	Integer	3000	Hz x 100

Table 2: Site Specific Constants defined in the RTU

Tag Name	Description	Type	Value	Units
flw1almInhibitTm	Delivery flow - Alarm inhibit timer	Integer	15	sec
pre1almInhibitTm	Delivery pressure - Alarm inhibit timer	Integer	15	sec
wwl1surchLvlVol	Wet well volume at surcharge level	Real	24.9	kl
wwl1lvlSurcharge	Wet well surcharge occurring level	Real	2.180	mAHD
Pumps 1 & 2				
Pmp[x]almInhPwrTm	Pump [x] - Motor power alarm inhibit timer.	Integer	15	sec
pmp[x]almInhCrntTm	Pump [x] - Motor current alarm inhibit timer.	Integer	15	sec
pmp[x]currRange	Pump [x] - Motor current range	Real		Amps

Table 3: Site Specific Variable defined in the RTU

Tag Name	Description	Type	Value	Units
Wet well level				
wwl1highLimit	Wet well level - High alarm set point	Integer	510	mmAHD
wwl1lowLimit	Wet well level - Low alarm set point	Integer	-970	mmAHD
Delivery flow				
flw1highLimit	Delivery flow - High alarm set point	Integer	3600	ml/s x 10
flw1lowLimit	Delivery flow - Low alarm set point	Integer	700	ml/s x 10
flw2highLimit	Delivery flow - High alarm set point	Integer	3600	ml/s x 10
flw2lowLimit	Delivery flow - Low alarm set point	Integer	700	ml/s x 10
Delivery pressure				
pre1highLimit	Delivery pressure DN1370 - High alarm set point	Integer		mmAHD
pre1lowLimit	Delivery pressure DN1370 - Low alarm set point	Integer		mmAHD
pre2highLimit	Delivery pressure DN1840 - High alarm set point	Integer		mmAHD
pre2lowLimit	Delivery pressure DN1840 - Low alarm set point	Integer		mmAHD
Pumps 1 & 2				
pmp[x]currHiLimit	Pump [x] - Motor current high alarm set point [4]	Integer		mAmps
pmp[x]currLoLimit	Pump [x] - Motor current low alarm set point [5]	Integer		mAmps
pmp[x]powHiLimit	Pump [x] - Motor power high alarm set point	Integer		Watts
pmp[x]powLoLimit	Pump [x] - Motor power low alarm set point	Integer		Watts

Table 4: Wet Well Level vs Volume Data

	Height (mAHD)	Volume m^3	Remaining Storage m^3	% Level	% Volume
1	-0.25	0.0	24.9	0%	0%
2	-0.10	1.5	23.4	6%	6%
3	0.05	3.1	21.9	12%	12%
4	0.25	5.1	19.8	20%	20%
5	1.25	15.3	9.7	61%	61%
6	1.40	16.8	8.1	67%	67%
7	1.50	17.8	7.1	71%	71%
8	1.65	19.3	5.6	78%	78%
9	1.70	19.8	5.1	80%	80%
10	1.90	21.9	3.1	88%	88%
11	2.18	24.7	0.2	99%	99%
12	2.20	24.9	0.0	100%	100%

3.2 Non Standard Control

3.2.1 Valve Control

The two knife gate valve which determine which rising main the station is discharging into are not standard equipment and their functionality are not covered by the standard specification. These valves also effect the pump control functionality however this section only covers the valve control functionality.

The two knife gate valves are the mechanism in which the station switches between 2 modes of operation, controlled by the open and close status of valve 1 and valve 2. These modes are:

Rising Main	Valve 1	Valve 2	Description
1 – DN1370	OPEN	CLOSED	SP299 is discharging into the high pressure steel rising main.
2 – DN1840	CLOSED	OPEN	SP299 is discharging into the low pressure concrete rising main.

The rising main can be selected under the following modes of operation

1. Local
2. Remote – Manual
3. Remote – Auto (FUTURE)

Control Modes

Local

The valves can also be controlled locally via hard wiring (independent of the PLC). While in local control, it is the responsibility of the on site technician to ensure the correct rising main is in operation.

Remote – Manual

Under remote-manual mode the valves are controlled by the control room operator via the IDTS master station. The selection of the valve position is done via a selection popup screen in which the operator can choose to select either the DN1370 or the DN1840. The PLC will then operate the valves in the sequence outlined in the following section.

Remote – Auto (FUTURE)

The mode which is selected is governed by which rising main(s) is being used by Eagle Farm. The following table details the active mode depending on the status of the two Eagle Farm pumping stations.

The default mode is mode 1 – DN1370. This has SP299 discharging into the high pressure rising main. This is the safest mode as there are no pressure restriction. Eagle Farm pumping station will communicate, via peer to peer communication over the Trio radio network, the status of both of the Eagle Farm pump stations. If the peer to peer communications fail, then SP300 will revert back to remote-manual mode.

Sequencing

The valves can change position while the pumps are off or while they are running. As the wet well has a very small volume compared with the flow rates, there is minimal retention time in the system while the pumps are off. The most likely change over will therefore occur while the pumps are running. At no stage should both valves be open, as this could lead to the high pressure steel main over pressurising the low pressure concrete main. The change over sequence will be as follows.

Mode 1 → Mode 2

1. Starting conditions are valve 1 open, valve 2 closed, 0 to 2 pumps running at up to 55 Hz.
2. Limit the station to only 1 pump.
3. Clamp the speed of the pump to minimum speed (25 Hz).
4. Close Valve 1.
5. When valve 1 is closed, open valve 2.
6. When valve 2 is open, unclamp the speed of the pump (to a maximum of 30Hz)

Mode 2 → Mode 1

1. Starting conditions are valve 1 closed, valve 2 open, 0 or 1 pump running at up to 30 Hz.
2. Clamp the speed of the pump to minimum speed (25 Hz).
3. Close valve 2.
4. When valve 2 is closed, open valve 1.
5. When valve 1 is open, unclamp the speed of the pump and allow 2 pumps to run (if needed).

Failure States

There are three failure modes that will prevent a successful mode change. These failure modes and their respective recovery procedures are as follows.

Failure Mode	Recovery Process for Failed Valve	Recovery Process for Other (Healthy) Valve
Fail to Close	Command to Open. Can not close until failed to close alarm has been reset.	Stays closed
Fail to Open	Command to Close. Can not open until failed to open alarm has been reset.	Once failed valve has re-closed, then healthy valve is commanded to open.
Failed in Transit (Both Failed to Open and Failed to Close are active)	Stays in current (failed position) until faults have been reset.	The healthy valve will stay in its current position.

3.2.2 Pump Controls

The pump control will be based upon the standard pump control philosophy outlined in the standard specification. This included the wet well to flow to speed cascaded P.I.D. which will be tuned maintain the wet well level yet still provide control over the flow rate. The following sections highlight the specific differences between this site and standard functionality.

Number of Pumps

SP299 is designed to normally operate with the DN1370 steel rising main. In this mode, the station acts as per the functionality outlined in the standard Functional Specification. The duty block is modified to only consider 2 pumps (the standard has 3 pumps).

Interlocking and Speed Limiting

As mentioned in the Valve Control section, if the station is operating with the DN1840 concrete rising main, the station will become interlocked, allowing only one pump to operate at any given time. This interlock is both in the hard wiring as well as in the PLC code. Not only is the station interlocked, the variable speed drives are limited to run at a much lower speed (30Hz). All these limitations are imposed to ensure that the low pressure rinsing main operates acceptable pressures. These limitations are in effect during both local and remote control modes.

3.2.3 Peer to Peer Comms

From SP010 Eagle Farm ((FUTURE))

To achieve remote-auto mode for the valve control, this site will have to communicate to the Eagle Farm pumping station, to receive the operational status of both the EFPS#1 and EFPS#2. To achieve this, a Logica MD3311 RTU has to be installed at Eagle Farm pumping station to communicate directly via the Trio radio network.

3.3 Non Standard Monitoring and Alarms

3.3.1 Additional Valve Monitoring and Alarms

The following alarms and events are associated with both valves

Plant	Quantity	Priority
Valve	Available	1
Valve	Available_remote	0
Valve	Open	0
Valve	Closed	0
Valve	Fail_open_alarm	1
Valve	Fail_close_alarm	1
Valve_station	Auto_manual	Control
Valve_station	Auto_manual_Fbk	0
Sewage_pumping_station	Mode_control	Control
Sewage_pumping_station	Mode_selected	0

Available

The valve is considered available only when all of the following conditions are present:

- Available for Remote
- Not "Failed to Open"
- Not "Failed to Close"

Available for Remote

The digital input status for "valve available for remote" is transferred directly to the IDTS master station.

Open

The digital input status for "valve open" is transferred directly to the IDTS master station. This is used to animate the valve status on the main IDTS page.

Closed

The digital input status for "valve closed" is transferred directly to the IDTS master station. This is used to animate the valve status on the main IDTS page.

Fail to Open

If the valve is commanded to open and does not reach the open limit within the pre determined time period (set at two times the normal travel time) then the failed to open alarm will be activated. The valve will then revert back to the last heatlhy position (ie pen). This alarm can be reset locally by pressing either of the pump (1 & 2) reset push buttons or remotely by the IDTS master station.

Fail to Close

If the valve is commanded to close and does not reach the close limit within the pre determined time period (set at two times the normal travel time) then the failed to close alarm will be activated. . The valve will then revert back to the last heatlhy position (ie closed). This alarm can be reset locally by pressing either of the pump (1 & 2) reset push buttons or remotely by the IDTS master station.

Valve Station Auto / Manual Control and Feedback

When the sewage pumping station is in remote mode, the valve station (both valve 1 and 2) can be selected to be in either manual or auto mode. The current mode selected is returned back to the IDTS master station via the feedback variable.

Sewage Pumping Station Mode Control / Selected

If the valve station is selected to be in auto mode, then the control room operator is able to select which rising main is to be operational via the 'mode control' control variable. The current mode selection will be returned back to the IDTS master station via the feedback variable.

3.3.2 Additional RTU Monitoring and Alarms

Plant	Quantity	Priority
Remote_rtu	Comms_fault	1

Remote RTU Comms Fault *(FUTURE)*

The station will monitor the peer communications. If the site has not received a peer communication within the specified time period (site specific peer timeout value (in seconds) set in the initial block). If the station will revert to using the pressure signals of both rising mains to determine the valve positions as described in the valve control section.

3.4 Non Standard IDTS Picture

3.4.1 Additional Valves

The two valves will be displayed and will be animated to indicated open, closed and faulted conditions. Double clicking on the valve will bring up the valve control page, on which the operator will be able to send a remote reset.

3.4.2 Additional Pipe Animation

The two rising main pipes (which are connected to the DN1370 and the DN1840) will be animated to show a "filled" condition if their respective valve is open.

4 REFERENCES

1

TITLE	SPSV3 Sewage Pumping Station Submersible 3 Pumps With VFD – Functional Specification
DOCUMENT ID	003589
VERSION	0.30
AUTHOR	Alex Witthoft , Brisbane Water – Network Control Systems
DOCUMENT OWNER	Peter Sherriff, Brisbane Water – Network Control Systems

2

TITLE	SP299 Functional Specification
DOCUMENT ID	N/A
VERSION	REVISION 1
AUTHOR	M. BRAND
DOCUMENT OWNER	Leighton Contractors Pty Ltd

3

TITLE	Diesel Standby Generator - Local Control Panel - Functional Description
DOCUMENT ID	N/A
VERSION	02
AUTHOR	SOUTH EAST POWER GENERATION
DOCUMENT OWNER	

Brisbane City

Brisbane Water

BRISBANE WATER

Network Control Systems

FACTORY ACCEPTANCE TEST (FAT)

TEST DOCUMENT

SP299 Viola Place

Submersible 2 Sewage Pumping Station

Pumps With VSD,

2 Valves (Outlet) and Generator

Project & Commissioning Details

Date Commissioned	21 & 23 March 2005
Project Manager	Andrew Bannink
Construction Manager	Reg McGuire
Electrical Inspector	[redacted] Peter Hague
RTU Programmer (NCS)	Alex Hatchett.
Electricians	Common Logic

FAT TEST (FOR ELECTRICAL INSPECTOR)

SP299 VIOLA PLACE

This check list is to be performed before the official IDTS commissioning of the sewerage pump station.

CABINET

Task	Outcome
Check that locks are fitted on all doors and keyed correctly.	OK ☐ X – ONSITE
Check that the Power Supply, Radio and RTU have their lights visible	OK ☐ ✓
The heat shield are to be attached via welding NOT drilling throught the board.	OK ☐ ✓
Drawing Sheet pouch to be attached on the RTU cubicle door	OK ☐ ✓
90mm gap above and below the RTU (to allow for cables from laptop to be plugged into the ports)	OK ☐ ✓
Gland plate in the PLC cubicle (cables such as aerial, phone line, surcharge imminent electrode).	OK ☐ ✓
Check that the limit switch works and turns off when the doors are closed.	OK ☐ ✓
Check that Energex meter lock is fitted on the meter box.	OK ☐ X – ONSITE
Red Indicator Line on the Wet Well Indicator	OK ☐ ✓
Antenna Pole is Hinged	OK ☐ ✓
Caps on the lifting points – and adequatly sealed	OK ☐ ✓
No means of Gas Ingress	OK ☐ ✓
No 240VAC in the RTU section	OK ☐ ✓
Perform a physical inspection of the site and switchboard to determine if it is safe. Note any defect on the Defect notification sheet. Note any defects in switchboard.**(On Defect Sheet)**	OK ☐ ✓

POINT TO POINT

Task	Outcome
Using the Electrical Drawing do a thorough point to point on the control circuit to ensure that the local control of the pump operates independantly of the RTU (ie Part of the PLC) Wired to the RTU/PLC from beginning to end. (ie press the actual button and watch the I-O change in Isagraf / Versapro).	OK ☐ ✓
The Drawings should be marked up with any changes to provide the AS BUILT markups (in conjuction with any modifications made during Site Acceptance Testing). (All circuits shoud be 'highlighted' as they are checked.	By Comms – Losi

VARIABLE SPEED DRIVE

Task	Outcome
Check that the motor starter is programmed and able to start the each pump	Pmp1-OK☑ ✓ Pmp2-OK☑ ✓
Check that each VSD modbus connection active and that the Power and Current are being read correctly and are scalled correctly.	Pmp1-OK☐ Pmp2-OK☐

Site pre-commissioned by (Electrical Inspector)

Name: ....

Signature: ....

Date: ....

Pre-commissioning Test Sheet checked by NCS Project Officer

Name: ....

Signature: ....

Date: ....

FAT TEST (RTU PROGRAMMER)

SP299 VIOLA PLACE

RTU

Task	Outcome
Check that the RTU has the correct IP address set	IP Address 192.168.34.93 Subnet mask 255.255.255.0
Check that the RTU has the correct program code loaded	Code Name SP299-x6
Check CPU Firmware Version and Serial Number	Serial Number 1004-3445 Firmware Ver 1.0.4.
Check that the .main file has been downloaded from the IDTS	OK ☑ (SP300.main).

POINT TO POINT

Task	Outcome
Using the Physical I-O Spreadsheeet check each individual physical I-O Wired to the RTU from beginning to end. ie press the actual button and watch the I-O change in Isagraf. Output lights and relays activate Inject 4-20mA into the Analog Inputs The I-O spreadsheet should be ticked and signed by the test and atteched to this FAT Test Document.	OK ☑

BATTERY

Task	Outcome
Check that the battery is connected and charging (i.e. 24V across the terminals).	OK ☑
Check that the RTU is running off battery when the mains supply is isolated	OK ☑

RADIO

Task	Outcome
Check that the correct radio type has been installed - high or low (transmit frequency)	High ☐ Low ☐ N/A (On site)
Check that radio is set on the correct frequency for the desired base station.	Tx MHz Rx MHz N/A (On site) Base Station:

Site FAT by (RTU Programmer)

Name: Alex Withoff

Signature: AWithoff

Date: 23/03/05

FAT Test Sheet checked by NCS Project Officer

Name: .....

Signature: .....

Date: .....

FUNCTIONALITY TESTING OF VFD

The following test should be carried out once a full point to point test has been completed and the VFD drives have been completely configured.

NOTE: the VFD drive has 2 setups – local and remote – both of which are configurable. To ensure full functionality, the test below are often repeated for both local and remote mode.

