

Constant Discharge Pump Testing Methodology

1 General

Constant discharge pump tests are an important investigation as the ability and sustainability of any new or increased abstraction from a well. For results to be meaningful readings must be taken at the production bore (the bore being pumped) and at least two appropriate observation bores.

The constant discharge pump test comprises two phases. The first being the pumping phase, the second being the pump off phase (recovery). The water level in the bores is measured prior to the pump being started, during pumping, and after the pump is turned off, until the water level reaches what it was before the pump was turned on.

2 Preparation for Testing

(a) Observation Bores

In selecting observation bores you should consider the following matters:

- The bores should be the same or similar depth as the pumped bore.
- Are the bores into the same aquifer as the pumped bore (bore log information may provide this information).
- If there are multiple bores available, the analysis **must** include justification of why the observation bores used were chosen.
- If inappropriate bores are chosen the pump test may not produce meaningful data, and you may be required to repeat the testing.
- If there are no suitable bores within 1km of your pumped bore please contact a Groundwater Scientist at the Bay of Plenty Regional Council to discuss your situation and ensure that meaningful information can be obtained.

The Bay of Plenty Regional Council can supply a map of bores within 1km of the production bore and bore log information. Please contact a Science Administration Officer to assist you.

(b) Equipment

The following equipment may be required:

- An accurate means of measuring discharge (flow), such as a flow meter, water meter, or orifice meter.
- Gate valve to control the flow rate, so the flow remains constant throughout the test.
- Digital watch(es)
- Accurate means of measuring water level in bore(s), such as electric water level probe(s) and tape measure(s).
- Record sheets, one for each bore being monitored.

(c) **Setup**

Set up the discharge measuring device and the gate valve. There should be a minimum of 10x the diameter of straight pipe before and 5x the diameter of straight pipe after discharge measuring device.

(d) **Pre-Test**

It is very important that the flow rate should be at, or above, the maximum pumping rate intended for the production bore (rate of take L per second).

Do a pre-test to set the flow rate and to reveal and resolve any problems. Start up the pump and run briefly, just long enough to adjust the flow rate. Shut the pump off and allow the water level to fully recover to level prior to pump on.

3 **Test Procedure**

Plan to start the test by no later than 9.00 a.m. This makes the time intervals easier for over night monitoring.

- (a) One hour before starting ensure that the water level, in all bores to be monitored, are measured and recorded.
- (b) Ensure that all watches are set exactly the same time and that people involved in the test are familiar with how to operate the water level measuring device and read the measure to the nearest millimetre.
- (c) Start the pump at the agreed time and adjust the flow if necessary, making water level measurements according to the schedule on the data sheets. After half an hour pumping the observation bore(s) water level should be read. Make sure the pumping rate is recorded at the start of the test and record the pumping rate regularly during the test, **to ensure that the pumping rate is constant.**
- (d) Continue pumping at a constant rate for at least 24 hours (1440 minutes). A longer pump test may be required for industrial, municipal or substantial abstractions, please contact a Bay of Plenty Regional Council Groundwater Scientist to discuss.
- (e) Immediately at pump off, begin water level measurements in all bores as per the record sheet schedule. **The 'recovery' phase (pump off) is as important as the pumping stage. Any loss or lack of data from this section may compromise the outcome.**
- (f) Continue (e) for 1440 minutes or until the groundwater levels have returned to their pre-test levels.

Constant Discharge Test - Production Bore Pumping

Bore owner:	<u>Please tick duration of test</u>
Postal address:	<input type="checkbox"/> 24 hour <input type="checkbox"/> 72 hour
Environment Bay of Plenty	Bore number:
Drillers Bore Log number:	Site ID/Address:
Measured by:	Date:
Distance from pumping bore: m	Pumping rate: L/s

Date Time Level

Background readings

Actual (time)	Elapsed (minutes)	Groundwater Level Reading (metres)	Comments
	0		PUMP ON
	0.5		<i>30 second readings</i>
	1		
	1.5		
	2.0		
	3.0		
	3.5		
	4.0		
	4.5		
	5.0		
	5.5		
	6.0		
	6.5		
	7.0		
	7.5		
	8.0		
	8.5		
	9.0		
	9.5		
	10.0		<i>1 minute readings</i>
	11.0		
	12.0		
	13.0		

Constant Discharge Test - Production Bore: Pumping page 2

Actual (time)	Elapsed (minutes)	Groundwater Level Reading (metres)	Comments
	14.0		
	15.0		
	16.0		
	17.0		
	18.0		
	19.0		
	20.0		2 minutes readings
	22.0		
	24.0		
	26.0		
	28.0		
	30.0		5 minute readings
	35.0		
	40.0		
	45.0		
	50.0		
	55.0		
	60.0		
	65.0		
	70.0		
	75.0		
	80.0		
	85.0		
	90.0		
	95.0		
	100.0		10 minute readings
	120.0		
	140.0		
	160.0		
	180.0		30 minute readings
	210.0		
	240.0		
	270.0		
	300.0		60 minute readings
	360.0		
	420.0		
	480.0		
	540.0		
	600.0		5 hour readings
	900.0		
	1200.0		
	1500.0		