Task	VFD 1	VFD 2
Local/Remote Mode Setup Selection:		
Ensure that with Valve 1 ~~Not Open OR Valve 2 NOT Closed (Abnormal Positions).~~		
When the station local-remote selector switch is selected to		
1. Remote that setup 1 is active on both Drives	☑	☑
2. Local setup 2 is active on both Drives	☑	☑
Ensure that with Valve 1 Open and Valve 2 Closed (Normal Position).		
When the station local-remote selector switch is selected to		
3. Remote that setup 3 is active on both Drives	☑	☑
4. Local setup 4 is active on both Drives	☑	☑
Drive in Auto Mode:		
In both local and remote modes repeat the following:		
☐ Ensure that the Auto mode is active	☑	☑
*Press the **"Hand Start"** button on the keypad*		
☐ Ensure that the Auto mode feeback deactivates	☑	☑
*Press the **"Auto Start"** button on the keypad*		
☐ Ensure that the Auto mode is active	☑	☑
Run Command, Speed Control and Speed Feedback, Run at Maximum		
In Remote: (Concrete Main – Setup 1) DO FOR BOTH PUMPS SEPERATLY		
Command the pump to run via the digital output from the PLC.		
☐ Ensure that the VFD runs and the running signal is received from by the PLC.	☑	☑
☐ Ensure that the VFD speed is controlled by the PLC Analog output.	☑	☑
☐ Ensure that the speed of the pump from the VFD to the PLC is accurate.	☑	☑
☐ Ensure that the Maximum Speed is 33Hz (or whatever is the current design max for the concrete mains).	☑	☑
Checking interlock is ON		
Initiate Surcharge Pumping mode		
☐ Ensure that **only 1** pump is commanded to run at maximum speed and that the run at max is active.	☑	☑
Force the duty B pump run command on		
☐ Ensure that the pump does NOT start. (ie the VFD interlock digital input should stop it from running).	☑	☑
Turn the other pump into Keypad mode and attempt to start		
☐ Ensure that the pump does NOT start. (ie the VFD interlock digital input should stop it from running).	☑	☑
Set the Drive to run in remote at minimum speed, then force the run at max output.	☑	☑
☐ Ensure that the drive runs at maximum speed.		

23/03/05

Task	VFD 1	VFD 2
In Local: (Concrete Main – Setup 2) DO FOR BOTH PUMPS SEPERATLY		
Command the pump to run via the start pushbutton (output from the PLC)		
❑ Ensure that the VFD runs and the running signal is received from by the PLC.	☑	☑
❑ Ensure that the VFD speed is controlled by the POT.	☑	☑
❑ Ensure that the Maximum Speed is 33Hz (or whatever is the current design max for the concrete mains).	☑	☑
❑ Ensure that the speed of the pump from the VFD to the PLC is accurate.	☑	☑
Checking interlock is ON - Try to start 2nd pump		
❑ Ensure that it does NOT get commanded to run	☑	☑
Turn the other pump into Keypad mode and attempt to start		
❑ Ensure that the pump does NOT start. (ie the VFD interlock digital input should stop it from running).	☑	☑
Set the Drive to run in local at minimum speed, then force the run at max output.		
❑ Ensure that the drive **DOES NOT** runs at maximum speed.		
In Remote: (Steel Main – Setup 3) DO FOR BOTH PUMPS SEPERATLY		
Command the pump to run via the digital output from the PLC.		
❑ Ensure that the VFD runs and the running signal is received from by the PLC.	☑	☑
❑ Ensure that the VFD speed is controlled by the PLC Analog output.	☑	☑
❑ Ensure that the speed of the pump from the VFD to the PLC is accurate.	☑	☑
❑ Ensure that the Maximum Speed is 50Hz (or whatever is the current design max for the steel mains).	☑	☑
Checking interlock is OFF		
Initiate Surcharge Pumping mode.		
❑ Ensure that **both** pump are commanded to run at maximum speed and that the run at max is active.	☐	☑
Stop Surcharge Pumping mode but activate duty A and then Duty B start commands		
❑ Ensure that the duty A and then the duty B pumps are commanded to run at the PID speed control and that the speed feedback is accurate.	☑	☑
Set the Drive to run in remote at minimum speed, then force the run at max output.	☑	☑
❑ Ensure that the drive runs at maximum speed.		
In Local: (Concrete Main – Setup 4) DO FOR BOTH PUMPS SEPERATLY		
Command the pump to run via the start pushbutton (output from the PLC)		
❑ Ensure that the VFD runs and the running signal is received from by the PLC.	☑	☑
❑ Ensure that the VFD speed is controlled by the POT.	☑	☑
❑ Ensure that the Maximum Speed is ~~33Hz~~ 50Hz (or whatever is the current design max for the ~~concrete~~ mains).	☑	☑
❑ Ensure that the speed of the pump from the VFD to the PLC is accurate.	☑	☑
Checking interlock is OFF - Try to start 2nd pump		
❑ Ensure that it gets commanded to run and does so	☑	☑
Set the Drive to run in local at minimum speed, then force the run at max output.		
❑ Ensure that the drive **DOES NOT** runs at maximum speed.	☑	☑
VFD Ready / Thermistor Fault / Reset:		
Repeat the following for both local and remote modes		
Trigger the thermistor fault.		
❑ Ensure that the VFD ready siganl deactiveates (fault).	☑	☑
Re-enable the thermistor and ensure that the VFD is still not ready.		
Activate the reset output from the PLC.		
❑ Ensure that the VFD resets.	☑	☑

Brisbane City

Brisbane Water

BRISBANE WATER

Network Control Systems

PRE-COMMISSIONING ACCEPTANCE TEST DOCUMENT

SP299 Viola Place

Conventional 2 Sewage Pumping Station

Pumps With VSD,

2 Valves (Outlet) and Generator

Project & Commissioning Details

Date Commissioned	
Project Manager	
Construction Manager	
Electrical Inspector	
RTU Programmer (NCS)	
Electricians	

PRE-COMMISSIONING CHECK LIST (RTU PROGRAMMER)

SP299 VIOLA PLACE

ANTENNA

Task	Outcome
Check that the antenna mast (pole) has adequate clearance from overhead power lines. ▪ 1.8 metres for LV line ▪ 3 metres for HV line ▪ Antenna should NOT be mounted vertically beneath a power line.	OK ☑
Check that antenna is pointing in the correct direction. (Bearing the same as the Radio Survey result)	OK ☑

SURCHARGE IMMINENT PROBE

Task	Outcome
Check that the surcharge imminent probe is fixed at the correct height and is operational. (Actually ground the electrode to ensure full ponit to point)	OK ☑

WET WELL PROBE

Task	Outcome
Calibrate the Vega probe.	OK ☑
Check that the "deragging" tube is fitted over the Vega and covers the pump start and stop range.	OK ☑

RTU

Task	Outcome
Check that the RTU has the correct IP address set	IP Address 192 . 168 . 39 . 93 Subnet mask 255 . 255 . 255 . 0
Check that the RTU has the correct program code loaded	Code Name SP299_X9
Check CPU Firmware Version and Serial Number	Serial Number 1004-3445 Firmware Ver 1.0.5
Check that the .main file has been downloaded from the IDTS	OK ☒

FLOWMETER

Task	Outcome
Check that the range of the F/M is the same as the value in the INIT block	OK ☑ 250.00
Check that the flow reading on the flow meter is the same as the RTU/PLC	OK ☑

Site pre-commissioned by (RTU Programmer)

Name: Alex Withnall

Signature: .....

Date: 25/04/2005

Pre-commissioning Test Sheet checked by NCS Project Officer

Name: .....

Signature: .....

Date: .....

RADIO

Task	Outcome
Check that the antenna mast (pole) has adequate clearance from overhead power lines. ▪ 1.8 metres for LV line ▪ 3 metres for HV line ▪ Antenna should NOT be mounted vertically beneath a power line.	OK ☑
Check that antenna is pointing in the correct direction. (Bearing the same as the Radio Survey result)	OK ☑ 254° 4.06km to Bartleys
Check the VSWR of the cable with the antenna connected.	____VSWR
Check that the correct radio type has been installed - high or low (transmit frequency)	High ☐ Low ☑
Check that radio is set on the correct frequency for the desired base station.	Tx Yes MHz Rx Yes MHz
Check that the RSSI is similar to the signal strength obtained in the Radio Survey results. Check that the (BER) packet test is similar to the Radio Survey.	-54 RSSI N/A % loss with 10 dB attenuation
Check that the antenna is mounted with the drain hole in the dipole facing towards the ground.	OK ☑
Check that the antenna cable joints are wrapped with weather proof tape.	OK ☑

Geoff Timms

WET WELL PROBE

Task	Outcome
Check that the range of the Vega is the same as the value in the RTU initialisation block.	Range 4.15 m
Check that the suspended length of the Vega matches the "zero" value (4mA) in the RTU initialisation block.	Zero -0.020 m

PRESSURE GAUGE

Task	Outcome
Check that the range of the PG is the same as the value in the INIT block	OK ☑ N/A

Site pre-commissioned by (RTU Programmer)

Name: Alex Lutthoff

Signature: .....

Date: 25/01/04

Pre-commissioning Test Sheet checked by NCS Project Officer

Name: .....

Signature: .....

Date: .....

SIR001
SITE INSPECTION REPORT - SWITCHBOARDS

PROJECT: VIOLA PLACE SP299

PROJECT No: SQTG

Inspector: PETER HAGUE

Legend: Acc=Accept Rej=Reject N/A= Not Applicable

Item No.	Activity Description	Comments	Inspection Results			Date Accepted
			Acc	Rej	N/A	
1	Location Correct as per Contract Drawing		✔			23/05/05
2	Orientation Correct		✔			23/05/05
3	Material/Finish as per Specification		✔			23/05/05
4	Unauthorised Modifications		✔			23/05/05
5	Anchor Bolts Fitted / Tight		✔			23/05/05
6	IP Rating as per Specifications		✔			23/05/05
7	Panel Layout as per Drawings		✔			23/05/05
8	Labelling - Wording, Size, Fixing, Material, Level	*1		✘		
9	Enclosure Free of Debris		✔			23/05/05
10	Components Fitted are as Specified		✔			23/05/05
11	Main Switches/Circuit Breakers/Fuses Sizes OK		✔			23/05/05
12	Thermal Overloads Appropriately Set		✔			23/05/05
13	CT Ratios are as Specified	Energex	✔			23/05/05
14	Metering Fuses Fed off Line Side Main Sw & CT's		✔			23/05/05
15	Equip Fed from Line Side is Appropriately Labelled		✔			23/05/05
16	Neutral & Earth Connections not in CT Section		✔			23/05/05
17	All Neutral Connections are Accessible		✔			23/05/05
18	MEN Connections Provided		✔			23/05/05
19	Earth Bar/Earth Connections Fitted & OK		✔			23/05/05
20	Check Phasing of Circuits		✔			23/05/05
21	Cores Ferruled & Numbered		✔			23/05/05
22	Colour Coding of Wiring as per Spec.		✔			23/05/05
23	Terminals Identified per Dwg. and Spares Provided		✔			23/05/05
24	Indicators Fitted with Correct Coloured Bezels		✔			23/05/05
25	Selector Switches Engraved Correctly	*2		✘		
26	Main Switches Lockable/Defeatable as per Spec.		✔			23/05/05
27	Terminals & Busbar Connections Tight		✔			23/05/05
28	Busbars appropriately shielded		✔			23/05/05
29	Check internal access & routes for field cabling		✔			23/05/05
30	Check Operation of Mech & Key Interlocks		✔			23/05/05
31	Check Operation and Orientation of Door Handles		✔			23/05/05
32	Circuit Breakers Isolate Stated Circuits		✔			23/05/05
33	ELCB's Tested		✔			23/05/05
34	Test Sheets Provided for Insulation Tests	Still to come		✘		
35	Test Sheets Provided for Earth Continuity Tests	Still to come		✘		
36	"As Built" Drawings Marked Up	Still to come		✘		
37	Legend & Drawings Secured in Enclosure	*3	✔			23/05/05
38	Laytop Support Tray Provided		✔			23/05/05
39	Sunshields Fitted with IP56 Maintained		✔			23/05/05
40	Door Locks as Required	Not fitted as yet		✘		
41	Manual Functions Tested		✔			23/05/05
42	Outlets fitted to Sw/Bd as required		✔			23/05/05
43	Surge Diverter earthed to adjacent stud.	By Networks	✔			23/05/05
44	Switchboard Lights Operate OK		✔			23/05/05
45	Adequate access to RTU comms plugs		✔			23/05/05

Special Notes:

1 Label required over generator connection escutcheon
2 Flowmeter indicator scaling wrong. To be changed
3 No asbuilt drawings enclosed
4 labels required for pressure TX in switchboard

Signature 23/05/05 Date

SIR002

SITE INSPECTION REPORT - CABLES

PROJECT: VIOLA PLACE SP299

PROJECT No: SQTG

Inspector: PETER HAGUE

Legend: Acc=Accept Rej=Reject N/A= Not Applicable

Item No.	Activity Description	Comments	Inspection Results			Date Accepted
			Acc	Rej	N/A	
1	Cables Sized as per Cable Schedule	2-120mm/Phase	✔			23/05/05
2	Correct Cable Types Installed		✔			23/05/05
3	Cables Glanded/Bushed Satisfactorily	See Note *2 & 3	✔			23/05/05
4	Cables Terminated Satisfactorily	See Note *4	✔			23/05/05
5	Sheathes/Insulation not Damaged		✔			23/05/05
6	Bending Radius not Exceeded		✔			23/05/05
7	Mechanical Protection Provided as Required	See Note *1			-	23/05/05
8	Cables Adequately Supported		✔			23/05/05
9	Power & Signal Cable Clearances Adequate		✔			23/05/05
10	All Cables Identified as per Cable Schedule	See Note *5	✔			23/05/05
11	Overall Appearance Satisfactory		✔			23/05/05
12	Insulation Tests Carried out on all Cables		✔			23/05/05
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23	Cable Tests:					

Cable No.	Insulation		Continuity Test
	Voltage	Resistance	

Special Notes:

1 Provide mechanical protection around pole base on service pole
2 Recommend larger blockout into wetwell for cable entry
3 Pump cables to be glanded at switchboard
4 Sump pump still to be terminated
5 Flowmeters to be installed

Signature 23/05/05 Date

SIR003

SITE INSPECTION REPORT - CABLE LADDER/TRAY/DUCT

PROJECT: VIOLA PLACE SP299

PROJECT No: SQTG

Inspector: PETER HAGUE

Legend: Acc=Accept Rej=Reject N/A= Not Applicable

Item No.	Activity Description	Comments	Inspection Results			Date Accepted
			Acc	Rej	N/A	
1	Ladder/Tray/Duct Correct Size/Type as per Spec.		✔			23/05/05
2	Correct Routing as per Specification/Drawings		✔			23/05/05
3	Sufficient Brackets/Fixings to Suit Span		✔			23/05/05
4	Brackets/Fixings Secure		✔			23/05/05
5	Ladder/Tray/Duct Earthed/Bonded Correctly		✔			23/05/05
6	Covers Fitted & Secured Correctly	See Note *1 & 2		✖		
7	Protrusions & Sharp Edges Removed		✔			23/05/05
8	Dissimilar Metals Not in Contact		✔			23/05/05
9	Segregation Barriers Fitted Correctly				-	23/05/05
10	Adequate Mechanical Protection Provided	See Note *3 & 5		✖		
11	Integrity of Finish/Coating Maintained		✔			23/05/05
12	Penetrations Sealed Correctly	See Note *4		✖		
13	Clearance from Other Trades Satisfactory		✔			23/05/05
14	"As Built" Drawings Marked Up			✖		
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Special Notes:

1 Cable pit lid to be fitted under generator
2 Cable trench cover to be secured at switchboard ends
3 service pole conduits to be protected
4 Seal all conduits - eg. base of crane isolator
5 Grout around conduit at base of crane isolator
6 Draining of cable trench under switchboard

Signature

23/05/05
Date

SIR004

SITE INSPECTION REPORT - INSTRUMENTS

PROJECT: VIOLA PLACE SP299

PROJECT No: SQTG

Inspector: PETER HAGUE

Legend: Acc=Accept Rej=Reject N/A= Not Applicable

Item No.	Activity Description	Comments	Inspection Results			Date Accepted
			Acc	Rej	N/A	
1	Instrument Types/Models as per Specification		✔			23/05/05
2	Model Range as per Specification	See Note *1	✔			23/05/05
3	Suitably Mounted & Orientation Correct		✔			23/05/05
4	Clearances Adequate for Correct Operation				-	23/05/05
5	Adequate Mechanical Protection Provided		✔			23/05/05
6	IP Ratings Suitable for Location		✔			23/05/05
7	Earthing Provided as per Instrument Manual	See Note *2		✖		
8	Identification Tags Fitted		✔			23/05/05
9	Termination Covers & Seals Securely Fitted		✔			23/05/05
10	Data Plate Fitted & Legible		✔			23/05/05
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Special Notes:

1 Pressure TX = -100 to 1000kPa bar 64
2 Flowmeters to be re-installed abd calibrated

Signature _____ Date _____

SIR005

SITE INSPECTION REPORT - FIELD EQUIPMENT

PROJECT: VIOLA PLACE SP299

PROJECT No: SQTG

Inspector: PETER HAGUE

Legend: Acc=Accept Rej=Reject N/A= Not Applicable

Item No.	Activity Description	Comments	Inspection Results			Date Accepted
			Acc	Rej	N/A	
1	Equipment Types/Models as per Specification	Multitrode	✔			23/05/05
2	Suitably Mounted for Correct Operation		✔			23/05/05
3	Adequate Mechanical Protection Provided		✔			23/05/05
4	IP Ratings Suitable for Location		✔			23/05/05
5	Identification Tags Fitted		✔			23/05/05
6	Termination Covers & Seals Securely Fitted		✔			23/05/05
7	Limit/Float Arms Adjusted Correctly				-	23/05/05
8	Multitrode probe adjustment		✔			23/05/05
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Special Notes:

Signature

23/05/05
Date

SIR006

SITE INSPECTION REPORT - ELECTRIC MOTORS

PROJECT: VIOLA PLACE SP299

PROJECT No: SQTG

Inspector: PETER HAGUE

Legend: Acc=Accept Rej=Reject N/A= Not Applicable

Item No.	Activity Description	Comments	Inspection Results			Date Accepted
			Acc	Rej	N/A	
1	Motors Correct Size/Type as per Drawings		✔			23/05/05
2	Star/Delta Connections Correct		✔			23/05/05
3	Mountings Adequate & Secured		✔			23/05/05
4	IP Ratings Suitable for Location (eg. Hosing)		✔			23/05/05
5	Termination Covers & Seals Securely Fitted		✔			23/05/05
6	Isolators Positioned & Sized Correctly	Sw/Bd mounted	✔			23/05/05
7	Isolators Accessable & Labelled	Sw/Bd mounted	✔			23/05/05
8	Isolators Function Correctly		✔			23/05/05
9	Overloads Adjusted Correctly	VSD	✔			23/05/05
10	Circuit Breaker Sized Correctly	VSD	✔			23/05/05
11	No Obstructions at Coupling or Fan		✔			23/05/05
12	Motor Test Sheets Completed		✔			23/05/05
13	Identification Tags Fitted		✔			23/05/05
14	Data Plate Fitted & Legible	Submerged			-	23/05/05
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Special Notes:

Signature

23/05/05
Date

Inspection Check List 1 Pump Stations Valving.
Refer to Viola Place SP299 Sectional Plan Drg No. 486/5/7-SQ700/008

The following manual/actuator operated Valving to be inspected and checked for correct position open/closed.
Print name/signed and dated in the following check list.

Item No	Item Description	BW Drawing No.	Valve Position As Found	Valve Position	Date Checked	Code/Print Name	Coments	Sgn
1	Viola Place SP299 Sectional Plan Viola Place SP299 Equipment List and Notes Mark No. 47 (3off)	486/5/7-SQ700/008 486/5/7-SQ700/007	CLOSED	Closed	31/1/06	Scott Peel		
1.1	Viola Place SP299 Sectional Plan Viola Place SP299 Equipment List and Notes Mark No. 46 (1off)	486/5/7-SQ700/008 486/5/7-SQ700/007	CLOSED	Closed	31/1/06	Scott Peel		
1.2	Viola Place SP299 Sectional Plan Viola Place SP299 Equipment List and Notes Mark No. 40 (2off)	486/5/7-SQ700/008 486/5/7-SQ700/007	1 OPEN 1 CLOSED	Closed	31/1/06	Scott Peel	MARKED ON GRIT COLLECTOR SIDE (OPEN) ALL VALVES LEFT IN CLOSED POSITION	
1.3	Viola Place SP299 Sectional Plan Viola Place SP299 Equipment List and Notes Mark No. 53 (1off)	486/5/7-SQ700/008 486/5/7-SQ700/007	OPEN	Closed	31/1/06	Scott Peel	FOUND OPEN LEFT CLOSED	
1.4	Viola Place SP299 Sectional Plan Viola Place SP299 Equipment List and Notes Mark No. 15 (2off)	486/5/7-SQ700/008 486/5/7-SQ700/007	CLOSED	Closed	31/1/06	Scott Peel	CLOSED ON STANDBY (SURCHARGE)	
1.5	Viola Place SP299 Sectional Plan Viola Place SP299 Equipment List and Notes Mark No. 9 (2off)	486/5/7-SQ700/008 486/5/7-SQ700/007	CLOSED	Closed	31/1/06	Scott Peel		
1.6	Viola Place SP299 Setout Plan SV1/SV2 Viola Place SP299 General Arrangement Chemical Spill/Stormwater	486/5/7-SQ700/002 486/5/7-SQ700/003	CLOSED PARTLY OPEN	(SV1) Closed (SV2) Open	31/1/06 31/1/06	Scott Peel Scott Peel	FOUND CLOSED LEFT FULLY OPEN	
1.7	Miscellaneous Details Item V1 (2off)	486/5/8-SM16/023	CLOSED ?	(1370) Closed (1840) Closed	31/1/06	Scott Peel	1370 LEFT OPEN. VALVE SPINDLE SUSPECT	
1.8								
1.9								

Issue Date: 31/01/06
Rev No: 0

AUSTRALIAN TRADE COAST PROJECT
STYLE INDUSTRIES – ITP
LEIGHTON J/N Q1112

DOCUMENT NUMBER: 9835c - ITP	INSPECTION AND TEST PLAN	B.W C/N : 30137-02/03 LEIGHTON J/N : Q1112	BRISBANE WATER AUSTRALIA TRADE COAST SEWERAGE PROJECT

					ACTION BY			COMPLETED			
SEQ. NO	ITEM / DESCRIPTION	INSPECTION ACTIVITY	ACCEPTANCE CRITERIA	LOCATION	STL	LCPL	BW	STL	LCPL	BW	REPORT DOC REF
	VIOLA PLACE										
1	CONCRETE WORKS	DIMENSION CHECK	CONTRACT DWGS	SITE	W/H CB	W/S JR	27/4	27/4 CB			CONTRACT DWGS
2	PIPE & VALVES	GOODS INSPECTION & DIMENSION CHECK	PIPE & VALVE SCHEDULE (FROM CONTRACT DWGS)	SITE	W/H CB	W/S JR	27/4	27/4 CB			CONTRACT DWGS
3	PUMPS	DIMENSIDN CHECK	WEIR IOM & 9835-PSCL	SITE	W/H CB	W/S JR	11/5	11/05 CB			WEIR IOM & 9835-PSCL
4	PIPE & VALVES	INSPECTION OF INSTALLATION	CONTRACT DWGS & 9838-PSCL	SITE	W/H CB	W/H JR	W/H 6/5	6/5 CB		12/05/05	CONTRACT DWGS
5	TEST PIPEWORK FOR LEAKS	PRESSURE TEST	SPECIFICATION & 9825-HSTC	SITE	W/H CB	W/H JR	W/H 6/5	6/5 CB		12/05/05	SPECIFICATION & 9825-HSTC
6	PRIOR TO EPOXY GROUT POUR	INSPECTION	SPECIFICATION	SITE	W/H CB	W/H JR	W/H 9/5	9/5 CB		12/05/05	
7	PUMPS	INSPECTION OF INSTALLATION	WEIR IOM & 9835-PSCL	SITE	W/H CB	W/H JR	W/H 11/5	11/5 CB		12/05/05	WEIR IOM & 9835-PSCL
8	SUMP PUMP & PIPEWORK	INSPECTION OF INSTALLATION	CONTRACT DWGS	SITE	W/H CB	W/S JR		6/5 CB			CONTRACT DWGS

ACTION CODES :		REVISION STATUS	DATE	DRAWN	CHECKED	REASON FOR REVISION
W/H	WITNESS - MANDATORY HOLD POINT					
W/S	WITNESS - INSPECT AT RANDOM					
W/I	WITNESS INITIAL, THEN AT RANDOM					
R/A	REVIEW AND SIGN DOCUMENTATION					
R	REVIEW DOCUMENTATION ONLY					
STL	STYLE ROUTINE INSPECTION ONLY	2	25/02/05	CB	CB	LEIGHTONS REQUEST
G	GENERAL INSPECTION BY CUSTOMER DURING ACTIVITY.	1	14/1/05	MC	MC	LEIGHTONS REQUEST
		0		MR	MR	FIRST ISSUE

STYLE INDUSTRIES	CUSTOMER / SITE :	BRISBANE WATER AUSTRALIA TRADE COAST SEWER PROJECT	PAGE 1 OF 1
DENK INVESTMENTS PTY. LTD. A.C.N. 010 418 014 T/A	VIOLA PLACE PS		

9835c - ITP-Viola Place

AUSTRALIAN TRADE COAST PROJECT
STYLE INDUSTRIES – ITP
LEIGHTON J/N Q1112

PUMP STATION CHECKLIST

REF NO. – 9835/PSCL

CONCRETE WORKS – CHECK	CHECKED BY	DATE	COMMENTS
Check Dimensions of pump well to Leighton Contractors Pty Ltd Drawings	CB	27/04	Complete
Ensure all core holes are correct in size and position	CB	27/04	"
Check to ensure all surfaces are smooth and level where required	CB	27/04	"
PIPE & VALVES – GOODS INSPECTION & DIMENSION CHECK			
Check dimensions of all items ordered against those received	CB	27/04	Complete
Check correct quantity has been supplied of each item	CB	"	"
Ensure goods are in as new condition (e.g. no cracks, scratches, or other damage)	CB	"	"
Check all sockets are correct	CB	"	"
PUMPS – DIMENSIONAL CHECK			
Ensure pump is correct model and type	CB	11/05	Complete
Check dimensions of pump to that of the Weir drawing	CB	"	"
Visually inspect pump for damage before installation	CB	"	"
Check electrical cable is undamaged and correct length	CB	"	"
PIPE & VALVES – INSPECTION OF INSTALLATION			
Ensure all gasket materials are clean and free from grit before install	CB	27/04	Complete
Install all pipework and valves as per the drawings	CB	"	"
Check that pipework is level and that faces are mating correctly aligned	CB	"	"
Ensure all valves are closed after installation	CB	"	"
Make sure bolts are of correct size, material, and tightness	CB	"	"
Tighten bolts in star pattern (tighten opposites)	CB	"	"
Install temporary support structures for pipework	CB	"	"

9835c - ITP-Viola Place

AUSTRALIAN TRADE COAST PROJECT
STYLE INDUSTRIES – ITP
LEIGHTON J/N Q1112

Tighten bolts after installation as per Table 2 Sect 5 of WS-Spec	CB	27/04	Complete
Ensure pipes are clean once installed	CB	27/04	"

AUSTRALIAN TRADE COAST PROJECT
STYLE INDUSTRIES – ITP
LEIGHTON J/N Q1112

PUMP STATION CHECKLIST

REF NO. – 9835/PSCL

PUMPS – INSPECTION OF INSTALLATION	CHECKED BY	DATE	COMMENTS
Ensure suction and discharge are free from any foreign matter	CB	11/05	Complete
Install pump pedestal and ensure discharge is aligned correctly	CB	27/04	"
Secure electrical cable, ensure no water ingress at open ends	CB	11/05	"
Grout under pump pedestal	CB	9/05	"
PRESSURE TESTING PIPEWORK – HYDROSTATIC TESTING			
Pipework will be isolated by lowering the pump stools to a point where a plate can be inserted between the stool flange and riser pipe flange. The stool will be jacked up and the bolts tightened which will isolate the pipework. The discharge pipework down the line from the valve pit will have a tee inserted and a pipe return line back to the well (by others). Water for test to be supplied by others.	CB	6/05	Complete
Pipework will be filled with water allowing to vent air	CB	6/05	"
Pressure will pumped up to 600kPa	CB	"	"
No drop in pressure allowed over 15min	CB	"	"
Check visually for leaks and or pipe deformations	CB	"	"

AUSTRALIAN TRADE COAST PROJECT
STYLE INDUSTRIES – ITP
LEIGHTON J/N Q1112

ON COMPLETION OF CHECKLIST SIGN OFF BELOW

NAME:	CLIVE BLORE
SIGNED:	
DATE:	12/05/05

9835c - ITP-Viola Place

AUSTRALIAN TRADE COAST PROJECT
STYLE INDUSTRIES – ITP
LEIGHTON J/N Q1112

PIPEWORK HYDROSTATIC TEST CERTIFICATE

REF NO: 9835-Viola-HSTC

PAGE 1 OF 1

TEST PRESSURE:	660kPa
DESCRIPTION OF WORKS:	Pressure test pipework to 600kPa or more and hold at the achieved pressure for 15 minutes. Check for leaks, deformations and substantial pressure drop.
TIME PRESSURE HELD:	15 minutes
JOB NO:	9835C
CERTIFIED BY:	Clive Blore
WITNESSED BY:	Gary Mole
CERTIFICATE NO:	9835-Viola Place-HSTC
DATE:	6 May 2005
COMMENTS:	No leaks or deformations. 2kPa pressure drop over 15 minutes.

9835c - ITP-Viola Place

SECTION 3

Australia TradeCoast Sewer Project
Contract No. BW 30137-02.03

Pre-commissioning Report Viola Place Pump Station SP299

August, 2005

Brisbane Water

Winner
Engineering
Excellence Award 2003
Category: Project Management

Highly Commended
Engineering
Excellence Award 2003
Category: Project Management

Winner
National and Queensland
Case Earth Award 2003
Category 3: Environmental
Excellence - projects over
$10 million

Highly Commended
Queensland Stormwater
Industry Association
State Award 2003
Category: Major WSUD Project
>$1.0 million

Minister's Grand Prize
Healthy Waterways Awards 2003
Category: Industry Award

Finalist
Healthy Waterways Awards 2003
Category: Industry Award

Commendation
Public Domain Awards 2003
Category: Bridges

2138110B-RPT022Avb

PB PARSONS BRINCKERHOFF

Parsons Brinckerhoff Australia Pty Limited ACN 078 004 798 and Parsons Brinckerhoff International (Australia) Pty Limited ACN 006 475 056 trading as Parsons Brinckerhoff ABN 84 797 323 433

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Facsimile +61 7 3831 4223
Email brisbane@pb.com.au

ABN 84 797 323 433
NCSI Certified Quality System ISO 9001

Author: Vic Bowyer, Senior Water Engineer

Signed: .....

Reviewer: Ian Cameron, Water Executive

Signed: .....

Approved by: Ian Cameron, Water Executive

Signed: .....

Date: 4 August 2005, Revision A (2138110B).....

Distribution: Brisbane Water .....

PARSONS BRINCKERHOFF

Contents

List of appendices

PARSONS BRINCKERHOFF

1. Introduction

On 24 May 2005 pre-commission was undertaken at the new Viola Place Pumping Station (SP299) under the supervision of PB Commissioning Engineer, Vic Bowyer and Leightons Mechanical and Electrical Manager, Frank Mitchell. Pre-commissioning was undertaken generally in accordance with the Construction Method Statement prepared by Leightons entitled "Commissioning of Viola Place Pumping Station SPS 299", 23 May 2005. The method statement is included in Appendix A. During pre-commissioning it was necessary to depart slightly from the methodology provided in the method statement in order to produce suitable results. In all cases departure from the method statement were agreed on site by all parties.