Constant Discharge Test - Production Bore Recovery

Bore owner:	<u>Please tick duration of test</u>	
Postal address:	<input type="checkbox"/> 24 hour	<input type="checkbox"/> 72 hour
Environment Bay of Plenty	Bore number:	
Drillers Bore Log number:	Site ID/Address:	
Measured by:	Date:	
Distance from pumping bore: m	Pumping rate:	L/s

Actual (time)	Elapsed (minutes)	Groundwater Level Reading (metres)	Comments
	0		PUMP OFF
	0.5		30 second readings
	1		
	1.5		
	2.0		
	3.0		
	3.5		
	4.0		
	4.5		
	5.0		
	5.5		
	6.0		
	6.5		
	7.0		
	7.5		
	8.0		
	8.5		
	9.0		
	9.5		
	10.0		1 minute readings
	11.0		
	12.0		
	13.0		
	14.0		
	15.0		
	16.0		
	17.0		

Constant Discharge Test - Production Bore: Recovery page 2

Actual (time)	Elapsed (minutes)	Groundwater Level Reading (metres)	Comments
	19.0		
	18.0		
	20.0		2 minutes readings
	22.0		
	24.0		
	26.0		
	28.0		
	30.0		5 minute readings
	35.0		
	40.0		
	45.0		
	50.0		
	55.0		
	60.0		
	65.0		
	70.0		
	75.0		
	80.0		
	85.0		
	90.0		
	95.0		
	100.0		10 minute readings
	120.0		
	140.0		
	160.0		
	180.0		30 minute readings
	210.0		
	240.0		
	270.0		
	300.0		60 minute readings
	360.0		
	420.0		
	480.0		
	540.0		
	600.0		5 hour readings
	900.0		
	1200.0		
	1500.0		

Constant Discharge Test - Observation Bore *Pumping*

Bore owner:	<u>Please tick duration of test</u>
Postal address:	<input type="checkbox"/> 24 hour <input type="checkbox"/> 72 hour
Environment Bay of Plenty	Bore number:
Drillers Bore Log number:	Site ID/Address:
Measured by:	Date:
Distance from pumping bore: m	Pumping rate: L/s

Actual (time)	Elapsed (minutes)	Groundwater Level Reading (metres)	Date	Time	Level
	Background readings				
	0				PUMP ON
	0.5				30 second readings
	1				
	1.5				
	2.0				
	3.0				
	3.5				
	4.0				
	4.5				
	5.0				
	5.5				
	6.0				
	6.5				
	7.0				
	7.5				
	8.0				
	8.5				
	9.0				
	9.5				
	10.0				1 minute readings
	11.0				
	12.0				
	13.0				

Constant Discharge Test - Observation Bore: Pumping page 2

Actual (time)	Elapsed (minutes)	Groundwater Level Reading (metres)	Comments
	14.0		
	15.0		
	16.0		
	17.0		
	18.0		
	19.0		
	20.0		2 minutes readings
	22.0		
	24.0		
	26.0		
	28.0		
	30.0		5 minute readings
	35.0		
	40.0		
	45.0		
	50.0		
	55.0		
	60.0		
	65.0		
	70.0		
	75.0		
	80.0		
	85.0		
	90.0		
	95.0		
	100.0		10 minute readings
	120.0		
	140.0		
	160.0		
	180.0		30 minute readings
	210.0		
	240.0		
	270.0		
	300.0		60 minute readings
	360.0		
	420.0		
	480.0		
	540.0		
	600.0		5 hour readings
	900.0		
	1200.0		
	1500.0		

Constant Discharge Test - Observation Bore Recovery

Bore owner:	<u>Please tick duration of test</u>
Postal address:	<input type="checkbox"/> 24 hour <input type="checkbox"/> 72 hour
Environment Bay of Plenty	Bore number:
Drillers Bore Log number:	Site ID/Address:
Measured by:	Date:
Distance from pumping bore: m	Pumping rate: L/s

Actual (time)	Elapsed (minutes)	Groundwater Level Reading (metres)	Comments
	0		PUMP OFF
	0.5		30 second readings
	1		
	1.5		
	2.0		
	3.0		
	3.5		
	4.0		
	4.5		
	5.0		
	5.5		
	6.0		
	6.5		
	7.0		
	7.5		
	8.0		
	8.5		
	9.0		
	9.5		
	10.0		1 minute readings
	11.0		
	12.0		
	13.0		
	14.0		
	15.0		
	16.0		
	17.0		
	18.0		
	19.0		

Constant Discharge Test - Observation Bore: Recovery page 2

Actual (time)	Elapsed (minutes)	Groundwater Level Reading (metres)	Comments
	20.0		2 minutes readings
	22.0		
	24.0		
	26.0		
	28.0		
	30.0		5 minute readings
	35.0		
	40.0		
	45.0		
	50.0		
	55.0		
	60.0		
	65.0		
	70.0		
	75.0		
	80.0		
	85.0		
	90.0		
	95.0		
	100.0		10 minute readings
	120.0		
	140.0		
	160.0		
	180.0		30 minute readings
	210.0		
	240.0		
	270.0		
	300.0		60 minute readings
	360.0		
	420.0		
	480.0		
	540.0		
	600.0		5 hour readings
	900.0		
	1200.0		
	1500.0		