2. Temporary pre-commissioning system

Pipework just outside the north-eastern end of the valve pit was temporarily modified to allow all pumped flows to be directed to the inlet valve pit. A temporary OD315 PE pipeline was installed from the inlet valve pit Tee branch to the grit collector manhole to recycle pumped flows back into the wet well. Valving in the inlet valve pit was adjusted to direct all flows through the temporary recycling pipework. The temporary pipework was equipped with a 300 mm flowmeter and a 300 mm Fig 694 John valve to throttle the pump discharge. The temporary pipeline discharged to below the standing water level within the grit collector manhole. Appendix B contains photos of the temporary pipework arrangement.

3. Pre-commissioning tests

3.1 Pump performance

The wet well was filled from a water truck to RL 2.17 mAHD and the pumps operated at 25, 33, 50, 53 and 55 Hz with various amounts of throttling imposed by the throttling valve. The pumps were operated manually in local mode for each pump test. Flow, pressure and pump motor performance data were recorded and the results compared to the manufacturers pump test data. The manufacturers test data is included in Appendix C while the results of the pre-commissioning testing are included in Appendix D. Comparison graphs comparing the manufactures test data to the pre-commissioning results are include in Appendix E.

No testing was performed with both pumps operating simultaneously. Operation of the pumps at 55 Hz was stopped following the failure of a flanged connection of the temporary recycling pipework.

3.2 Automatic pump changeover

The station was set to local mode with pump 1 manually started at full speed with the pump delivering about 115 L/s. The duty pump isolator was opened and it was observed that the standby pump automatically started. The test was repeated for pump 2 and similar results observed.

3.3 Automatic generator start

The station was set to local mode with pump 1 manually started at full speed with the pump delivering about 115 L/s. The main incomer isolator was open to simulate a power cut. It was noted that after the mains power had been off for about 30 seconds the generator automatically started. It was noted that after the mains power had been off for about 60 seconds the generator started and after a further 30 seconds the automatic power transfer switches on the switchboard operated thus providing generator power throughout the switchboard. When the mains power was restored by re-closing the main incomer isolator the transfer switches again operated after a time delay of approx 30 seconds thus restoring mains power throughout the switchboard. The generator then ran-on for about five minutes before shutting down.

3.4 Vortices inspection

A visual inspection of the wet well was undertaken. The wet well level was drawn down to the low water alarm level and the duty pump operated in local mode at 25 Hz. No vortices were observed.

3.5 Automatic emptying/filling of the well wet

The final test that was undertaken was to observe the station as the wet well levels were lowered. The wet well was drawn down using a 2" pump running to waste. The test commenced with the station operating in remote mode and the wet well level at RL 2.17 mAHD. The operation of the pumps was observed as the wet well level was drawn down. Pump operation was compared with the PLC level set-points. The comparison showed good agreement between PLC logic and pump operation. The wet well was then refilled via a water truck and the operation of the pumps observed as the wet well filled. This comparison also showed good agreement between PLC logic and pump operation.

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4. Pump data comparison

4.1 H/Q curve

The head and flow data was recorded for individual pump operation at a number of different pump speeds. This data is summarised in Appendix D. The collected data points were then compared to the factory test data supplied by the manufacturer. The comparison has been graphed and is included in Appendix E. From the graph it is apparent that there is very good correlation between the measured pump data and the previous factory test data.

4.2 Power curve

The power consumption, voltage and current of each pump were also measure for the various pump tests. These readings were read off the VSD controller. It was observed that the current and power readings tended to be unsteady and varied by about 10% even though other parameter remained relatively stable. The recorded values included in Appendix D are roughly the average values observed. The collected data points were then compared to the factory test data supplied by the manufacturer. The comparison has been graphed and is included in Appendix E. From the graph it is apparent that the observed pump power readings were slightly higher than expected however they still show good correlation to the manufacturers test data.

There are two reasons that contribute to the observed power reading being higher than those provided by the manufacturer. These include;

- The Hydrostal factory tests were undertaken without a VFD in the circuit while the permanent installation utilises a VSD. The inclusion of a VSD in the permanent installation introduces an efficiency loss not accounted for in the factory tests. The Danfoss VSD manual indicates that the VDS has a nominal efficiency of about 95% however this efficiency will reduce as motor load increases. The factory test power readings would therefore be at least 5% smaller than the observed readings.
- During site testing it was observed that the power readings fluctuated as the pumps were operating even though the load on the pumps remained the same. These fluctuations suggest that the on site power measuring equipment may be of a lower accuracy introducing error into power readings.

5. Conclusion

Based on the pre-commissioning tests and subsequent analysis PB is of the opinion the pumps meet the nominated requirements of the contract and are capable of achieving the design duties.

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Appendix A

Pre-commissioning plan

Leighton Contractors
Pty Limited
ACN 000 893 667

Level 3
143 Coronation Drive
MILTON Qld 4064
PO Box 288
Toowong Qld 4066

FORM

CONSTRUCTION METHOD STATEMENT

Project:	Australia Trade Coast Sewer	No.:	Q1112

CMS TITLE: **Commissioning of Viola Pump Station SP299**

CMS No.: **Q1112-CS-803**

START DATE: **23rd May 2005**

DURATION: **1 day**

Submit to Client / Nominate for review where specified in contract

- ❑ Rejected, resubmit _____ / /
- ❑ Accepted, with comments _____ / /
- ❑ Accepted _____ / /

Approved: _____ **Date:** _____

James Whybrow

Table of Contents

1 SCOPE OF WORK

The following is a method statement for the precommissioning of Viola Pump Station.

The purpose of the precommissioning is to determine that the pumpstation will perform in accordance with the expected criterion that has been assumed in the design of the system. Testing will determine operational points (head vs. flow) for each pump and checks that the system will operate in accordance with the operation programming that has been agreed in functional specifications.

The testing will simulate the four pumping modes of high-pressure operation into the 1340 Luggage point main (55Hz), the low pressure pumping into the 1340 Luggage point main (25Hz) and the low pressure pumping into the 1840 Luggage Point main (25-33Hz).

This statement includes the construction sequencing, associated risks and hazards and identifies critical activities. Supplementary to this will be risk assessments and toolbox talks itemising all safety and environmental hazards and control measures.

2 CONSTRAINTS

Constraints on the project include the following:

- Completion of mechanical and electrical works
- Completion of BW programming of the PLC "Program Logic Control

3 REFERENCES

3.1 Specifications and Approvals 0.10

- BW functional specification Version 1.01 – Sp299 Viola Pumpstation.
- SP299 design report.
- Attachment 5 of the contract – Mechanical Works
- All associated Brisbane City Council drawings and specifications

3.2 Drawings

- 486/5/7-SQ700/000 to 058 – Viola SP299 pump station
- Associated Brisbane City Council standard drawings

3.3 Management Plans & Documents

- Project Management Plan
- Safety and Health Management Plan
- Environmental Management Plan
- Construction Management Plan

3.4 Pump Station Duties

SP299 is required to deliver a maximum of 104 L/s into either the high pressure DN1370 Eagle Farm to Luggage Point rising main, or the low pressure DN1840 Eagle Farm to Luggage Point rising main. Both the large diameter rising mains are connected to variable speed pumps at the Eagle Farm Pump Station (EFPS) and hence the sewage flows in each main are variable.
The EFPS actually consists of two pump stations:

- EFPS#1, which has three 2000kW pumps in a two duty/one standby arrangement; and
- EFPS#2, which has two 1850kW pumps in a duty/standby arrangement.

During dry weather, EFPS#1 is normally used in conjunction with the DN1370 main. Under the current operating arrangements, EFPS#1 can deliver a maximum of around 4200 L/s through the DN1370 main to the Luggage Point WWTP.
During wet weather events, EFPS#1 is normally used in conjunction with the DN1370 main, and EFPS#2 is brought online to assist, in conjunction with the DN1840 main. Under the current operating arrangements, the EFPS can deliver a maximum of around 8000 L/s through both mains to the WWTP.
As SP299 is required to deliver sewage directly into the existing rising mains, its duty head is a strong function of the residual head in the selected discharge main. The maximum and minimum pump duties for SP299 are presented in the table below.

Main in Use	EFPS Flow (L/s)	SP299 Flow (L/s)	SP299 Head (m)
DN1370	4200	104	54.2
	0	104	11.6
DN1840	3800	104	19.6
	0	104	11.6

System curves, pump performance curves and duty calculations for SP299 are presented in the Section 7.1.

4 STAFF RESPONSIBILITIES

Commissioning Manager – Vic Bowyer, to provide direction as required, record readings and provide technical support for the Pre-commissioning

Mechanical and Electrical Manager – Frank Mitchell, to insurer that ITP's are complete and pre-check done prior to Precommissioning.

Commissioning Forman – Dave Manson, to coordinate the works and do most of the work.

BW Commissioning Manager – Reg McGirr/Henry Lai to observe and verify as required

BW PLC Manager – Alex Witthoft/Geoffrey Timms, to program, operate and monitor the PLC to insurer pump station operates correctly.

5 PERMITS / APPROVALS

N/A

6 CONSTRUCTION SEQUENCE

6.1 Previous Works

The previous works to be completed prior to this work commencing is listed below.

a) ITP complete for mechanical installation (Style)

b) ITP complete for electrical installation (Reidlec)

c) ITP complete for recycle main system (LC)

d) BW complete programming of PLC

e) Suction valve chamber all valves closed and tagged out.

f) Valves in discharge valve pit fully open.

g) To fill with water, the Wet Well and grit collector filled to "Start Duty A" and standby water tanker.

6.2 Completion of Works

Completion of the Viola Pump Station is May 2005.

7 PRE-COMMISSIONING TESTING

7.1 Pump Curve (Flow vs. Head) Testing

The purpose of the testing is to determine operational points (head vs. flow) for each pump and compare these points to the pump curves supplied by the manufacturer. Each pump will be tested operating at variable speeds 25, 33, 50 and 55Hz.

The test needs to be undertaken with the pump station in Manual mode to allow the pumps to be run with the resistance being provided by setting the throttling valve and obtaining points on the curves for varying speeds. Thus the tests will be done with the throttling valve opened at predetermined amounts (3,4,5, turns opened from the closed position) and the speed of the pumps varied to obtain points along the curves). The judgement of the position of the throttling valve will be estimated on the day to obtain points near the "Duty Points". (Note that valve should not be moved while excessive head is applied as it may damage the valve.

7.1.1 Pump Curve verification

7.1.1.1. Valve setting open 100%.

A. Fill wet well to **RL 0.350** mAHD to test pump station at low levels. This level is higher than target to allow for system to stabilise.

B. Set discharge-throttling valve fully open.

C. With the station in "Manual Mode" start Pump A at min 25Hz

D. With the discharge throttling valve fully open record readings for Q (max ≅ 90L/s) & H.

E. Repeat Step D for pump speed = 33Hz.

F. Repeat Step D for pump speed = 50Hz.

G. Repeat Step D for pump speed = 55Hz

Note that these may exceed the range of the flow meter, if so move to next step.

H. Shut down Pump 1 and repeat steps C. to G for Pump 2.

I. Reduce speed to 25Hz

7.1.1.2. Valve setting open 40%.

J. Set discharge-throttling valve @ 40% open or when flow is reduced to 60L/s.

K. With the Pump at min 25Hz record readings for Q (≅60L/s) & H.

L. Repeat Step D for pump speed = 33Hz.

M. Repeat Step D for pump speed = 50Hz.

N. Repeat Step D for pump speed = 55Hz

O. Shut down Pump and repeat steps K. to N for second Pump.

7.1.1.3. **Valve setting open 15% (Q=40L/s@25Hz).**

P. Set discharge-throttling valve so that flow is reduced to 40L/s.

Q. With the Pump at min 25Hz record readings for Q (≅40L/s) & H.

R. Repeat Step D for pump speed = 33Hz.

S. Repeat Step D for pump speed = 50Hz.

T. Repeat Step D for pump speed = 55Hz

U. Shut down Pump and repeat steps K. to N for second Pump.

7.1.1.4. **Valve setting open 5% (Q=30L/s@25Hz).**

V. Set discharge-throttling valve so that flow is reduced to 30L/s.

W. With the Pump at min 25Hz record readings for Q (≅30L/s) & H.

X. Repeat Step D for pump speed = 33Hz.

Y. Repeat Step D for pump speed = 50Hz.

Z. Repeat Step D for pump speed = 55Hz

AA. Shut down Pump and repeat steps W. to Z for second Pump.

7.1.1.5. **Duty Point 55Hz (Q ≈104L/s @55Hz).**

BB. From interpolation of the above reading set discharge-throttling valve so that flow is approximately 104L/s @ 55Hz.

CC. With the Pump at 50 and 55 Hz record readings for Q & H.

DD. Shut down Pump and repeat steps CC for second Pump.

7.2 PLC Functionality

This test is required to assess operation of flow banding of the station. Pump trip test and power failure tests are also tested when the station is delivering at approximately its duty flow.

A. Open the discharge-throttling valve back to ≈15%.

B. Set the station to operate on Auto. Pumps should start at 25 Hz.

C. Commence filling the well from the water tankers.

D. Once the level reaches 0.5 mAHD commence **Trip the duty pump**. Pump to be tripped by simulating fault, using Emergency Stop.

E. Observe that the standby pump starts and observe timing of restart.

F. Reset the tripped pump.

G. Observe that the duty pump's speed increases as the well level increases. From RL 0.25 – RL 1.25 mAHD (Approx 10,000L)

H. After the first tanker has emptied test generator simulation by trip power supply to switchboard by opening main isolator.

I. Observe start up of **generator** and continued operation of station.

J. Restore power to the switchboard by closing main isolator.

K. Observe shutdown of generator and continued operation of station.

7.2.1 Pump A & B (High level wet well) 50Hz Simulation pump faults.

A. Fill wet well to RL 1.40 mAHD. (Run two pumplimit)

B. The second pump should cut in once the level is reached

C. Gradually the VSD should increase to **50Hz** as the water level increases and record readings. *(Note this will be limited by the maximum flow in the flow meter of 250L/s)*

D. Switch station to "Local" and shutdown pumps.

7.2.2 PLC Functionality – Final fill and Emptying

This test is required to assess operation of flow banding of the station while emptying.

A. Continue filling station and verify senor probes levels and PLC records to overflow.

B. While in "Locate" mode switch one pump on and run at 25Hz.

C. Open valves to Luggage Point main and empty wet well down to RL 1.5mAHD (6,600L) Note throttling valve may need to be closed for this. Shut off pump once level is achieved.

D. Close valves to Luggage Point main and open discharge throttling valve.

E. Set the station to operate on Remote.

F. Pump water out of the wet well via temporary diverter valve at end of 1840 pipe.

G. Observe the pump performance verses the PCL programming is as expected. Criteria to be set by Alex Witthoft once PB functional Specification is finalised.

H. Observe that the duty pump reaches minimum speed at RL 0.25mAHD. (TBC)

I. Reduce level in wet well to **RL -0.00** mAHD to test pump station at low levels and observe for any vortices in wet well. (If vortices are observed the water level will need to be raised until these disappear. These levels will need to be recorded.)

J. Observe that the pump stops at RL-0.1

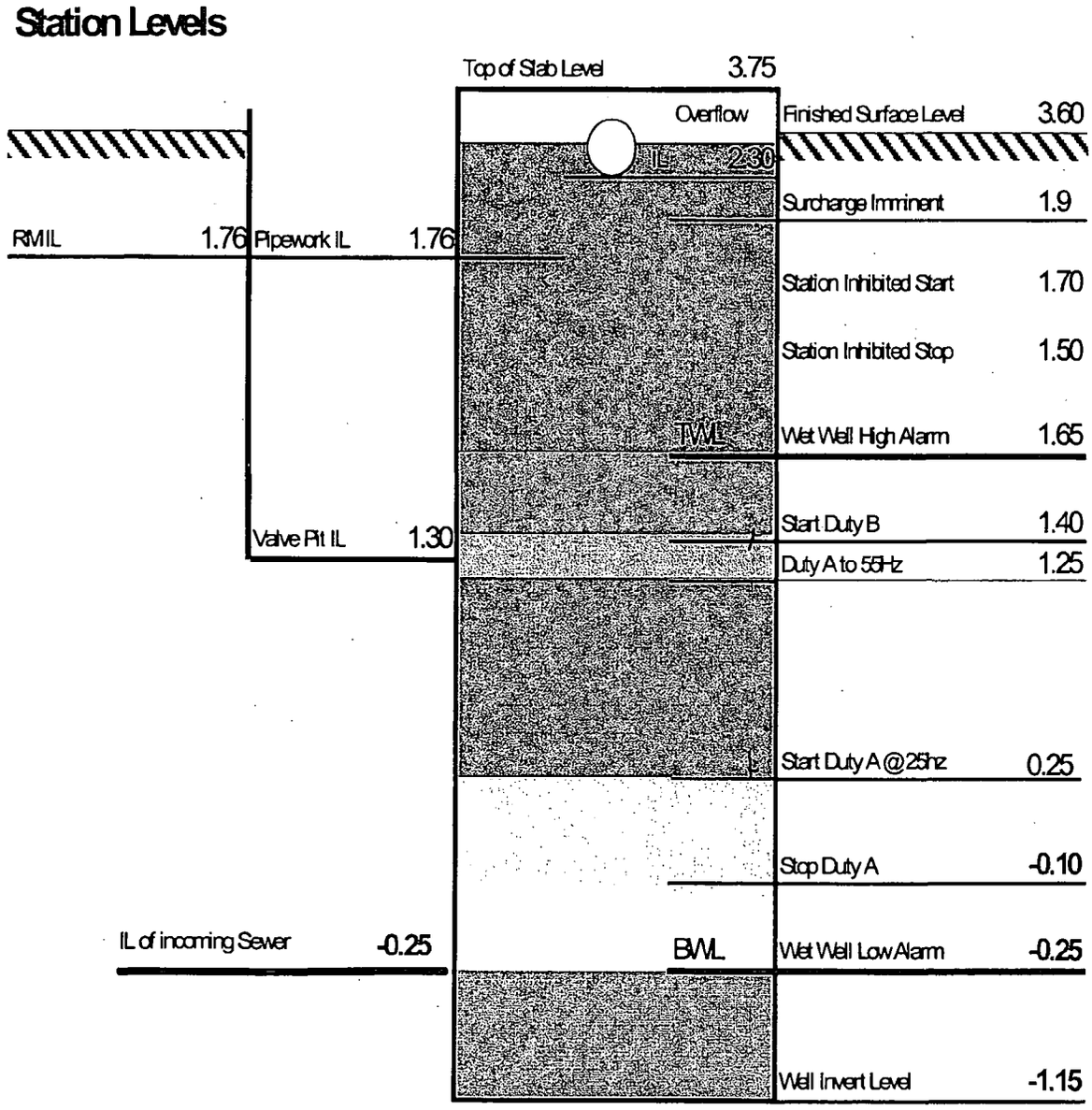
K. Stop pump station

7.3 Reinstatement of system

Once the testing is complete the recycle pipe will be removed and site backfilled and fencing completed

7.4 Operational Diagram

The following diagram shows the station structure levels and operating levels.



7.5 Wet Well Volume

The wet well level is calculated using a wet well levels versus volume look up table

		Water Height (mAHD)	Stored Volume (m^3)	Remaining Storage Capacity [m^3]	Comments	% Level	% Volume
1	Wet Well Low & incoming main	-0.25	0.0	25.9	BWL	0%	0%
2	Stop Duty A	-0.10	1.5	24.4		6%	6%
3	Stop Duty B	0.05	3.1	22.9		12%	12%
4	Start Duty A	0.25	5.1	20.8		20%	20%
5	Duty A Full Speed	1.25	15.3	10.7		59%	59%
6	Start Duty B	1.40	16.8	9.1		65%	65%
7	Station Inhibited Stop	1.50	17.8	8.1		68%	68%
8	High Level Alarm	1.65	19.3	6.6	TWL	74%	74%
9	Station Inhibited Start	1.70	19.8	6.1		77%	77
10	Surcharge Imminent Alarm	1.90	21.9	4.1		84%	84%
11	Surcharge Occurring Alarm	2.18	24.7	1.2		95%	95%
12	Overflow Level	2.30	26.0	0.0		100%	100%

8 PLANT, EQUIPMENT AND MATERIALS

8.1 Plant

- Backhoe
- Water Truck

8.2 Equipment

- Flex drive pumps and motors
- pumps
- Wacker Packer
- Small tools

8.3 Materials

- Bedding material – sand or crusher dust

9 PARTICULAR HAZARDS / RISKS

9.1 Safety & Health

9.2 Environment

⇒ The water used in the testing will be in a recycling system to minimise water usage.

⇒ Discharge of excess water will be done through rock check dam so to avoid erosion of the area.

Please refer to each individual Safe work method Statement and risk assessment to show associated risks and hazards. This includes all environmental risks as well. This statement must be completed and have a tool box talk completed for each activity.

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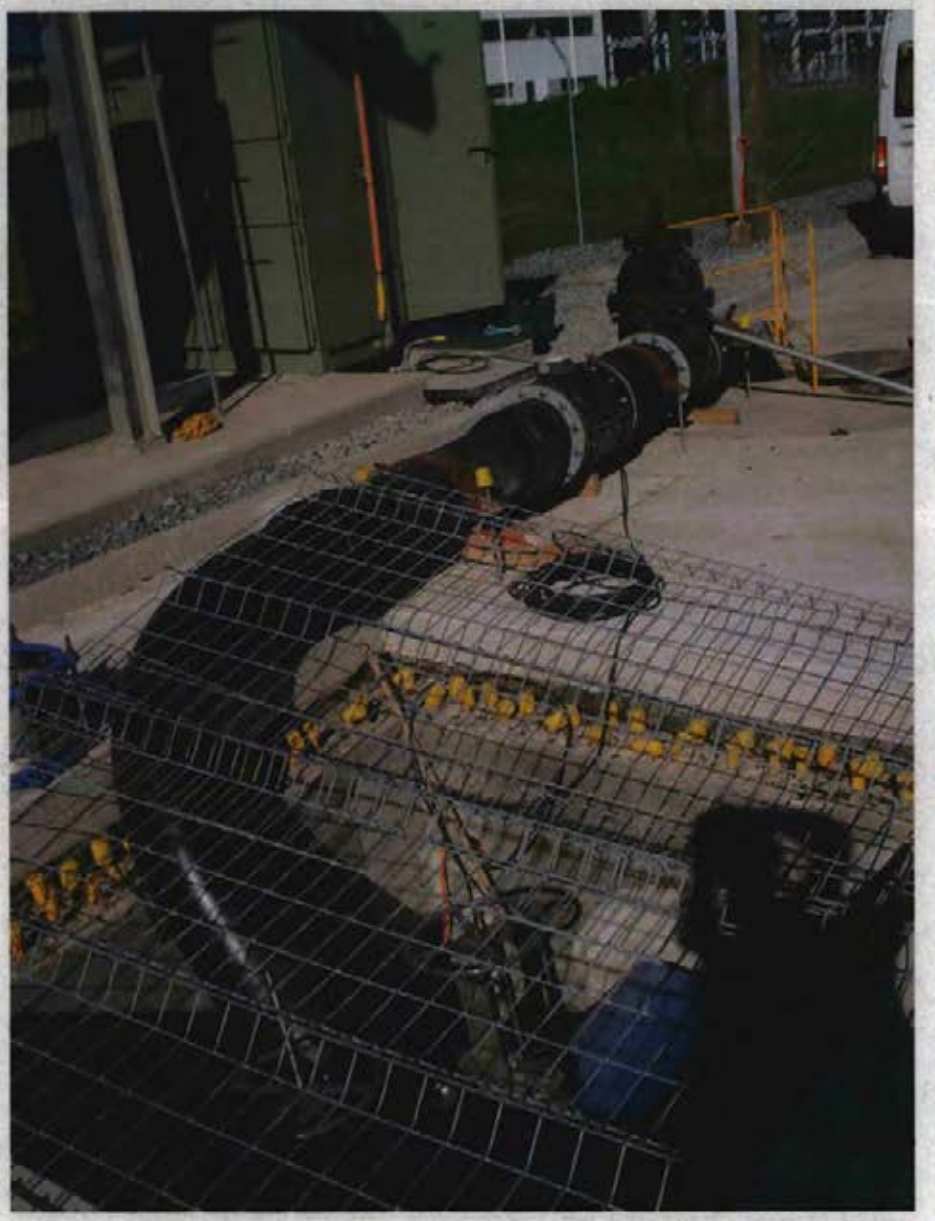
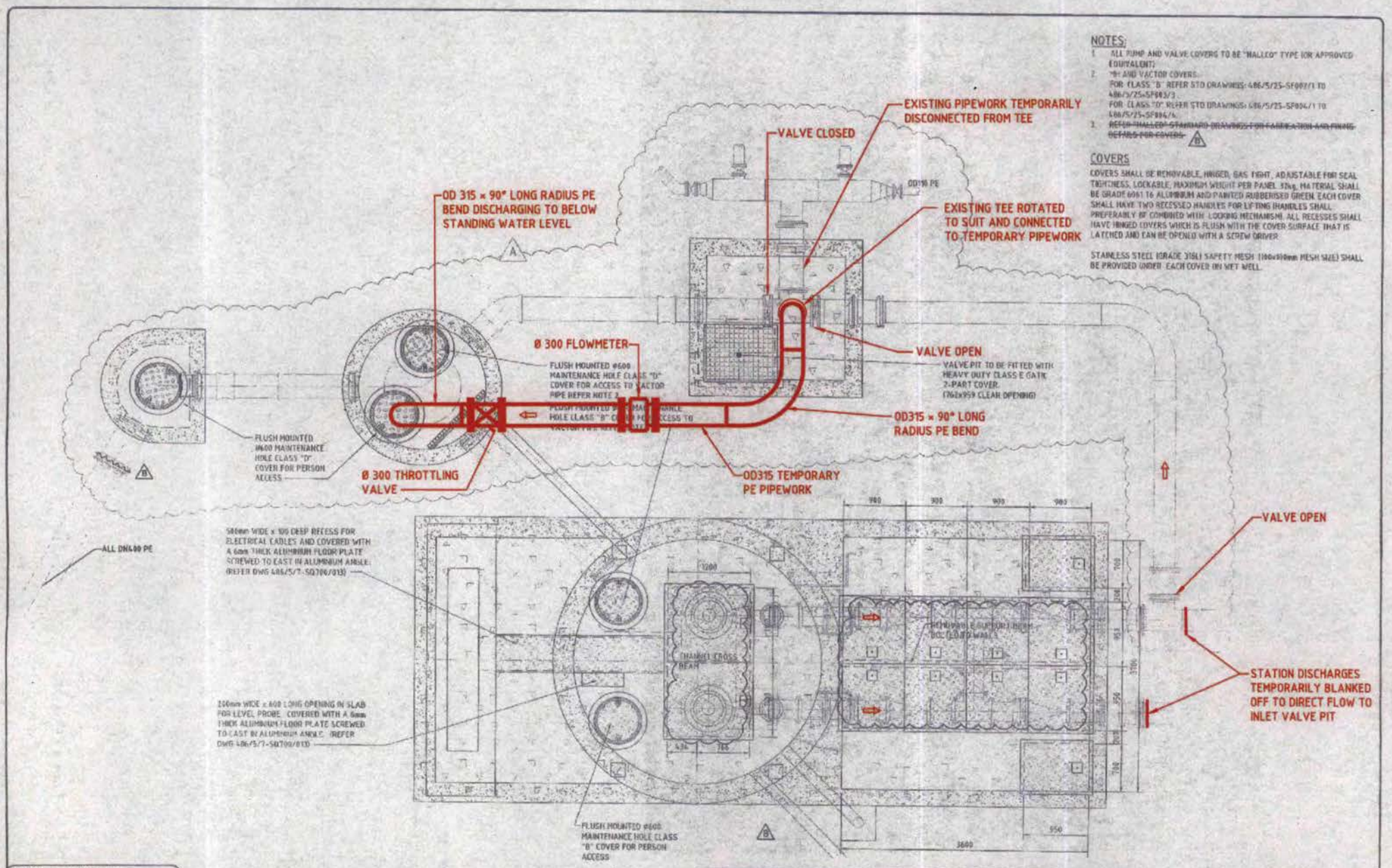
Appendix B

Temporary pre-commissioning pipework arrangement




NOTES:
1. ALL PUMP AND VALVE COVERS TO BE "HALLCO" TYPE (OR APPROVED EQUIVALENT)
2. "H" AND VACTOR COVERS:
FOR CLASS "B" REFER STD DRAWINGS: 486/5/25-SF007/1 TO 486/5/25-SF007/3.
FOR CLASS "D" REFER STD DRAWINGS: 486/5/25-SF004/1 TO 486/5/25-SF004/4.
3. REFER "HALLCO" STANDARD DRAWINGS FOR FABRICATION AND FIXING DETAILS FOR COVERS.
COVERS
COVERS SHALL BE REMOVABLE, HINGED, GAS TIGHT, ADJUSTABLE FOR SEAL TIGHTNESS, LOCKABLE, MAXIMUM WEIGHT PER PANEL 32kg, MATERIAL SHALL BE GRADE 6061 T6 ALUMINIUM AND PAINTED RUBBERISED GREEN. EACH COVER SHALL HAVE TWO RECESSED HANDLES FOR LIFTING (HANDLES SHALL PREFERABLY BE COMBINED WITH LOCKING MECHANISM). ALL RECESSES SHALL HAVE HINGED COVERS WHICH IS FLUSH WITH THE COVER SURFACE THAT IS LATCHED AND CAN BE OPENED WITH A SCREW DRIVER.
STAINLESS STEEL (GRADE 316L) SAFETY MESH (100x100mm MESH SIZE) SHALL BE PROVIDED UNDER EACH COVER (IN WET WELL).
EXISTING PIPEWORK TEMPORARILY DISCONNECTED FROM TEE
VALVE CLOSED
OD 315 x 90° LONG RADIUS PE BEND DISCHARGING TO BELOW STANDING WATER LEVEL
EXISTING TEE ROTATED TO SUIT AND CONNECTED TO TEMPORARY PIPEWORK
Ø 300 FLOWMETER
FLUSH MOUNTED Ø600 MAINTENANCE HOLE CLASS "D" COVER FOR ACCESS TO VACTOR PIPE REFER NOTE 2
VALVE OPEN
VALVE PIT TO BE FITTED WITH HEAVY DUTY CLASS E GATIC 2-PART COVER (760x959 CLEAR OPENING)
OD315 x 90° LONG RADIUS PE BEND
FLUSH MOUNTED Ø600 MAINTENANCE HOLE CLASS "B" COVER FOR PERSON ACCESS
Ø 300 THROTTLING VALVE
OD315 TEMPORARY PE PIPEWORK
ALL DN600 PE
580mm WIDE x 100 DEEP RECESS FOR ELECTRICAL CABLES AND COVERED WITH A 6mm THICK ALUMINIUM FLOOR PLATE SCREWED TO CAST IN ALUMINIUM ANGLE. (REFER DWG 486/5/7-SQ700/013)
VALVE OPEN
STATION DISCHARGES TEMPORARILY BLANKED OFF TO DIRECT FLOW TO INLET VALVE PIT
250mm WIDE x 600 LONG OPENING IN SLAB FOR LEVEL PROBE. COVERED WITH A 6mm THICK ALUMINIUM FLOOR PLATE SCREWED TO CAST IN ALUMINIUM ANGLE. (REFER DWG 486/5/7-SQ700/013)
FLUSH MOUNTED Ø600 MAINTENANCE HOLE CLASS "B" COVER FOR PERSON ACCESS
PROJECT AUSTRALIA TRADE COAST SEWERAGE PROJECT
AS CONSTRUCTED
Cardno MBK
PB
Brisbane Water
VIOLA PLACE SP299 ROOF PLAN
AS SHOWN
A.H. DATUM
486/5/7-SQ700/0
B

PARSONS BRINCKERHOFF

Appendix C

Manufacturers test data

Australia Trade Coast Sewerage Project
SPS 299 - Viola Place Pumping Station
Manufacturers Test Data

Viola Place - Pump 1

Pump :- H05K-S02R+HEUC4-XMEK
Fab-No. 138073

Hz	50
RPM	1485

Flow (l/s)	Head (m)	P (kW)
70.3	53.2	66.7
90	47.3	66.7
108.6	43.3	70.4
120	41	71.5
133	38.3	74.2
148.6	34.8	76
190	25.5	75.5

Hz	33
RPM	980

Flow (l/s)	Head (m)	P (kW)
46.4	23.2	19.2
59.4	20.6	19.2
71.7	18.9	20.2
79.2	17.9	20.6
87.8	16.7	21.3
98.1	15.2	21.8
125.4	11.1	21.7

Hz	25
RPM	743

Flow (l/s)	Head (m)	P (kW)
35.2	13.3	8.3
45.0	11.8	8.3
54.3	10.8	8.8
60.0	10.3	8.9
66.5	9.6	9.3
74.3	8.7	9.5
95.0	6.4	9.4

Hz	53
RPM	1574

Flow (l/s)	Head (m)	P (kW)
74.5	59.8	79.4
95.4	53.1	79.4
115.1	48.7	83.8
127.2	46.1	85.2
141.0	43.0	88.4
157.5	39.1	90.5
201.4	28.7	89.9

Viola Place - Pump 2

Pump :- H05K-S02R+HEUC4-XMEK
Fab-No. 138074

Hz	50
RPM	1485

Flow (l/s)	Head (m)	P (kW)
70.3	53.9	63.9
90.7	46.3	66.4
109.3	42.3	69.5
120	39.9	71.2
133.6	36.9	72.9
148.6	33.6	74.3
190	24.1	74.8

Hz	33
RPM	980

Flow (l/s)	Head (m)	P (kW)
46.4	23.5	18.4
59.9	20.2	19.1
72.1	18.4	20.0
79.2	17.4	20.5
88.2	16.1	21.0
98.1	14.6	21.4
125.4	10.5	21.5

Hz	25
RPM	743

Flow (l/s)	Head (m)	P (kW)
35.2	13.5	8.0
45.4	11.6	8.3
54.7	10.6	8.7
60.0	10.0	8.9
66.8	9.2	9.1
74.3	8.4	9.3
95.0	6.0	9.4

Hz	53
RPM	1574

Flow (l/s)	Head (m)	P (kW)
74.5	60.6	76.1
96.1	52.0	79.1
115.9	47.5	82.8
127.2	44.8	84.8
141.6	41.5	86.8
157.5	37.8	88.5
201.4	27.1	89.1

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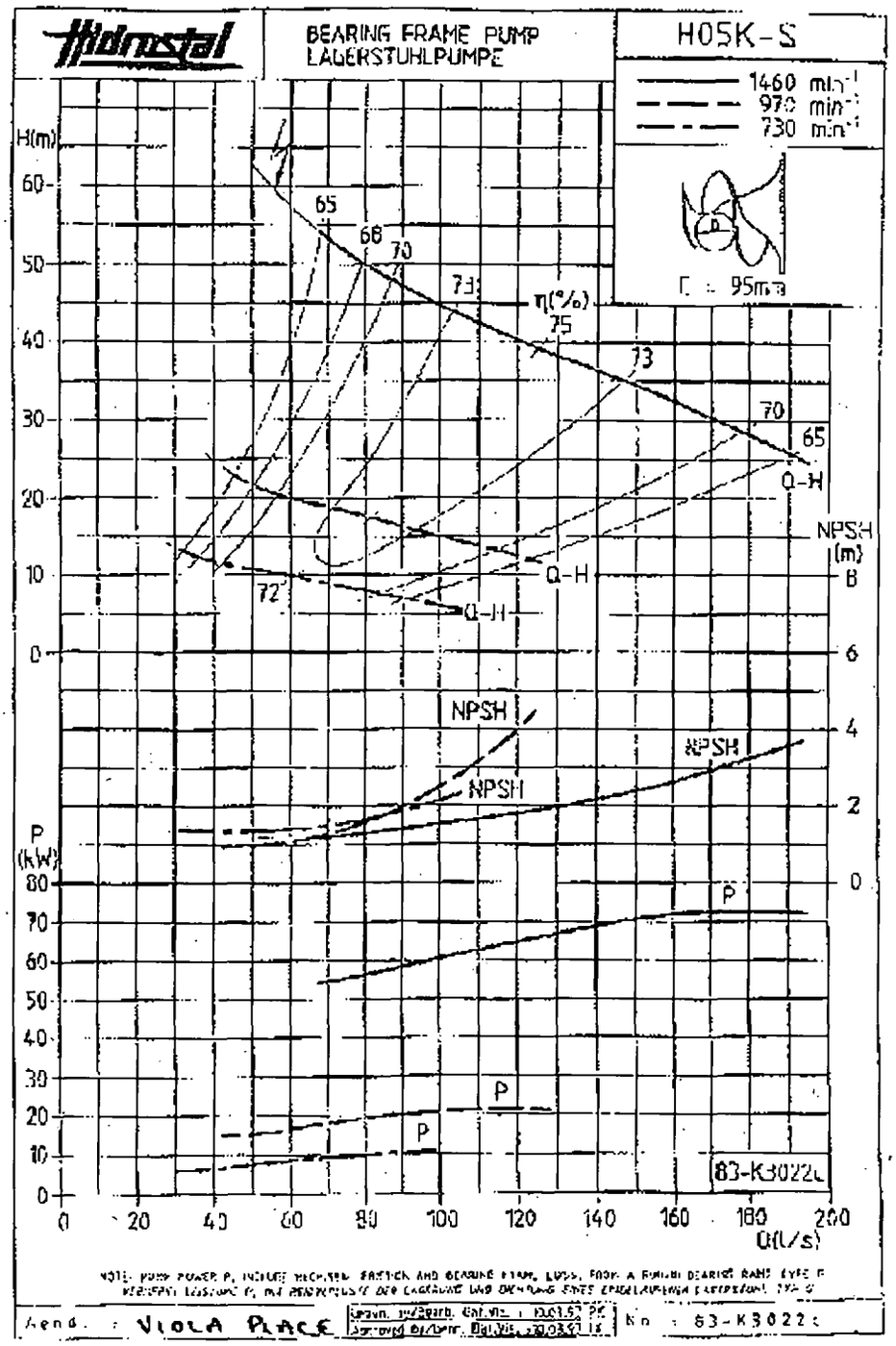


PARSONS BRINCKERHOFF

Appendix D

Pre-commissioning test data

Australia Trade Coast Sewerage Project
SPS 299 - Viola Place Pumping Station
Pre-Commissioning Test Data Summary

Viola Place - Pump 1

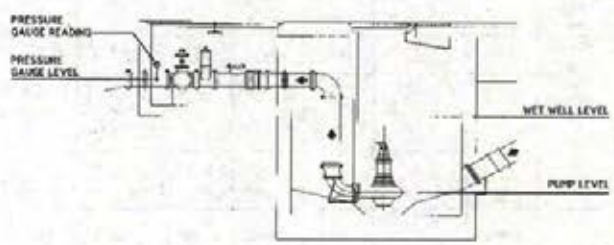
Pump :- H05K-S02R+HEUC4-XMEK
Fab-No. 138073

Hz / RPM	Pump Discharge Head (m)	Pump Discharge Flow (l/s)	Pump Power (kW)
25 / 747	8.147	70.5	10.7
	9.727	57	10
	11.427	42	9.2
33 / 985	14.477	93.5	23.5
	17.427	75	22
	20.327	55	20.2
50 / 1493	34.427	139.5	80
	40.927	112	74.8
	47.227	84	67
53 / 1583	39.027	147	94
	46.827	115	87
55 / 1642	57.427	92	87

Viola Place - Pump 2

Pump :- H05K-S02R+HEUC4-XMEK
Fab-No. 138074

Hz / RPM	Pump Discharge Head (m)	Pump Discharge Flow (l/s)	Pump Power (kW)
25 / 747	8.227	68	10.5
	8.827	64.3	10.3
	11.427	43	9.3
33 / 985	16.027	82	22.1
	15.727	84	22.4
	20.327	57.5	20.1
50 / 1493	35.027	136	77
	37.027	128	75.5
	47.427	85	66
53 / 1583			
55 / 1642	42.527	150	103
	45.227	140	102
	57.427	93	



PUMP DISCHARGE HEAD = PRESSURE GAUGE READING + (PRESSURE GAUGE LEVEL - PUMP LEVEL) - (WET WELL LEVEL - PUMP LEVEL)

CALCULATION DIAGRAM

PUMP TEST SHEET

Brisbane Water

Australia Trade Coast Sewer Project
CONTRACT NO: BW30137-02/03
Pump Station: ~~Serpentine Road SP300~~ VIOLA PLACE SPS 299

Test Date: 24/5/05

Mode	Running Local Remote	Pump Serial No: Type: H0K-M02R+ETZ4-XMEK+NEE8-16 Make: Hidrostal	Time	Incomming Mains		Wet Well Level Set Points (m AHD)										Wet Well Level	Pump Delivery	Flow	Motor			Discharge Valve	Water	Generator	Pump motor
				SP298 Lytton Road P/S	SP131 McBride Road P/S	Low Alarm	Stop Duty A	Stop Duty B	Start Duty A	PID Setpoint	Start Duty B	High Level Alarm	Emergency Storage Imminent	Emergency Storage Active	Overflow Level	Vega Probe	Head	Rate	Speed	Current	Power	Position Open	Temp	Running	Hours Run VOLTAGE
No	Mode	No	Hr/Min	Open/Close		-0.72	-0.52	0.01	0.21	0.26	0.41	0.51	0.71	0.91		%/mAHD	m AHD	l/s	RPM/Hz	A	Kw	%	Deg.C	Yes/No	Hrs ✓
	(Local) Remote	PUMP 1		Open Close	Open Close											2·17	8·42	70·5	25	69·5	10·7	5%		Yes No	108
	(Local) Remote	"		Open Close	Open Close											2·17	14·75	93·5	33	93	23·5	5%		Yes No	177
	(Local) Remote	"		Open Close	Open Close											2·17	34·7	139·5	50	165·5	80	5%		Yes No	360
	(Local) Remote	"		Open Close	Open Close											2·17	39·3	147	53	170	94	5%		Yes No	392
	Local Remote			Open Close	Open Close																			Yes No	
	(Local) Remote	PUMP 2		Open Close	Open Close											2·17	8·5	68	25	67·5	10·5	5%		Yes No	110
	(Local) Remote	"		Open Close	Open Close											2·17	16·3	82	33	88·5	22·1	5%		Yes No	175·5
	(Local) Remote	"		Open Close	Open Close											2·17	35·3	136	50	151	77	5%		Yes No	361
	(Local) Remote	"		Open Close	Open Close											2·17	42·8	150	55	174	103	5%		Yes No	417
	Local Remote			Open Close	Open Close																			Yes No	
	(Local) Remote	PUMP 2		Open Close	Open Close											2·17	9·1	64·3	25	66·7	10·3	3%		Yes No	109
	(Local) Remote	"		Open Close	Open Close											2·17	16	84	33	88·6	22·4	3%		Yes No	177·5
	(Local) Remote	"		Open Close	Open Close											2·17	37·3	128	50	148	75·5	3%		Yes No	359
	(Local) Remote	"		Open Close	Open Close											2·17	45·5	140	55	171	102	3%		Yes No	416
	Local Remote			Open Close	Open Close																			Yes No	
	(Local) Remote	PUMP 1		Open Close	Open Close											2·17	10	57	25	66·5	10	3%		Yes No	105·5
	(Local) Remote	"		Open Close	Open Close											2·17	17·7	75	33	89	22	3%		Yes No	173·5
	(Local) Remote	"		Open Close	Open Close											2·17	41·2	112	50	147·5	74·8	3%		Yes No	353
	(Local) Remote	"		Open Close	Open Close											2·17	47·1	115	53	158	87	3%		Yes No	385
	Local Remote			Open Close	Open Close																			Yes No	
	Local Remote			Open Close	Open Close																			Yes No	
	Local Remote			Open Close	Open Close																			Yes No	

Mode 1 One or Two Pump running into 1370 Rising Main Entered By: Vic Bowyer (PB)

Mode 2 One Pump running into 1840 Rising Main

Pump Serial No: ~~138077~~ 138073 Pump (1)—2

Witnessed By: Reg McGirr (BW)

Pump Serial No: ~~138078~~ 138074 Pump 1—(2)

Comments:

Wet well probe:		
0%=	-0·25	mAHD
100%=	2·30	mAHD
Discharge:		
Gauge RL	1·90	mAHD

Site Fc Rev 0

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PUMP TEST SHEET

Brisbane Water

Australia Trade Coast Sewer Project
CONTRACT NO: BW30137-02/03
Pump Station: ~~Serpentine Road SP300~~ VIOLA PLACE SPS 299

Test Date: 24/5/05

Mode	Running Local Remote	Pump Serial No: Type: H0K-M02R+ETZ4-XMEK+NEE8-16 Make: Hidrostal	Time	Incomming Mains: SP298 Lytton Road P/S	Incomming Mains: SP131 McBride Road P/S	Wet Well Level Set Points (m AHD): Low Alarm	Stop Duty A	Stop Duty B	Start Duty A	PID Setpoint	Start Duty B.	High Level Alarm	Emergency Storage Imminent	Emergency Storage Active	Overflow Level	Wet Well Level: Vega Probe	Pump Delivery: Head	Flow: Rate	Motor: Speed	Motor: Current	Motor: Power	Discharge Valve: Position Open	Water: Temp	Generator: Running	~~Pump~~ MOTOR ~~Hours Run~~ VOLTAGE
No	Mode	No	Hr/Min	Open/Close		-0.72	-0.52	0.01	0.21	0.26	0.41	0.51	0.71	0.91		%/mAHD	m AHD	l/s	RPM/Hz	A	Kw	%	Deg.C	Yes/No	~~Hrs~~ V
	(Local) Remote	PUMP 2		Open Close	Open Close											2.17	11.7	43	25	62.5	9.3	2%		Yes No	104.5
	(Local) Remote	"		Open Close	Open Close											2.17	20.6	57.5	33	83.7	20.1	2%		Yes No	170
	(Local) Remote	"		Open Close	Open Close											2.17	47.7	85	50	136	66	2%		Yes No	348.
	(Local) Remote	"		Open Close	Open Close											2.17	57.7	93	55	FLANGE	FAILURE	2%		Yes No	—
	Local Remote			Open Close	Open Close																			Yes No	
	(Local) Remote	PUMP 1		Open Close	Open Close											2.17	11.7	42	25	63.5	9.2	2%		Yes No	101.9
	(Local) Remote	"		Open Close	Open Close											2.17	20.6	55	33	84	20.2	2%		Yes No	167
	(Local) Remote	"		Open Close	Open Close											2.17	47.5	84	50	137	67	2%		Yes No	344
	(Local) Remote	"		Open Close	Open Close											2.17	57.7	92	55	160	87	2%		Yes No	399
	Local Remote			Open Close	Open Close																			Yes No	
	Local Remote			Open Close	Open Close																			Yes No	
	Local Remote			Open Close	Open Close																			Yes No	
	Local Remote			Open Close	Open Close																			Yes No	
	Local Remote			Open Close	Open Close																			Yes No	
	Local Remote			Open Close	Open Close																			Yes No	
	Local Remote			Open Close	Open Close																			Yes No	
	Local Remote			Open Close	Open Close																			Yes No	
	Local Remote			Open Close	Open Close																			Yes No	
	Local Remote			Open Close	Open Close																			Yes No	
	Local Remote			Open Close	Open Close																			Yes No	
	Local Remote			Open Close	Open Close																			Yes No	
	Local Remote			Open Close	Open Close																			Yes No	

Mode 1 One or Two Pump running into 1370 Rising Main

Mode 2 One Pump running into 1840 Rising Main

Pump Serial No: ~~138077~~ 138073 Pump (1)—2

Pump Serial No: ~~138078~~ 138074 Pump 1—(2)

Entered By: Vic Bowyer (PB)

Witnessed By: Reg McGirr (BW)

Comments:

Wet well probe:
0%= -0.25 mAHD
100%= 2.30 mAHD

Discharge:
Gauge RL 1.90 mAHD

Site Form 001 Rev 0

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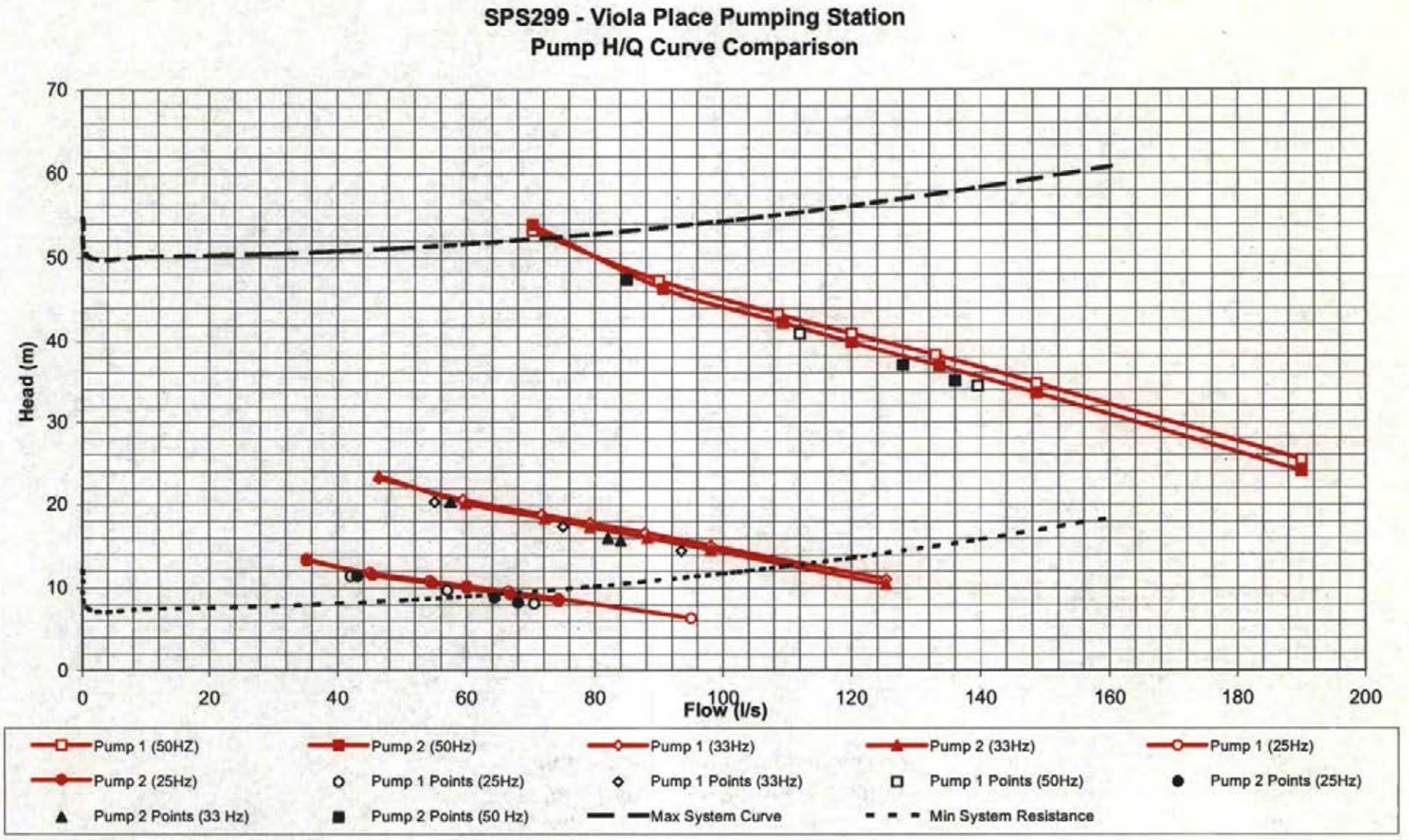
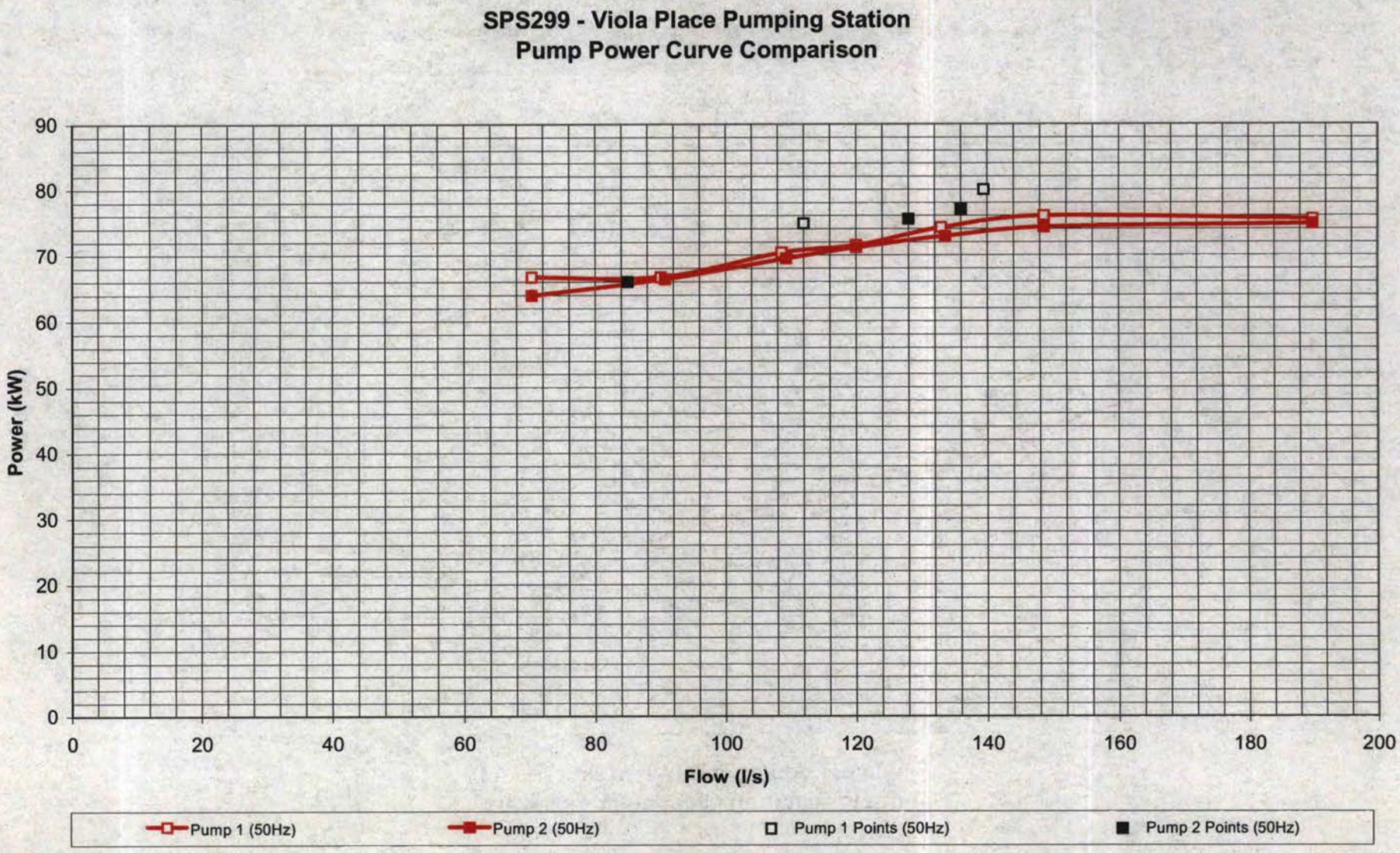
Appendix E

Pump data comparison graphs


SPS299 - Viola Place Pumping Station
Pump H/Q Curve Comparison
Head (m)
Flow (l/s)
0
10
20
30
40
50
60
70
0
20
40
60
80
100
120
140
160
180
200
Pump 1 (50HZ)
Pump 2 (50Hz)
Pump 1 (33Hz)
Pump 2 (33Hz)
Pump 1 (25Hz)
Pump 2 (25Hz)
Pump 1 Points (25Hz)
Pump 1 Points (33Hz)
Pump 1 Points (50Hz)
Pump 2 Points (25Hz)
Pump 2 Points (33 Hz)
Pump 2 Points (50 Hz)
Max System Curve
Min System Resistance


SPS299 - Viola Place Pumping Station
Pump Power Curve Comparison
Power (kW)
0
10
20
30
40
50
60
70
80
90
0
20
40
60
80
100
120
140
160
180
200
Flow (l/s)
Pump 1 (50Hz)
Pump 2 (50Hz)
Pump 1 Points (50Hz)
Pump 2 Points (50Hz)

SECTION 4

Leighton Contractors
Pty Limited
ACN 000 893 667

Level 3
143 Coronation Drive
MILTON Qld 4064
PO Box 288
Toowong Qld 4066

FORM

CONSTRUCTION METHOD STATEMENT

Project:	Australia Trade Coast Sewer	No.:	Q1112

CMS TITLE: **Construction of Viola Pump Station**

CMS No.: **Q1112-CS-702**

START DATE: **19 July 2004**

DURATION: **3 months**

Submit to Client / Nominate for review where specified in contract

- ☐ Rejected, resubmit _____ / /
- ☐ Accepted, with comments _____ / /
- ☐ Accepted _____ / /

Approved: _____ **Date:** _____

Project Manager

Table of Contents

1. SCOPE OF WORK

The following is a method statement for the construction of Viola Pump Station in separable portions 3. The Viola pump station is made up of civil, concrete, reinforcement and mechanical works.

This statement includes the construction sequencing, associated risks and hazards and identifies critical activities. Supplementary to this will be risk assessments and toolbox talks itemising all safety and environmental hazards and control measures.

2. CONSTRAINTS

Constraints on the project include the following:

- Alignment approvals.
- Interaction with major stakeholders and the community.
- Indigenous community
- "For construction" drawings

3. REFERENCES

3.1 Specifications

- Attachment 4 of the contract – Civil Works Construction Specification
- Attachment 5 of the contract – Mechanical Works
- All associated Brisbane City Council drawings and specifications
- Manual of Uniform Traffic Control Devices 2003 edition Part 3 (MUTCD)

3.2 Drawings

- 486/5/7-SQ700/000 to 057 – Viola Place SP299 pump station
- Associated Brisbane City Council standard drawings
- Associated IPWEAQ standard drawings

3.3 Management Plans & Documents

- Project Management Plan
- Safety and Health Management Plan
- Environmental Management Plan
- Construction Management Plan

4. STAFF RESPONSIBILITIES

Staff will be responsible for all associated work according to their project descriptions which can be found in the Project Management Plan. The Project Engineer will coordinate with the Site Engineer and Foreman the supervision of all direct labour and subcontractors to ensure that all work is completed in a professional manner with no class 1 or 2 safety and environmental incidents. All costs and production will be reviewed on a daily basis to ensure the work is completed on time and to budget.

5. PERMITS / APPROVALS

Prior to commencing construction all relevant permits and approvals are required to be signed and approved for construction. This includes BACL development application approvals, section 86 and 51 permits and also Main Roads alignment approvals. Other approvals that are to be completed are "for construction' drawing approvals from Brisbane City Council, Community consultation to ensure the public are aware of the works and any Traffic Control permits to complete works on or near the road alignment. All of these approvals will be required to be signed off on a works pre-commencement checklist by all associated people looking after each particular area. Construction on site will not commence until this checklist is completely signed off, reviewed and approved by the Project Manager.

6. CONSTRUCTION SEQUENCE

6.1 Previous Works

Previous work to be completed is the approval of all the associated permits and alignments as detailed in section 5. Once this has been achieved construction can commence on site.

6.2 Works to be Completed

Completion of the Viola pump station is currently targeted for November 2004.

7. DETAILED CONSTRUCTION METHODS

Works will be carried out in the following stages:

7.1 Clearing, Grubbing and Topsoil Removal

Once the pre-commencement checklist (this includes all external permits and approvals required) has been completed and approved, construction can take place.

The approved clearance zone as specified in the section 51, 86 and BACL development approvals will be pegged out using survey and any trees, shrubs or grass that needs to remain will be clearly marked. A 20 Tonne excavator will use a straight edge batter bucket to remove all vegetation and topsoil. This material will be taken to a dumping area on site. Where drains are present silt fences will be erected between the drain and the work area to ensure no runoff will take place. Where required the silt fence will have 20mm aggregate or ballast placed at the base to ensure stability problems are overcome. Any cooch grass will be removed with care so it can be used to reinstate the area.

The areas that have "trapped" water will be pumped out using sump holes and flex drive pumps into grassland so it can be filtered prior to entering any waterways. The water will be tested for pH prior to pumping and neutralised if required. No untreated water will be entering directly into the waterways.

7.2 Stage 1 (refer to attached drawings)

Viola Drawings CS702.pdf

The pump station's structures will be marked out using survey on the ground. Once survey has been completed a 20T Excavator will remove material down to approximately RL1.2 as shown on stage 1 drawing. This will be completed using benching, battering or shoring where required.

7.3 Stage 2 (refer to attached drawings)

The excavator will then remove material from the wet well region down to RL -1.4 as shown on the stage 2 drawing. Once the excavation has been completed a steel form will be placed into the excavation. Survey will confirm this is in the correct position. The steel form will be 2.4m high which makes it level to stage 1 excavation. A timber blockout will be placed on the steel form where the pipe from the grit collector will need to be placed. This is so the concrete will not have to be hammered out at a later stage. Concrete is then pour around the outside of the steel plate to stabilise the excavation and help prevent water entering. This will act as the backform for all subsequent concrete pours. The steel liner is then removed from the pit area.

7.4 Stage 3

Blinding concrete will be placed as soon as possible in each hole to ensure there is a firm clean environment for the rest of the structure to be constructed on. This concrete is usually 20Mpa and 50mm thick.

This stage of the works consists of pouring the floor slab and the first section of the walls. The base reinforcement will be tied as a prefabricated cage and lifted into position. The starter bars will then be tied insitu. All other reinforcement will also be tied in situ. Once the floor has been poured the reinforcement for the wall will be completed. While this is being done the inside form will have the PE liner attached, fitted and cut to size. A specialist subcontractor will complete this. Once the reinforcement is completed the inside form is placed into position ensuring there is adequate cover

on all sides. Once all prepour checklists are completed concrete will be poured. The next day after the pour the steel liner will be removed.

7.5 Stage 4

The next section of works is to complete the valve pit and the grit collector bases. While the reinforcement is being completed on the valve base a backhoe will excavate the remaining material around the grit collector. These two bases will be complete concurrently. While these 2 bases are being poured a scaffold / formwork system will be constructed in the wet well ready for the next pour.

7.6 Stage 5

Once the scaffolding has been placed inside the wet well, the external steel form will be put into position. Reinforcement will be completed and then the internal steel form with the PE liner will be installed. Once cover is ok and prepour checklists have been approved the walls will be poured. The top of the steel form will require a working platform so the pour this section can be completed safely. During this process the Grit collector walls will be poured in the same way.

As shown on the drawings some of the pipe work that penetrates the wall in the wet well will be placed and secured in their correct positions prior to the concrete being poured. The penetrations in the grit collector will be completed using a blockout and placed at a later stage. Once all concrete has cured the steel forms will be removed.

7.7 Stage 6

This stage consists of forming fixing and pouring the valve pit wall. This is to be completed using standard ply and timber formwork. The penetration will be secured into position prior to pouring. The lower pipe from the grit chamber to the wet well will be placed. Once into position the penetration in the wet well will be poured and completed. Once cured, the area will be backfilled up to the high level pipe. This will be completed in layers and tested to ensure compaction is maintained. The high level pipe will be placed and backfilled using the same method just mentioned.

Once both pipes have been installed and backfilled the collection manhole will be completed. A backhoe will excavate the required area. Once the excavation is in the correct position the precast collection manhole will be placed. Once checked for position and height the pipe between it and the grit collector will be placed. Backfilling will then be completed using a sand backfill in layers and to the required standards.

7.8 Stage 7

The remaining pits and roofs are now constructed. A scaffolding / formwork system will be placed inside the wet well and the valve pit where required. Once the formwork is in place the PE liner will be placed and welded to the walls by the subcontractor. Once this is completed the reinforcement is fixed and the concrete is poured. While the roof is curing, the overflow and discharge manholes are completed. These are completed the same way as the collection manhole as they are also precast units. The Grit collector roof will be formed, fixed and poured on site but as a precast unit on the ground. Once the roof has cured it is placed into position.

Once the roof for the valve pit and wet well is cured, the scaffolding and formwork is removed and everything is backfilled as described earlier. All of the pits will then be cleaned up and made watertight. They will all then have the ladder, lids and any other miscellaneous materials installed. The PE liner will then be cut, patched and welded where required (eg around penetrations) so the pits are completed sealed. The liner will be spark tested and certified that it is sealed.

Any dewatering throughout the entire process will be completed using correct pumps and sizes and the water will be tested prior to being released. It will not be released directly into any waterway unless it has been tested and everything is at acceptable levels.

7.9 Mechanical and Electrical Works

Once all civil works has been completed mechanical, electrical and all miscellaneous works will commence. A separate construction method statement will cover this work.

7.10 General

All works will be carried in daylight hours. There will be exceptions where critical activities will require completion, which could carry into night works. If night works is required all surrounding stakeholders will be notified about the works. The lighting that will be used will be portable lighting towers positioned so not to intrude on anyone's home.

Each of the pump stations will have fencing installed as shown on the drawings. If work commences before the permanent fencing is installed, then temporary fencing will be placed to secure the compound.

8. PLANT, EQUIPMENT AND MATERIALS

8.1 Plant

- 12 and 20 Tonne Excavator
- Backhoe
- Trench roller
- 10m Tip trucks
- Water Truck
- 12 or 20T Franna

8.2 Equipment

- Flex drive pumps and motors
- pumps
- Wacker Packer
- Small tools
- Concreting tools
- Welding machines
- Environmental silt fencing

8.3 Materials

- Bedding material – sand or crusher dust
- Lime
- Road base
- 10mm aggregate
- PE Liner
- Concrete
- Reinforcement
- Formwork

9. PARTICULAR HAZARDS / RISKS

9.1 Safety & Health

9.2 Environment

9.3 Community

Please refer to each individual Safe work method Statement and risk assessment to show associated risks and hazards. This includes all environmental risks as well. This statement must be completed and have a tool box talk completed for each activity.

SECTION 5

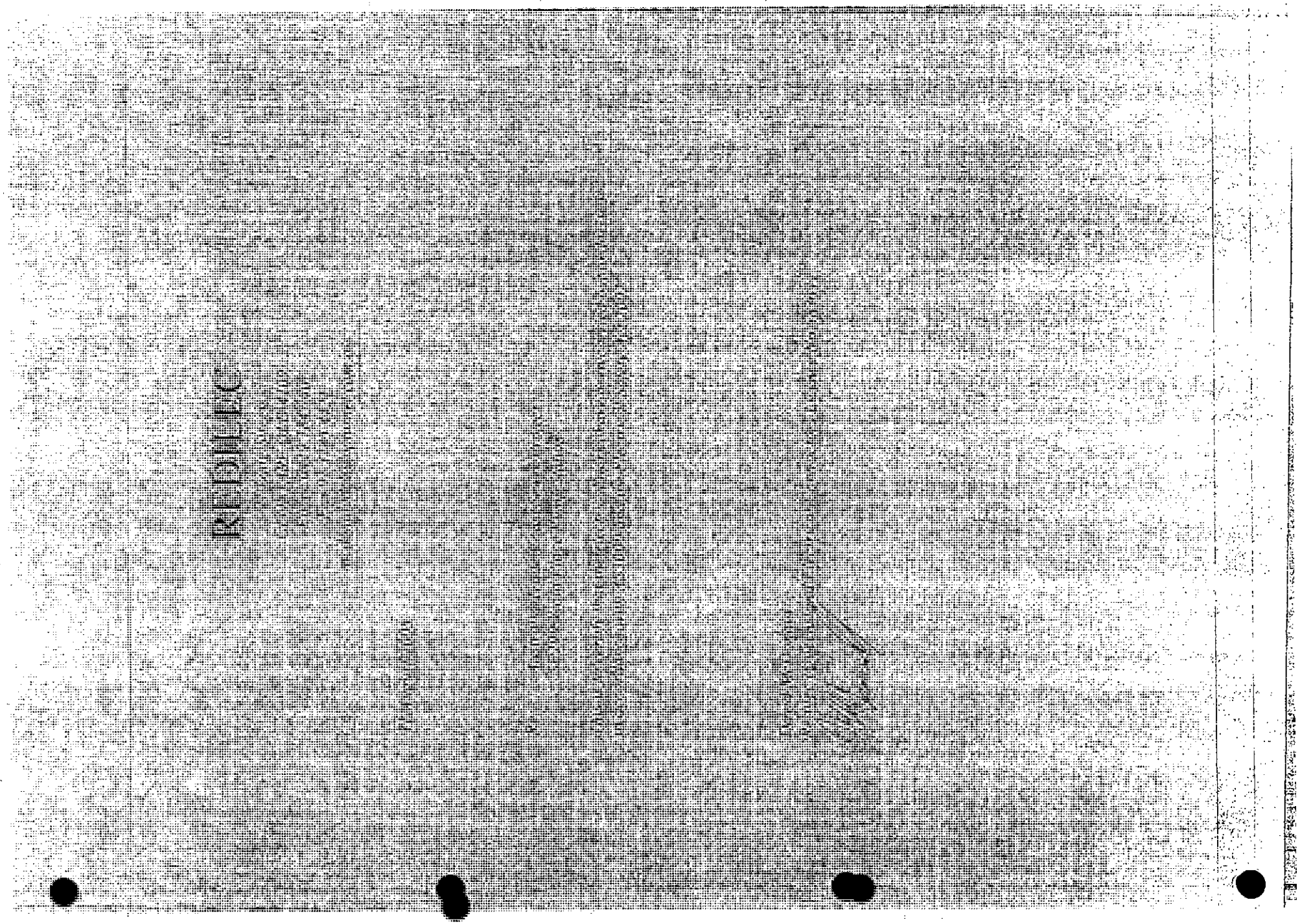
BRISBANE CITY COUNCIL
Brisbane Water
Australia Trade Coast Sewer Project

BW30137-02/03

QA Register Viola Place SP299

Lot No.	Description	Chainage From	Chainage To	Date Opened	Date Closed
AV10	Air Valve Pit Installation SM16 Ch 244	244		3/11/2004	14/03/2005
BW11	Butt Welding SM16 Ch 0 - 350 Sewer 315dia			20/09/2004	26/02/2005
CG07	SM16, SM17, SM18 clearing and grubbing			4/06/2004	23/12/2004
CP03	SP299 Viola Place Pump Station			19/11/2004	19/11/2004
CW14	SP299 Base slab of pump Well			3/12/2004	11/01/2005
CW30	SP299 Pumpwell walls 1st lift & Valve Pit Base			22/02/2005	29/03/2005
CW33	SP299 Pumpwell walls 2nd lift			3/03/2005	20/04/2005
CW34	SP299 Valve Pit walls			8/03/2005	20/04/2005
CW35	SP299 Grit collector base and walls 1st lift, Inlet vale pit base			10/03/2005	20/04/2005
CW36	SP299 Grit collector walls 2nd lift			11/03/2005	20/04/2005
CW37	SP299 Inlet Valve pit walls			15/03/2005	20/03/2005
CW38	SP299 Pump Station roof slab			23/03/2005	9/05/2005
CW39	SP299 Grit collector Roof			24/03/2005	
W42	SP299 Overflow pit walls and roof			7/04/2005	28/04/2005
W43	SP299 Kerb and Channel			13/04/2005	28/04/2005
CW44	SP299 Driveway			19/04/2005	
CW45	SP299 Generator Slab			20/04/2005	8/05/2005
EC75	Electrofusion Coupling SM16 complete (refer to TW117 - TW121)	TW117	TW121	3/11/2004	20/01/2005
EL03	Electrical works Viola Pump Station SP299			24/04/2005	16/06/2005
ME03	Mechanical Works Viola Pump Station SP299			24/04/2005	12/05/2005
PT09	Pipe testing SM16 both lines (Viola)			22/03/2005	24/03/2005
SG04	Subgrade Viola Pl PS backfill & subgrade			3/05/2005	5/05/2005
ST03	PE liner spark testing Viola P/S			21/02/2005	20/05/2005
SV08	Scour Valve Pit Installation SM16 Ch 36, 252 Sewer	36	252	7/09/2004	10/03/2005
TW117	Trenching SM16 Ch 205 - 252 Sewer	205	252	3/11/2004	17/01/2005
TW118	Trenching SM16 Ch 160 - 205 Sewer	160	205	4/11/2004	20/01/2005
TW119	Trenching SM16 Ch 115 - 160 Sewer	115	160	16/11/2004	20/01/2005
TW120	Trenching SM16 Ch 85 - 115 Sewer	70	115	15/11/2004	20/01/2005
TW121	Trenching SM16 Ch 35 - 70 Sewer	0	70	22/11/2004	20/01/2005
TW123	Trenching SM16 Ch 252 - 275 Sewer	252	270	14/03/2005	17/03/2005
306	Unbound Pavement under turning bay Viola PS			5/05/2005	10/05/2005

SECTION 6



Prüfzertifikat

für Druckmessumformer

Test certificate for pressure transmitters

VEGA

VEGA bestätigt, dass die zur Qualitätsprüfung des Erzeugnisses eingesetzten Messmittel gültig kalibriert und auf nationale Normale der Physikalischen Technischen Bundesanstalt (PTB) rückführbar sind.
VEGA confirms that all instruments used to assure the quality of our products are calibrated and traceable to national standards of PTB (Physikalischen Technischen Bundesanstalt)

VEGA Grieshaber KG, Am Hohenstein 113, 77761 Schiltach, Tel. 0 78 36/50-0, Fax. 0 78 36/50 201

Druckmessumformer / Pressure transmitter:	BAR64	**Kundennummer** Customer ID	44741
Messbereich / Meassuring range:	-1 bis/to 10,0bar rel. -100 bis/to 1000 kPa rel.	**Auftragsnummer** Order number	1178741
Seriennummer / Series no.:	14125999		
Ausgang / Output:	4 ... 20mA, HART	**Auftragsposition** Order position	3
Zulassungen / Approvals:	OHNE		

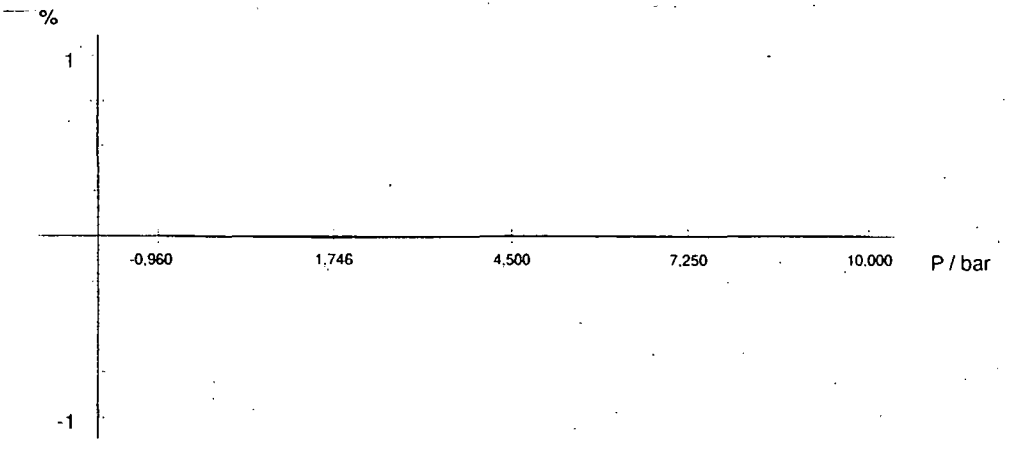
Kennwerte / Characteristics: -0,960 bis/to 10,000 bar rel.

0,36 bis/to 100,00 %

Kennliniencharakteristik / Output characteristics:

max. zul. Abweichung bezogen auf Messbereich: < 0,08 %
/ Dev. in linearity rel. to measuring range

Ref.-Druck / Ref. pressure [bar]:	-0,960	1,746	4,500	7,250	10,000
Soll-Ausgang / Ideal output [%]:	0,36	24,96	50,00	75,00	100,00
Ist-Ausgang / Real output [%]:	0,36	24,95	50,00	75,00	100,00
Abweichung / Accuracy [%]:	0,00	-0,01	0,00	0,00	0,00



Temperatureinfluss
/ Temperature influence:

Temperaturfehler bei 0 bar rel.
/ Temperature accuracy at 0 bar rel.

Bezogen auf den Messbereich / Related to the measuring range

Bezugstemperatur 20 °C / Ref. temperature 20 °C

Temperatur [°C] Temperature	0	20	60	100
Ist-Ausgang [%] Real output	9,01	9,02	9,01	8,98
Abweichung [%] Accuracy	-0,01	0,00	0,00	-0,04

Datum / Date: 16.12.2004 **Unterschrift** / Signature:

Prüfzertifikat

für Druckmessumformer

Test certificate for pressure transmitters

VEGA bestätigt, dass die zur Qualitätsprüfung des Erzeugnisses eingesetzten Messmittel gültig kalibriert und auf nationale Normale der Physikalischen-Technischen-Bundesanstalt (PTB) rückführbar sind.
VEGA confirms that all instruments used to assure the quality of our products are calibrated and traceable to national standards of PTB (Physikalischen Technischen Bundesanstalt)

VEGA Grieshaber KG, Am Hohenstein 113, 77761 Schiltach, Tel. 0 78 36/50-0, Fax. 0 78 36/50 201

Druckmessumformer / Pressure transmitter:	WELL72	**Kundennummer** Customer ID	44741
Messbereich / Meassuring range:	0 bis/to 1 bar rel. 0 bis/to 100 kPa rel.	**Auftragsnummer** Order number	1178741
Seriennummer / Series no.:	14195113		
Ausgang / Output:	4 ... 20mA, HART	**Auftragsposition** Order position	5
Zulassungen / Approvals:	OHNE		

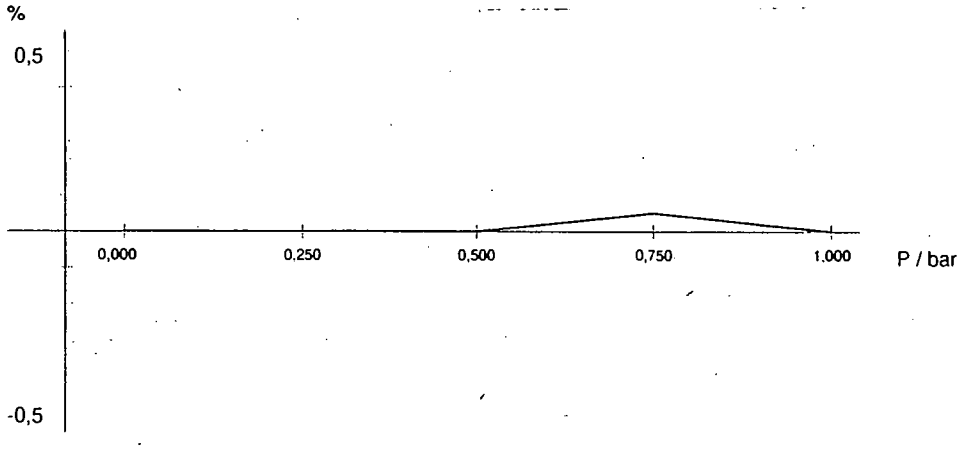
Kennwerte / Characteristics: 0,000 bis/to 1,000 bar rel.

4,007 bis/to 19,994 mA

Kennliniencharakteristik / Output characteristics:

max. zul. Abweichung bezogen auf Messbereich: < 0,25 %
/ Dev. in linearity rel. to measuring range

Ref.-Druck / Ref. pressure [bar]:	0,000	0,250	0,500	0,750	1,000
Soll-Ausgang / Ideal output [mA]:	4,007	8,004	12,001	15,999	19,994
Ist-Ausgang / Real output [mA]:	4,007	8,004	12,001	16,006	19,994
Abweichung / Accuracy [%]:	0,00	0,00	0,00	0,05	0,00



Temperatureinfluss
/ Temperature influence:

Temperaturfehler bei 0 bar rel.
/ Temperature accuracy at 0 bar rel.

Bezogen auf den Messbereich / Related to the measuring range

Bezugstemperatur 20 °C / Ref. temperature 20 °C

Temperatur [°C] Temperature	0	20	60	100
Ist-Ausgang [mA] Real output	4,009	4,007	4,005	4,013
Abweichung [%] Accuracy	0,01	0,00	-0,02	0,04

Datum / Date: 15.12.2004 **Unterschrift** / Signature: