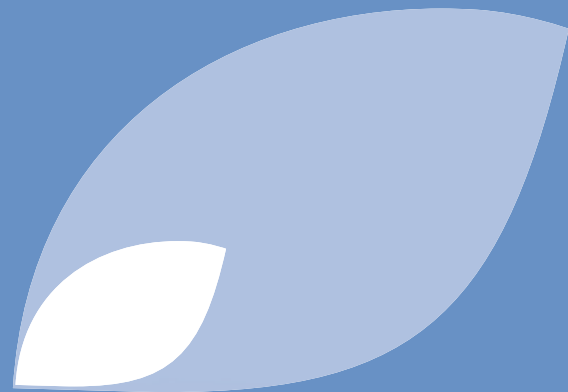




APPENDIX D

Groundwater assessment (Part B)



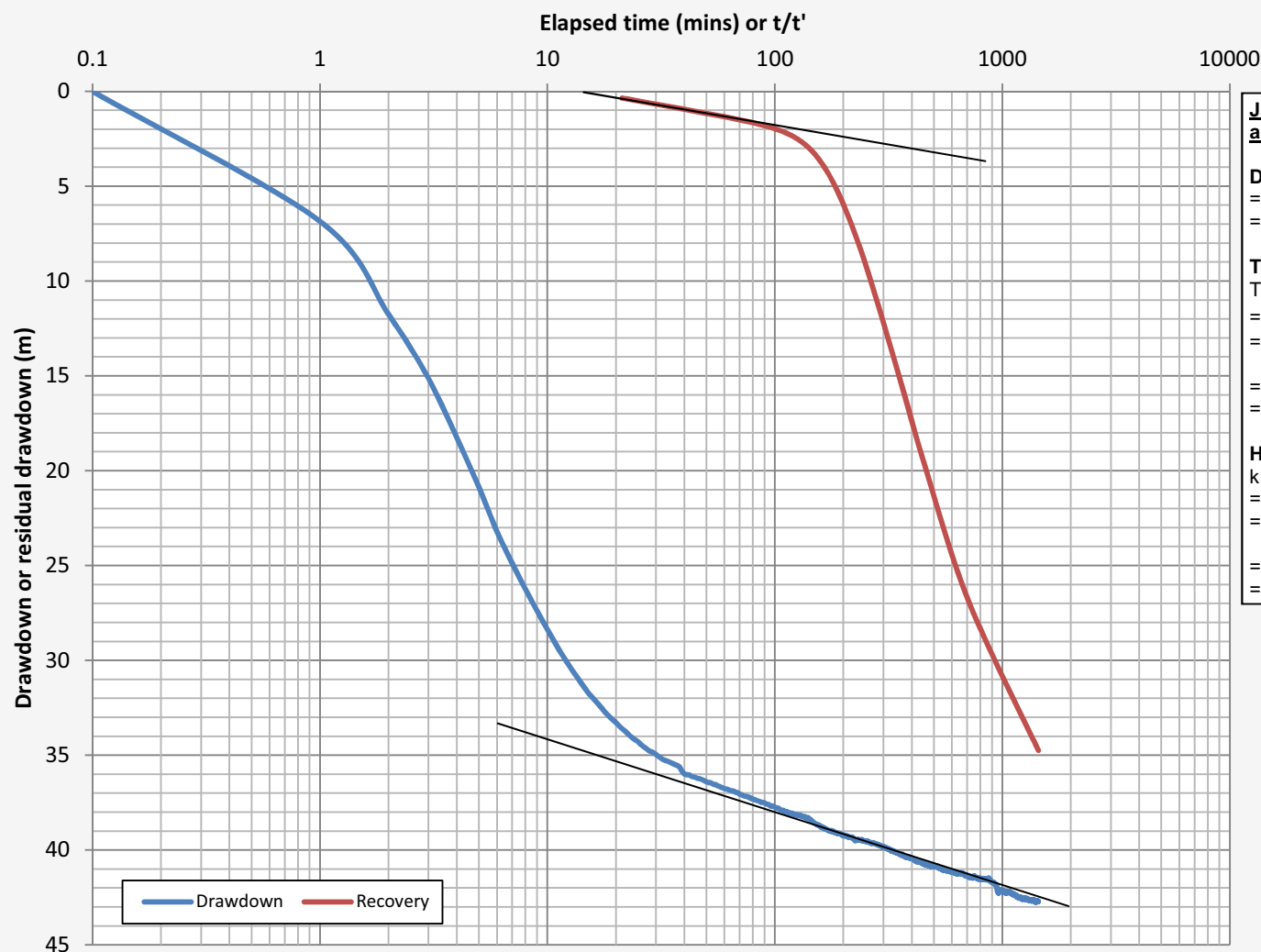


Appendix

B

Pumping tests and slug tests





**Jacob Straight Line Method
and Theis recovery**

Discharge
= 4.4 L/s
= 380.2 m³ /day

Transmissivity
 $T = 2.3Q/4\pi\Delta s$
= $2.3 \times 380.2 / 4 \times \pi \times 4.5$
= 15.5 m² /day (drawdown)

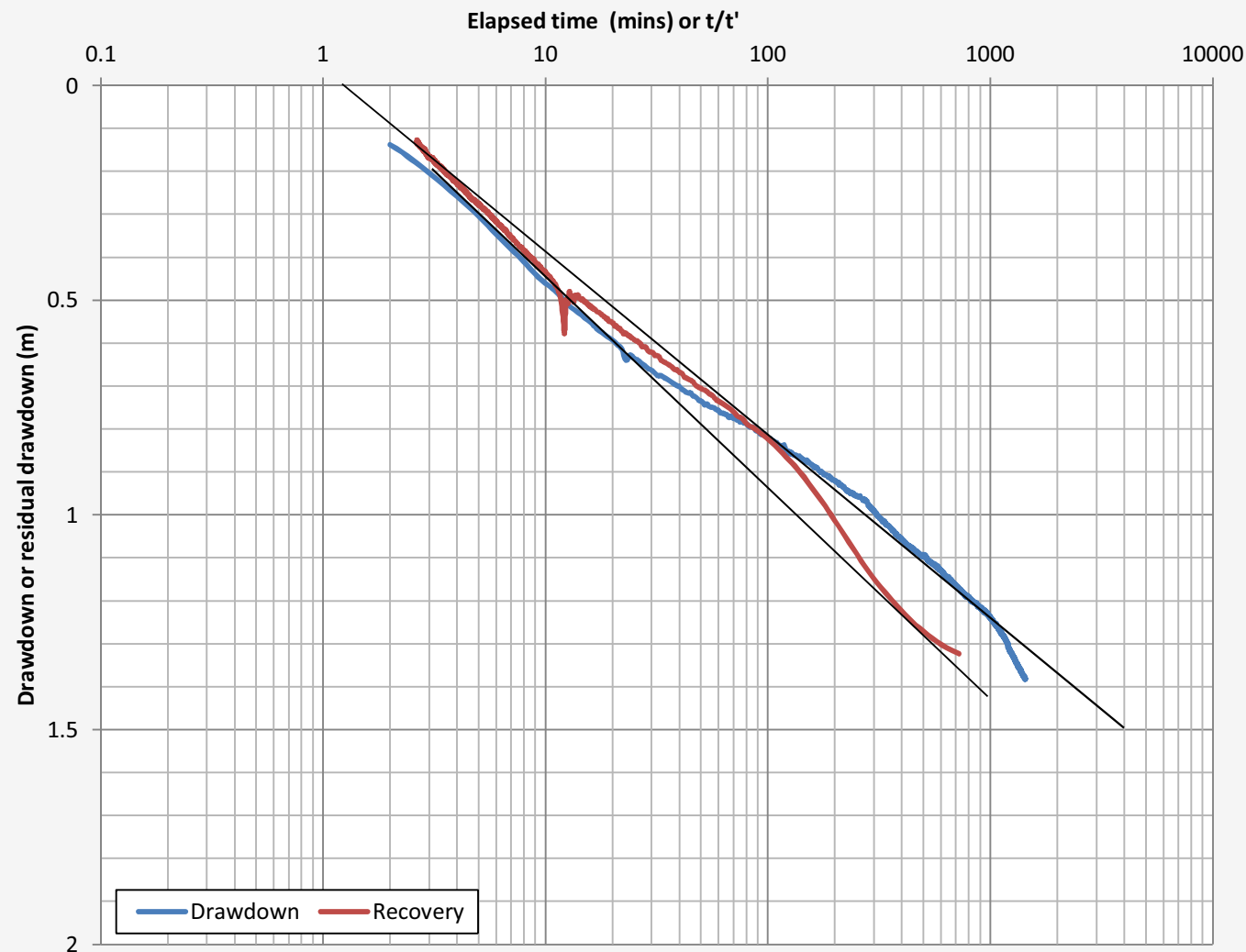
= $2.3 \times 380.2 / 4 \times 3.14 \times 2.5$
= 27.8 m² /day (recovery)

Hydraulic conductivity
 $k = T/b$
= 15.5/12.5
= 1.2 m/day (drawdown)

= 27.8/12.5
= 2.2 m/day (recovery)

(Artesian test production bore)

Figure B.1: GW3_TPB 24 hour test analysis



**Jacob Straight Line Method
and Theis recovery**

Discharge

$=4.4 \text{ L/s}$
 $=380.2 \text{ m}^3/\text{day}$

Transmissivity

$T=2.3Q/4\pi\Delta s$
 $=2.3*380.2/(4*\pi*0.45)$
 $=154.6 \text{ m}^2/\text{day}$ (drawdown)

$=2.3*380.2/(4*\pi*0.53)$
 $=131.4 \text{ m}^2/\text{day}$ (recovery)

Hydraulic conductivity

$k=T/d$
 $=154.6/12.5$
 $=12.4 \text{ m/day}$ (drawdown)

$=131.4/12.5$
 $=10.5 \text{ m/day}$ (recovery)

Storativity

$S=2.25Tt_o/r^2$
 $=2.25*154.6*0.000764/6.8^2$
 $=5.7 \times 10^{-3}$ (drawdown)

(Artesian observation bore)

Figure B.2: GW3B 24 hour test analysis



**Jacob Straight Line Method and
Theis recovery**

Discharge

=4.4 L/s
=380.2 m³/day

Transmissivity

$T = 2.3Q / (4\pi\Delta s)$
= $2.3 * 380.2 / (4 * \pi * 1.4)$
=49.7 m²/day (drawdown)

= $2.3 * 380.2 / (4 * \pi * 0.9)$
=77.3 m²/day (recovery)

Hydraulic conductivity

$K = T/b$
=49.7/6
=8.3 m/day (drawdown)

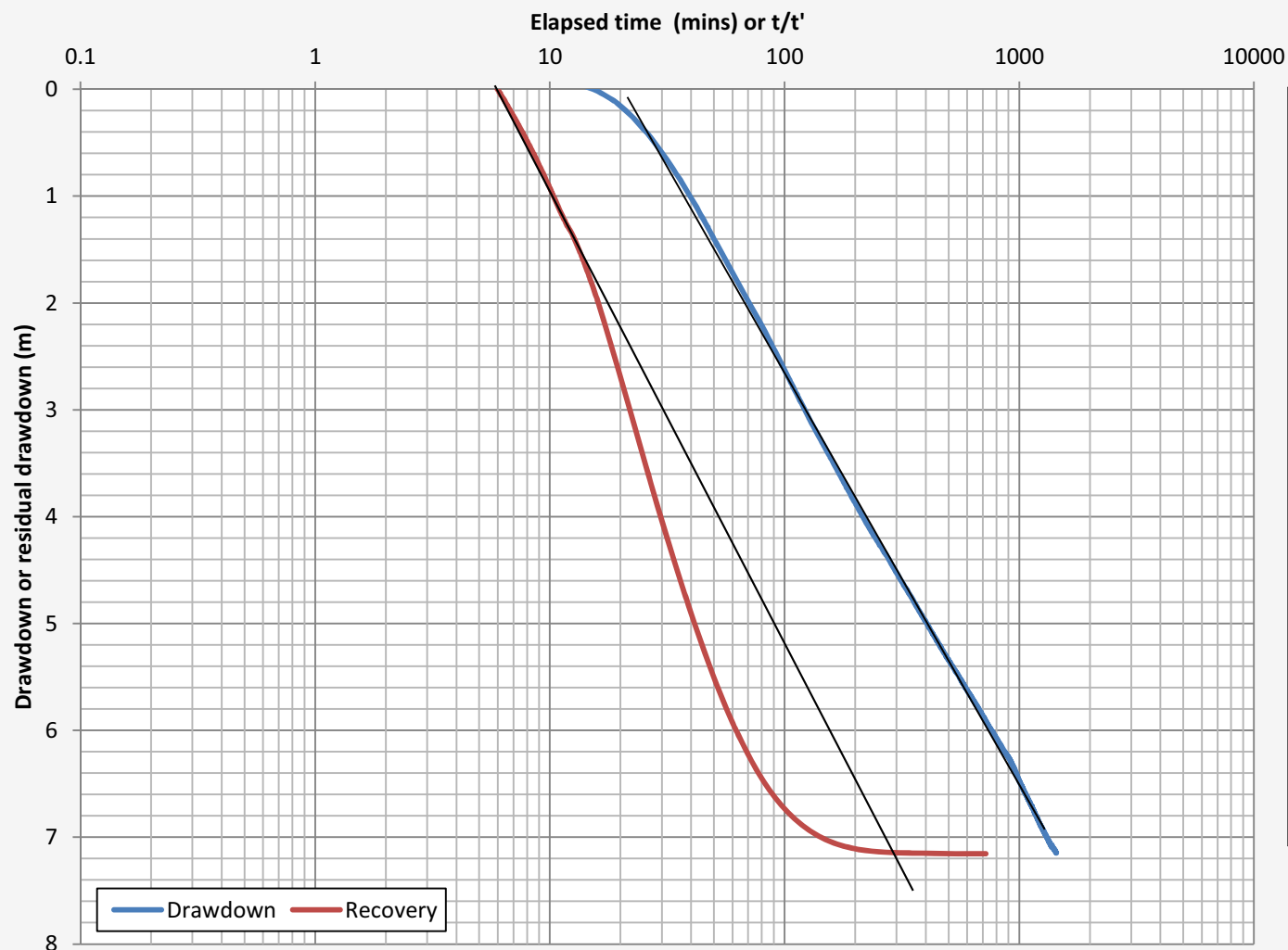
=77.3/6
=12.9 m/day (recovery)

Storativity

$S = 2.25Tt_0 / r^2$
= $2.25 * 49.7 * 0.0056 / 12.5^2$
= 4.7×10^{-3} (drawdown)

(Artesian observation bore)

Figure B.3: GW3C 24 hour test analysis



**Jacob Straight Line Method
and Theis recovery**

Discharge

=4.4 L/s
=380.2 m³/day

Transmissivity

$T = 2.3Q / (4\pi\Delta s)$
= $2.3 \times 380.2 / (4 \times \pi \times 3.8)$
= 18.3 m²/day (drawdown)

= $2.3 \times 380.2 / (4 \times \pi \times 4.13)$
= 16.9 m²/day (recovery)

Hydraulic conductivity

$k = T/d$
= $18.3/6$
= 3.1 m/day (drawdown)

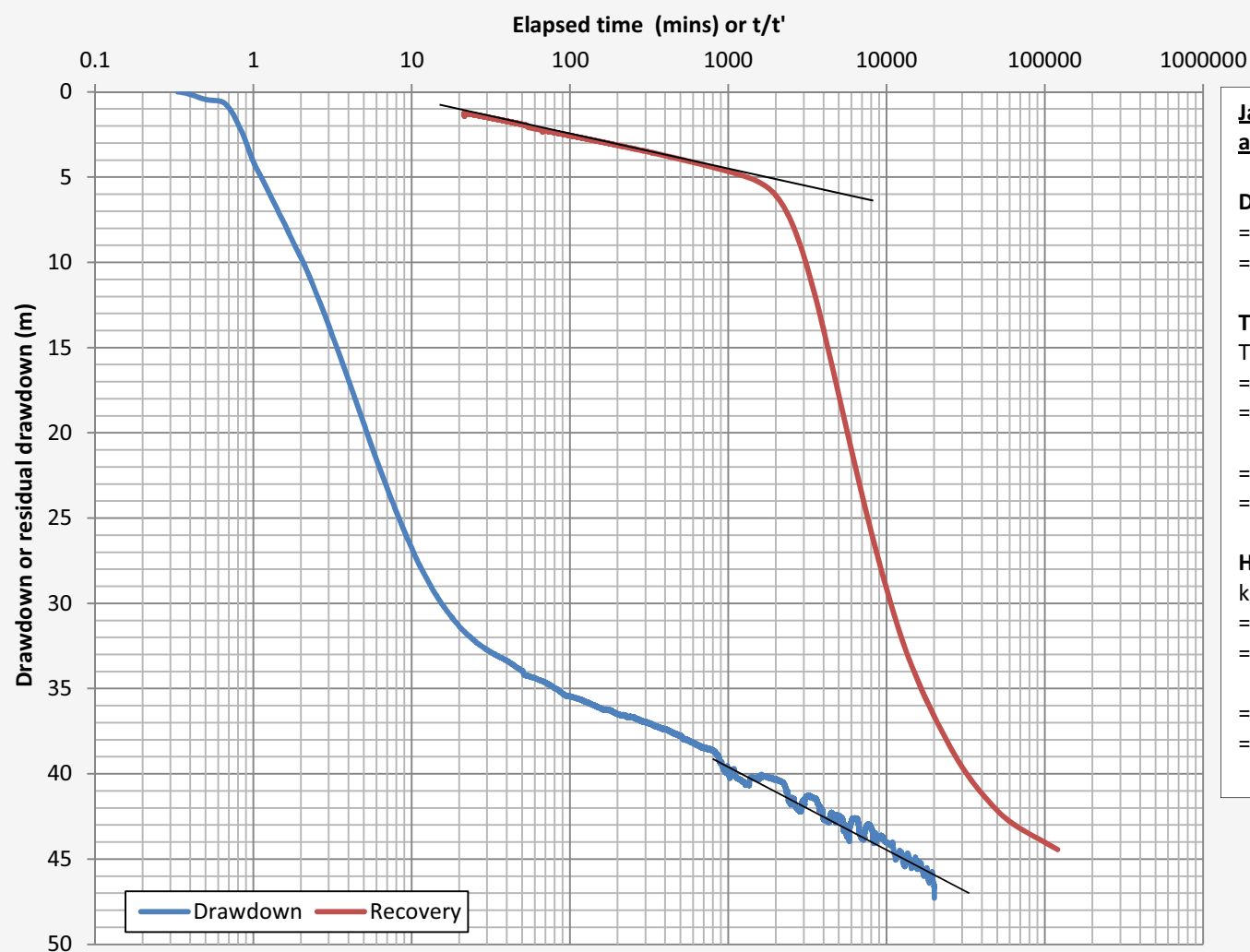
= $16.9/6$
= 2.8 m/day (recovery)

Storativity

$S = 2.25Tt_o/r^2$
= $2.25 \times 18.3 \times 0.0125/28^2$
= 6.6×10^{-4} (drawdown)

(Artesian observation bore)

Figure B.4: GW3E 24 hour test analysis



**Jacob Straight Line Method
and Theis recovery**

Discharge

=4.4 L/s
=380.2 m³/day

Transmissivity

$T = 2.3Q / (4\pi\Delta s)$
= $2.3 \times 380.2 / (4 \times \pi \times 5)$
=13.9 m²/day (drawdown)

= $2.3 \times 380.2 / (4 \times \pi \times 1.9)$
=36.6 m²/day (recovery)

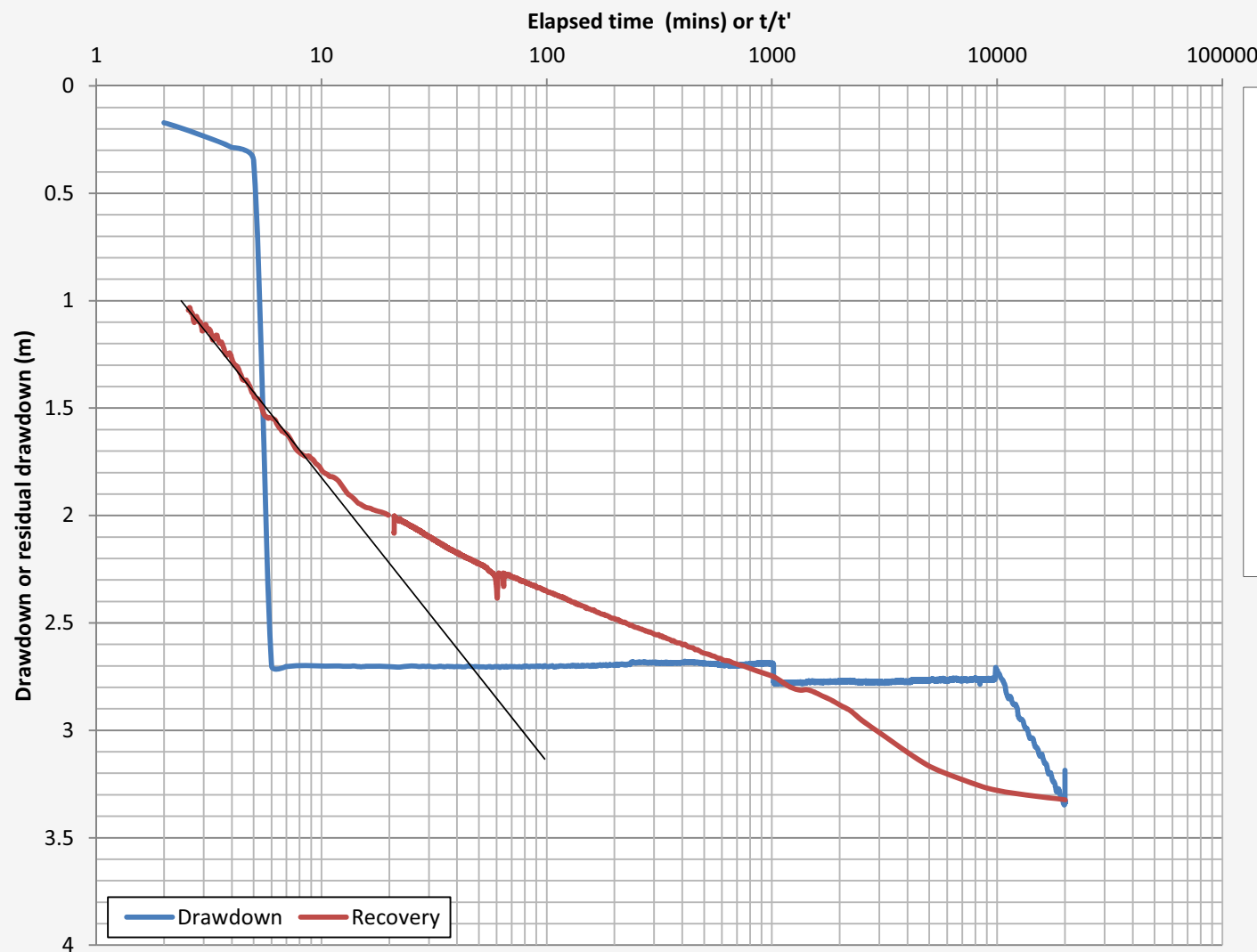
Hydraulic conductivity

$k = T/d$
=13.9/12.5
=0.9 m/day (drawdown)

=36.6/12.5
=2.9 m/day (recovery)

(Artesian test production bore)

Figure B.5: GW3_TPB 14 day test analysis



**Jacob Straight Line Method
and Theis recovery**

Discharge

=4.4 L/s
=380.2 m³/day

Transmissivity

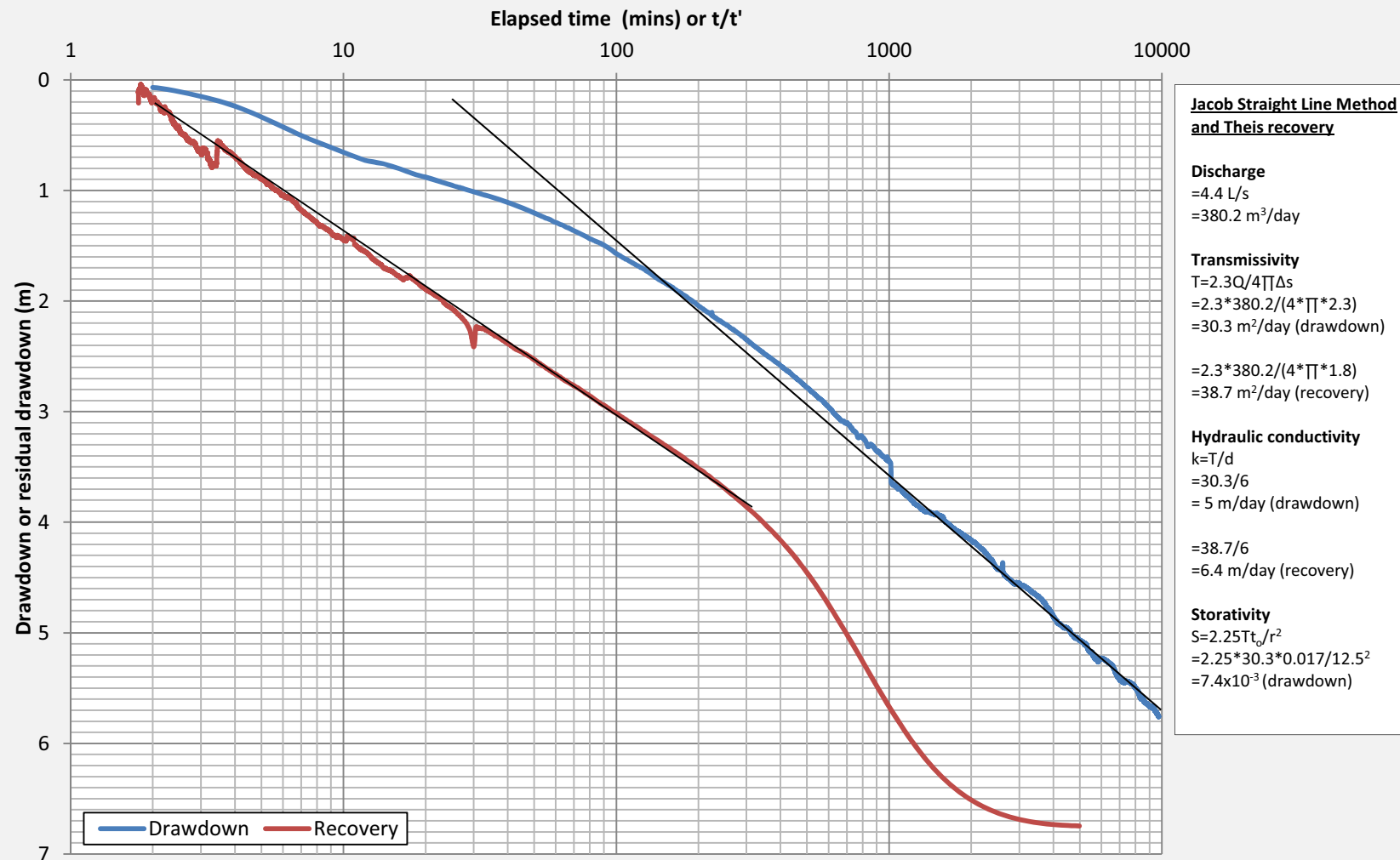
$T = 2.3Q / (4\pi\Delta s)$
= $2.3 \times 380.2 / (4 \times \pi \times 1.6)$
=43.5 m²/day (recovery)

Hydraulic conductivity

$k = T/d$
=43.5/12.5
=3.5 m/day (recovery)

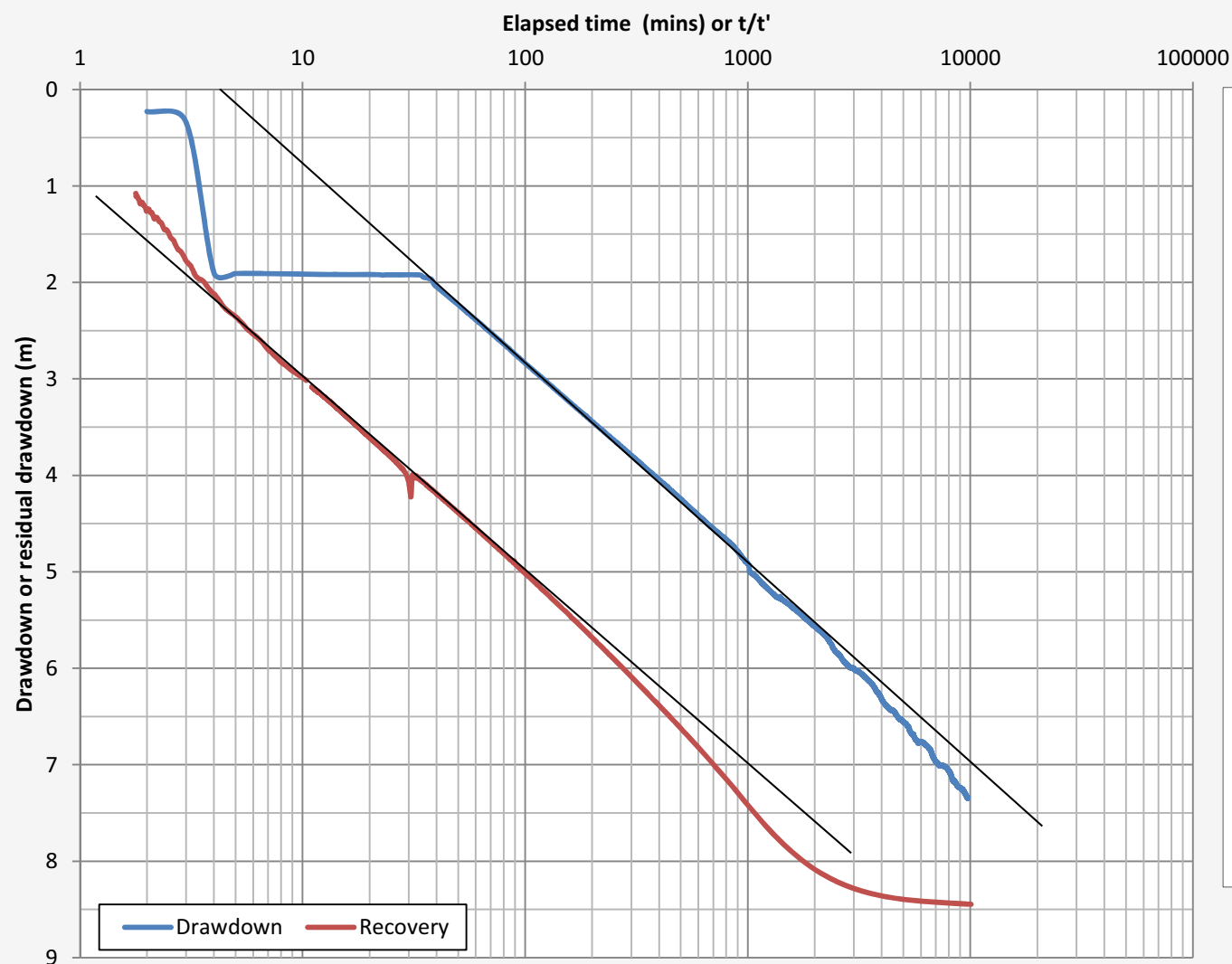
(Artesian observation bore)

Figure B.6: Stage 1 GW3B 14 day test analysis



(Artesian observation bore)

Figure B.7: GW3C 14 day analysis



**Jacob Straight Line Method
and Theis recovery**

Discharge

=4.4 L/s
=380.2 m³/day

Transmissivity

= $2.3 \times 380.2 / (4 \times \pi \times 2.1)$
=33.15 m²/day (drawdown)

= $2.3 \times 380.2 / (4 \times \pi \times 2.2)$
=31.6 m²/day (recovery)

Hydraulic conductivity

$k = T/d$
=33.2/12
=2.8 m/day (drawdown)

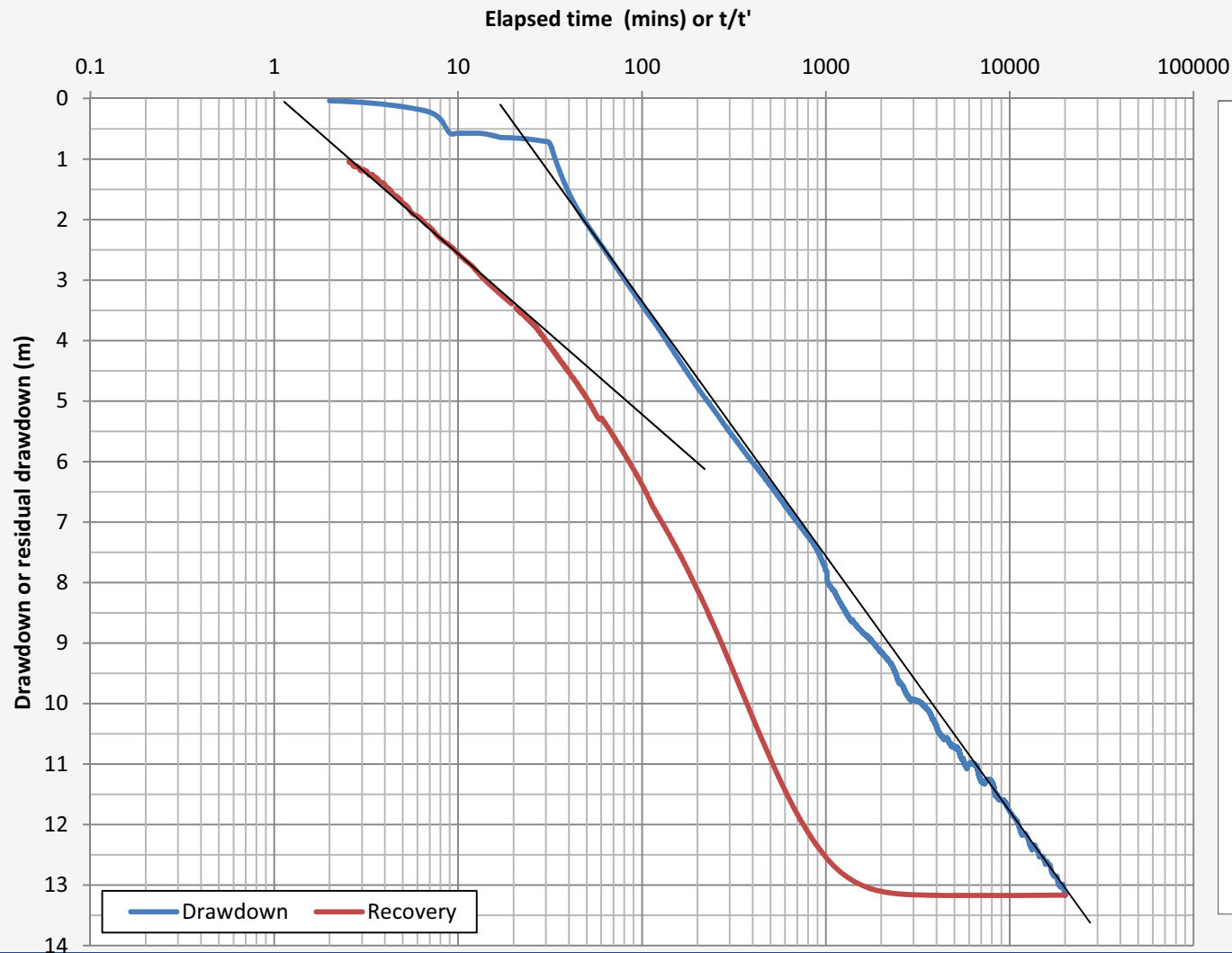
=31.6/12
=2.6 m/day (recovery)

Storativity

$S = 2.25 T t_c / r^2$
= $2.25 \times 33.2 \times 0.003 / 20.4^2$
=5.4x10⁻⁴(drawdown)

(Artesian observation bore)

Figure B.8: GW3D 14 day analysis



**Jacob Straight Line Method
and Theis recovery**

Discharge

=4.4 L/s
=380.2 m³/day

Transmissivity

$T = 2.3Q / (4\pi\Delta s)$
=2.3*380.2/(4* π *4.2)
=16.6 m²/day (drawdown)

=2.3*380.2/(4* π *2.65)
=26.3 m²/day (recovery)

Hydraulic conductivity

$k = T/d$
=16.6/6
=2.8 m/day (drawdown)

=26.3/6
=4.4 m/day (recovery)

Storativity

$S = 2.25Tt_o / r^2$
=2.25*16.6*0.0125/28²
=6.0x10⁻⁴(drawdown)

(Artesian observation bore)

Figure B.9: Stage 1 GW3E 14 day analysis



**Jacob Straight Line Method
and Theis recovery**

Discharge

=3.5 L/s
=302.4 m³/day

Transmissivity

$T = 2.3Q / (4\pi\Delta s)$
=2.3*302.4/(4* π *1.25)
=44.3 m²/day (drawdown)

=2.3*302.4/(4* π *0.65)
=85.2 m²/day (recovery)

Hydraulic conductivity

$k = T/d$
=44.3/18
=2.5 m/day (drawdown)

=85.2/18
=4.7 m/day (recovery)

(Test production bore)

Figure B.10: Stage 1 GW5_TPB 24 hour test analysis



**Jacob Straight Line Method
and Theis recovery**

Discharge

=3.5 L/s
=302.4 m³/day

Transmissivity

$T = 2.3Q / (4\pi\Delta s)$
=2.3*302.4/(4* π *1.05)
=52.7 m²/day (drawdown)

=2.3*302.4/(4* π *0.8)
=69.2 m²/day (recovery)

Hydraulic conductivity

$k = T/d$
=52.7/3
=17.6 m/day (drawdown)

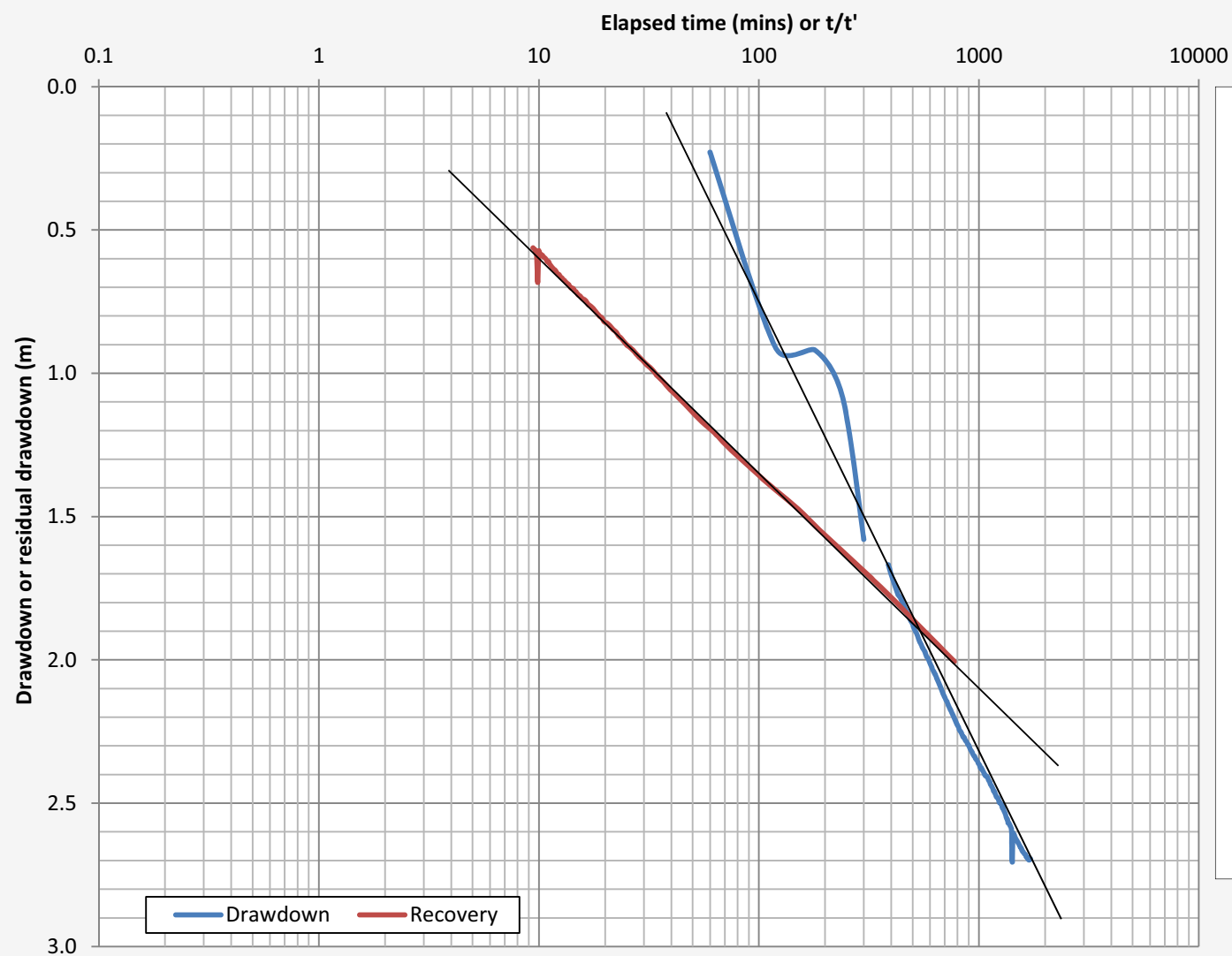
=69.2/3
=23.1 m/day (recovery)

Storativity

$S = 2.25Tt_o/r^2$
=2.25*52.7*0.076/17.4²
=3x10⁻² (drawdown)

(Observation bore)

Figure B.11: Stage 1 GW5B 24 hour test analysis



**Jacob Straight Line Method
and Theis recovery**

Discharge

=3.5 L/s
=302.4 m³/day

Transmissivity

$T = 2.3Q / (4\pi\Delta s)$
=2.3*302.4/(4* π *1.6)
=34.6 m²/day (drawdown)

=2.3*302.4/(4* π *0.8)
=69.2 m²/day (recovery)

Hydraulic conductivity

$k = T/d$
=34.6/6
=5.8 m/day (drawdown)

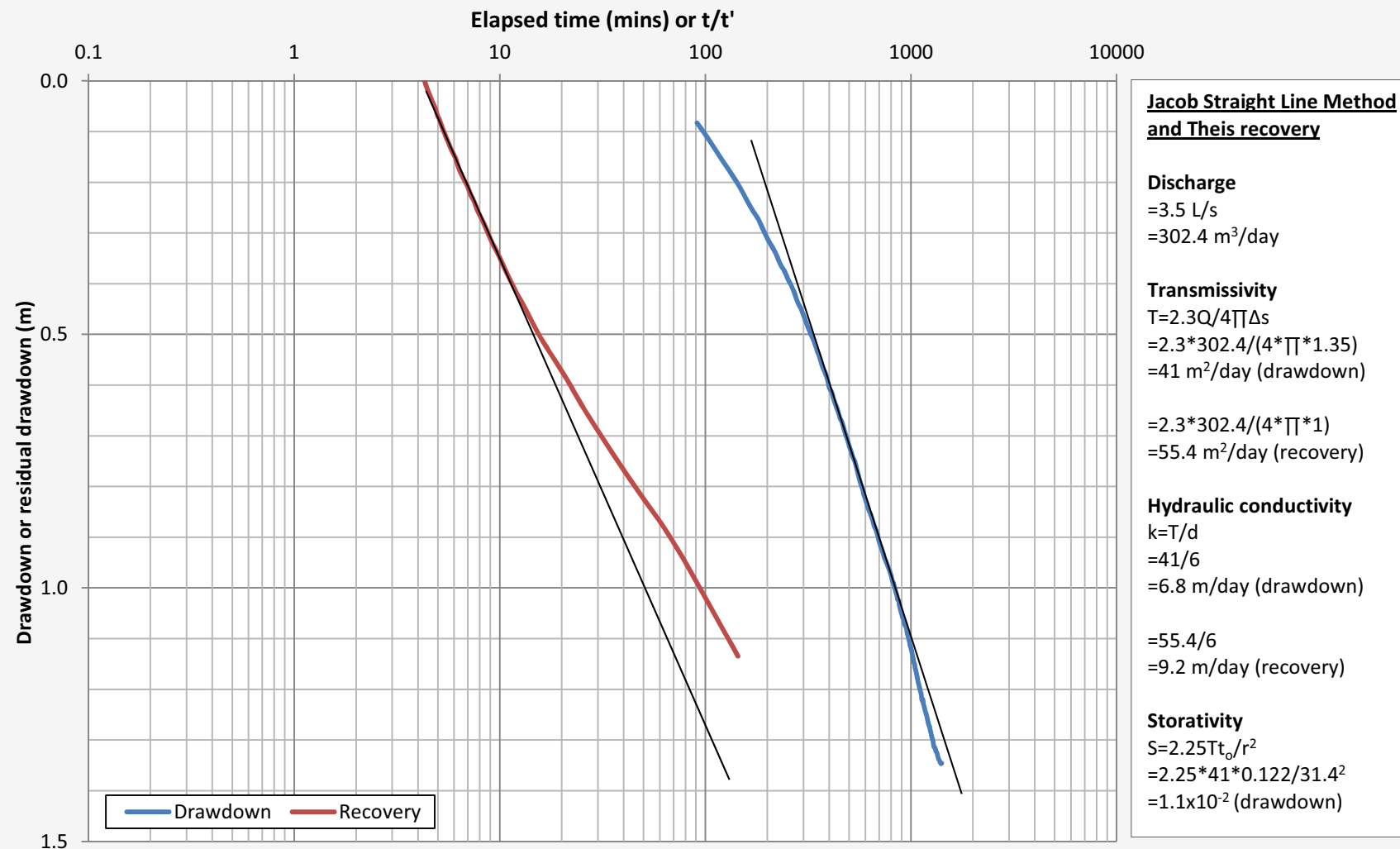
=69.2/6
=11.5 m/day (recovery)

Storativity

$S = 2.25Tt_o / r^2$
=2.25*34.6*0.022/24.1²
=2.9x10⁻³ (drawdown)

(Observation bore)

Figure B.12: Stage 1 GW5C 24 hour test analysis



(Observation bore)

Figure B.13: Stage 1 GW5D 24 hour test analysis



**Jacob Straight Line Method
and Theis Recovery**

Discharge

=4.4 L/s
=380.2 m³/day

Transmissivity

$T = 2.3Q / (4\pi\Delta s)$
= $2.3 \times 380.2 / (4 \times \pi \times 8.2)$
= 8.5 m²/day (drawdown)

= $2.3 \times 380.2 / (4 \times \pi \times 4.5)$
= 15.5 m²/day (recovery)

Hydraulic conductivity

$k = T/d$
= 8.5/55
= 0.15 m/day (drawdown)

= 15.5/55
= 0.28 m/day (recovery)

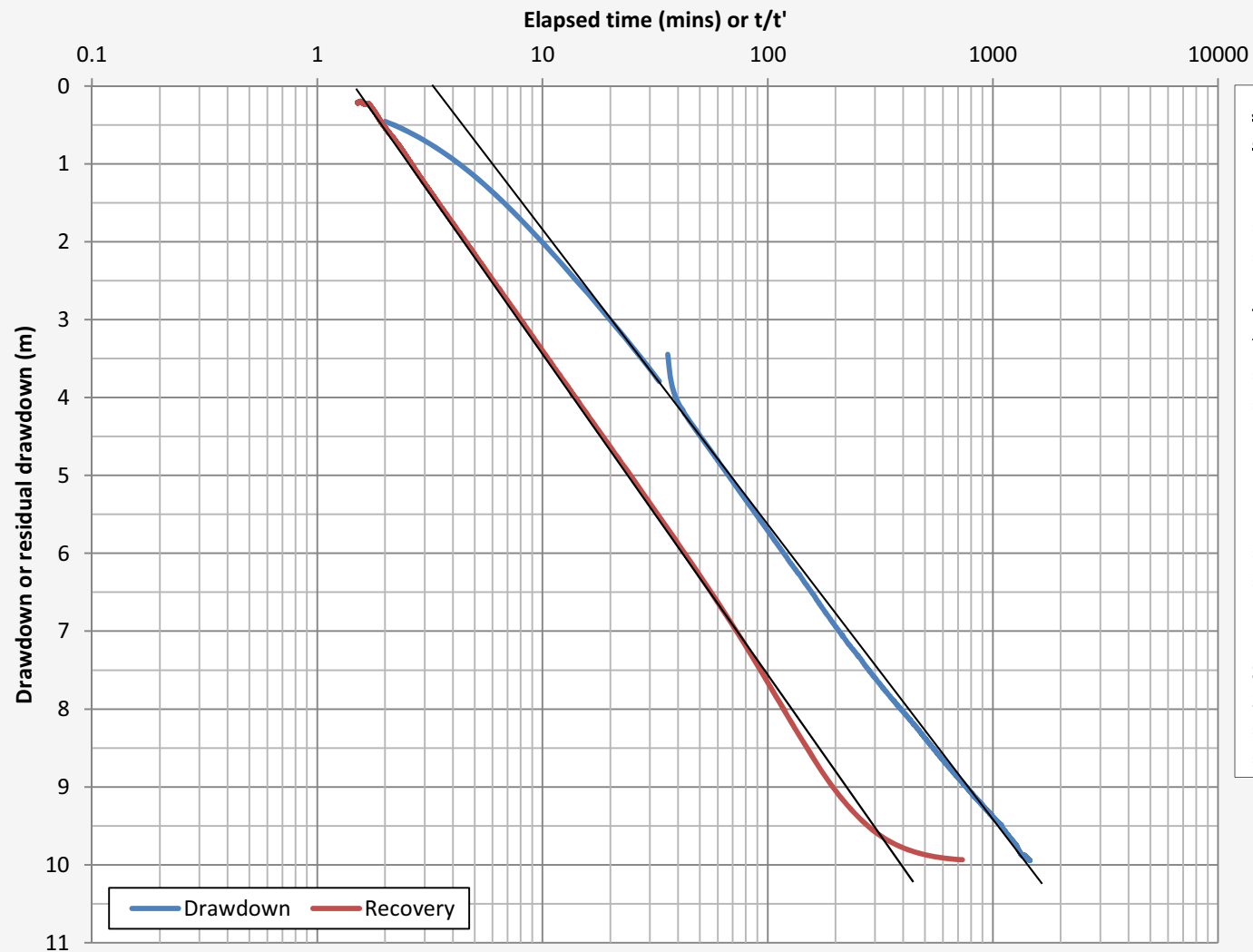
(Artesian test production bore)

Figure B.14: Stage 1 GW7_TPB 24 hour test analysis



(Artesian observation bore)

Figure B.15: Stage 1 GW7C 24 hour test analysis



**Jacob Straight Line Method
and Theis recovery**

Discharge

=4.4 L/s
=380.2 m³/day

Transmissivity

$T = 2.3Q / (4\pi\Delta s)$
=2.3*380.2/(4* π *4.0)
=17.4 m²/day
(drawdown/recovery)

Hydraulic conductivity

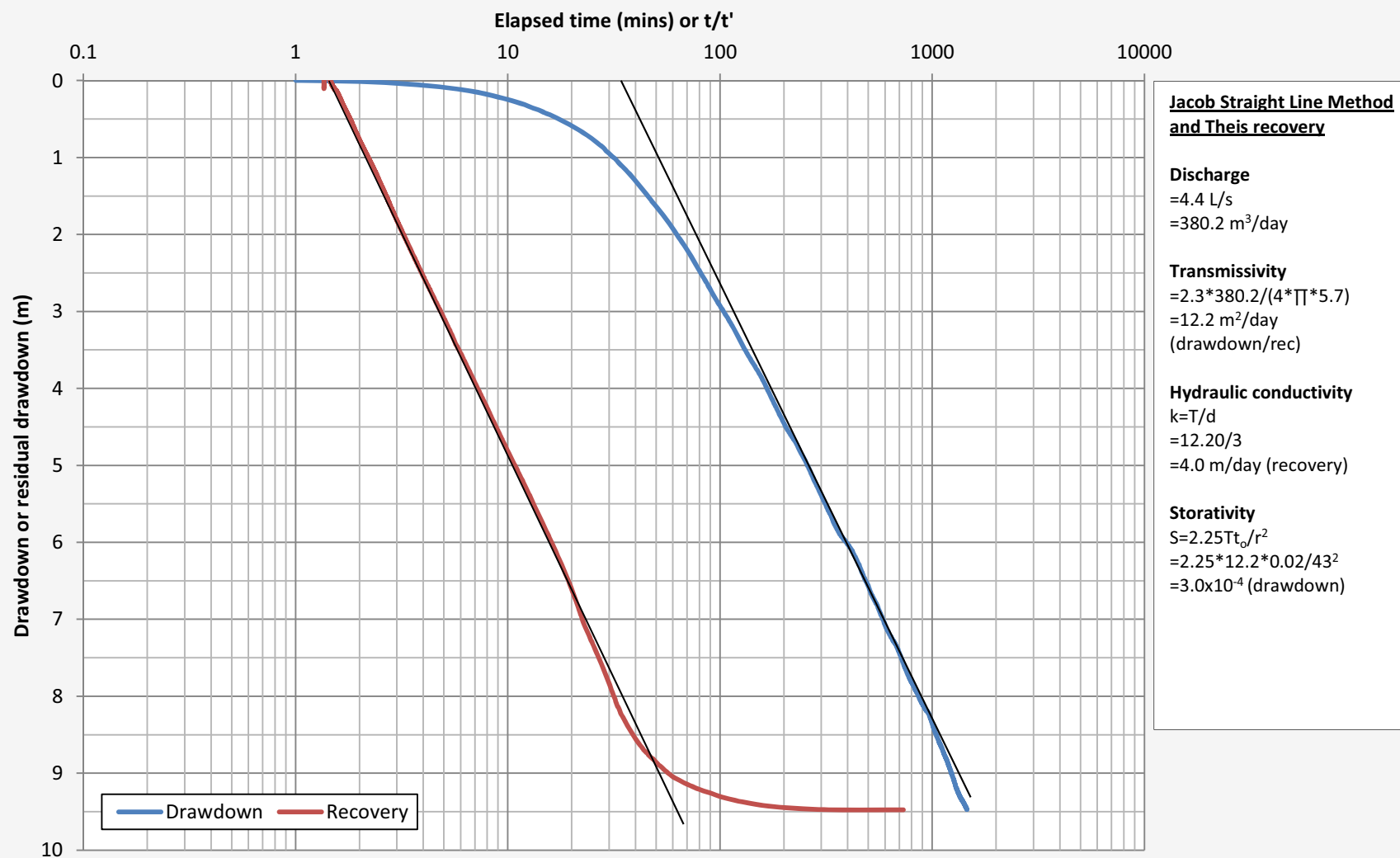
$k = T/d$
=17.4/3
=5.8 m/day
(drawdown/recovery)

Storativity

$S = 2.25Tt_0/r^2$
=2.25*17.4*0.0022/36.3²
=6.5x10⁻⁵ (drawdown)

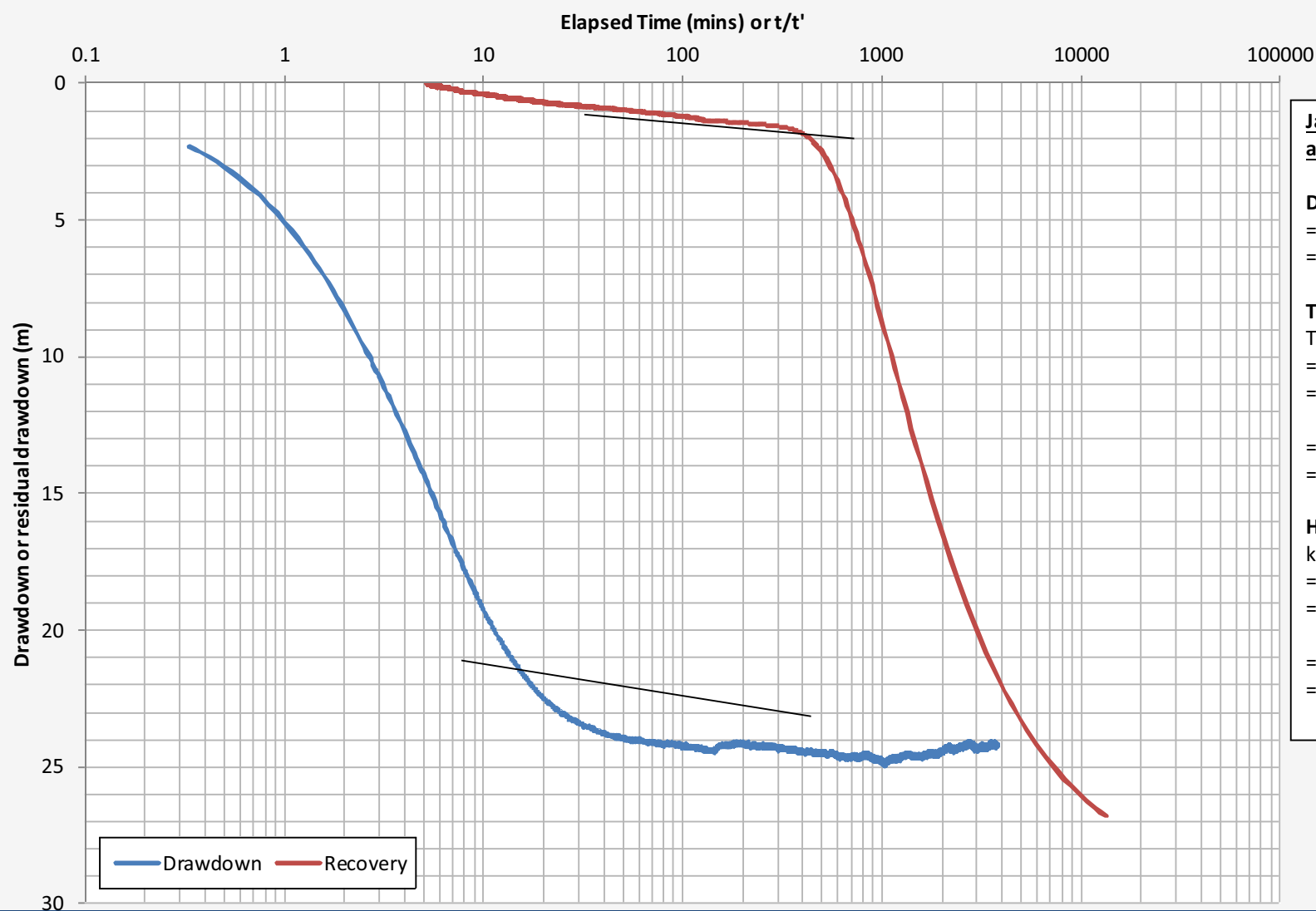
(Observation bore)

Figure B.16: Stage 1 GW7D 24 hour test analysis



(Artesian observation bore)

Figure B.17: Stage 1 GW7E 24 hour test analysis



**Jacob Straight Line Method
and Theis recovery**

Discharge

=1.8 L/s
=155.5m³/day

Transmissivity

$T = 2.3Q / (4\pi\Delta s)$
=2.3*155.5/(4* π *1)
=28.5 m²/day (drawdown)

=2.3*155.5/(4* π *0.9)
=31.6 m²/day (recovery)

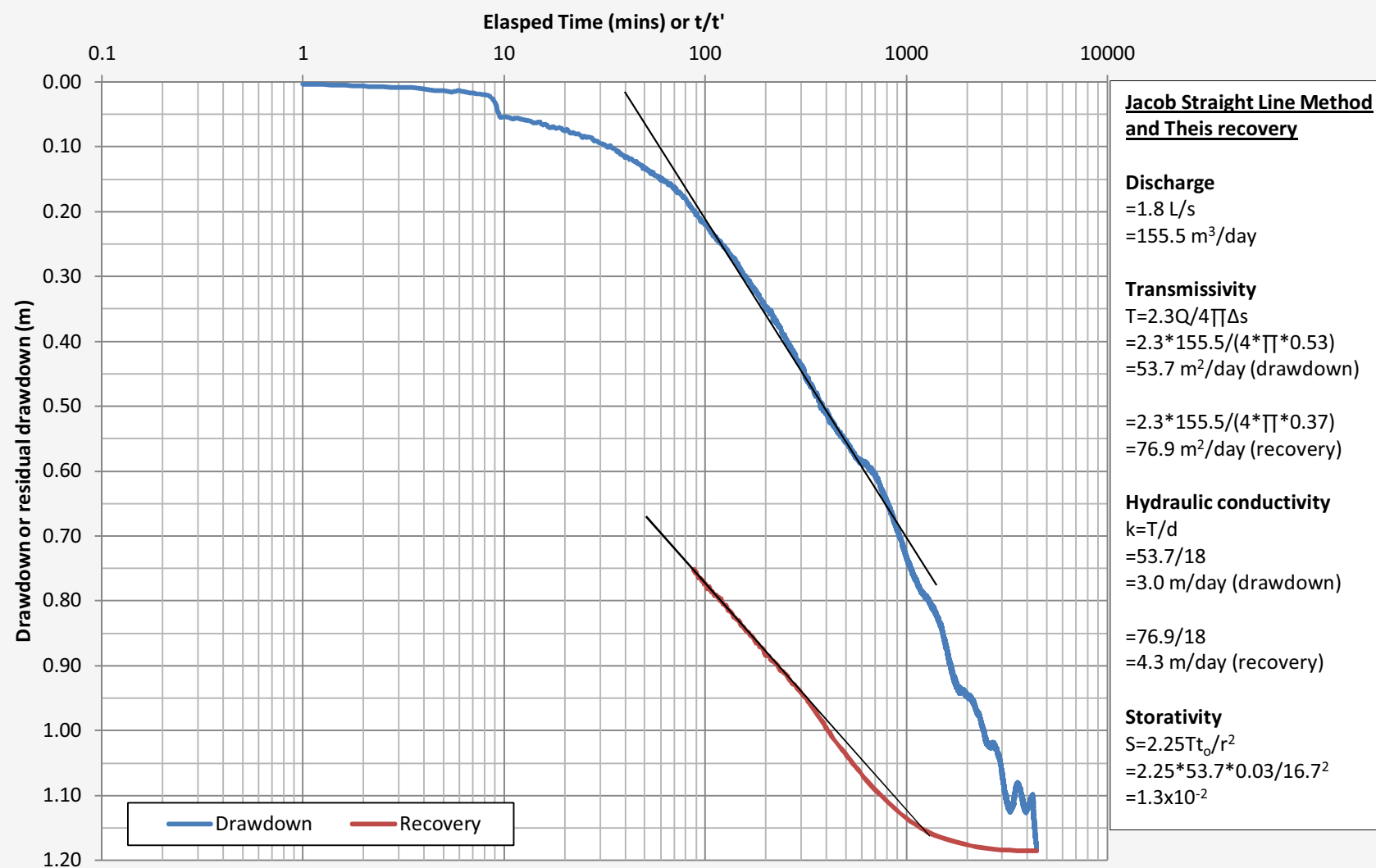
Hydraulic conductivity

$k = T/d$
=28.5/15
=1.9 m/day (drawdown)

=31.6/15
=2.1 m/day (recovery)

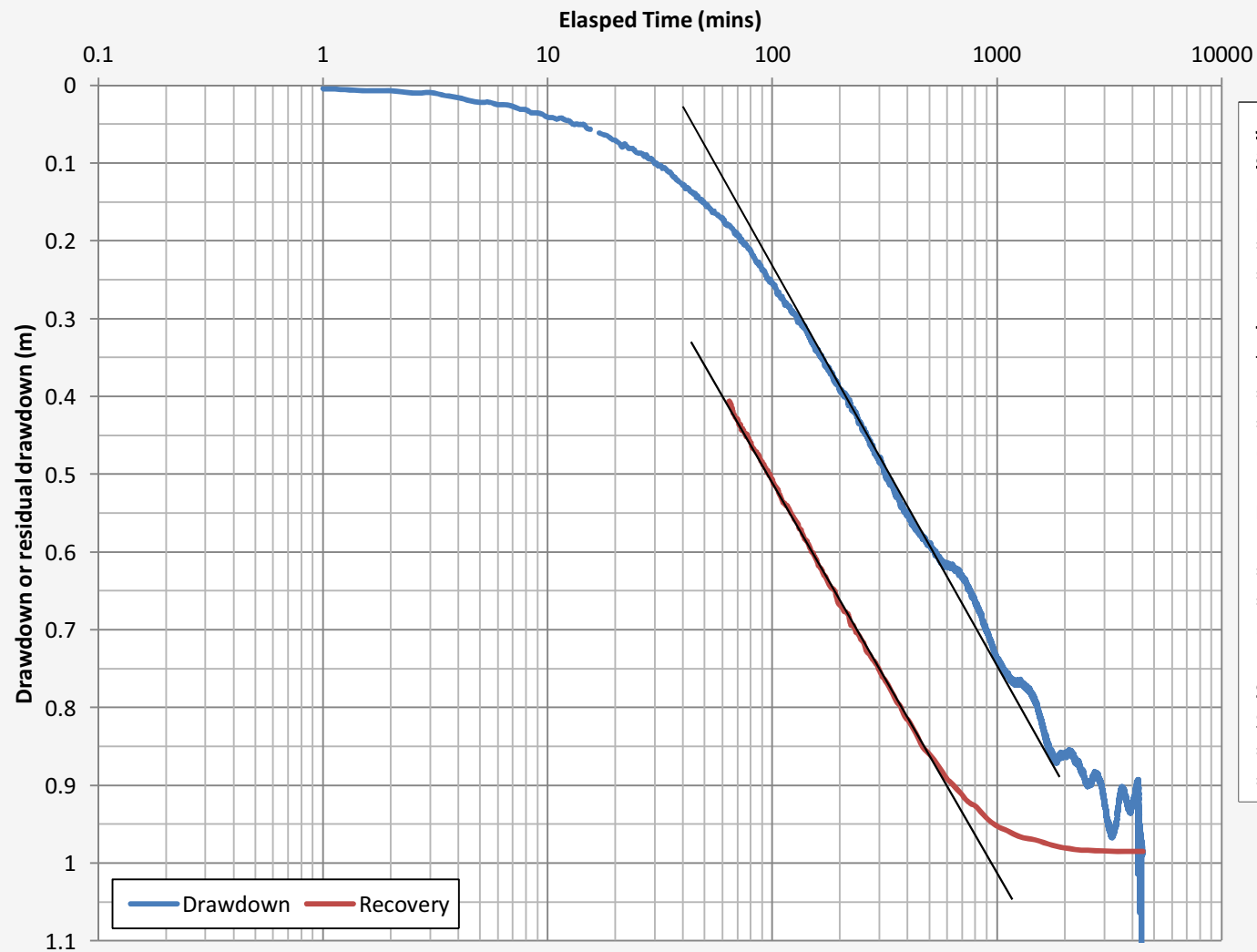
(Test production bore)

Figure B.18: GW22_TPB 3 day test analysis



(Observation bore)

Figure B.19: GW5_TPB 3 day test analysis



**Jacob Straight Line Method
and Theis recovery**

Discharge

=1.8 L/s

=155.5 m³/day

Transmissivity

$T = 2.3Q / (4\pi\Delta s)$

=2.3*155.5 / (4*π*0.51)

=55.8 m²/day

(drawdown/recovery)

Hydraulic conductivity

$k = T / d$

=55.8/3

=18.6 m/day

(drawdown/recovery)

Storativity

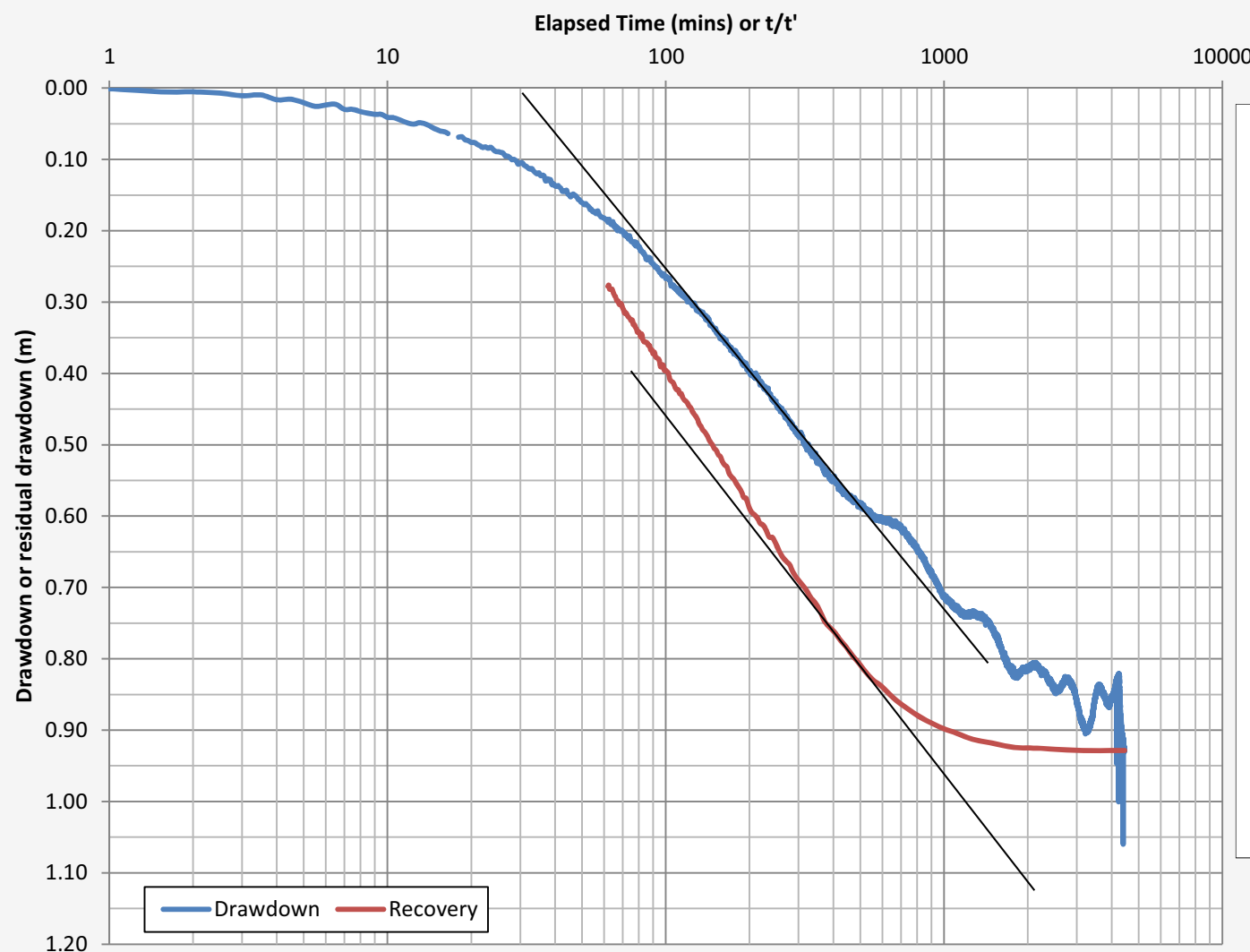
$S = 2.25Tt_o / r^2$

=2.25*55.8*0.0245/34²

=2.7x10⁻³

(Observation bore)

Figure B.20: GW5B 3 day test analysis



**Jacob Straight Line Method
and Theis recovery**

Discharge

=1.8 L/s
=155.5 m³/day

Transmissivity

$T = 2.3Q / 4\pi \Delta s$
= $2.3 * 155.5 / (4 * \pi * 0.47)$
= 60.6 m²/day (drawdown)

= $2.3 * 155.5 / (4 * \pi * 0.5)$
= 57.0 m²/day (recovery)

Hydraulic conductivity

$k = T / d$
= 60.6 / 6
= 10.1 m/day (drawdown)

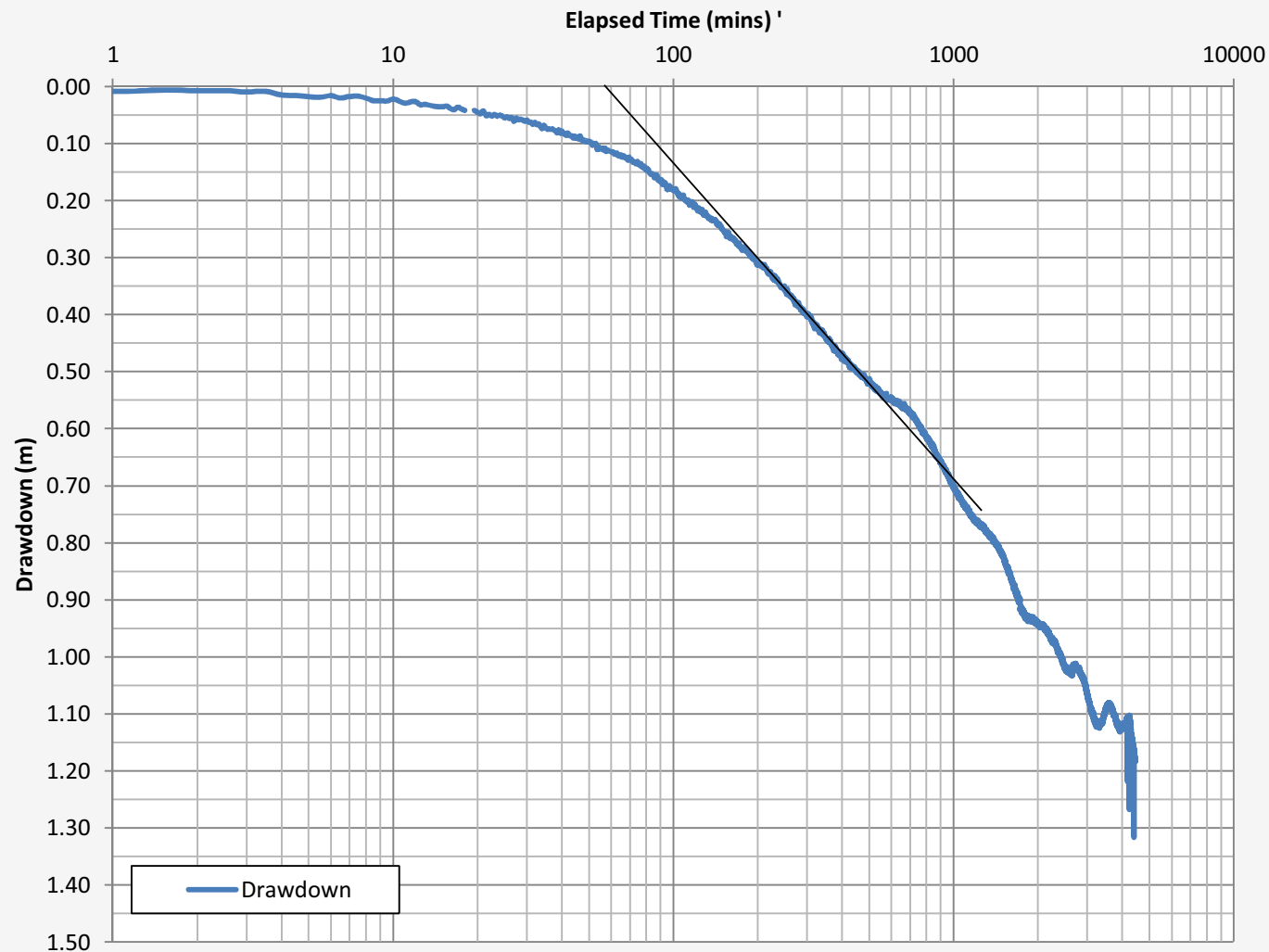
= 57.0 / 6
= 9.5 m/day (recovery)

Storativity

$S = 2.25 T t_o / r^2$
= $2.25 * 60.6 * 0.02 / 40.8^2$
= 1.6×10^{-3} (drawdown)

(Observation bore)

Figure B.21: GW5C 3 day test analysis



Jacob Straight Line Method

Discharge

=1.8 L/s
=155.5 m³/day

Transmissivity

$T = 2.3Q / (4\pi\Delta s)$
=2.3*155.5/(4* π *0.55)
=51.7 m²/day (drawdown)

Hydraulic conductivity

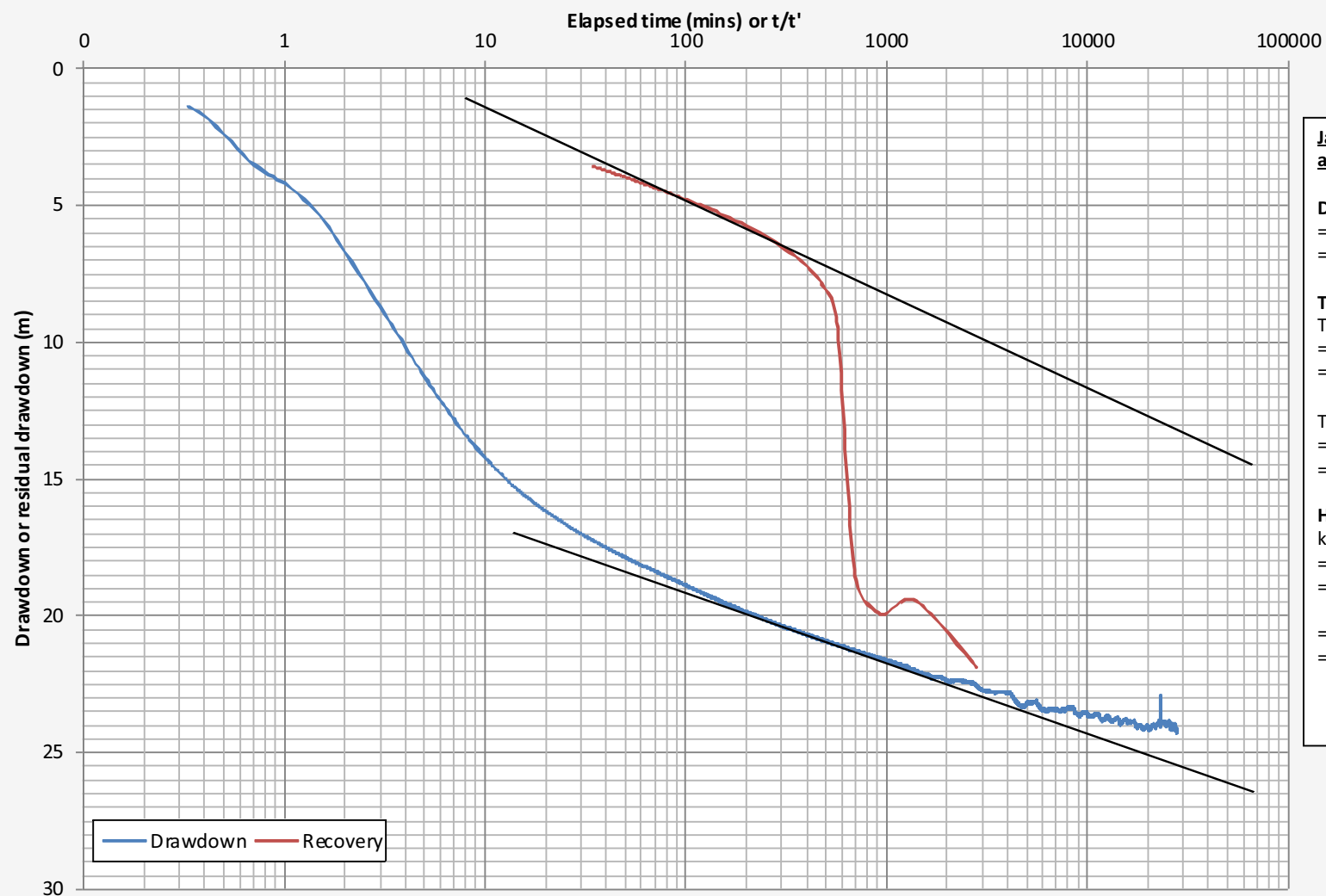
$k = T/d$
=51.7/6
=8.6 m/day (drawdown)

Storativity

$S = 2.25Tt_o / r^2$
=2.25*51.7*0.028/48.1²
=1.4x10⁻³ (drawdown)

(Observation bore)

Figure B.22: GW5D 3 day test analysis



**Jacob Straight Line Method
and Theis recovery**

Discharge
 $=4.4 \text{ l/s}$
 $=380.2 \text{ m}^3/\text{day}$

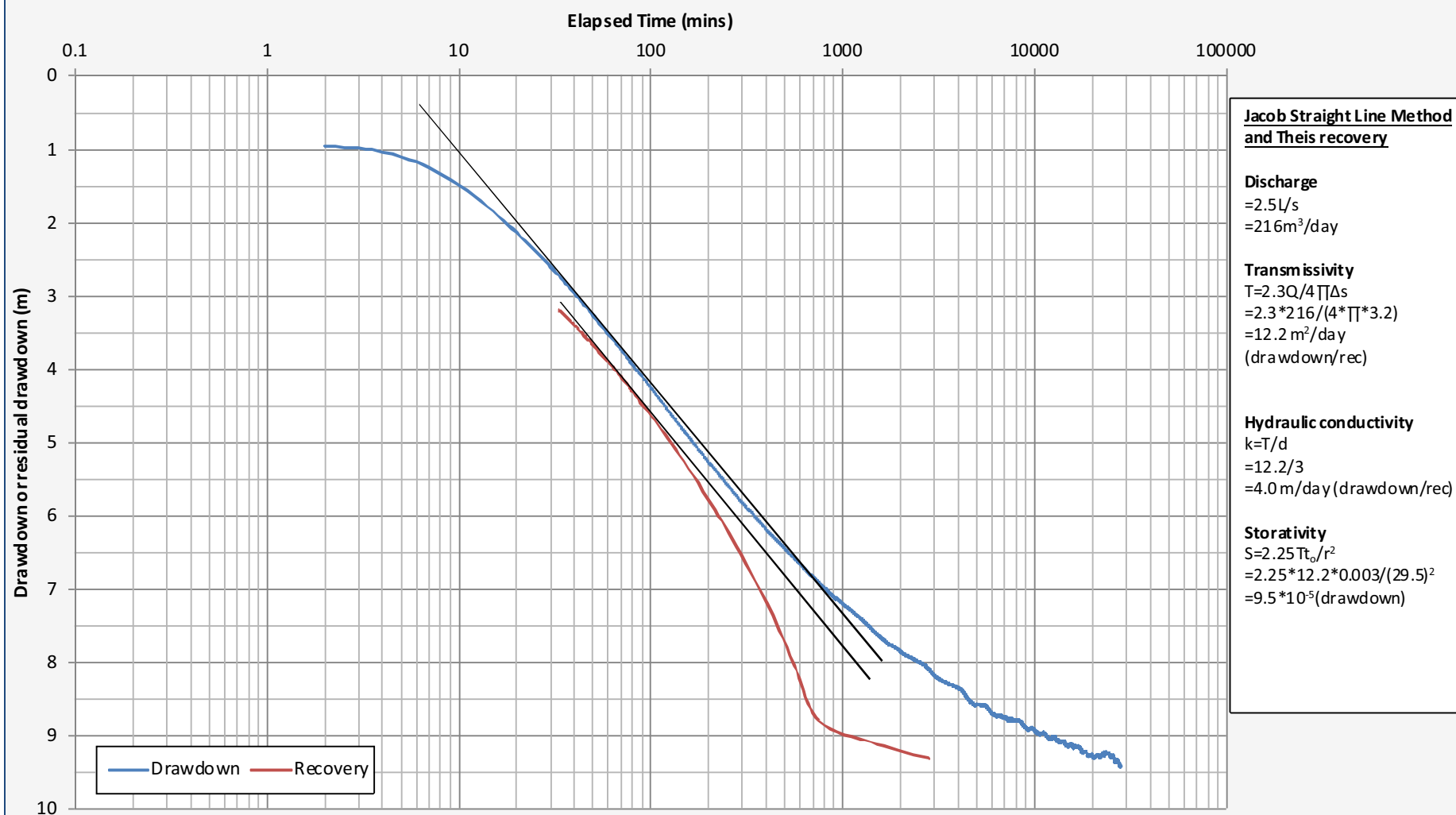
Transmissivity
 $T=2.3Q/4\pi\Delta s$
 $=2.3 * 380.2 / (4 * \pi * 2.5)$
 $=27.9 \text{ m}^2/\text{day}$ (drawdown)

$T=2.3Q/4\pi\Delta s$
 $=2.3 * 380.2 / (4 * \pi * 3)$
 $=23.2 \text{ m}^2/\text{day}$ (recovery)

Hydraulic conductivity
 $k=T/d$
 $=27.9/55$
 $=0.5 \text{ m/day}$ (drawdown)
 $=23.2/55$
 $=0.4 \text{ m/day}$ (recovery)

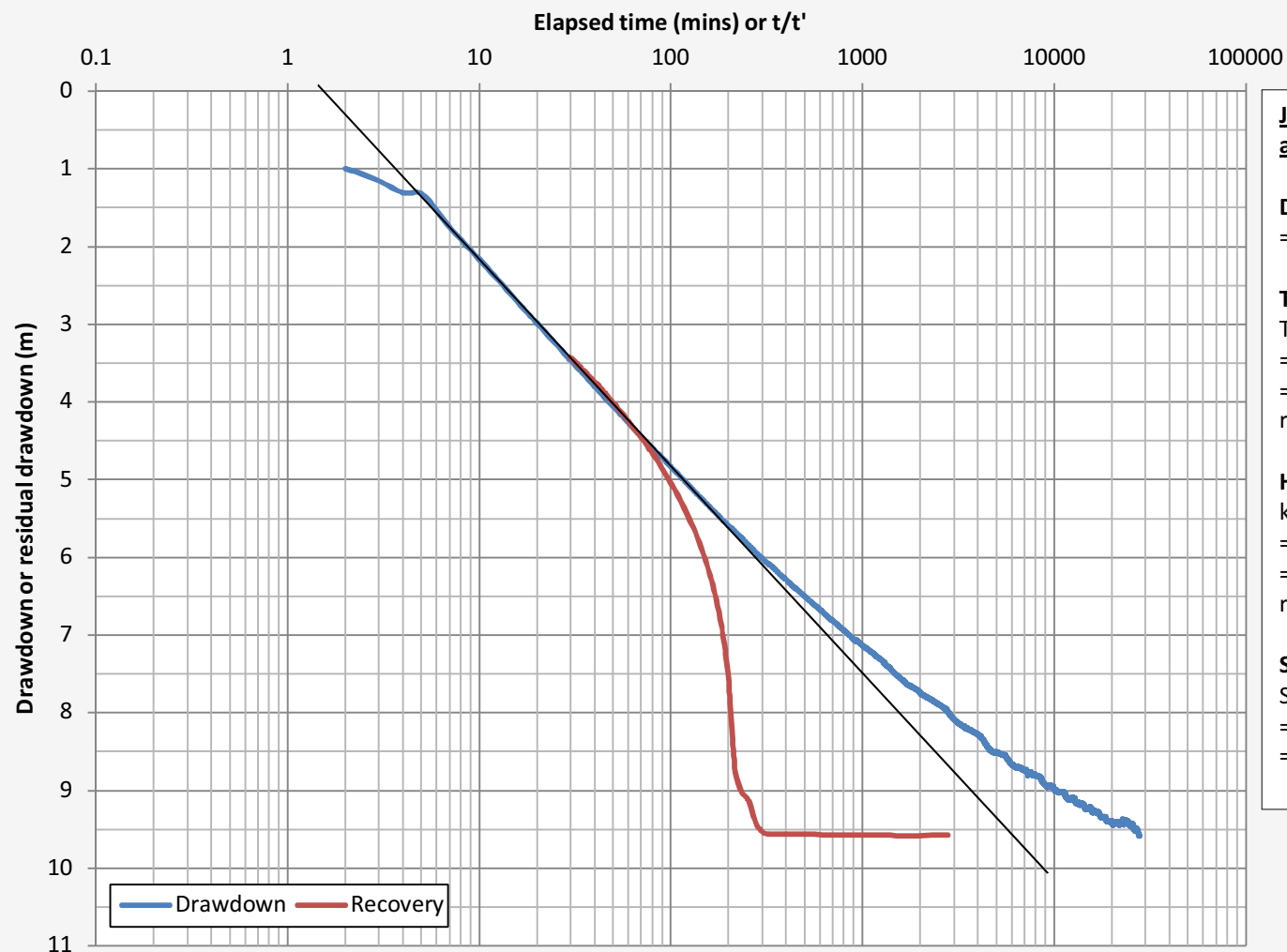
(Test production bore)

Figure B.23: GW7_TPB 21 day test analysis



(Observation bore)

Figure B.24: GW7C 21 day test analysis



**Jacob Straight Line Method
and Theis recovery**

Discharge
=216 m³/day

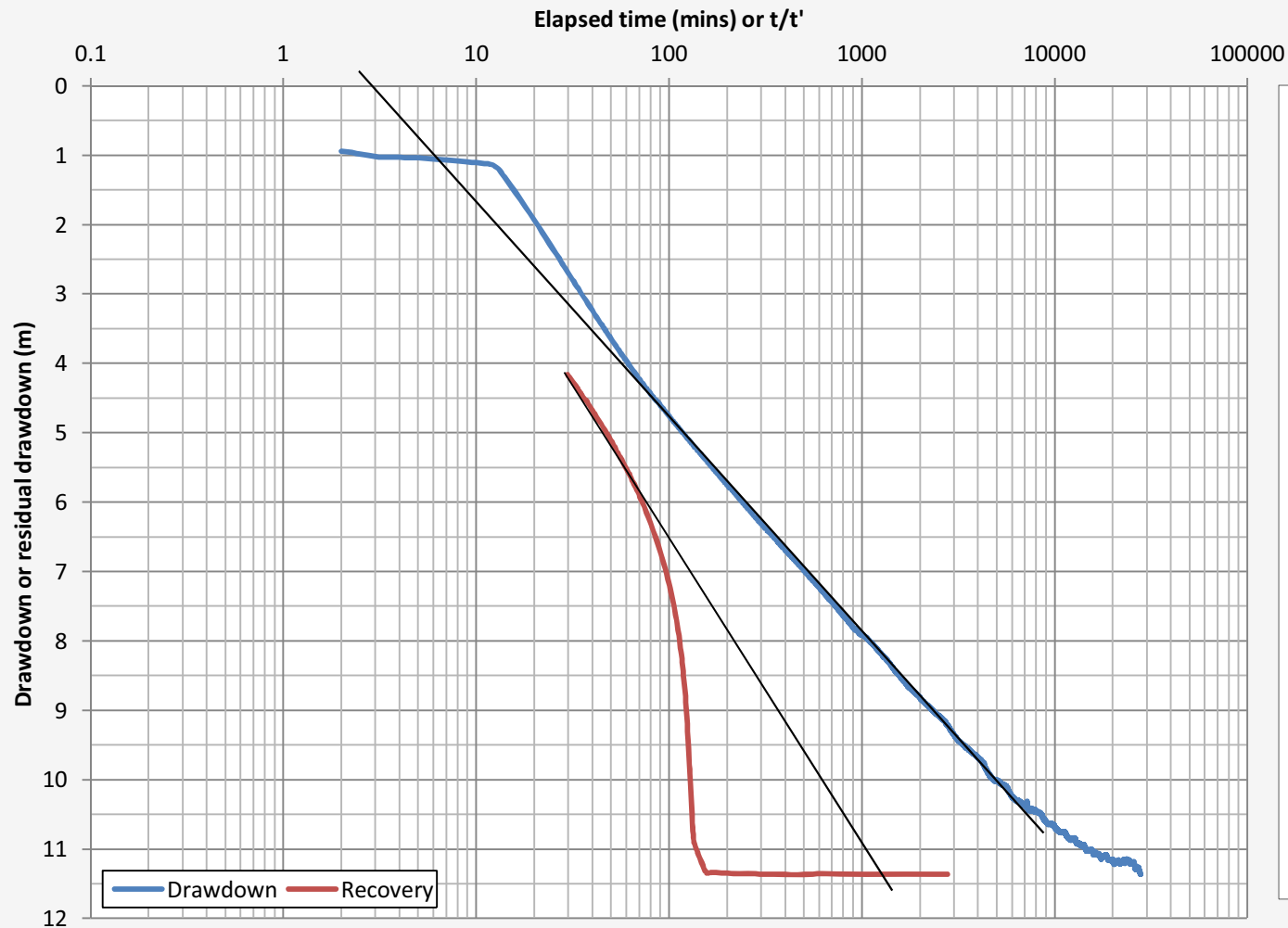
Transmissivity
 $T = 2.3Q / (4\pi\Delta s)$
 $= 2.3 * 216 / (4 * \pi * 2.8)$
 $= 14.1 \text{ m}^2/\text{day}$ (drawdown and recovery)

Hydraulic conductivity
 $k = T/d$
 $= 14.1/3$
 $= 4.7 \text{ m/day}$ (drawdown and recovery)

Storativity
 $S = 2.25Tt_o/r^2$
 $= 2.25 * 14.1 * 0.000764 / (36.3)^2$
 $= 1.8 * 10^{-5}$ (drawdown)

(Observation bore)

Figure B.25: GW7D 21 day test analysis



**Jacob Straight Line Method
and Theis recovery**

Discharge

=216 m³/day

Transmissivity

$T = 2.3Q / (4\pi\Delta s)$
 $= 2.3 * 216 / (4 * \pi * 3.2)$
 $= 12.4 \text{ m}^2/\text{day (drawdown)}$

$= 2.3 * 216 / (4 * \pi * 4.4)$
 $= 8.9 \text{ m}^2/\text{day (recovery)}$

Hydraulic conductivity

$k = T/d$
 $= 12.4/6$
 $= 2.1 \text{ m/day (drawdown)}$

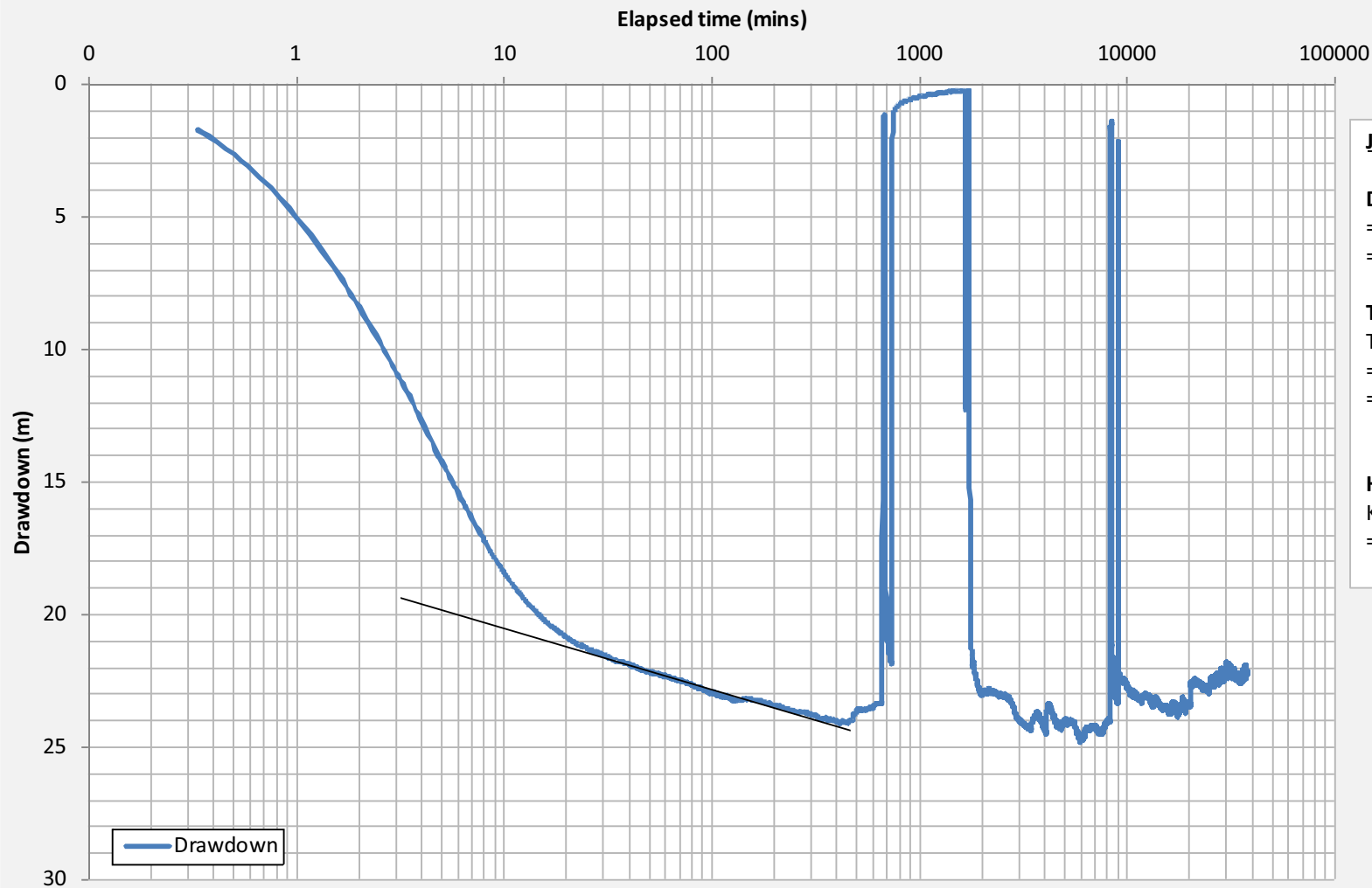
$= 8.9/6$
 $= 1.5 \text{ m/day (recovery)}$

Storativity

$S = 2.25Tt_o / r^2$
 $= 2.25 * 12.4 * 0.002 / (43)^2$
 $= 3 \times 10^{-5} \text{ (drawdown)}$

(Observation bore)

Figure B.26: GW7E 21 day test analysis



Jacob Straight Line Method

Discharge

=2 L/s
=172.8 m³/day

Transmissivity

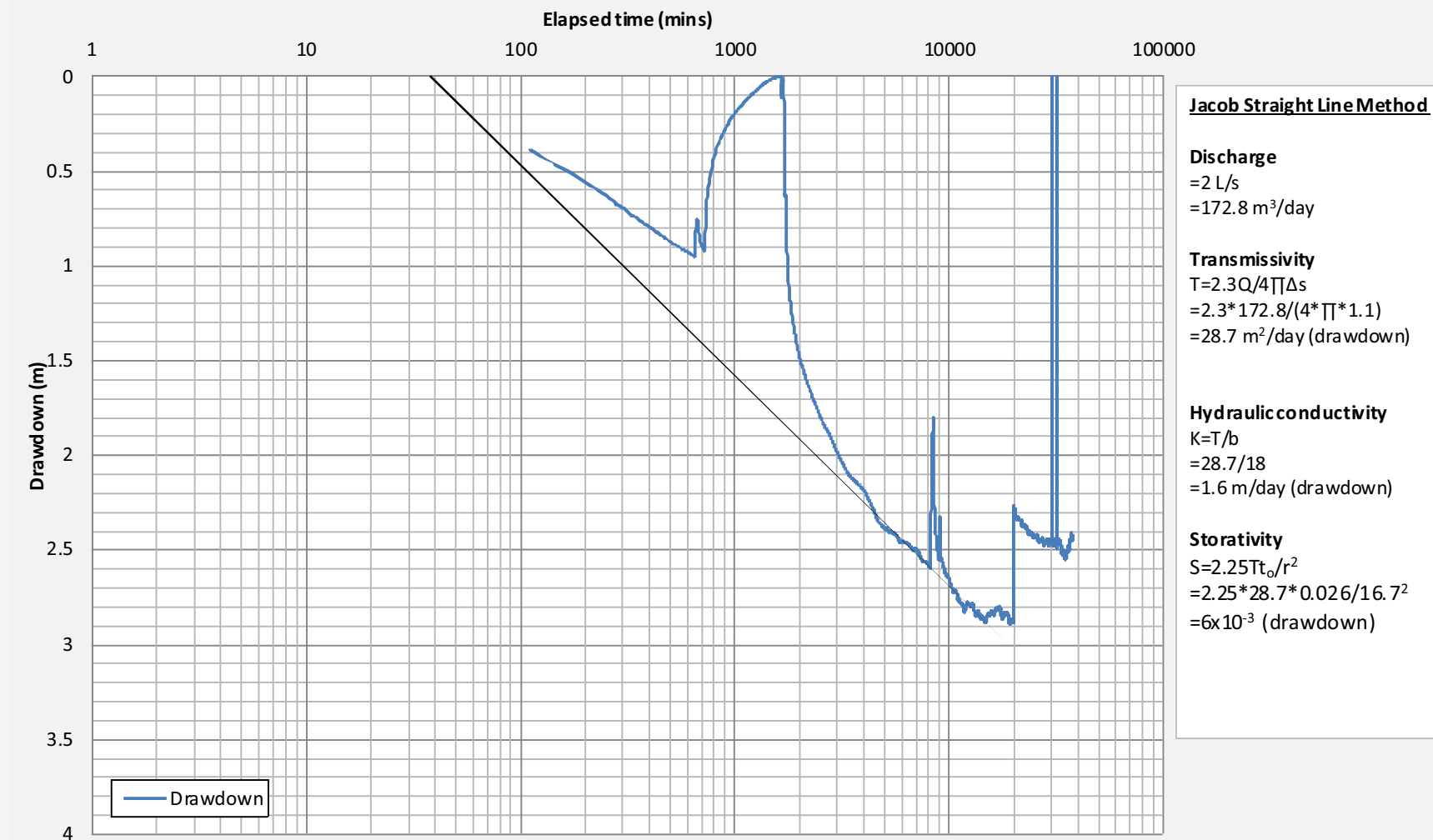
$T = 2.3Q / (4\pi \Delta s)$
=2.3*172.8/(4* π *2.25)
=14.1 m²/day (drawdown)

Hydraulic conductivity

$K = T/b$
=14.1/15

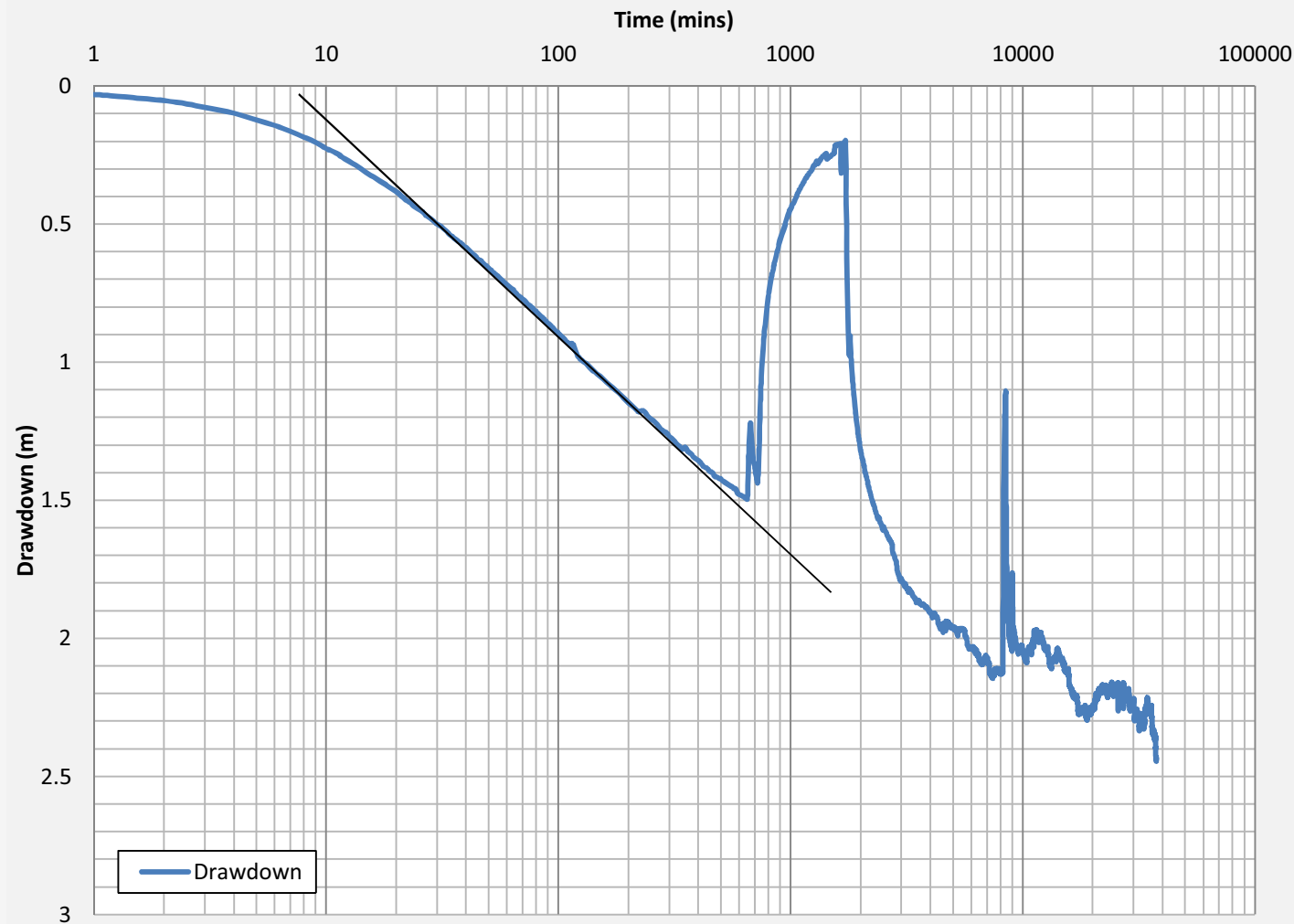
(Test production bore)

Figure B.27: GW22_TPB 21 day test analysis



(Test production bore)

Figure B.28: GW5_TPB 21 day test analysis



Jacob Straight Line Method

Discharge

=2 L/s

=172.8 m³/day

Transmissivity

$T = 2.3Q / (4\pi\Delta s)$

=2.3*172.8/(4*π*0.8)

= 39.6 m²/day (drawdown)

Hydraulic conductivity

$K = T/b$

=39.6/3

=13.2 m/day (drawdown)

Storativity

$S = 2.25Tt_o / r^2$

=2.25*39.6*0.005/16.7²

=1.6x10⁻³ (drawdown)

(Observation bore)

Figure B.29: GW5B 21 day test analysis



Jacob Straight Line Method

Discharge

=2 L/s
=172.8 m³/day

Transmissivity

$T = 2.3Q / (4\pi \Delta s)$
=2.3*172.8/(4* π *0.8)
= 39.6 m²/day (drawdown)

Hydraulic conductivity

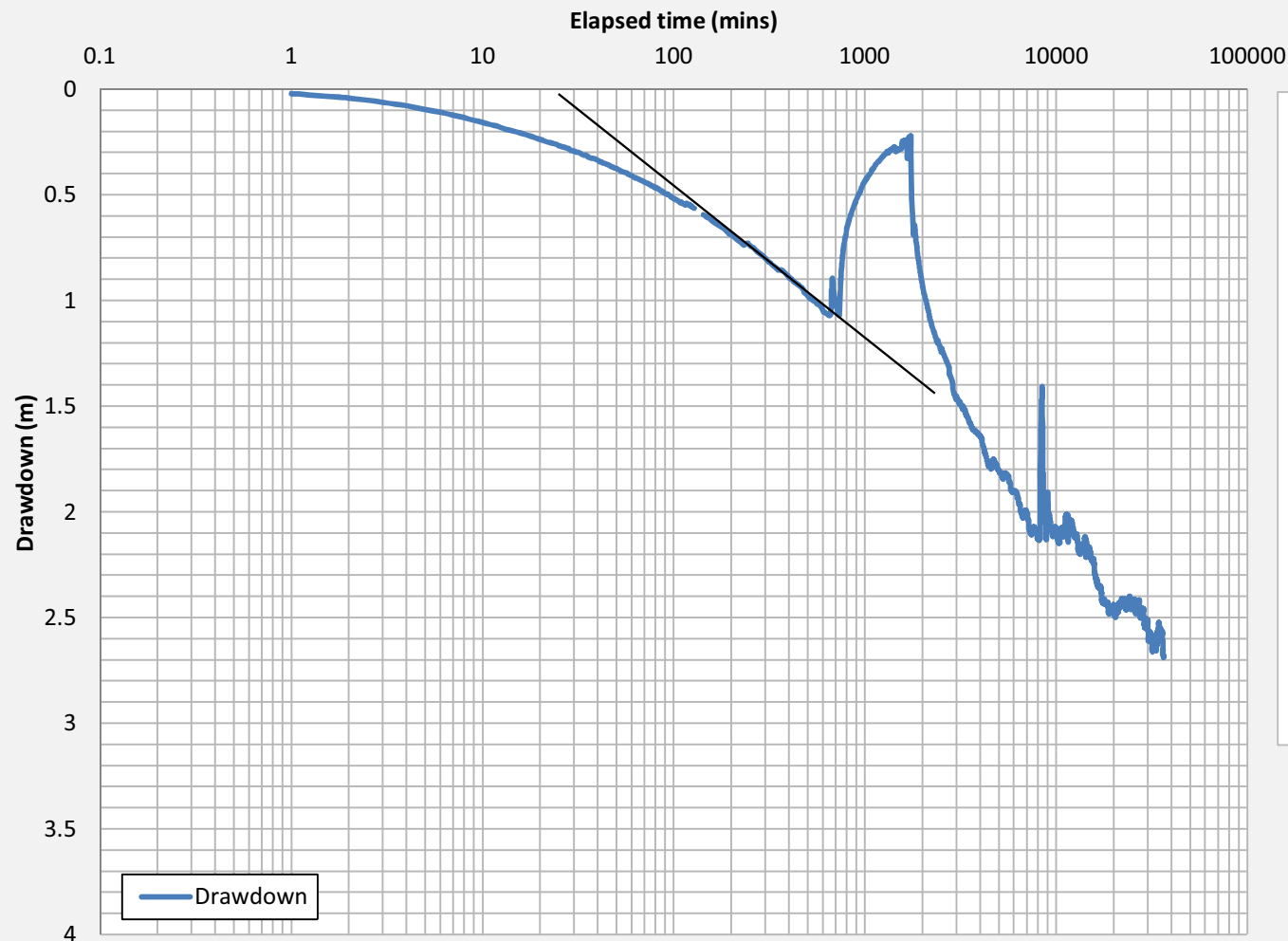
$K = T/b$
= 39.6/6
= 6.6 m/day (drawdown)

Storativity

$S = 2.25Tt_o / r^2$
=2.25*39.6*0.006/40.8²
=3.2x10⁻⁴ (drawdown)

(Observation bore)

Figure B.30: GW5C 21 day test analysis



Jacob Straight Line Method

Discharge

=2 L/s
=172.8 m³/day

Transmissivity

$T = 2.3Q / 4\pi \Delta s$
=2.3*172.8/(4* π *0.7)
= 45.2 m²/day (drawdown)

Hydraulic conductivity

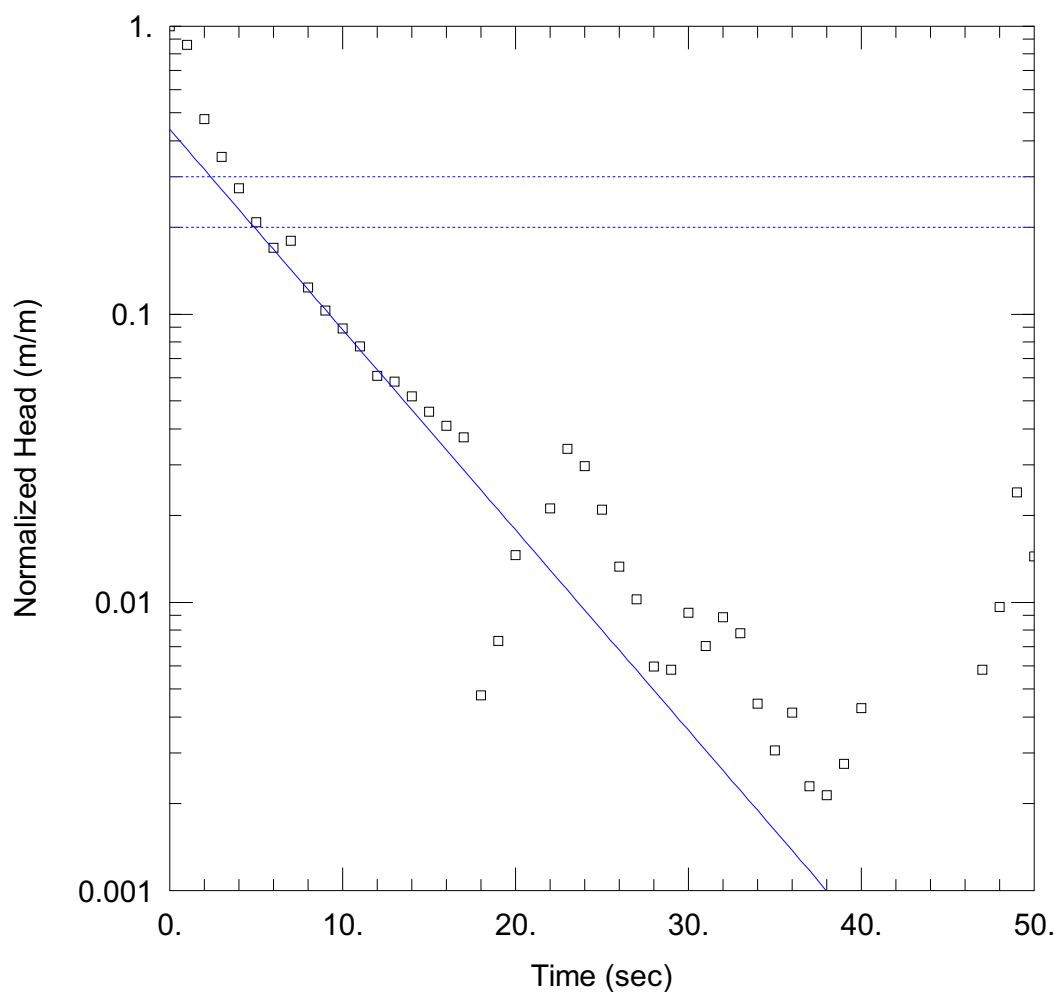
$K = T/b$
= 45.2/18
= 2.5 m/day (drawdown)

Storativity

$S = 2.25Tt_o / r^2$
=2.25*45.2*0.015/48.1²
=6.6x10⁻⁴ (drawdown)

(Observation bore)

Figure B.31: GW5D 21 day test analysis



COBBORA COAL PROJECT

Data Set: \\...\GW5A.aqt

Date: 01/18/12

Time: 16:19:21

PROJECT INFORMATION

Company: Parsons Brinckerhoff

Client: CHC Pty Ltd

Project: 2162570B

Test Well: GW5A

Test Date: 12/11/2011

AQUIFER DATA

Saturated Thickness: 11.38 m

Anisotropy Ratio (K_z/K_r): 0.1

WELL DATA (GW5A)

Initial Displacement: -0.6536 m

Static Water Column Height: 11.38 m

Total Well Penetration Depth: 9.38 m

Screen Length: 3. m

Casing Radius: 0.025 m

Well Radius: 0.127 m

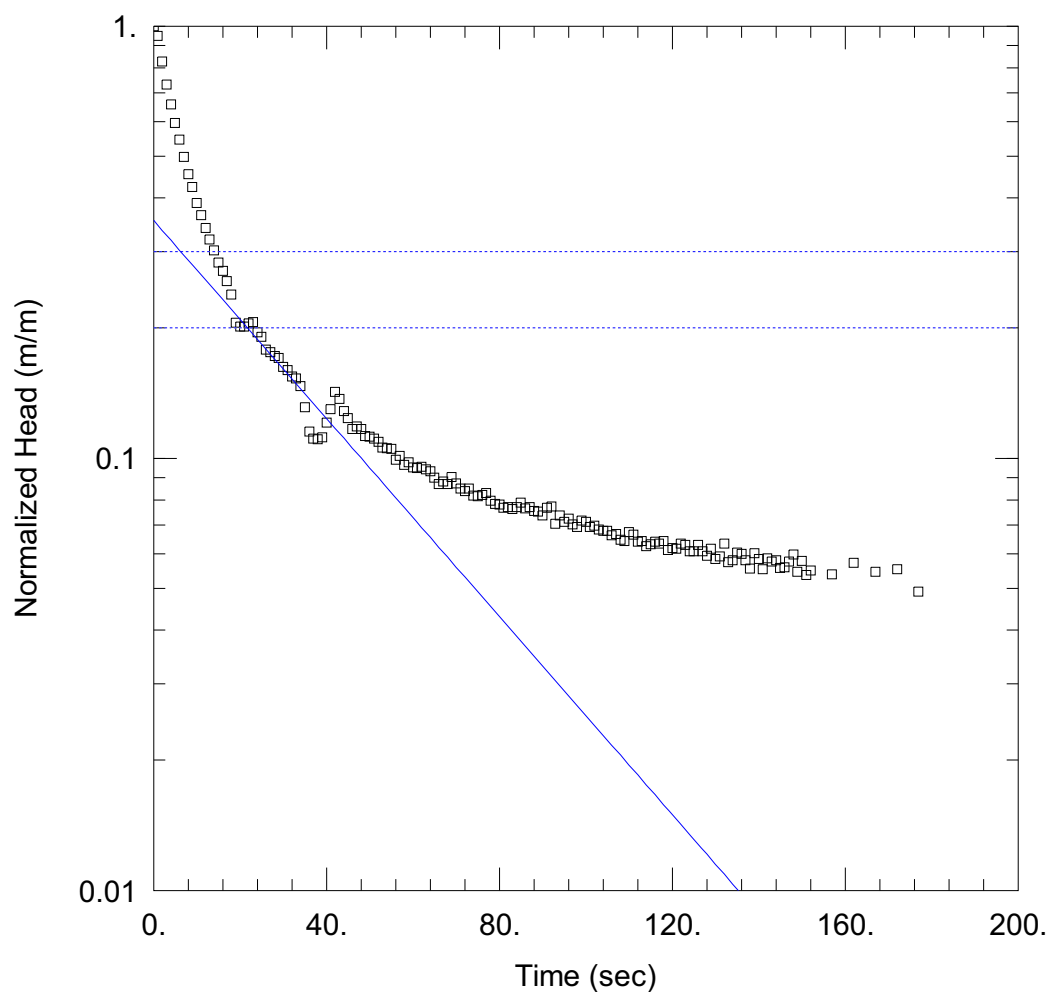
SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

$K = 5.063$ m/day

$y_0 = -0.2864$ m



COBBORA COAL PROJECT

Data Set: \\...\GW5B.aqt

Date: 01/18/12

Time: 16:21:27

PROJECT INFORMATION

Company: Parsons Brinckerhoff

Client: CHC Pty Ltd

Project: 2162570B

Test Well: GW5B

Test Date: 12/11/2011

AQUIFER DATA

Saturated Thickness: 22.72 m

Anisotropy Ratio (K_z/K_r): 0.1

WELL DATA (GW5B)

Initial Displacement: -0.8091 m

Total Well Penetration Depth: 21.72 m

Casing Radius: 0.025 m

Static Water Column Height: 22.72 m

Screen Length: 3. m

Well Radius: 0.127 m

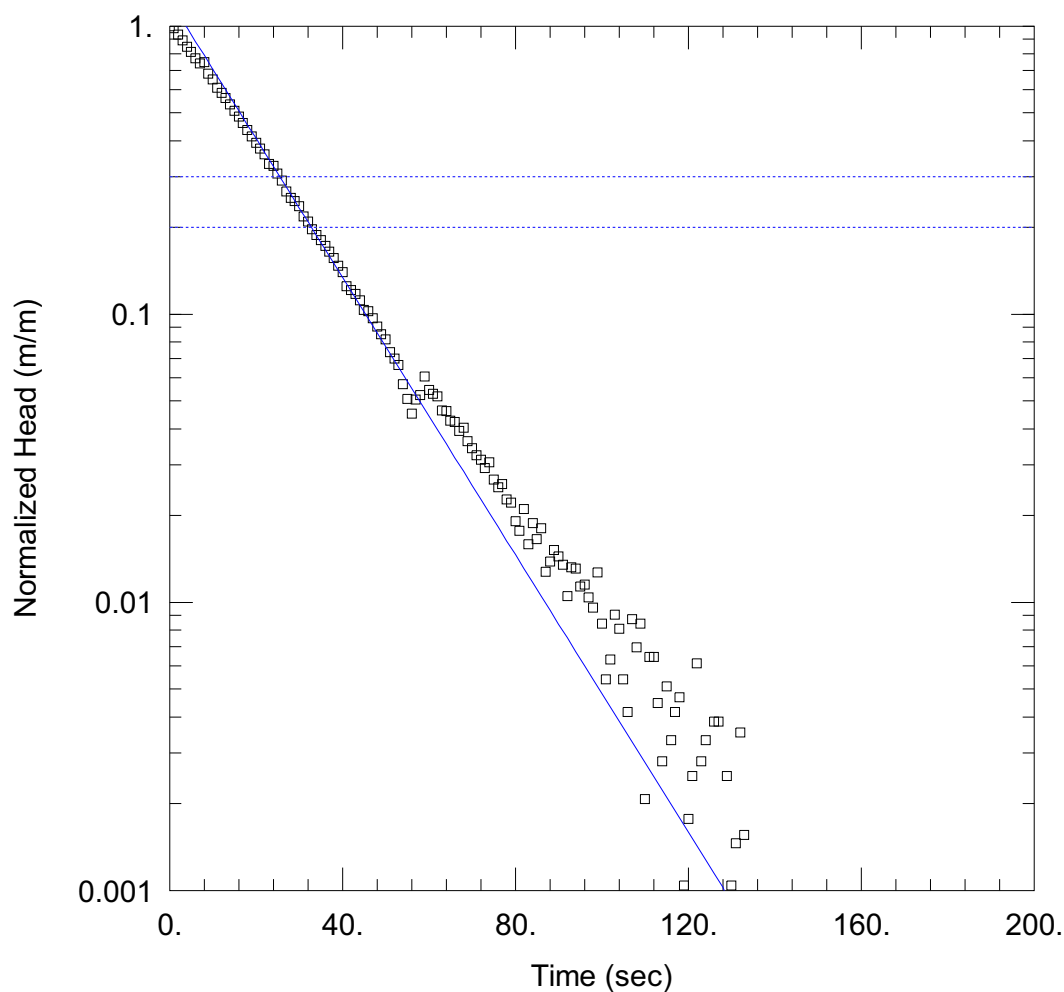
SOLUTION

Aquifer Model: Confined

$K = 0.9423$ m/day

Solution Method: Bouwer-Rice

$y_0 = -0.2872$ m



COBBORA COAL PROJECT

Data Set: \\...\GW5C.aqt

Date: 01/18/12

Time: 16:23:33

PROJECT INFORMATION

Company: Parsons Brinckerhoff

Client: CHC Pty Ltd

Project: 2162570B

Test Well: GW5C

Test Date: 12/11/2011

AQUIFER DATA

Saturated Thickness: 35.11 m

Anisotropy Ratio (K_z/K_r): 0.1

WELL DATA (GW5C)

Initial Displacement: -0.9625 m

Static Water Column Height: 35.11 m

Total Well Penetration Depth: 34.11 m

Screen Length: 6. m

Casing Radius: 0.025 m

Well Radius: 0.127 m

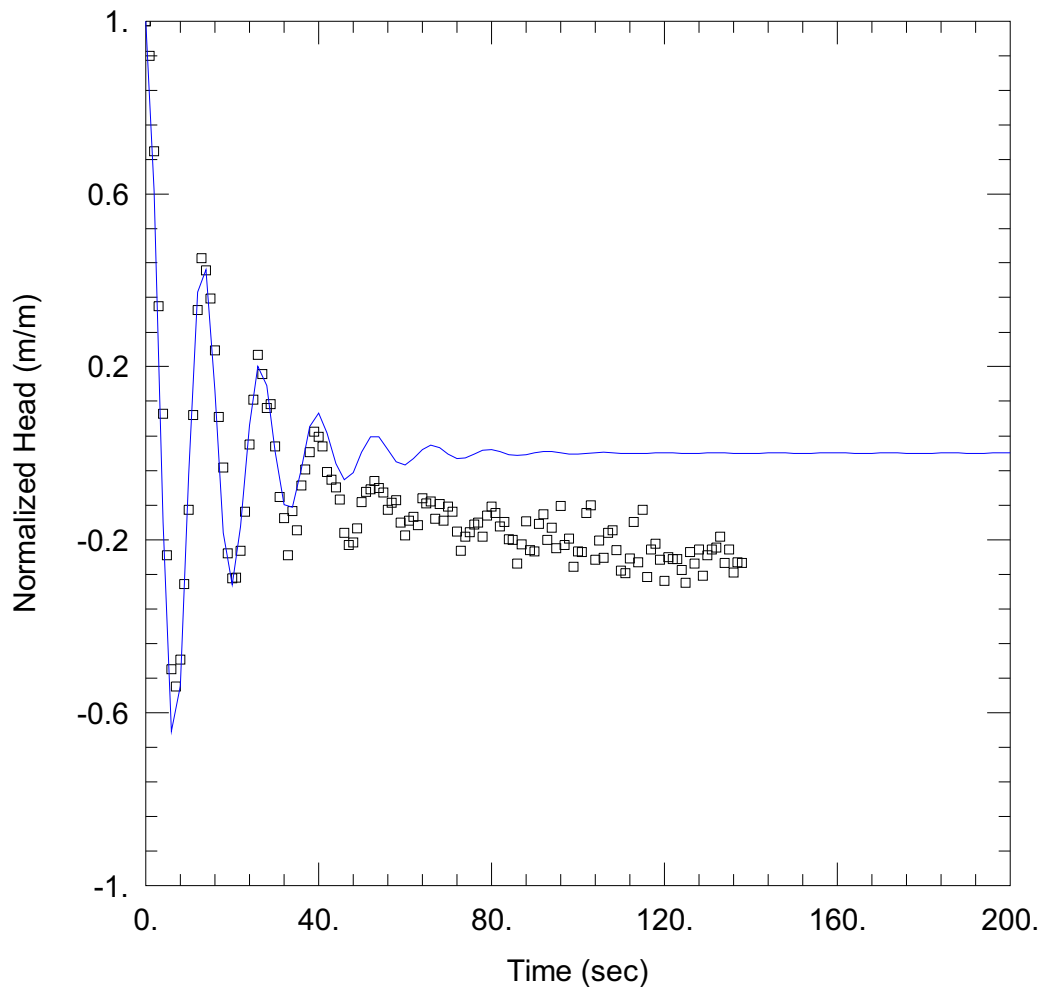
SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

$K = 1.135$ m/day

$y_0 = -1.185$ m



COBBORA COAL PROJECT

Data Set: \\...\GW5D.aqt

Date: 01/18/12

Time: 16:24:48

PROJECT INFORMATION

Company: Parsons Brinckerhoff

Client: CHC Pty Ltd

Project: 2162570B

Test Well: GW5D

Test Date: 12/11/2011

AQUIFER DATA

Saturated Thickness: 47.65 m

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (GW5D)

Initial Displacement: 0.0558 m

Static Water Column Height: 47.65 m

Total Well Penetration Depth: 52.05 m

Screen Length: 6. m

Casing Radius: 0.025 m

Well Radius: 0.127 m

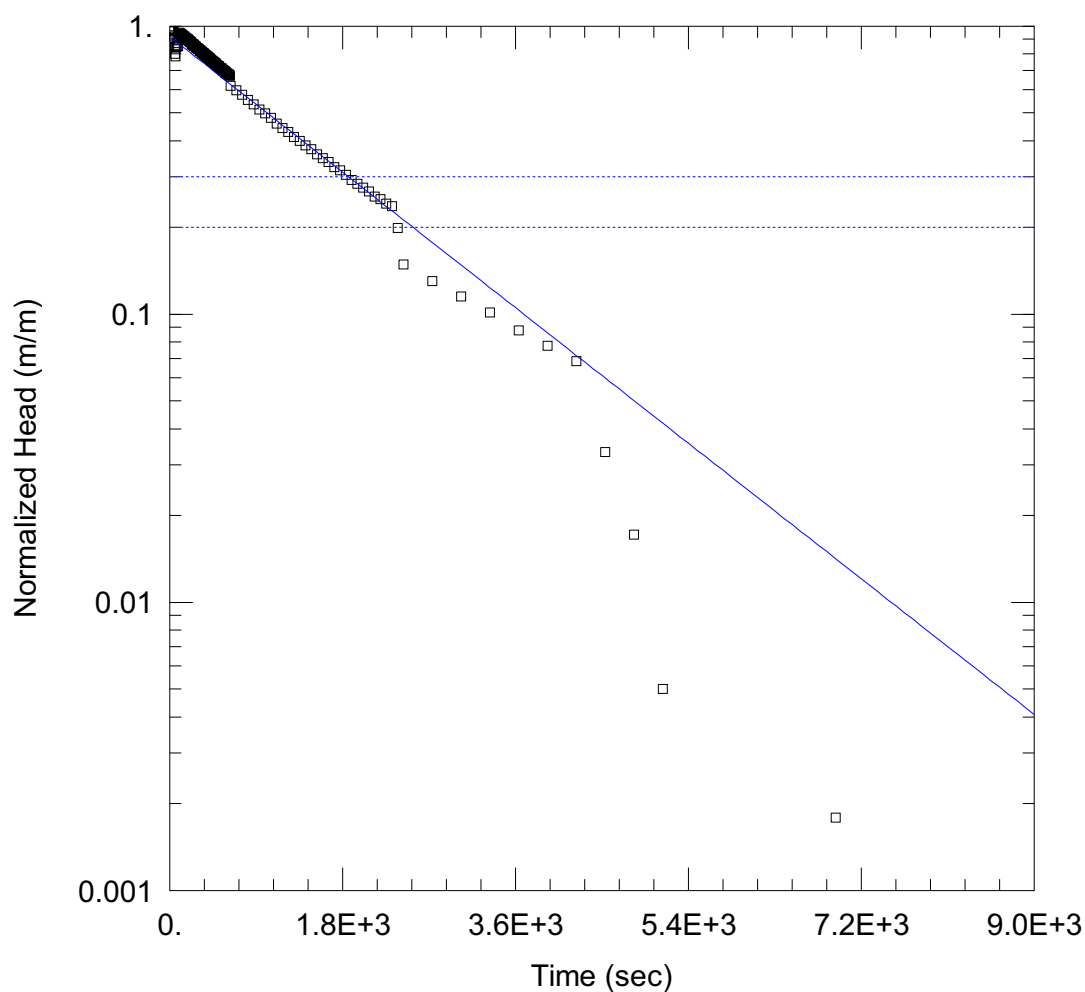
SOLUTION

Aquifer Model: Confined

Solution Method: Butler

K = 44.72 m/day

Le = 42.83 m



COBBORA COAL PROJECT

Data Set: \\...\GW6A.aqt

Date: 01/18/12

Time: 16:26:36

PROJECT INFORMATION

Company: Parsons Brinckerhoff

Client: CHC Pty Ltd

Project: 2162570B

Test Well: GW6A

Test Date: 11/11/2011

AQUIFER DATA

Saturated Thickness: 22.51 m

Anisotropy Ratio (K_z/K_r): 0.1

WELL DATA (GW6A)

Initial Displacement: -1.12 m

Total Well Penetration Depth: 22.51 m

Casing Radius: 0.025 m

Static Water Column Height: 22.51 m

Screen Length: 20.5 m

Well Radius: 0.127 m

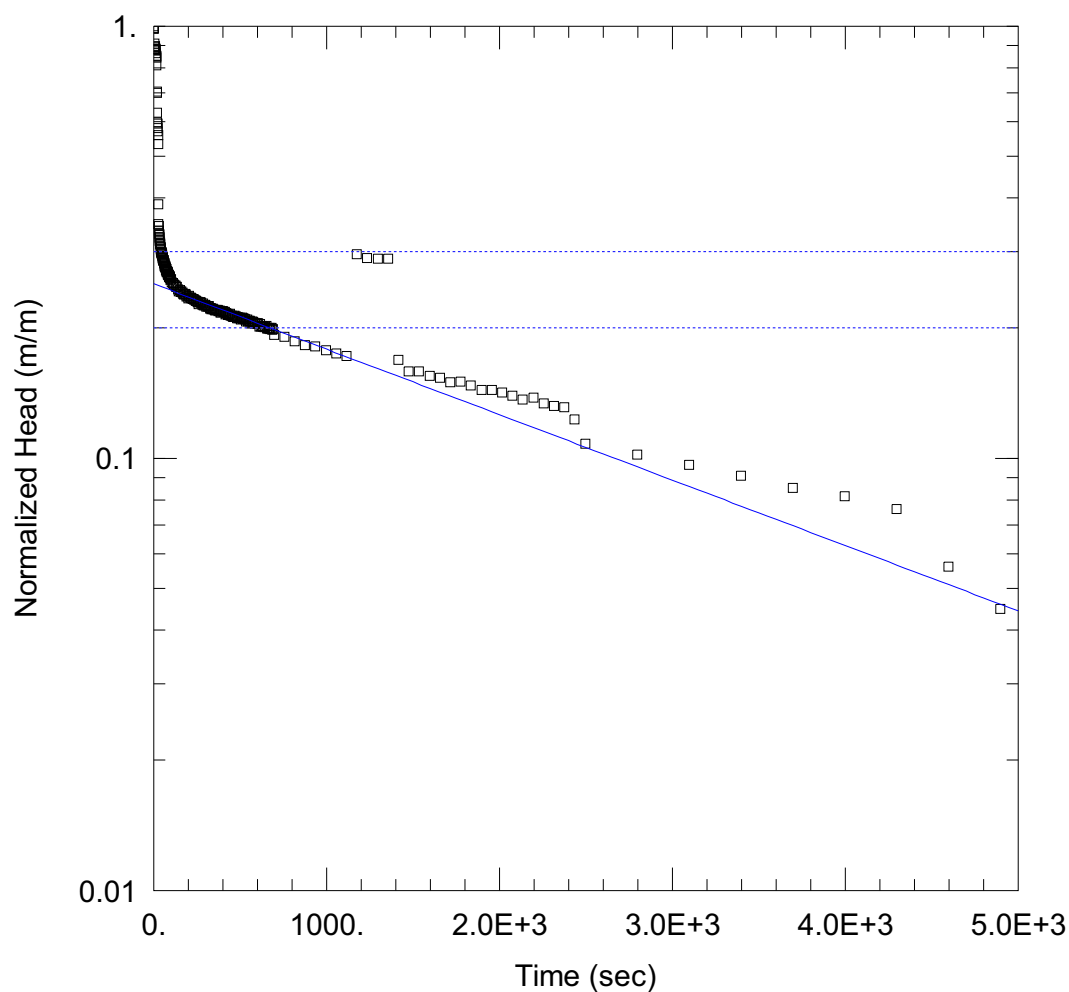
SOLUTION

Aquifer Model: Confined

$K = 0.004065$ m/day

Solution Method: Bouwer-Rice

$y_0 = -1.029$ m



COBBORA COAL PROJECT

Data Set: \\...\GW6B.aqt

Date: 01/18/12

Time: 16:30:53

PROJECT INFORMATION

Company: Parsons Brinckerhoff

Client: CHC Pty Ltd

Project: 2162570B

Test Well: GW6B

Test Date: 11/11/2011

AQUIFER DATA

Saturated Thickness: 25.58 m

Anisotropy Ratio (K_z/K_r): 0.1

WELL DATA (GW6B)

Initial Displacement: -1.452 m

Static Water Column Height: 25.58 m

Total Well Penetration Depth: 25.58 m

Screen Length: 1.5 m

Casing Radius: 0.025 m

Well Radius: 0.127 m

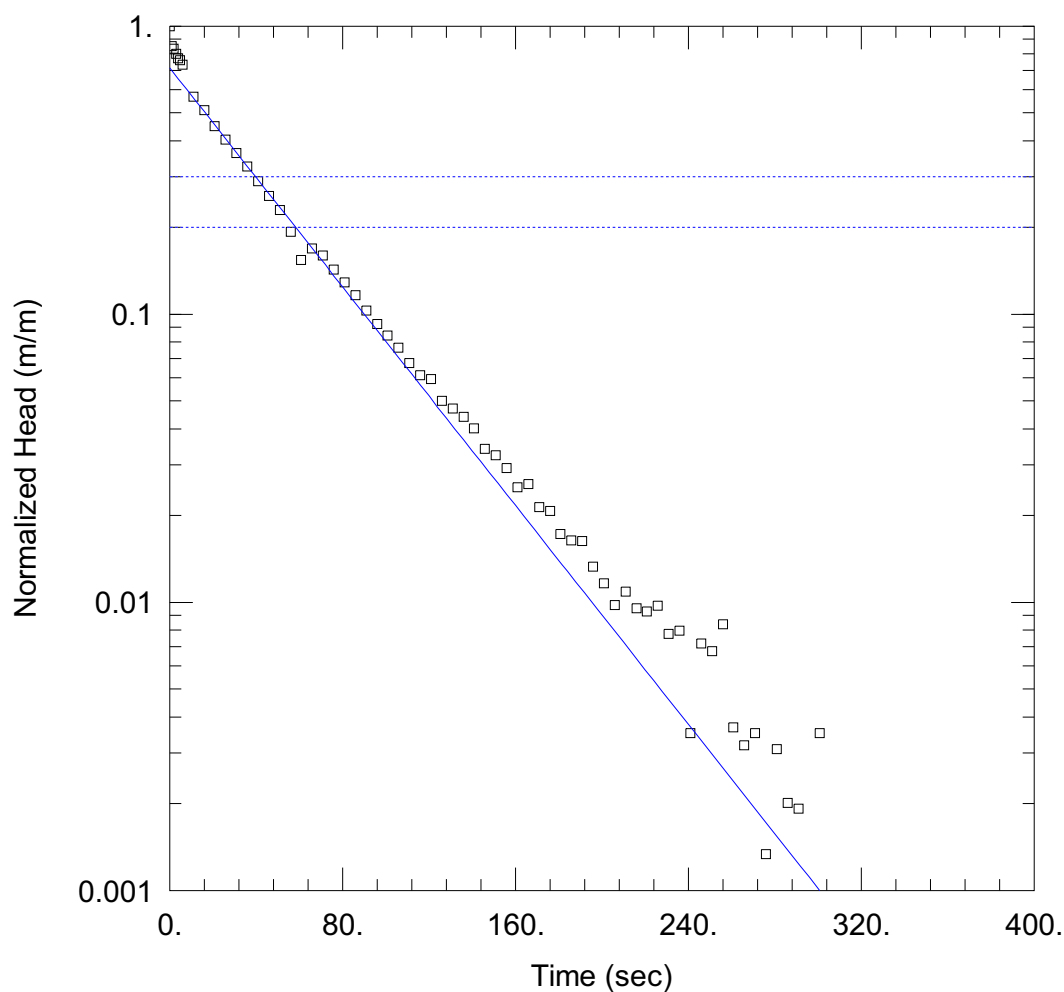
SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

$K = 0.0273$ m/day

$y_0 = -0.3675$ m



COBBORA COAL PROJECT

Data Set: \\...\GW6C.aqt

Date: 01/18/12

Time: 16:31:48

PROJECT INFORMATION

Company: Parsons Brinckerhoff

Client: CHC Pty Ltd

Project: 2162570B

Test Well: GW6C

Test Date: 11/11/2011

AQUIFER DATA

Saturated Thickness: 36.54 m

Anisotropy Ratio (K_z/K_r): 0.1

WELL DATA (GW6C)

Initial Displacement: -1.195 m

Static Water Column Height: 36.54 m

Total Well Penetration Depth: 36.54 m

Screen Length: 9. m

Casing Radius: 0.025 m

Well Radius: 0.127 m

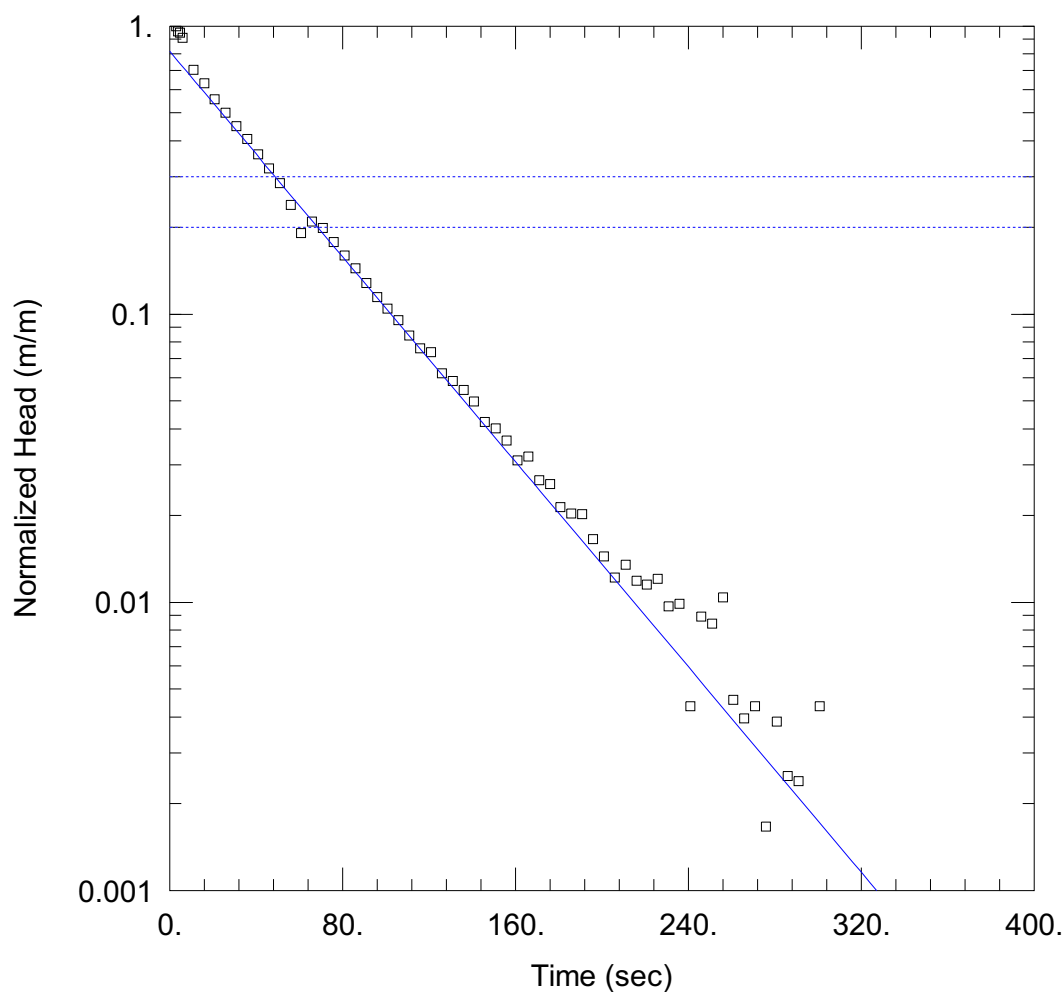
SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

$K = 0.3368$ m/day

$y_0 = -0.8553$ m



COBBORA COAL PROJECT

Data Set: \\...\GW6D.aqt

Date: 01/18/12

Time: 16:32:34

PROJECT INFORMATION

Company: Parsons Brinckerhoff

Client: CHC Pty Ltd

Project: 2162570B

Test Well: GW6D

Test Date: 11/11/2011

AQUIFER DATA

Saturated Thickness: 48.73 m

Anisotropy Ratio (K_z/K_r): 0.1

WELL DATA (GW6D)

Initial Displacement: -0.9625 m

Static Water Column Height: 48.73 m

Total Well Penetration Depth: 48.73 m

Screen Length: 6. m

Casing Radius: 0.025 m

Well Radius: 0.127 m

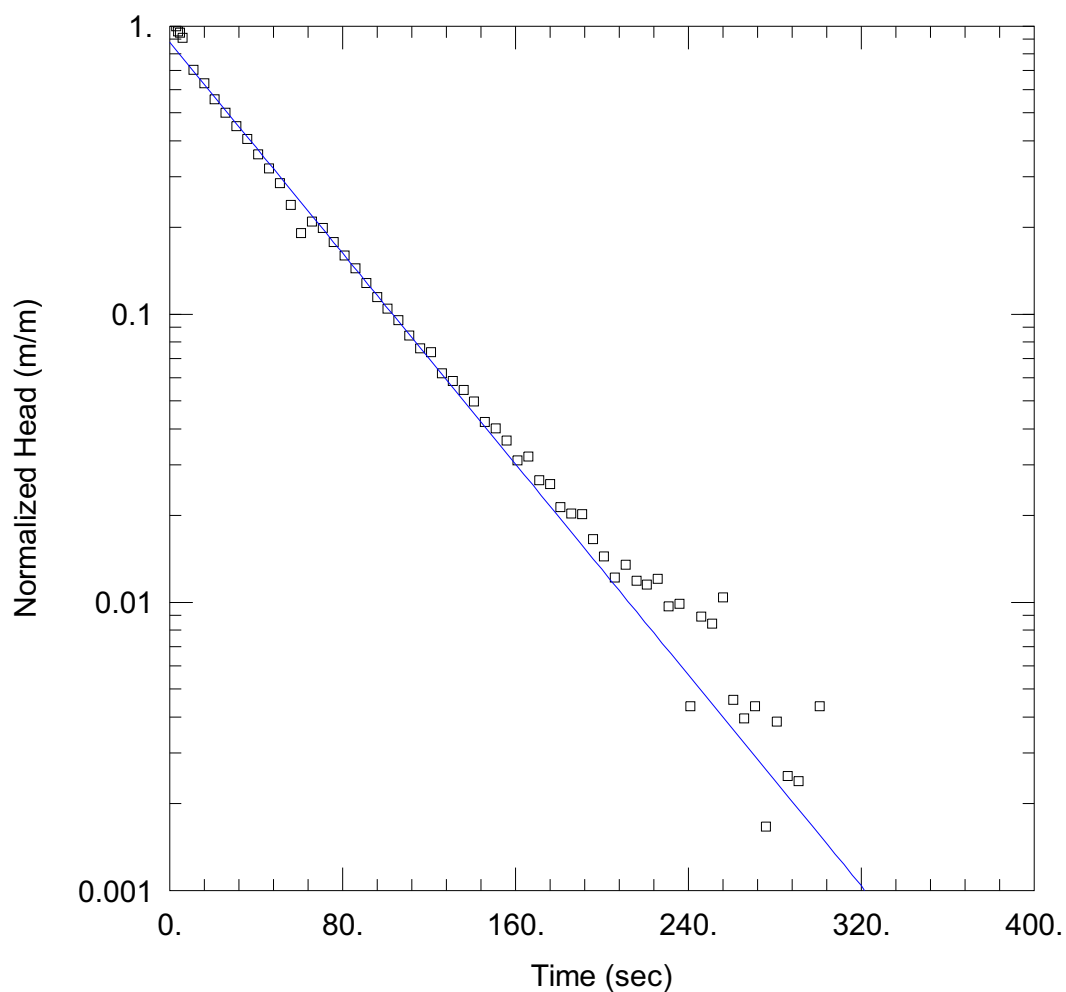
SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

$K = 0.4763$ m/day

$y_0 = -0.7852$ m



COBBORA COAL PROJECT

Data Set: \\...\MB1A.aqt

Date: 01/18/12

Time: 16:58:41

PROJECT INFORMATION

Company: Parsons Brinckerhoff

Client: CHC Pty Ltd

Project: 2162570B

Test Well: GW24A

Test Date: 23/11/2011

AQUIFER DATA

Saturated Thickness: 48.73 m

Anisotropy Ratio (K_z/K_r): 1.

WELL DATA (GW24A)

Initial Displacement: -0.9625 m

Static Water Column Height: 48.73 m

Total Well Penetration Depth: 48.73 m

Screen Length: 6. m

Casing Radius: 0.025 m

Well Radius: 0.127 m

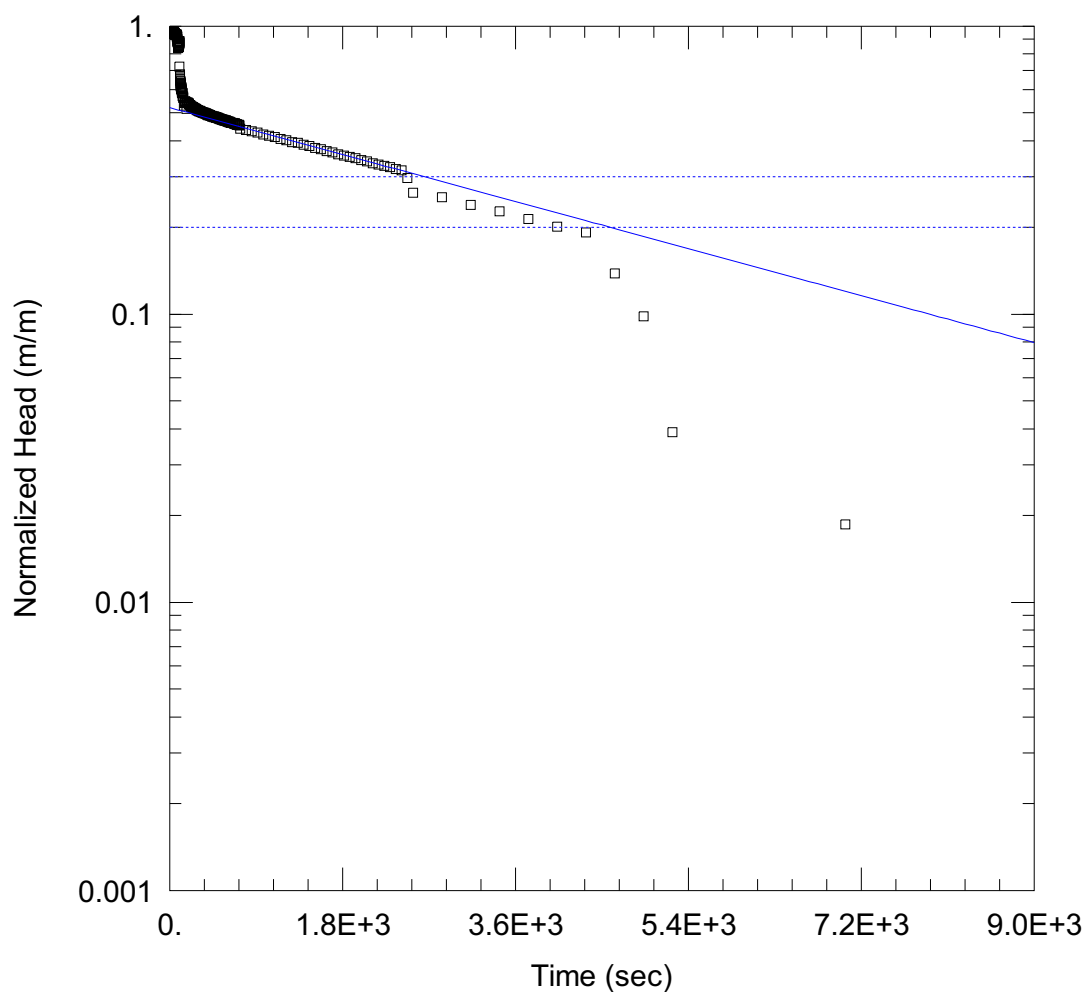
SOLUTION

Aquifer Model: Confined

Solution Method: Hvorslev

$K = 0.4305$ m/day

$y_0 = -0.8457$ m



COBBORA COAL PROJECT

Data Set: \\...\MB1C.aqt

Date: 01/18/12

Time: 17:00:32

PROJECT INFORMATION

Company: Parsons Brinckerhoff

Client: CHC Pty Ltd

Project: 2162570B

Test Well: GW24C

Test Date: 23/11/2011

AQUIFER DATA

Saturated Thickness: 24.89 m

Anisotropy Ratio (K_z/K_r): 0.1

WELL DATA (GW24C)

Initial Displacement: -0.9246 m

Total Well Penetration Depth: 22.99 m

Casing Radius: 0.025 m

Static Water Column Height: 24.89 m

Screen Length: 0.8 m

Well Radius: 0.127 m

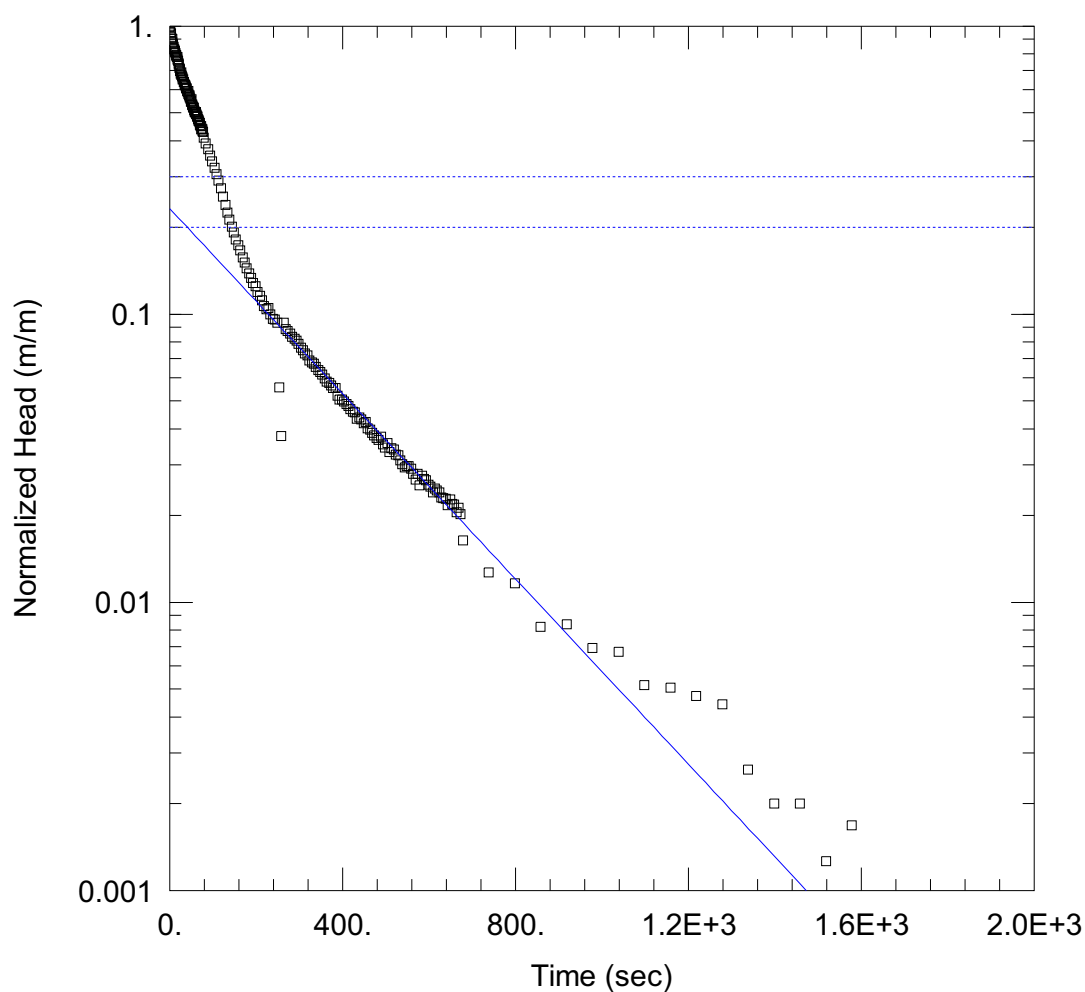
SOLUTION

Aquifer Model: Confined

$K = 0.02031$ m/day

Solution Method: Bouwer-Rice

$y_0 = -0.4815$ m



COBBORA COAL PROJECT

Data Set: \\...\MB1E.aqt

Date: 01/18/12

Time: 17:01:41

PROJECT INFORMATION

Company: Parsons Brinckerhoff

Client: CHC Pty Ltd

Project: 2162570B

Test Well: GW24E

Test Date: 23/11/2011

AQUIFER DATA

Saturated Thickness: 50.05 m

Anisotropy Ratio (K_z/K_r): 0.1

WELL DATA (GW24E)

Initial Displacement: -0.9521 m

Total Well Penetration Depth: 49.05 m

Casing Radius: 0.025 m

Static Water Column Height: 50.05 m

Screen Length: 15. m

Well Radius: 0.127 m

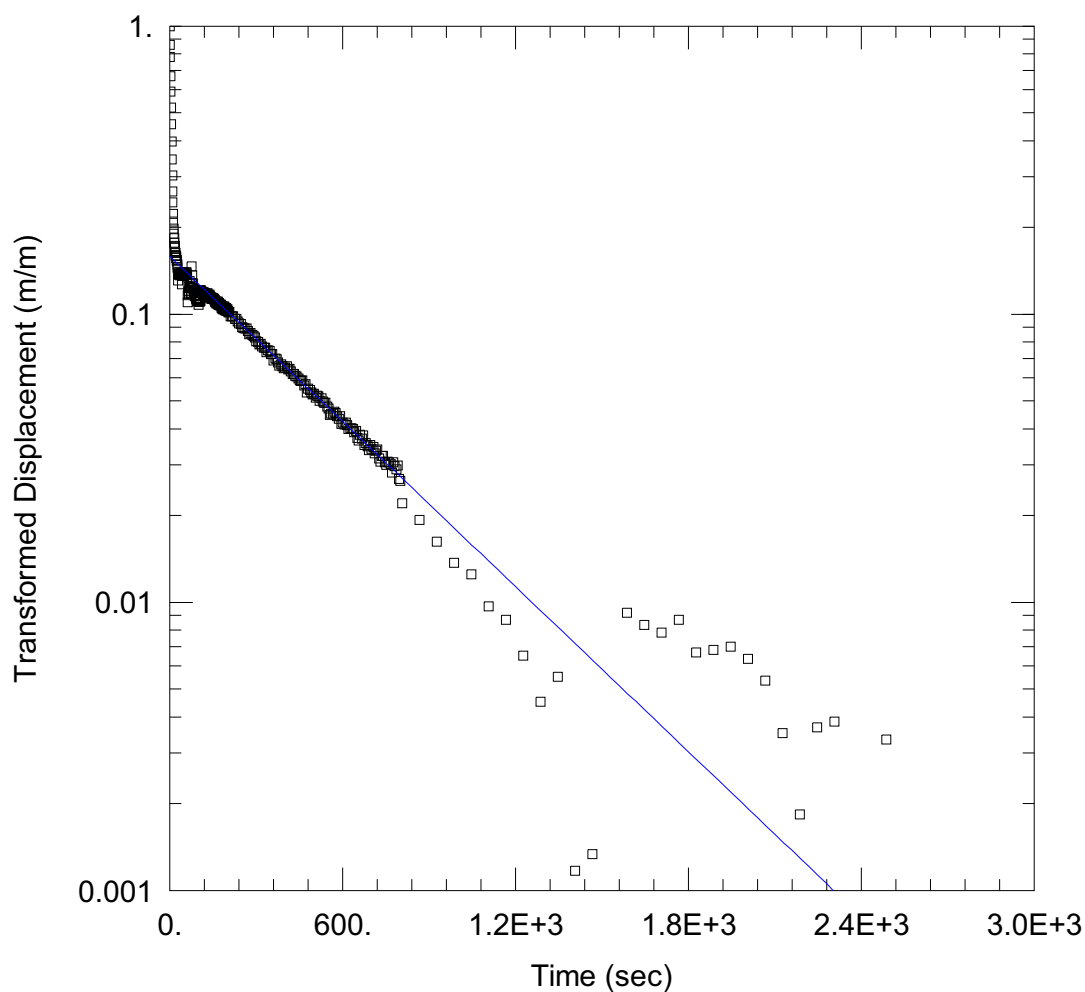
SOLUTION

Aquifer Model: Confined

$K = 0.03496$ m/day

Solution Method: Bouwer-Rice

$y_0 = -0.2215$ m



COBBORA COAL PROJECT

Data Set: \\...\MB6A.aqt

Date: 01/18/12

Time: 17:03:13

PROJECT INFORMATION

Company: Parsons Brinckerhoff

Client: CHC Pty Ltd

Project: 2162570B

Test Well: GW28A

Test Date: 15/11/2011

AQUIFER DATA

Saturated Thickness: 2.96 m

Anisotropy Ratio (K_z/K_r): 0.1

WELL DATA (GW28A)

Initial Displacement: -0.6649 m

Static Water Column Height: 2.96 m

Total Well Penetration Depth: 3. m

Screen Length: 3. m

Casing Radius: 0.025 m

Well Radius: 0.127 m

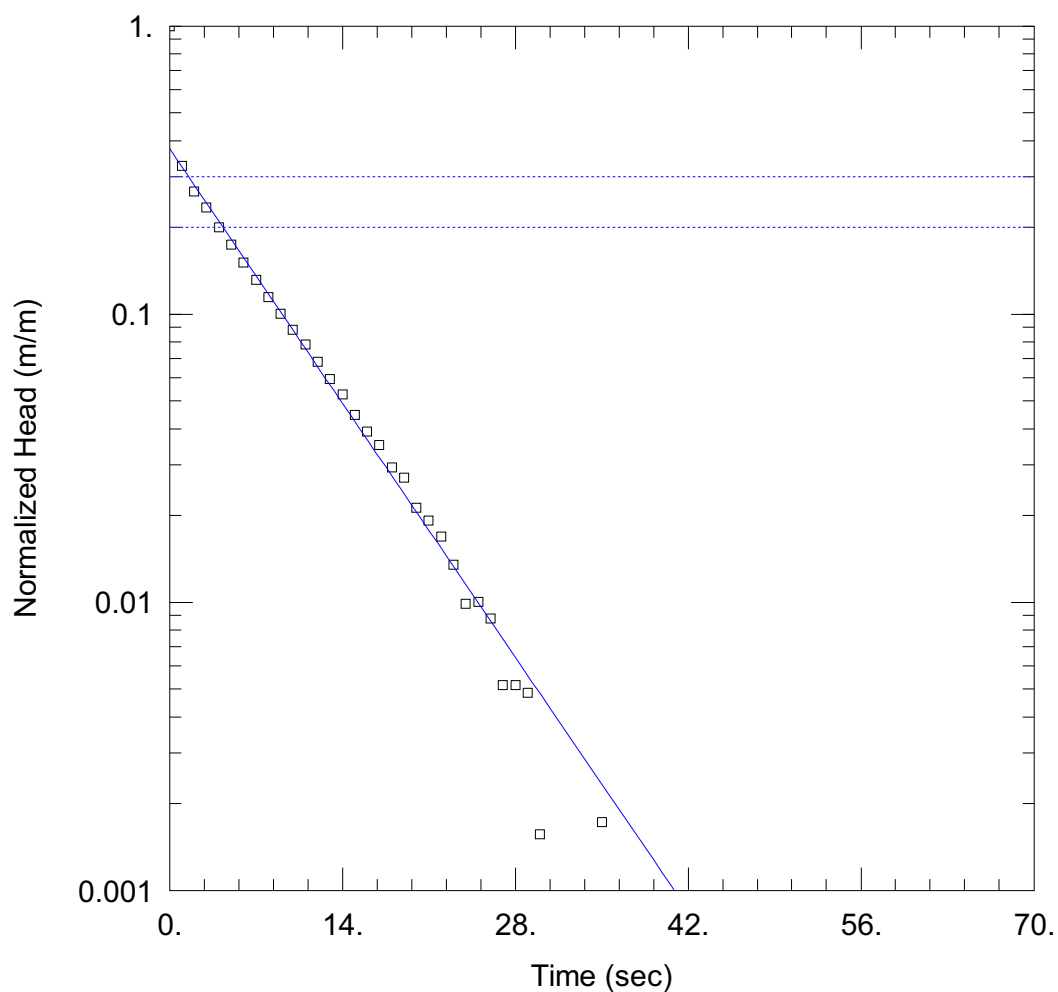
SOLUTION

Aquifer Model: Unconfined

Solution Method: Dagan

$K = 0.05567$ m/day

$y_0 = -0.0965$ m



COBBORA COAL PROJECT

Data Set: \...\MB6B.aqt

Date: 01/18/12

Time: 17:04:38

PROJECT INFORMATION

Company: Parsons Brinckerhoff

Client: CHC Pty Ltd

Project: 2162570B

Test Well: GW28B

Test Date: 15/11/2011

AQUIFER DATA

Saturated Thickness: 4.891 m

Anisotropy Ratio (K_z/K_r): 0.1

WELL DATA (GW28B)

Initial Displacement: -0.639 m

Total Well Penetration Depth: 4.391 m

Casing Radius: 0.025 m

Static Water Column Height: 4.891 m

Screen Length: 3. m

Well Radius: 0.127 m

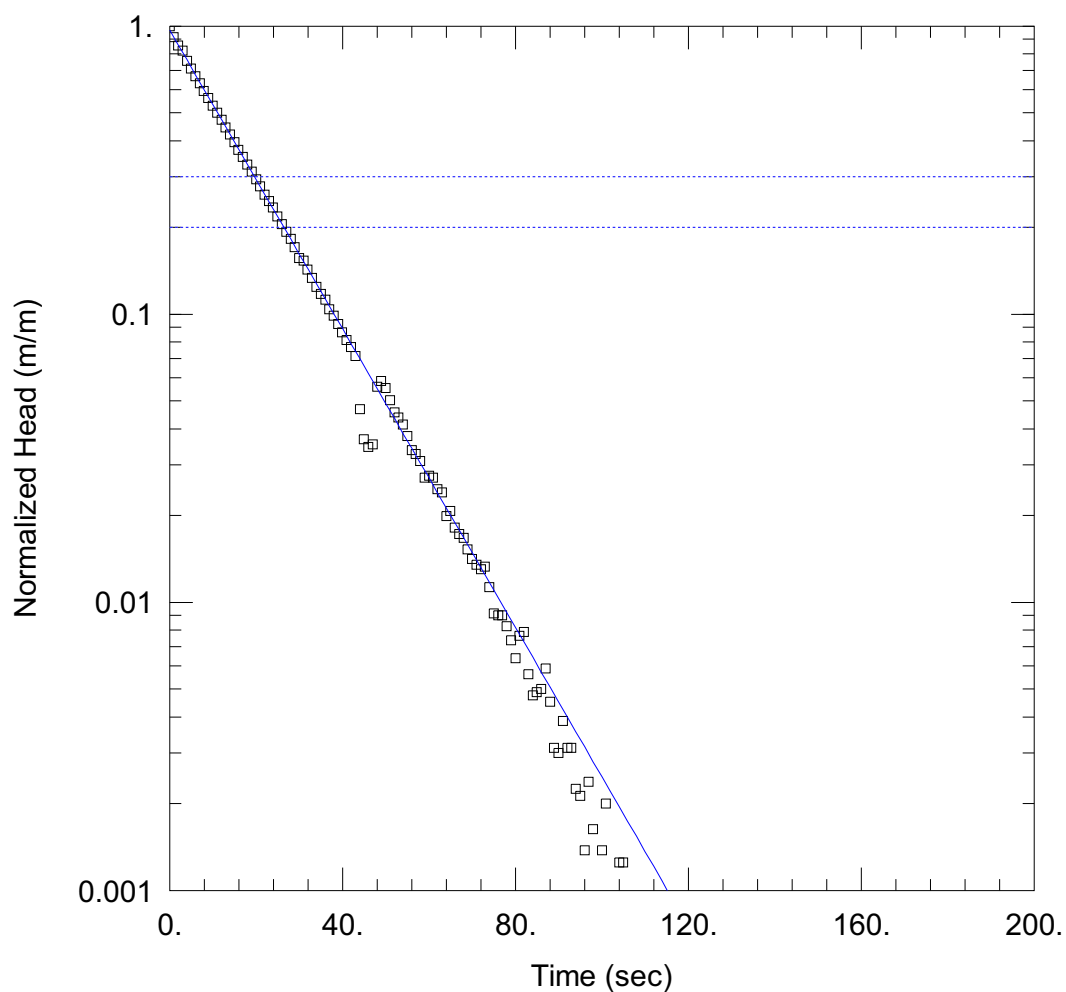
SOLUTION

Aquifer Model: Confined

$K = 4.265$ m/day

Solution Method: Bouwer-Rice

$y_0 = -0.2393$ m



COBBORA COAL PROJECT

Data Set: \\...\MB6C.aqt

Date: 01/18/12

Time: 17:05:42

PROJECT INFORMATION

Company: Parsons Brinckerhoff

Client: CHC Pty Ltd

Project: 2162570B

Test Well: GW28C

Test Date: 15/11/2011

AQUIFER DATA

Saturated Thickness: 26.85 m

Anisotropy Ratio (K_z/K_r): 0.1

WELL DATA (GW28C)

Initial Displacement: -0.7995 m

Total Well Penetration Depth: 26.35 m

Casing Radius: 0.025 m

Static Water Column Height: 26.85 m

Screen Length: 9. m

Well Radius: 0.127 m

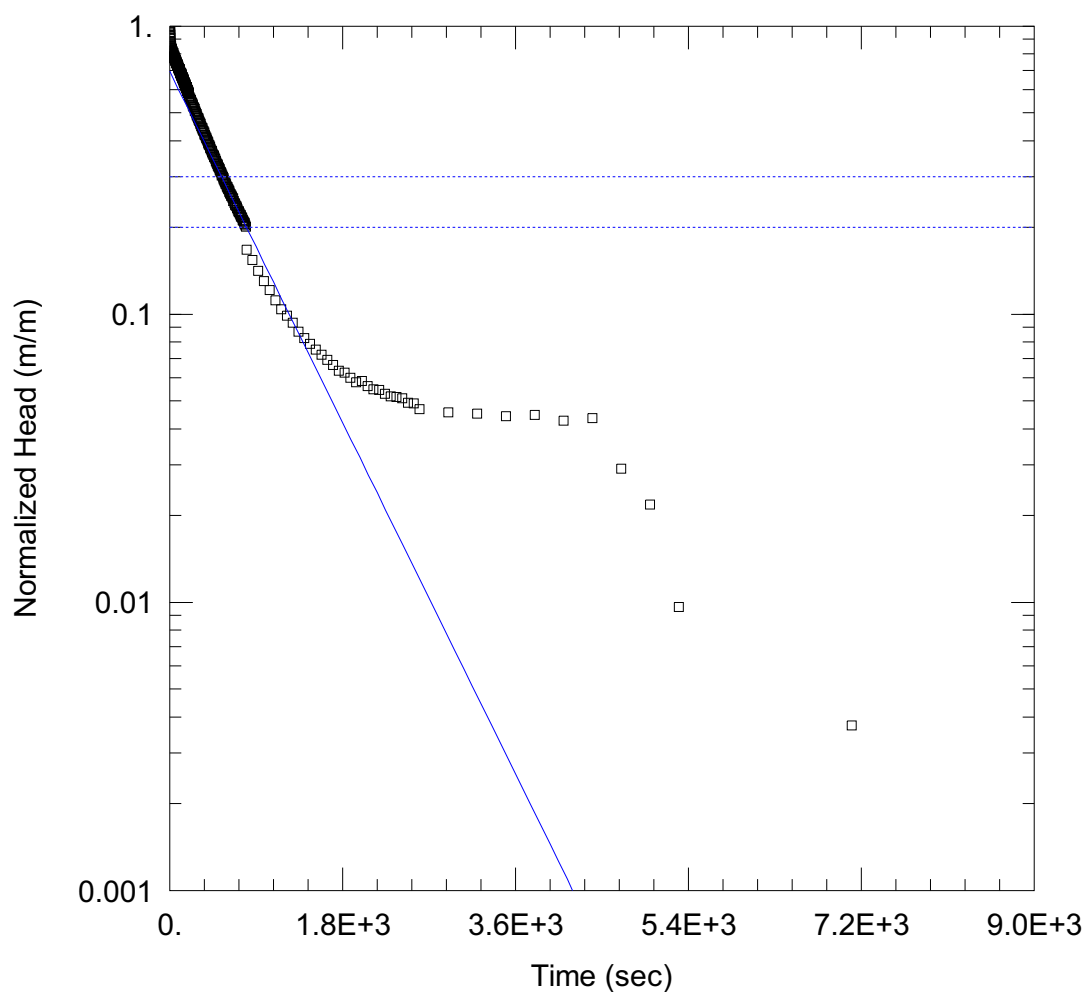
SOLUTION

Aquifer Model: Confined

$K = 0.8423$ m/day

Solution Method: Bouwer-Rice

$y_0 = -0.7741$ m



COBBORA COAL PROJECT

Data Set: \\...\MB6D.aqt

Date: 01/18/12

Time: 17:06:45

PROJECT INFORMATION

Company: Parsons Brinckerhoff

Client: CHC Pty Ltd

Project: 2162570B

Test Well: GW28D

Test Date: 15/11/2011

AQUIFER DATA

Saturated Thickness: 35.12 m

Anisotropy Ratio (K_z/K_r): 0.1

WELL DATA (GW28D)

Initial Displacement: -0.965 m

Total Well Penetration Depth: 32.62 m

Casing Radius: 0.025 m

Static Water Column Height: 35.12 m

Screen Length: 3. m

Well Radius: 0.127 m

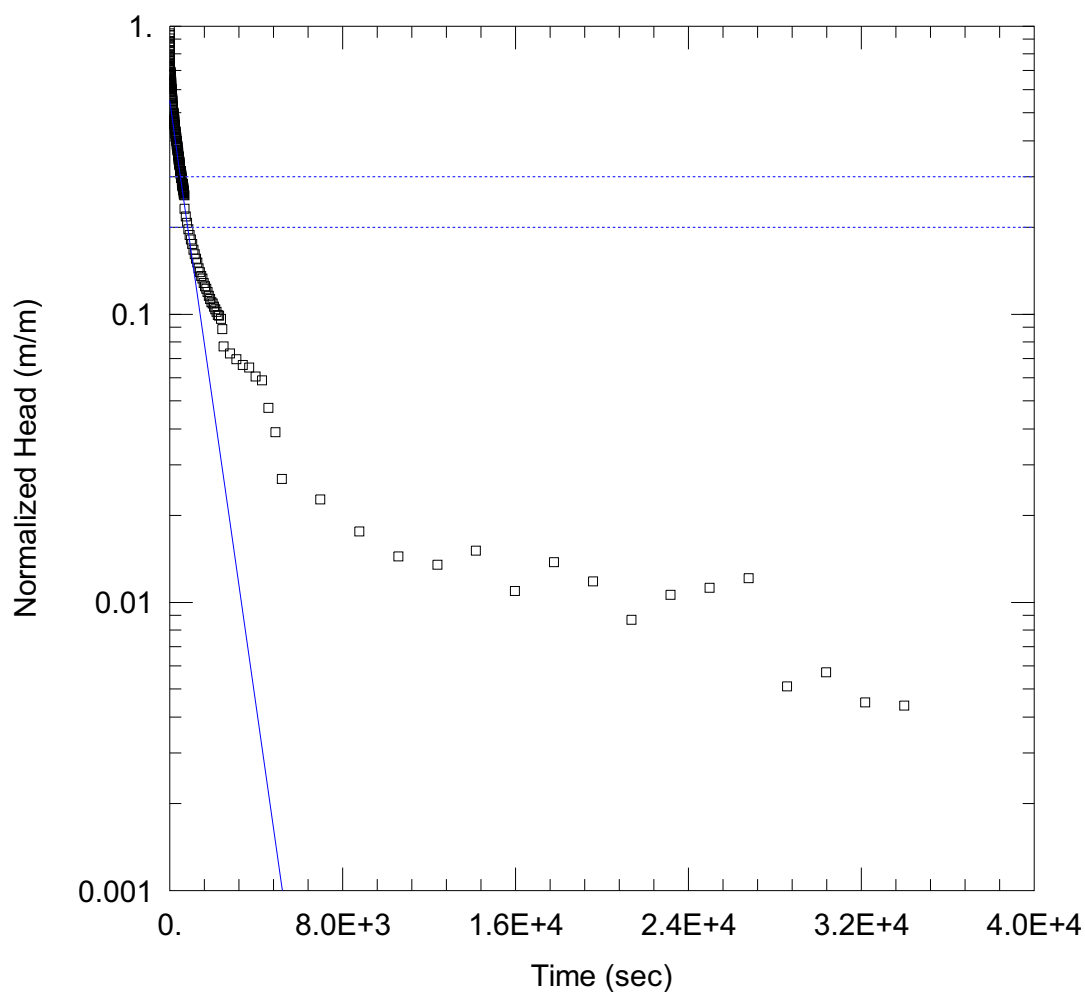
SOLUTION

Aquifer Model: Confined

$K = 0.0564$ m/day

Solution Method: Bouwer-Rice

$y_0 = -0.6724$ m



COBBORA COAL PROJECT

Data Set: \\...\MB7B.aqt

Date: 01/18/12

Time: 17:08:40

PROJECT INFORMATION

Company: Parsons Brinckerhoff

Client: CHC Pty Ltd

Project: 2162570B

Test Well: GW29B

Test Date: 23/11/2011

AQUIFER DATA

Saturated Thickness: 9.849 m

Anisotropy Ratio (K_z/K_r): 0.1

WELL DATA (GW29B)

Initial Displacement: -0.9804 m

Static Water Column Height: 9.849 m

Total Well Penetration Depth: 65.25 m

Screen Length: 3. m

Casing Radius: 0.025 m

Well Radius: 0.127 m

SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

$K = 0.05554$ m/day

$y_0 = -0.5408$ m

Appendix

C

Packer tests



**BOREHOLE WATER PRESSURE TEST
HOULSBY INTERPRETATION**

Borehole No:

GW18

Sheet 1 of 1

client: Cobbara Holding Company Pty Ltd
project: Cobbara Coal Project
location: Near Gulgong
job no: 2162570A

office: SYD
test date: 16-Sep-09
reduced by: JH
checked:

test details: Packer Type: Pneumatic HQ wire line
Type of Pump: Silven-Valve pump
Pressure Gauge: Y
Gauge Serial No: 7200119
Borehole Diam: 95mm

Borehole Incln.: -90

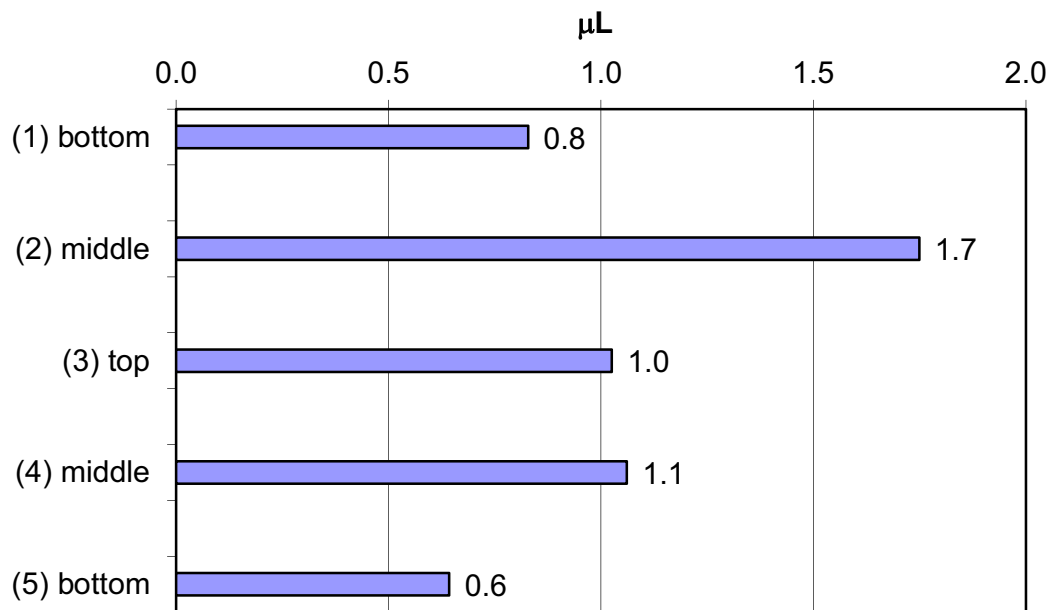
Borehole Azimuth: n/a

Depth from: 15.31 m

Depth to: 18.00 m

Test Interval length: 2.69 m

time interval (minutes)	gauge pressure (kPa)	water loss (L)	flow rate (L/minute) (over 10 mins)	pressure correction (kPa)	water loss rate (L/minute/m)	corrected pressure (kPa)	Lugeon Value (μL)
5	70	2.5	0.49	-150	0.18	220	0.8
5	70	2.4		-150			
5	120	6.2	1.27	-150	0.47	270	1.7
5	120	6.5		-150			
5	180	4.6	0.91	-150	0.34	330	1.0
5	180	4.5		-150			
5	120	3.9	0.77	-150	0.29	270	1.1
5	120	3.8		-150			
5	70	1.9	0.38	-150	0.14	220	0.6
5	70	1.9		-150			



Lugeon Pattern

Method based on Houlby, 1976

Interpreted Houlby Permeability:	1.0	μL (L/Min/m @ 1000kPa)
Interpreted Burgess Permeability:	1.7	μL (L/Min/m @ 1000kPa) - see Sheet 1

BOREHOLE WATER PRESSURE TEST HOULSBY INTERPRETATION

Borehole No:

GW18

Sheet 1 of 1

client: Cobbara Holding Company Pty Ltd
 project: Cobbara Coal Project
 location: Near Gulgong
 job no: 2162570A

office: SYD
 test date: 18-Sep-09
 reduced by: JH
 checked:

test details: Packer Type: Pneumatic HQ wire line
 Type of Pump: Silven-Valve pump
 Pressure Gauge: Y
 Gauge Serial No: 7200119
 Borehole Diam: 95 mm

Borehole Incl.: -90

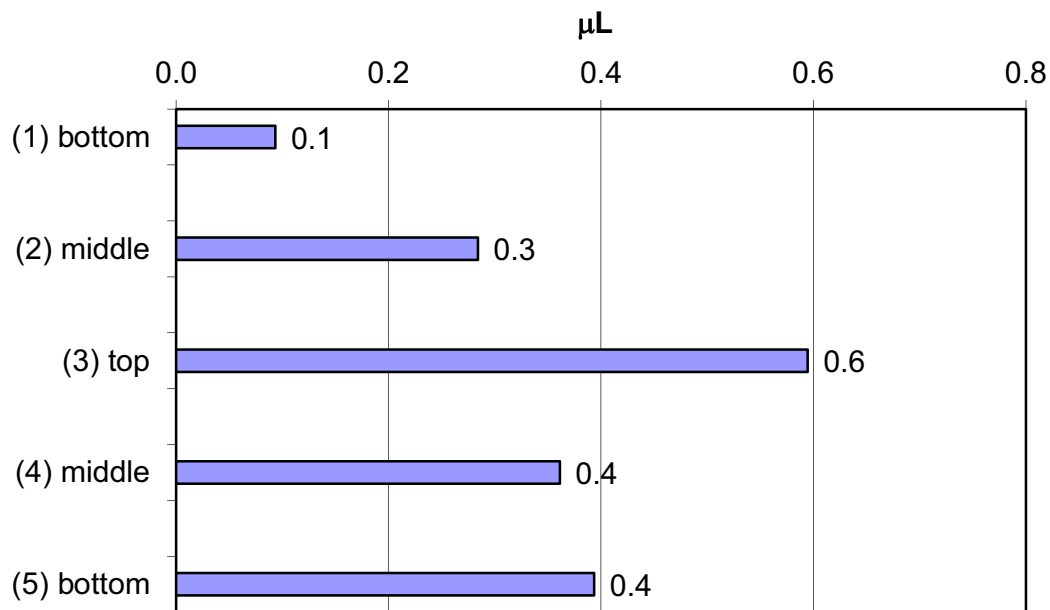
Borehole Azimuth: n/a

Depth from: 18.80 m

Depth to: 24.00 m

Test Interval length: 5.20 m

time interval (minutes)	gauge pressure (kPa)	water loss (L)	flow rate (L/minute) (over 10 mins)	pressure correction (kPa)	water loss rate (L/minute/m)	corrected pressure (kPa)	Lugeon Value (μL)
3	125	0.4	0.13	-150	0.03	275	0.1
3	125	0.4		-150			
4	180	2.0	0.49	-150	0.09	330	0.3
4	180	1.9		-150			
5	290	6.9	1.36	-150	0.26	440	0.6
5	290	6.7		-150			
5	180	3.0	0.62	-150	0.12	330	0.4
5	180	3.2		-150			
4	125	2.2	0.56	-150	0.11	275	0.4
4	125	2.3		-150			



Lugeon Pattern

Method based on Houlbsy, 1976

Interpreted Houlbsy Permeability: 0.4 μL (L/Min/m @ 1000kPa)

Interpreted Burgess Permeability: 0.9 μL (L/Min/m @ 1000kPa) - see Sheet 1

BOREHOLE WATER PRESSURE TEST HOULSBY INTERPRETATION

Borehole No:

GW18

Sheet 1 of 1

client: Cobbara Holding Company Pty Ltd
 project: Cobbara Coal Project
 location: Near Gulgong
 job no: 2162570A

office: SYD
 test date: 21-Sep-09
 reduced by: JH
 checked:

test details: Packer Type: Pneumatic HQ wire line
 Type of Pump: Silven-Valve pump
 Pressure Gauge: Y
 Gauge Serial No: 7200119
 Borehole Diam: 95 mm

Borehole Incl.: -90

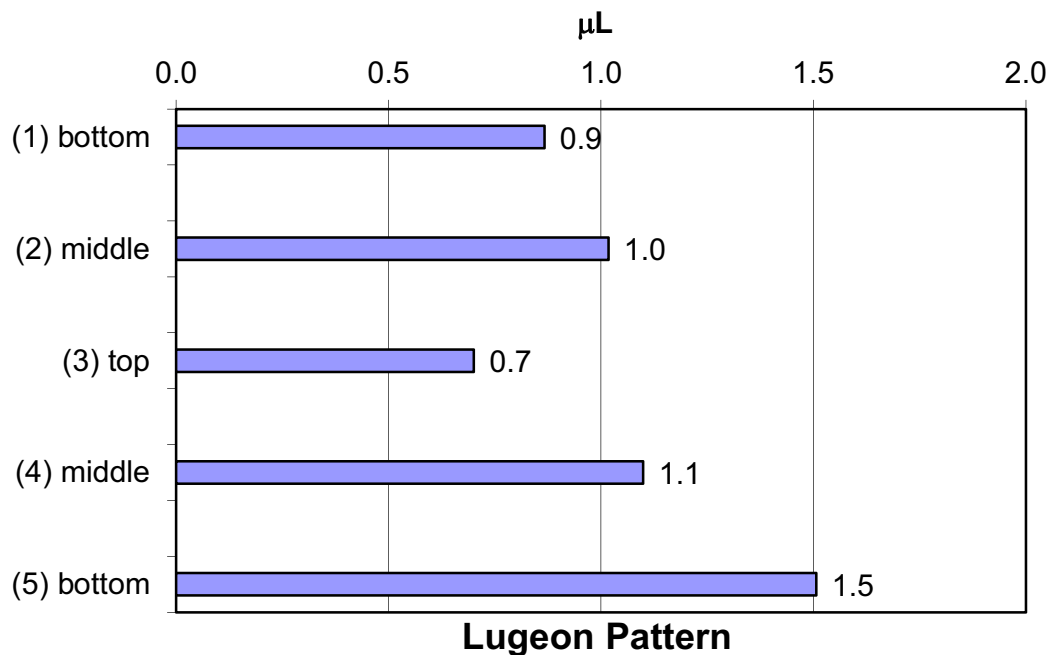
Borehole Azimuth: n/a

Depth from: 33.80 m

Depth to: 39.00 m

Test Interval length: 5.20 m

time interval (minutes)	gauge pressure (kPa)	water loss (L)	flow rate (L/minute) (over 10 mins)	pressure correction (kPa)	water loss rate (L/minute/m)	corrected pressure (kPa)	Lugeon Value (μL)
4	120	4.6	1.18	-141	0.23	261	0.9
4	120	4.8		-141			
5	260	10.2	2.12	-141	0.41	401	1.0
5	260	11.0		-141			
5	400	10.2	1.97	-141	0.38	541	0.7
5	400	9.5		-141			
5	260	11.2	2.29	-141	0.44	401	1.1
5	260	11.7		-141			
4	120	7.9	2.04	-141	0.39	261	1.5
3	120	6.4		-141			



Method based on Houlbys, 1976

Interpreted Houlbys Permeability: 0.7 μL (L/Min/m @ 1000kPa)

Interpreted Burgess Permeability: 0.6 μL (L/Min/m @ 1000kPa) - see Sheet 1

BOREHOLE WATER PRESSURE TEST HOULSBY INTERPRETATION

Borehole No:

GW18

Sheet 1 of 1

client: Cobbara Holding Company Pty Ltd
 project: Cobbara Coal Project
 location: Near Gulgong
 job no: 2162570A

office: SYD
 test date: 22-Sep-09
 reduced by: JH
 checked:

test details: Packer Type: Pneumatic HQ wire line
 Type of Pump: Silven-Valve pump
 Pressure Gauge: Y
 Gauge Serial No: 7200119
 Borehole Diam: 95 mm

Borehole Incln.: -90

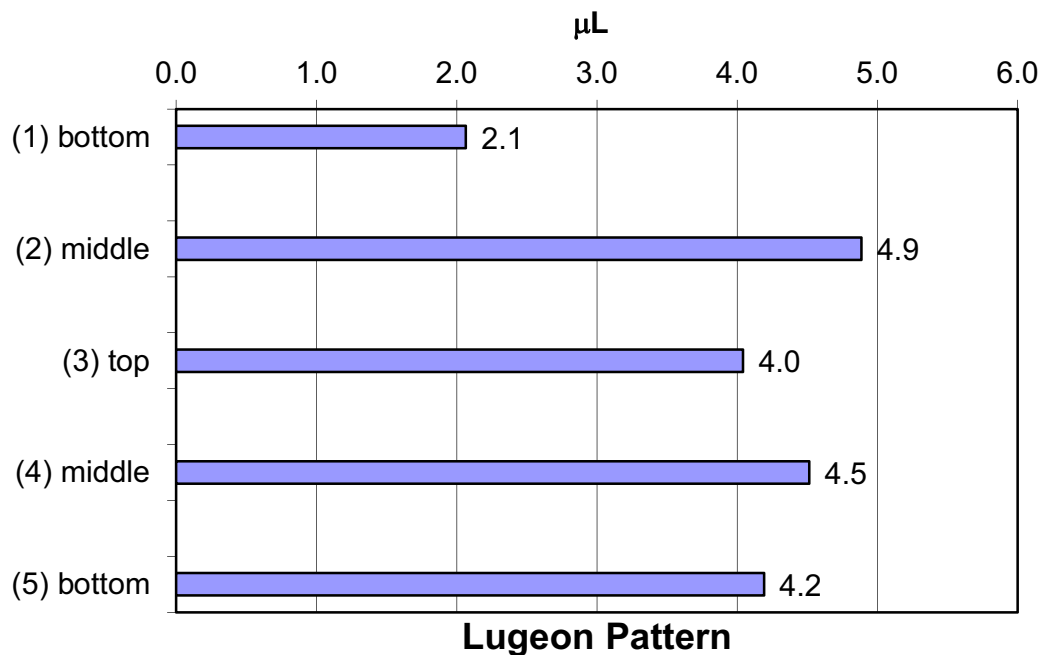
Borehole Azimuth: n/a

Depth from: 1.90 m

Depth to: 5.00 m

Test Interval length: 3.10 m

time interval (minutes)	gauge pressure (kPa)	water loss (L)	flow rate (L/minute) (over 10 mins)	pressure correction (kPa)	water loss rate (L/minute/m)	corrected pressure (kPa)	Lugeon Value (μL)
5	160	10.1	1.99	-151	0.64	311	2.1
5	160	9.8		-151			
5	300	35.1	6.83	-151	2.20	451	.9
5	300	33.2		-151			
5	450	38.1	7.53	-151	2.43	601	.0
5	450	37.2		-151			
5	300	31.2	6.31	-151	2.04	451	.5
5	300	31.9		-151			
5	160	20.7	4.04	-151	1.30	311	.2
5	160	19.7		-151			



Method based on Houlbsby, 1976

Interpreted Houlbsby Permeability:	4.4	μL (L/Min/m @ 1000kPa)
Interpreted Burgess Permeability:	.9	μL (L/Min/m @ 1000kPa) - see Sheet 1

BOREHOLE WATER PRESSURE TEST HOULSBY INTERPRETATION

Borehole No:

GW1

Sheet 1 of 1

client: Cobbara Holding Company Pty Ltd
 project: Cobbara Coal Project
 location: Near Gulgong
 job no: 2162570A

office: SYD
 test date: 8-Sep-09
 reduced by: JH
 checked:

test details: Packer Type: Pneumatic HQ wire line
 Type of Pump: Silven-Valve pump
 Pressure Gauge: Y
 Gauge Serial No: 7200119
 Borehole Diam: 95mm

Borehole Incl.: -90

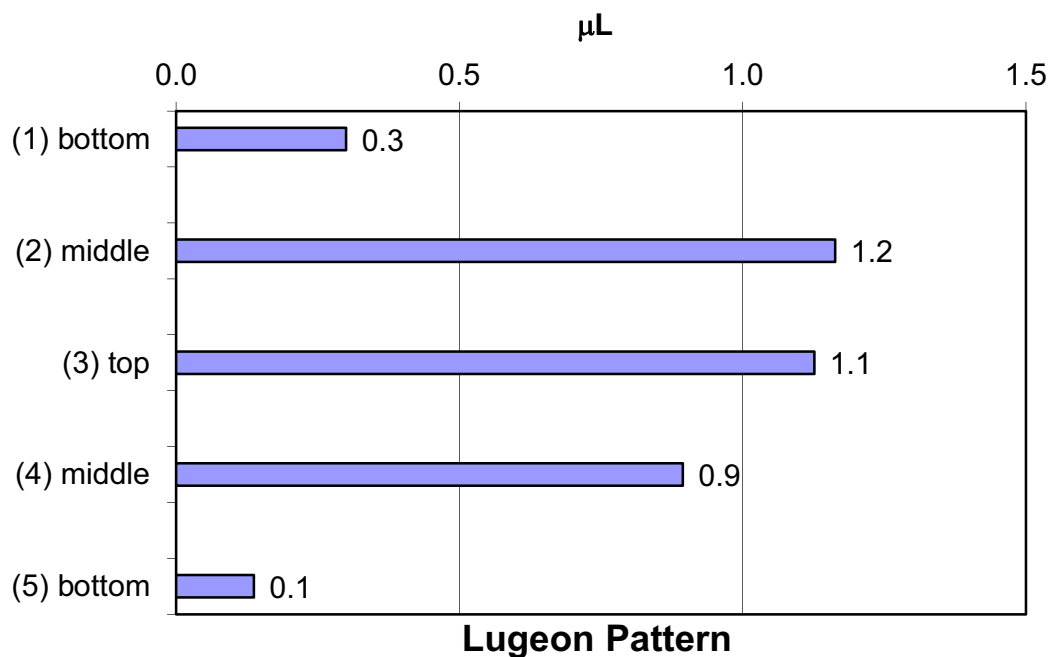
Borehole Azimuth: n/a

Depth from: 31.00 m

Depth to: 36.00 m

Test Interval length: 5.00 m

time interval (minutes)	gauge pressure (kPa)	water loss (L)	flow rate (L/minute) (over 10 mins)	pressure correction (kPa)	water loss rate (L/minute/m)	corrected pressure (kPa)	Lugeon Value (μL)
5	200	1.5	0.29	25	0.06	175	0.3
4	200	1.1		25			
1	300	1.7	1.60	25	0.32	275	1.2
2	300	3.1		25			
4	460	10.0	2.45	25	0.49	435	1.1
4	460	9.6		25			
5	300	6.3	1.23	25	0.25	275	0.9
5	300	6.0		25			
5	200	0.6	0.12	25	0.02	175	0.1
5	200	0.6		25			



Method based on Houlbsey, 1976

Interpreted Houlbsey Permeability:	1.1	μL (L/Min/m @ 1000kPa)
Interpreted Burgess Permeability:	1.6	μL (L/Min/m @ 1000kPa) - see Sheet 1

**BOREHOLE WATER PRESSURE TEST
HOULSBY INTERPRETATION**

Borehole No:

GW1

Sheet 1 of 1

client: Cobbara Holding Company Pty Ltd
project: Cobbara Coal Project
location: Near Gulgong
job no: 2162570A

office: SYD
test date: 11-Sep-09
reduced by: JH
checked:

test details: Packer Type: Pneumatic HQ wire line
Type of Pump: Silven-Valve pump
Pressure Gauge: Y
Gauge Serial No: 7200119
Borehole Diam: 95mm

Borehole Incln.: -90

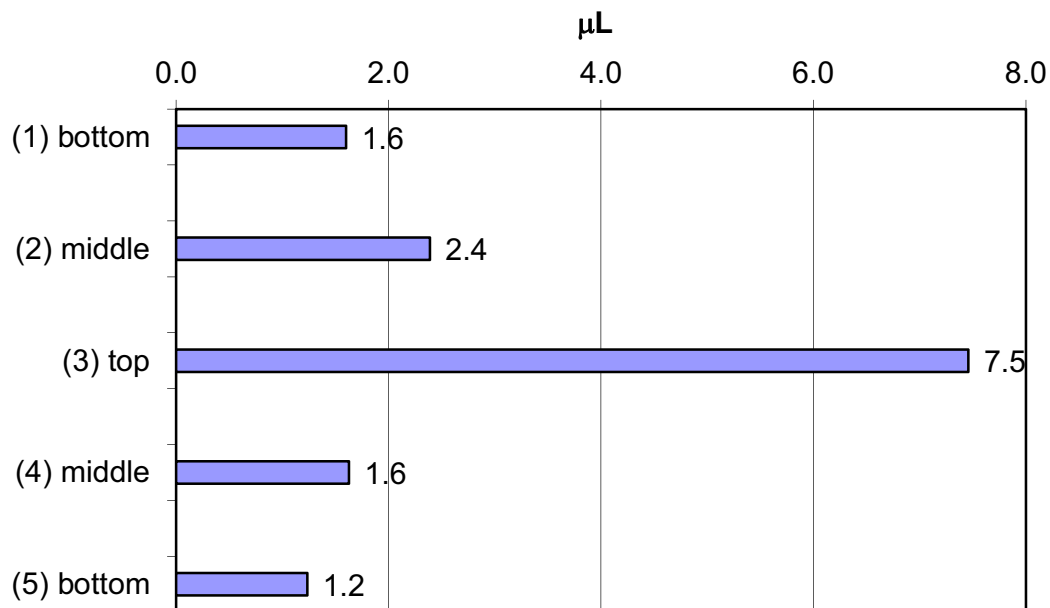
Borehole Azimuth: n/a

Depth from: 8.90 m

Depth to: 5.00 m

Test Interval length: 5.10 m

time interval (minutes)	gauge pressure (kPa)	water loss (L)	flow rate (L/minute) (over 10 mins)	pressure correction (kPa)	water loss rate (L/minute/m)	corrected pressure (kPa)	Lugeon Value (μL)
4	300	8.8	2.21	25	0.43	275	1.6
3	300	6.7		25			
5	400	23.1	4.57	25	0.90	375	2.
5	400	22.6		25			
5	460	83.4	16.55	25	3.25	435	7.5
5	460	82.1		25			
5	400	15.8	3.11	25	0.61	375	1.6
5	400	15.3		25			
5	300	9.0	1.73	25	0.34	275	1.2
5	300	8.3		25			



Lugeon Pattern

Method based on Houlbsy, 1976

Interpreted Houlbsy Permeability: 2.9 μL (L/Min/m @ 1000kPa)
Interpreted Burgess Permeability: 3.1 μL (L/Min/m @ 1000kPa) - see Sheet 1

BOREHOLE WATER PRESSURE TEST HOULSBY INTERPRETATION

Borehole No:

GW1

Sheet 1 of 1

client: Cobbara Holding Company Pty Ltd
 project: Cobbara Coal Project
 location: Near Gulgong
 job no: 2162570A

office: SYD
 test date: 15-Sep-09
 reduced by: JH
 checked:

test details: Packer Type: Pneumatic HQ wire line
 Type of Pump: Silven-Valve pump
 Pressure Gauge: Y
 Gauge Serial No: 7200119
 Borehole Diam: 95mm

Borehole Incl.: -90

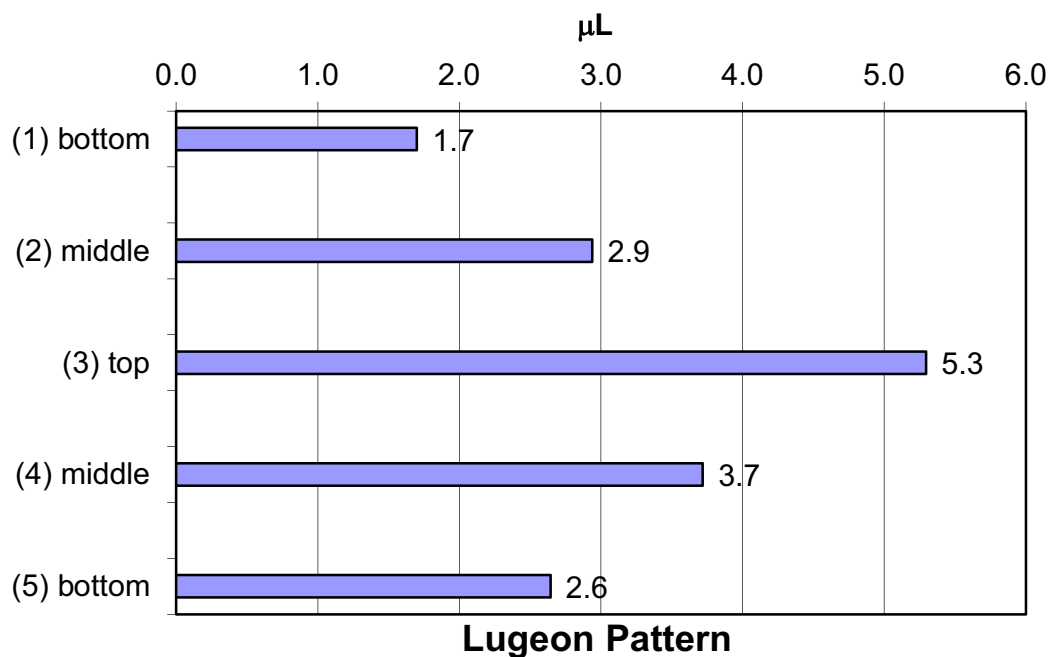
Borehole Azimuth: n/a

Depth from: 61.70 m

Depth to: 65.70 m

Test Interval length: 4.00 m

time interval (minutes)	gauge pressure (kPa)	water loss (L)	flow rate (L/minute) (over 10 mins)	pressure correction (kPa)	water loss rate (L/minute/m)	corrected pressure (kPa)	Lugeon Value (μL)
5	200	5.8	1.17	25	0.29	175	1.7
4	200	4.7		25			
5	310	17.6	3.35	25	0.84	285	2.9
5	310	15.9		25			
5	440	45.1	8.79	25	2.20	415	5.3
5	440	42.8		25			
5	300	19.9	4.09	25	1.02	275	3.7
5	300	21.0		25			
5	200	9.2	1.85	25	0.46	175	2.6
5	200	9.3		25			



Method based on Houlby, 1976

Interpreted Houlby Permeability: 3.7 μL (L/Min/m @ 1000kPa)

Interpreted Burgess Permeability: 4.9 μL (L/Min/m @ 1000kPa) - see Sheet 1

**BOREHOLE WATER PRESSURE TEST
HOULSBY INTERPRETATION**

Borehole No:

GW1

Sheet 1 of 1

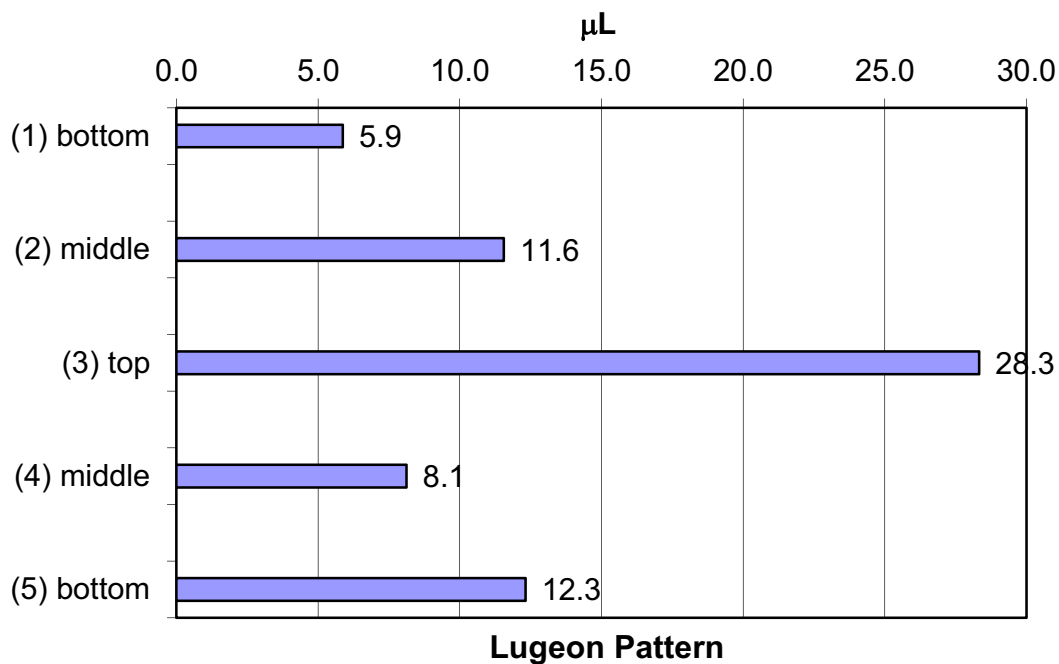
client: Cobbora Holding Company Pty Ltd
project: Cobbora Coal Project
location: Near Gulgong
job no: 2162570A

office: SYD
test date: 15-Sep-09
reduced by: JH
checked:

test details: Packer Type: Pneumatic HQ wire line
Type of Pump: Silven-Valve pump
Pressure Gauge: Y
Gauge Serial No: 7200119
Borehole Diam: 95 mm

Borehole Incl.: -90
Borehole Azimuth: n/a
Depth from: 65.90 m
Depth to: 66.80 m
Test Interval length: 0.90 m

time interval (minutes)	gauge pressure (kPa)	water loss (L)	flow rate (L/minute) (over 10 mins)	pressure correction (kPa)	water loss rate (L/minute/m)	corrected pressure (kPa)	Lugeon Value (μL)
2	200	1.8	0.93	25	1.03	175	5.9
2	200	1.9		25			
5	300	14.3	2.86	25	3.18	275	11.6
5	300	14.3		25			
5	440	53.8	10.58	25	11.76	415	28.3
5	440	52.0		25			
5	300	10.0	2.01	25	2.23	275	8.1
5	300	10.1		25			
5	200	9.3	1.94	25	2.16	175	12.3
5	200	10.1		25			



Method based on Houlsey, 1976

Interpreted Houlsey Permeability:	9.5	μL (L/Min/m @ 1000kPa)
Interpreted Burgess Permeability:	10.	μL (L/Min/m @ 1000kPa) - see Sheet 1

Appendix

D

Groundwater quality data



GW1

Analyte	Units	LOR	ANZECC 2000 Guidelines	1/10/2009	1/12/2009	10/03/2010	16/06/2010	2/02/2011	10/05/2011	25/08/2011
Field Parameters										
Conductivity	µS/cm	1	125 - 2200*	6620	6440	6780	6949	5482	5784	4653
pH	pH units	0.01	6.5-8*	7.24	7.27	7.07	7.59	7.21	7.16	7.3
Dissolved Oxygen	%sat	0.1	85-110*	34.1	na	50.1	65.5	6.9	12.8	10.4
Dissolved Oxygen	mg/L	0.01		3.27	3.63	2.3	6	0.62	1.16	0.96
Temperature	oC	0.01	ID	18.27	18.1	20.12	18.48	19.2	18.9	18.66
Redox	mV	0.1	ID	98	-90	-124	-86.4	-80.9	-82.5	-72.7
Total Dissolved Solids	mg/L	1	ID	4200	na	4300	na	3561	3760	3032
CO ₂ Titration	mg/L	1	ID	55	45	65	63	60	70	70
Alkalinity										
Hydroxide Alkalinity as CaCO3	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	1	ID	905	805	891	926	738	696	630
Total Alkalinity as CaCO3	mg/L	1	ID	905	805	891	926	738	696	630
Major ions										
Chloride	mg/L	0.5	ID	1530	1660	1730	1830	1460	1460	1270
Fluoride	mg/L	0.02	ID	0.88	1.42	na	na	na	na	na
Sulfate	mg/L	0.5	ID	154	146	159	264	156	188	161
Silicon	mg/L	0.05	ID	na	na	13.5	na	na	na	na
Silica	mg/L	0.1	ID	na	na	28.8	na	na	na	na
Calcium	mg/L	1	ID	124	94	47	84	65	68	71
Magnesium	mg/L	1	ID	169	189	182	203	156	160	161
Sodium	mg/L	1	ID	1070	1150	1160	1340	1020	932	919
Potassium	mg/L	1	ID	10	11	10	10	10	8	9
Dissolved Metals										
Aluminium	mg/L	0.01	0.055	<0.01	0.09	<0.01	<0.01	<0.01	<0.01	<0.01
Arsenic	mg/L	0.001	0.013 (As V)	<0.001	0.002	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	0.255	0.246	0.167	0.187	0.134	0.118	0.103
Cadmium	mg/L	0.0001	0.0002	<0.0001	<0.0001	na	na	na	na	na
Chromium	mg/L	0.001	0.001	<0.005	<0.005	na	na	na	na	na
Cobalt	mg/L	0.001	ID	0.009	0.005	0.004	0.003	0.002	0.002	0.002
Copper	mg/L	0.001	0.0014	0.002	<0.001	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.001	1.9	1.73	1.98	0.74	0.823	0.34	0.252	0.2
Nickel	mg/L	0.001	0.011	0.008	0.002	na	na	na	na	na
Selenium	mg/L	0.01	0.011	<0.01	<0.01	na	na	na	na	na
Vanadium	mg/L	0.01	ID	<0.01	<0.01	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.029	0.007	0.009	0.01	0.035	0.01	0.019
Boron	mg/L	0.05	0.37	0.17	0.15	na	na	na	na	na
Iron	mg/L	0.05	ID	<0.05	1.1	0.54	0.66	0.56	0.51	0.56
Mercury	mg/L	0.0001	ID	<0.0001	<0.0001	na	na	na	na	na
Total Metals										
Total Iron	mg/L	0.05	ID	7.51	2.76	na	na	na	na	na
Nutrients										
Ammonia as N	mg/L	0.01	0.9	0.05	0.05	<0.01	na	na	na	na
Nitrite as N	mg/L	0.01	ID	0.03	<0.01	<0.01	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	<0.01	0.12	0.15	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	<0.01	0.12	0.15	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		0.7	0.2	0.5	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	0.7	0.4	0.6	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	0.3	0.03	0.68	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	0.01	<0.01	na	na	na	na	na
Biochemical Oxygen Demand	mg/L	2		26	na	na	na	na	na	na

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatoc ecosystems.

*ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatoc ecosystems, South-East Australia, low lying river ecosystems

ID - insufficient data to determine trigger value

na - not analysed

GW2A

Analyte	Units	LOR	ANZECC 2000 Guidelines	29/09/2009	1/12/2009	9/03/2010	18/06/2010	30/01/2011	13/05/2011	24/08/2011
Field Parameters										
Conductivity	µS/cm	1	125 - 2200*	2754	2500	2550	2488	2056	2452	2141
pH	pH units	0.01	6.5-8*	5.59	5.69	5.35	5.27	5.47	5.64	5.8
Dissolved Oxygen	%sat	0.1	85-110*	28.4	na	69.7	13.9	7.4	11.1	13.3
Dissolved Oxygen	mg/L	0.01		2.41	4.16	4.19	1.28	0.75	1.02	1.15
Temperature	oC	0.01	ID	19.7	19.8	22.1	19.18	21.28	19.8	19.81
Redox	mV	0.1	ID	83.6	66	9	21.5	70.3	65.6	57.5
Total Dissolved Solids	mg/L	1	ID	na	na	1600	na	1336	1594	1392
CO ₂ Titration	mg/L	1	ID	118	150	160	166	na	na	150
Alkalinity										
Hydroxide Alkalinity as CaCO3	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	1	ID	31	21	15	28	14	47	41
Total Alkalinity as CaCO3	mg/L	1	ID	31	21	15	28	14	47	41
Major ions										
Chloride	mg/L	0.5	ID	763	704	629	783	572	673	657
Fluoride	mg/L	0.02	ID	0.32	0.49	na	na	na	na	na
Sulfate	mg/L	0.5	ID	176	164	153	265	132	177	171
Silicon	mg/L	0.05	ID	na	na	6.78	na	na	na	na
Silica	mg/L	0.1	ID	na	na	14.5	na	na	na	na
Calcium	mg/L	1	ID	23	18	16	19	16	19	20
Magnesium	mg/L	1	ID	76	67	66	76	56	70	67
Sodium	mg/L	1	ID	414	387	326	413	329	379	367
Potassium	mg/L	1	ID	18	20	15	18	18	19	17
Dissolved Metals										
Aluminium	mg/L	0.01	0.055	0.09	0.27	0.05	0.13	7.92	0.08	0.09
Arsenic	mg/L	0.001	0.013 (As V)	0.003	0.004	na	na	na	na	na
Beryllium	mg/L	0.001	ID	0.001	0.002	0.001	0.002	0.002	0.002	<0.001
Barium	mg/L	0.001	ID	0.082	0.082	0.077	0.081	0.093	0.077	0.076
Cadmium	mg/L	0.0001	0.0002	<0.0001	<0.0001	na	na	na	na	na
Chromium	mg/L	0.001	0.001	<0.001	<0.001	na	na	na	na	na
Cobalt	mg/L	0.001	ID	0.126	0.104	0.093	0.111	0.076	0.095	0.088
Copper	mg/L	0.001	0.0014	<0.001	<0.001	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001
Manganese	mg/L	0.001	1.9	3.56	3.16	2.63	2.84	2.48	2.85	2.82
Nickel	mg/L	0.001	0.011	0.156	0.14	na	na	na	na	na
Selenium	mg/L	0.01	0.011	<0.01	<0.01	na	na	na	na	na
Vanadium	mg/L	0.01	ID	<0.01	<0.01	na	na	na	na	na
Zinc	mg/L	0.005	0.008	1.04	1.02	0.873	1.08	0.769	0.966	0.928
Boron	mg/L	0.05	0.37	<0.05	<0.05	na	na	na	na	na
Iron	mg/L	0.05	ID	23.3	26.5	22.3	28.1	23.6	24.9	26.6
Mercury	mg/L	0.0001	ID	<0.0001	<0.0001	na	na	na	na	na
Total Metals										
Total Iron	mg/L	0.05	ID	48.5	35.4	na	na	na	na	na
Nutrients										
Ammonia as N	mg/L	0.01	0.9	0.57	0.36	0.23	na	na	na	na
Nitrite as N	mg/L	0.01	ID	0.02	<0.01	<0.01	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	1.99	0.03	0.01	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	2.01	0.03	0.01	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		7.3	3.2	7.2	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	9.3	3.2	7.2	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	1.52	0.4	2.47	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	0.02	<0.01		na	na	na	na
Biochemical Oxygen Demand	mg/L	2		3	na	na	na	na	na	na
Isotopes										
Oxygen-18	‰	0.01		na	na	na	na	na	na	-6.55
Deuterium	‰	0.1		na	na	na	na	na	na	-41.8
Carbon-13	‰	0.1		na	na	na	na	na	na	na
Radiocarbon	pMC	0.1		na	na	na	na	na	na	na
Radiocarbon Age (uncorrected)	yrs BP	1		na	na	na	na	na	na	na

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatoc ecosystems.

*ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatoc ecosystems, South-East Australia, low lying river ecosystems

ID - insufficient data to determine trigger value

na - not analysed

GW2B

Analyte	Units	LOR	ANZECC 2000 Guidelines	29/09/2009	1/12/2009	9/03/2010	18/06/2010	30/01/2011	13/05/2011	24/08/2011
Field Parameters										
Conductivity	µS/cm	1	125 - 2200*	1620	1614	1650	1659	1560	1630	1499
pH	pH units	0.01	6.5-8*	5.77	5.96	5.5	5.9	5.72	5.94	6.21
Dissolved Oxygen	%sat	0.1	85-110*	50.1	na	23.5	33.2	6.3	15	14.3
Dissolved Oxygen	mg/L	0.01		3.61	3.1	2.86	3.08	0.5	1.38	1.27
Temperature	oC	0.01	ID	20.27	20.6	20.8	18.91	21.1	19.81	21.38
Redox	mV	0.1	ID	78	45	-10	36.1	57.8	32.7	29.5
Total Dissolved Solids	mg/L	1	ID	1000	na	1100	na	1014	1060	975
CO ₂ Titration	mg/L	1	ID	154	120	185	130	125	180	>200
Alkalinity										
Hydroxide Alkalinity as CaCO3	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	1	ID	79	80	92	95	77	89	84
Total Alkalinity as CaCO3	mg/L	1	ID	79	80	92	95	77	89	84
Major ions										
Chloride	mg/L	0.5	ID	428	428	431	431	439	434	451
Fluoride	mg/L	0.02	ID	0.11	0.08	na	na	na	na	na
Sulfate	mg/L	0.5	ID	83.8	74.3	73.6	110	70	80	83
Silicon	mg/L	0.05	ID	na	na	6.08	na	na	na	na
Silica	mg/L	0.1	ID	na	na	13	na	na	na	na
Calcium	mg/L	1	ID	26	18	16	17	16	18	18
Magnesium	mg/L	1	ID	36	36	39	39	36	39	39
Sodium	mg/L	1	ID	248	240	236	262	241	250	252
Potassium	mg/L	1	ID	16	20	18	20	20	20	20
Dissolved Metals										
Aluminium	mg/L	0.01	0.055	0.02	0.3	<0.01	0.07	0.04	0.02	<0.01
Arsenic	mg/L	0.001	0.013 (As V)	0.004	0.005	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	0.067	0.075	0.039	0.062	0.063	0.053	0.058
Cadmium	mg/L	0.0001	0.0002	<0.0001	<0.0001	na	na	na	na	na
Chromium	mg/L	0.001	0.001	<0.001	<0.001	na	na	na	na	na
Cobalt	mg/L	0.001	ID	0.013	0.027	0.008	0.007	0.002	0.002	0.001
Copper	mg/L	0.001	0.0014	<0.001	0.001	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.001	1.9	1.51	2.01	0.851	1.18	1.3	1.26	1.25
Nickel	mg/L	0.001	0.011	0.014	0.015	na	na	na	na	na
Selenium	mg/L	0.01	0.011	<0.01	<0.01	na	na	na	na	na
Vanadium	mg/L	0.01	ID	<0.01	<0.01	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.03	0.012	0.014	0.009	0.012	0.014	0.007
Boron	mg/L	0.05	0.37	<0.05	<0.05	na	na	na	na	na
Iron	mg/L	0.05	ID	9.08	10.9	8.43	15.7	16.4	16.6	16.9
Mercury	mg/L	0.0001	ID	<0.0001	<0.0001	na	na	na	na	na
Total Metals										
Total Iron	mg/L	0.05	ID	10.9	11.4	na	na	na	na	na
Nutrients										
Ammonia as N	mg/L	0.01	0.9	0.23	0.19	0.19	na	na	na	na
Nitrite as N	mg/L	0.01	ID	<0.01	<0.01	<0.01	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	0.08	<0.01	0.01	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	0.08	<0.01	0.01	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		0.5	0.4	0.4	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	0.6	0.4	0.4	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	0.05	<0.01	<0.01	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	<0.01	<0.01		na	na	na	na
Biochemical Oxygen Demand	mg/L	2		<2	na	na	na	na	na	na
Isotopes										
Oxygen-18	‰	0.01		na	na	na	na	na	na	-6.52
Deuterium	‰	0.1		na	na	na	na	na	na	-41.2
Carbon-13	‰	0.1		na	na	na	na	na	na	na
Radiocarbon	pMC	0.1		na	na	na	na	na	na	na
Radiocarbon Age (uncorrected)	yrs BP	1		na	na	na	na	na	na	na

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatoc ecosystems.

*ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatoc ecosystems, South-East Australia, low lying river ecosystems

ID - insufficient data to determine trigger value

na - not analysed

GW2C

Analyte	Units	LOR	ANZECC 2000 Guidelines	29/09/2009	1/12/2009	9/03/2010	18/06/2010	30/01/2011	13/05/2011	24/08/2011
Field Parameters										
Conductivity	µS/cm	1	125 - 2200*	1570	1517	1590	1603	1504	1569	1433
pH	pH units	0.01	6.5-8*	5.81	5.88	5.69	5.88	5.75	5.99	6.2
Dissolved Oxygen	%sat	0.1	85-110*	29.5	na	41.7	20.3	6.8	14.3	10.3
Dissolved Oxygen	mg/L	0.01		2.5	0.65	1.94	1.91	0.61	1.35	0.91
Temperature	oC	0.01	ID	21.14	20.2	20.7	18.05	21.09	19.78	21.61
Redox	mV	0.1	ID	42	53	-31	31.2	50.9	26.5	23.9
Total Dissolved Solids	mg/L	1	ID	1000	na	1000	na	978	1019	931
CO ₂ Titration	mg/L	1	ID	113	100	130	155	180	125	190
Alkalinity								190		
Hydroxide Alkalinity as CaCO3	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	1	ID	97	96	106	110	92	99	97
Total Alkalinity as CaCO3	mg/L	1	ID	97	96	106	110	92	99	97
Major ions										
Chloride	mg/L	0.5	ID	376	389	391	424	404	411	419
Fluoride	mg/L	0.02	ID	0.12	0.09	na	na	na	na	na
Sulfate	mg/L	0.5	ID	75.2	72.9	71.4	114	72	81	97
Silicon	mg/L	0.05	ID	na	na	6.03	na	na	na	na
Silica	mg/L	0.1	ID	na	na	12.9	na	na	na	na
Calcium	mg/L	1	ID	23	19	16	18	16	19	18
Magnesium	mg/L	1	ID	31	31	36	37	31	38	33
Sodium	mg/L	1	ID	240	233	229	254	230	245	245
Potassium	mg/L	1	ID	17	20	18	20	20	20	20
Dissolved Metals										
Aluminium	mg/L	0.01	0.055	<0.01	0.03	<0.01	0.11	0.07	0.01	<0.01
Arsenic	mg/L	0.001	0.013 (As V)	0.007	0.007	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	0.065	0.068	0.052	0.058	0.06	0.06	0.06
Cadmium	mg/L	0.0001	0.0002	<0.0001	<0.0001	na	na	na	na	na
Chromium	mg/L	0.001	0.001	<0.001	<0.001	na	na	na	na	na
Cobalt	mg/L	0.001	ID	0.007	0.014	0.005	0.005	0.004	0.008	0.006
Copper	mg/L	0.001	0.0014	<0.001	<0.001	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.001	1.9	1.25	1.54	1.11	1.16	1.26	1.35	1.29
Nickel	mg/L	0.001	0.011	0.035	0.01	na	na	na	na	na
Selenium	mg/L	0.01	0.011	<0.01	<0.01	na	na	na	na	na
Vanadium	mg/L	0.01	ID	<0.01	<0.01	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.029	0.006	0.047	0.005	0.014	0.013	0.007
Boron	mg/L	0.05	0.37	<0.05	<0.05	na	na	na	na	na
Iron	mg/L	0.05	ID	10.6	10.6	13.7	15.6	16	14.5	15.2
Mercury	mg/L	0.0001	ID	<0.0001	<0.0001	na	na	na	na	na
Total Metals										
Total Iron	mg/L	0.05	ID	12.4	11.3	na	na	na	na	na
Nutrients										
Ammonia as N	mg/L	0.01	0.9	0.23	0.21	0.22	na	na	na	na
Nitrite as N	mg/L	0.01	ID	<0.01	<0.01	<0.01	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	0.02	<0.01	0.01	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	0.02	<0.01	0.01	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		0.4	0.3	0.5	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	0.4	0.3	0.5	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	0.02	<0.01	<0.01	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	<0.01	<0.01	na	na	na	na	na
Ionic Balance										
Total Anions	meq/L	0.01	ID	14.1	14.4	14.6	16.5	14.7	15.3	na
Total Cations	meq/L	0.01	ID	14.6	14.2	14.2	15.5	13.8	15.2	na
Ionic Balance	%	0.01	ID	1.84	0.81	1.6	3.06	3.14	0.07	na
Biochemical Oxygen Demand	mg/L	2		<2	na	na	na	na	na	na

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatoc ecosystems.

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ID - insufficient data to determine trigger value

na - not analysed

GW2D

Analyte	Units	LOR	ANZECC 2000 Guidelines	29/09/2009	1/12/2009	9/03/2010	18/06/2010	30/01/2011	13/05/2011	24/08/2011
Field Parameters										
Conductivity	µS/cm	1	125 - 2200*	1385	1380	1409	1410	1324	1387	1253
pH	pH units	0.01	6.5-8*	6.01	6.11	6.11	6.07	5.96	6.2	6.31
Dissolved Oxygen	%sat	0.1	85-110*	24.5	na	55.1	18.6	7.7	12.5	11.7
Dissolved Oxygen	mg/L	0.01		2.13	3.85	3.43	1.86	0.67	1.15	1.02
Temperature	oC	0.01	ID	20.95	21.3	21.27	18.71	21.93	19.91	22.16
Redox	mV	0.1	ID	39	45	-50	10.8	62.8	7.9	5.2
Total Dissolved Solids	mg/L	1	ID	900	na	900	na	861	901	815
CO ₂ Titration	mg/L	1	ID	135	115	93	66	130	120	90
Alkalinity										
Hydroxide Alkalinity as CaCO ₃	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	mg/L	1	ID	165	143	157	159	138	150	142
Total Alkalinity as CaCO ₃	mg/L	1	ID	165	143	157	159	138	150	142
Major ions										
Chloride	mg/L	0.5	ID	308	301	315	334	315	320	327
Fluoride	mg/L	0.02	ID	0.14	0.11	na	na	na	na	na
Sulfate	mg/L	0.5	ID	65	62	61.6	64.8	61	69	68
Silicon	mg/L	0.05	ID	na	na	5.64	na	na	na	na
Silica	mg/L	0.1	ID	na	na	12.1	na	na	na	na
Calcium	mg/L	1	ID	27	24	22	25	21	24	25
Magnesium	mg/L	1	ID	24	24	26	27	22	25	25
Sodium	mg/L	1	ID	209	210	202	233	207	209	227
Potassium	mg/L	1	ID	22	26	22	25	25	24	27
Dissolved Metals										
Aluminium	mg/L	0.01	0.055	<0.01	0.05	<0.01	0.03	<0.01	<0.01	<0.01
Arsenic	mg/L	0.001	0.013 (As V)	0.007	0.007	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001
Barium	mg/L	0.001	ID	0.057	0.06	0.052	0.064	0.063	0.057	0.061
Cadmium	mg/L	0.0001	0.0002	<0.0001	0.0004	na	na	na	na	na
Chromium	mg/L	0.001	0.001	<0.001	<0.001	na	na	na	na	na
Cobalt	mg/L	0.001	ID	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Copper	mg/L	0.001	0.0014	<0.001	<0.001	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.001	1.9	0.518	0.557	0.566	0.59	0.584	0.647	0.585
Nickel	mg/L	0.001	0.011	0.005	0.004	na	na	na	na	na
Selenium	mg/L	0.01	0.011	<0.01	<0.01	na	na	na	na	na
Vanadium	mg/L	0.01	ID	<0.01	<0.01	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.025	0.008	0.035	0.009	0.014	<0.005	0.005
Boron	mg/L	0.05	0.37	<0.05	<0.05	na	na	na	na	na
Iron	mg/L	0.05	ID	7.94	8.44	7.63	8.51	9.03	8.77	8.82
Mercury	mg/L	0.0001	ID	<0.0001	<0.0001	na	na	na	na	na
Total Metals										
Total Iron	mg/L	0.05	ID	8.44	9.27	na	na	na	na	na
Nutrients										
Ammonia as N	mg/L	0.01	0.9	0.3	0.23	0.25	na	na	na	na
Nitrite as N	mg/L	0.01	ID	<0.01	<0.01	<0.01	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	0.22	<0.01	<0.01	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	0.22	<0.01	<0.01	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		1	0.6	0.5	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	1.3	0.6	0.5	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	0.01	<0.01	<0.01	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	<0.01	<0.01		na	na	na	na
Biochemical Oxygen Demand	mg/L	2		<2	na	na	na	na	na	na

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatoc ecosystems.

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ID - insufficient data to determine trigger value

na - not analysed

GW3TPB

Analyte	Units	LOR	ANZECC 2000 Guidelines	2/10/2009	13/10/2009	2/12/2009	10/03/2010	15/06/2010	31/01/2011	9/05/2011	25/08/2011
Field Parameters											
Conductivity	µS/cm	1	125 - 2200*	1540	na	1393	1367	1453	1401	1236	1025
pH	pH units	0.01	6.5-8*	6.28	na	6.43	7.01	6.64	6.99	7.42	7.6
Dissolved Oxygen	%sat	0.1	85-110*	37.6	na	na	20.6	12.5	9.3	10.8	6.5
Dissolved Oxygen	mg/L	0.01		3.71	na	2.16	1.92	1.17	0.79	1.01	0.62
Temperature	oC	0.01	ID	19.6	na	21.4	20.03	18.45	21.41	19.52	19.83
Redox	mV	0.1	ID	-45	na	-65	-107	-124.7	-165.6	-180.5	-167.8
Total Dissolved Solids	mg/L	1	ID	1000	na	na	900	na	912	804	666
CO ₂ Titration	mg/L	1	ID	100	na	140	140	126	130	15	5
Alkalinity											
Hydroxide Alkalinity as CaCO3	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	1	ID	262	252	231	240	294	261	193	138
Total Alkalinity as CaCO3	mg/L	1	ID	262	252	231	240	294	261	193	138
Major ions											
Chloride	mg/L	0.5	ID	228	239	286	262	271	250	285	315
Fluoride	mg/L	0.02	ID	0.29	0.32	0.4	na	na	na	na	na
Sulfate	mg/L	0.5	ID	57	90.7	68.1	57.1	3.9	<1	<1	<1
Silicon	mg/L	0.05	ID	na	na	na	4.79	na	na	na	na
Silica	mg/L	0.1	ID	na	na	na	10.3	na	na	na	na
Calcium	mg/L	1	ID	38	35	35	33	30	26	22	22
Magnesium	mg/L	1	ID	33	34	32	30	28	25	23	22
Sodium	mg/L	1	ID	190	166	181	182	216	183	172	182
Potassium	mg/L	1	ID	40	37	41	41	45	42	38	39
Dissolved Metals											
Aluminium	mg/L	0.01	0.055	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01
Arsenic	mg/L	0.001	0.013 (As V)	<0.001	<0.001	<0.001	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	0.064	0.031	0.069	0.062	0.052	0.055	0.035	0.029
Cadmium	mg/L	0.0001	0.0002	<0.0001	<0.0001	<0.0001	na	na	na	na	na
Chromium	mg/L	0.001	0.001	<0.001	<0.001	<0.001	na	na	na	na	na
Cobalt	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	0.001	0.0014	<0.001	<0.001	<0.001	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.001	1.9	0.733	0.055	0.282	0.221	0.829	0.748	0.217	0.116
Nickel	mg/L	0.001	0.011	0.001	<0.001	<0.001	na	na	na	na	na
Selenium	mg/L	0.01	0.011	<0.01	<0.01	<0.01	na	na	na	na	na
Vanadium	mg/L	0.01	ID	<0.01	<0.01	<0.01	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.014	0.008	<0.005	0.055	0.005	<0.005	<0.005	<0.005
Boron	mg/L	0.05	0.37	<0.05	<0.05	<0.05	na	na	na	na	na
Iron	mg/L	0.05	ID	52.9	1.67	15	11.2	46.8	48.9	5.86	2.24
Mercury	mg/L	0.0001	ID	<0.0001	<0.0001	<0.0001	na	na	na	na	na
Total Metals											
Total Iron	mg/L	0.05	ID	55.4	1.64	15	na	na	na	na	na
Nutrients											
Ammonia as N	mg/L	0.01	0.9	0.65	0.72	0.51	0.54	na	na	na	na
Nitrite as N	mg/L	0.01	ID	0.01	<0.01	<0.01	<0.01	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	0.02	<0.01	0.01	0.01	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	0.03	<0.01	0.01	0.01	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		1.2	0.3	0.6	1	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	1.2	0.3	0.6	1	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	<0.01	<0.01	0.03	<0.01	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	<0.01	<0.01	<0.01	na	na	na	na	na
Biochemical Oxygen Demand	mg/L	2		10	na	na	na	na	na	na	na

Guideline values

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na - not analysed

GW3B

Analyte	Units	LOR	ANZECC 2000 Guidelines	10/09/2009	30/09/2009	2/12/2009	10/03/2010	15/06/2010	31/01/2011	9/05/2011	25/08/2011
Field Parameters											
Conductivity	µS/cm	1	125 - 2200*	907	1560	1086	1640	1482	1542	1544	1401
pH	pH units	0.01	6.5-8*	6.58	6.38	6.49	6.51	6.52	6.5	6.58	6.7
Dissolved Oxygen	%sat	0.1	85-110*	23.5	31.5	na	32	36.3	15.8	24.2	12.4
Dissolved Oxygen	mg/L	0.01		2.12	2.95	4.13	2.63	3.38	1.4	2.2	1.13
Temperature	oC	0.01	ID	19.34	19.53	21.4	20.1	18.78	21.33	19.94	20.01
Redox	mV	0.1	ID	37	-6	-52	-96	-66.9	-45.7	-35.8	-38.3
Total Dissolved Solids	mg/L	1	ID	600	1000	na	1100	na	1002	1064	80
CO ₂ Titration	mg/L	1	ID	na	121	110	75	55	95	80	150
Alkalinity											
Hydroxide Alkalinity as CaCO3	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	1	ID	<1	<1	25	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	1	ID	282	288	248	285	244	240	233	239
Total Alkalinity as CaCO3	mg/L	1	ID	282	288	273	285	244	240	233	239
Major ions											
Chloride	mg/L	0.5	ID	169	340	341	347	340	344	335	365
Fluoride	mg/L	0.02	ID	0.3	0.22	0.29	na	na	na	na	na
Sulfate	mg/L	0.5	ID	59	64	63	60.7	74.1	57	63	65
Silicon	mg/L	0.05	ID	na	na	na	5.02	na	na	na	na
Silica	mg/L	0.1	ID	na	na	na	10.8	na	na	na	na
Calcium	mg/L	1	ID	32	58	55	52	46	46	50	52
Magnesium	mg/L	1	ID	44	54	53	49	48	44	46	49
Sodium	mg/L	1	ID	101	190	186	185	196	182	174	190
Potassium	mg/L	1	ID	28	31	33	33	31	33	30	32
Dissolved Metals											
Aluminium	mg/L	0.01	0.055	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01
Arsenic	mg/L	0.001	0.013 (As V)	<0.001	<0.001	<0.001	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	0.105	0.095	0.1	0.091	0.079	0.095	0.091	0.092
Cadmium	mg/L	0.0001	0.0002	<0.0001	<0.0001	<0.0001	na	na	na	na	na
Chromium	mg/L	0.001	0.001	<0.001	<0.001	<0.001	na	na	na	na	na
Cobalt	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	0.001	0.0014	0.004	0.002	0.009	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	<0.001	<0.001	<0.001	0.022	<0.001	<0.001	<0.001
Manganese	mg/L	0.001	1.9	0.072	0.08	0.086	0.076	0.116	0.179	0.101	0.088
Nickel	mg/L	0.001	0.011	<0.001	0.016	<0.001	na	na	na	na	na
Selenium	mg/L	0.01	0.011	<0.01	<0.01	<0.01	na	na	na	na	na
Vanadium	mg/L	0.01	ID	<0.01	<0.01	<0.01	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.033	0.025	0.011	0.014	0.026	0.009	<0.005	<0.005
Boron	mg/L	0.05	0.37	<0.05	<0.05	<0.05	na	na	na	na	na
Iron	mg/L	0.05	ID	0.98	2.44	2.57	2.36	3.25	8.34	4.32	3.18
Mercury	mg/L	0.0001	ID	<0.0001	<0.0001	<0.0001	na	na	na	na	na
Total Metals											
Total Iron	mg/L	0.05	ID	na	2.48	2.72	na	na	na	na	na
Nutrients											
Ammonia as N	mg/L	0.01	0.9	na	0.2	0.23	0.36	na	na	na	na
Nitrite as N	mg/L	0.01	ID	<0.01	<0.01	<0.01	<0.01	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	0.01	<0.01	0.04	0.01	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	0.01	<0.01	0.04	0.01	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		na	0.3	0.4	0.6	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	na	0.3	0.5	0.6	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	na	<0.01	0.03	<0.01	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	<0.01	<0.01	<0.01	na	na	na	na	na
Biochemical Oxygen Demand	mg/L	2		na	3	na	na	na	na	na	na

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatoc ecosystems.

*ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatoc ecosystems, South-East Australia, low lying river ecosystems

ID - insufficient data to determine trigger value

na - not analysed

GW3C

Analyte	Units	LOR	ANZECC 2000 Guidelines	10/09/2009	1/10/2009	2/12/2009	9/03/2010	15/06/2010	31/01/2011	9/05/2011	25/08/2011
Field Parameters											
Conductivity	µS/cm	1	125 - 2200*	1070	1052	1105	1152	1150	1179	1193	1011
pH	pH units	0.01	6.5-8*	6.63	6.1	6.47	6.31	6.21	6.53	6.69	6.66
Dissolved Oxygen	%sat	0.1	85-110*	31.4	8	na	29.8	8.1	7.9	27.9	22.2
Dissolved Oxygen	mg/L	0.01		2.93	0.73	3.76	3.32	0.71	0.63	2.95	2.08
Temperature	oC	0.01	ID	18.31	21.33	22.3	21.95	19.89	26.28	19.35	18.77
Redox	mV	0.1	ID	24	15	-23	-49	-7	-74.6	-80.2	-93.1
Total Dissolved Solids	mg/L	1	ID	700	700	na	700	na	700	778	657
CO ₂ Titration	mg/L	1	ID	na	95	95	170	98	165	125	190
Alkalinity											
Hydroxide Alkalinity as CaCO3	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	1	ID	243	259	272	249	256	241	246	238
Total Alkalinity as CaCO3	mg/L	1	ID	243	259	272	249	256	241	246	238
Major ions											
Chloride	mg/L	0.5	ID	223	144	171	188	220	188	196	200
Fluoride	mg/L	0.02	ID	0.31	0.19	0.2	na	na	na	na	na
Sulfate	mg/L	0.5	ID	94.2	30.8	41.7	45	79.8	47	47	48
Silicon	mg/L	0.05	ID	na	na	na	5.06	na	na	na	na
Silica	mg/L	0.1	ID	na	na	na	10.8	na	na	na	na
Calcium	mg/L	1	ID	32	33	30	27	33	28	32	33
Magnesium	mg/L	1	ID	38	42	40	44	43	36	40	41
Sodium	mg/L	1	ID	156	107	121	120	153	138	130	136
Potassium	mg/L	1	ID	35	27	29	27	32	34	30	33
Dissolved Metals											
Aluminium	mg/L	0.01	0.055	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Arsenic	mg/L	0.001	0.013 (As V)	<0.001	<0.001	<0.001	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	0.059	0.114	0.12	0.115	0.121	0.114	0.109	0.107
Cadmium	mg/L	0.0001	0.0002	0.001	<0.0001	0.0004	na	na	na	na	na
Chromium	mg/L	0.001	0.001	<0.001	<0.001	<0.001	na	na	na	na	na
Cobalt	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	0.001	0.0014	0.004	<0.001	<0.001	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	<0.001	<0.001	<0.001	0.007	<0.001	<0.001	<0.001
Manganese	mg/L	0.001	1.9	0.088	0.058	0.063	0.059	0.075	0.163	0.152	0.12
Nickel	mg/L	0.001	0.011	<0.001	0.002	<0.001	na	na	na	na	na
Selenium	mg/L	0.01	0.011	<0.01	<0.01	<0.01	na	na	na	na	na
Vanadium	mg/L	0.01	ID	<0.01	<0.01	<0.01	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.031	0.021	<0.005	0.042	<0.005	0.016	<0.005	<0.005
Boron	mg/L	0.05	0.37	<0.05	<0.05	<0.05	na	na	na	na	na
Iron	mg/L	0.05	ID	2.16	2.39	2.35	2.37	2.83	16.2	14.4	7.83
Mercury	mg/L	0.0001	ID	<0.0001	<0.0001	<0.0001	na	na	na	na	na
Total Metals											
Total Iron	mg/L	0.05	ID	na	2.57	2.53	na	na	na	na	na
Nutrients											
Ammonia as N	mg/L	0.01	0.9		0.16	0.31	0.34	na	na	na	na
Nitrite as N	mg/L	0.01	ID	<0.01	<0.01	<0.01	<0.01	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	<0.01	<0.01	<0.01	0.01	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	<0.01	<0.01	<0.01	0.01	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		na	0.3	0.4	0.6	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	na	0.3	0.4	0.6	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	na	<0.01	<0.01	<0.01	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	<0.01	<0.01	<0.01	na	na	na	na	na
Biochemical Oxygen Demand	mg/L	2		na	<2	na	na	na	na	na	na

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatoc ecosystems.

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ID - insufficient data to determine trigger value

na - not analysed

GW3D

Analyte	Units	LOR	ANZECC 2000 Guidelines	10/09/2009	2/10/2009	2/12/2009	10/03/2010	15/06/2010	31/01/2011	9/05/2011	25/08/2011
Field Parameters											
Conductivity	µS/cm	1	125 - 2200*	1070	1231	1236	1217	1237	1214	1249	1088
pH	pH units	0.01	6.5-8*	6.64	6.3	6.98	6.53	6.41	6.46	6.69	6.65
Dissolved Oxygen	%sat	0.1	85-110*	8.3	24.4	na	31.9	43.1	14.6	22.3	14.2
Dissolved Oxygen	mg/L	0.01		0.86	2.09	3.74	2.99	3.94	1.26	2.63	1.3
Temperature	oC	0.01	ID	16.17	21.58	22	21.37	19.77	22.16	19.85	20.38
Redox	mV	0.1	ID	89	-9	-29	-80	-41.6	-14.9	-36.8	-42.6
Total Dissolved Solids	mg/L	1	ID	800	800	na	800	na	789	811	708
CO ₂ Titration	mg/L	1	ID	na	97	98	110	80	155	125	170
Alkalinity											
Hydroxide Alkalinity as CaCO3	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	1	ID	<1	<1	20	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	1	ID	452	274	230	241	246	237	227	226
Total Alkalinity as CaCO3	mg/L	1	ID	452	274	250	241	246	237	227	226
Major ions											
Chloride	mg/L	0.5	ID	153	186	211	216	265	221	226	230
Fluoride	mg/L	0.02	ID	0.37	0.21	0.28	na	na	na	na	na
Sulfate	mg/L	0.5	ID	10.7	53	60.3	59.3	104	60	68	64
Silicon	mg/L	0.05	ID	na	na	na	5.07	na	na	na	na
Silica	mg/L	0.1	ID	na	na	na	10.9	na	na	na	na
Calcium	mg/L	1	ID	30	33	31	29	30	26	30	31
Magnesium	mg/L	1	ID	23	37	36	32	35	31	34	35
Sodium	mg/L	1	ID	194	154	161	156	181	157	153	170
Potassium	mg/L	1	ID	42	32	37	36	37	36	34	38
Dissolved Metals											
Aluminium	mg/L	0.01	0.055	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Arsenic	mg/L	0.001	0.013 (As V)	<0.001	<0.001	<0.001	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	0.269	0.072	0.074	0.064	0.068	0.067	0.071	0.067
Cadmium	mg/L	0.0001	0.0002	<0.0001	<0.0001	<0.0001	na	na	na	na	na
Chromium	mg/L	0.001	0.001	<0.005	<0.001	<0.001	na	na	na	na	na
Cobalt	mg/L	0.001	ID	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	0.001	0.0014	<0.001	<0.001	<0.001	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.001	1.9	0.192	0.14	0.11	0.098	0.125	0.114	0.116	0.11
Nickel	mg/L	0.001	0.011	0.001	0.016	<0.001	na	na	na	na	na
Selenium	mg/L	0.01	0.011	<0.01	<0.01	<0.01	na	na	na	na	na
Vanadium	mg/L	0.01	ID	<0.01	<0.01	<0.01	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.06	0.044	0.012	0.022	0.031	<0.005	<0.005	<0.005
Boron	mg/L	0.05	0.37	<0.05	<0.05	<0.05	na	na	na	na	na
Iron	mg/L	0.05	ID	1.67	4.46	2.82	2.6	3.38	3.16	3.63	3.51
Mercury	mg/L	0.0001	ID	<0.0001	<0.0001	<0.0001	na	na	na	na	na
Total Metals											
Total Iron	mg/L	0.05	ID	na	4.63	3	na	na	na	na	na
Nutrients											
Ammonia as N	mg/L	0.01	0.9	na	0.58	0.42	0.63	na	na	na	na
Nitrite as N	mg/L	0.01	ID	<0.01	<0.01	<0.01	<0.01	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	0.04	<0.01	<0.01	0.02	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	0.04	<0.01	<0.01	0.02	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		na	1	0.9	0.9	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	na	1	0.9	0.9	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	na	<0.01	0.02	<0.01	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	<0.01	<0.01	<0.01	na	na	na	na	na
Biochemical Oxygen Demand	mg/L	2		na	<2	na	na	na	na	na	na

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatoc ecosystems.

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ID - insufficient data to determine trigger value

na - not analysed

GW3E

Analyte	Units	LOR	ANZECC 2000 Guidelines	30/09/2009	1/12/2009	10/03/2010	15/06/2010	10/02/2011	9/05/2011	25/08/2011
Field Parameters										
Conductivity	µS/cm	1	125 - 2200*	1295	1521	1340	1441	1380	1408	1243
pH	pH units	0.01	6.5-8*	6.45	6.75	6.38	6.48	7.69	6.88	6.72
Dissolved Oxygen	%sat	0.1	85-110*	37	na	66.9	14.3	16.3	22.6	20
Dissolved Oxygen	mg/L	0.01		3.19	4.12	na	1.31	1.21	2.15	1.91
Temperature	oC	0.01	ID	17.78	21	21.31	19.37	31.02	18.53	18.25
Redox	mV	0.1	ID	-27	-49	-83	-81.8	-199.5	-110.9	-144.5
Total Dissolved Solids	mg/L	1	ID	800	na	900	na	896	915	808
CO ₂ Titration	mg/L	1	ID	145	80	135	78	15	90	190
Alkalinity										
Hydroxide Alkalinity as CaCO3	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	1	ID	<1	20	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	1	ID	427	292	372	477	314	314	374
Total Alkalinity as CaCO3	mg/L	1	ID	427	312	372	477	314	314	374
Major ions										
Chloride	mg/L	0.5	ID	168	322	205	187	264	248	208
Fluoride	mg/L	0.02	ID	0.29	0.36	na	na	na	na	na
Sulfate	mg/L	0.5	ID	10.6	58.6	19.2	8.79	2	10	2
Silicon	mg/L	0.05	ID	na	na	6.23	na	na	na	na
Silica	mg/L	0.1	ID	na	na	13.3	na	na	na	na
Dissolved Major Cations										
Calcium	mg/L	1	ID	35	54	33	50	33	40	38
Magnesium	mg/L	1	ID	25	43	31	29	38	39	32
Sodium	mg/L	1	ID	193	179	186	220	172	165	200
Potassium	mg/L	1	ID	40	37	38	49	47	39	40
Dissolved Metals										
Aluminium	mg/L	0.01	0.055	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01
Arsenic	mg/L	0.001	0.013 (As V)	<0.001	<0.001	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	0.29	0.213	0.197	0.225	0.081	0.156	0.215
Cadmium	mg/L	0.0001	0.0002	<0.0001	<0.0001	na	na	na	na	na
Chromium	mg/L	0.001	0.001	<0.005	<0.001	na	na	na	na	na
Cobalt	mg/L	0.001	ID	0.001	0.002	0.002	0.002	<0.001	0.002	<0.001
Copper	mg/L	0.001	0.0014	<0.001	<0.001	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.001	1.9	0.2	0.475	0.491	0.415	0.072	0.558	0.828
Nickel	mg/L	0.001	0.011	0.002	0.003	na	na	na	na	na
Selenium	mg/L	0.01	0.011	<0.01	<0.01	na	na	na	na	na
Vanadium	mg/L	0.01	ID	<0.01	<0.01	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.018	<0.005	0.024	<0.005	<0.005	0.026	<0.005
Boron	mg/L	0.05	0.37	<0.05	<0.05	na	na	na	na	na
Iron	mg/L	0.05	ID	4.27	13	10.4	24.2	4.85	20.5	49.6
Mercury	mg/L	0.0001	ID	<0.0001	<0.0001	na	na	na	na	na
Total Metals										
Total Iron	mg/L	0.05	ID	4.32	15.2	na	na	na	na	na
Nutrients										
Ammonia as N	mg/L	0.01	0.9	0.35	0.39	0.52	na	na	na	na
Nitrite as N	mg/L	0.01	ID	<0.01	<0.01	<0.01	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	0.02	<0.01	0.02	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	0.02	<0.01	0.02	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		0.4	0.4	1	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	0.5	0.4	1	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	<0.01	0.03	<0.01	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	<0.01	<0.01	na	na	na	na	na
Biochemical Oxygen Demand	mg/L	2		<2	na	na	na	na	na	na

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatoc ecosystems.

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ID - insufficient data to determine trigger value

na - not analysed

GW4

Analyte	Units	LOR	ANZECC 2000 Guidelines	1/10/2009	2/12/2009	18/03/2010	16/06/2010	2/02/2011	10/05/2011	22/08/2011
Field Parameters										
Conductivity	µS/cm	1	125 - 2200*	2050	1983	1980	1950	1882	2076	1930
pH	pH units	0.01	6.5-8*	7	6.96	7.91	6.84	6.8	6.8	6.44
Dissolved Oxygen	%sat	0.1	85-110*	34	na	78.6	27.1	8.7	8.8	10.9
Dissolved Oxygen	mg/L	0.01		3.39	3.98	9.5	2.49	0.79	0.82	1
Temperature	oC	0.01	ID	18.66	17.4	19.48	19.25	18.99	18.66	17.89
Redox	mV	0.1	ID	105	43	-40	29.9	39.6	-40.3	257.4
Total Dissolved Solids	mg/L	1	ID	1300	na	1300	na	1223	1350	1451
CO ₂ Titration	mg/L	1	ID	21	27	45	24	25	40	60
Alkalinity										
Hydroxide Alkalinity as CaCO3	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	1	ID	<1	9	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	1	ID	236	204	236	230	178	189	221
Total Alkalinity as CaCO3	mg/L	1	ID	236	213	236	230	178	189	221
Major ions										
Chloride	mg/L	0.5	ID	433	497	452	429	458	477	661
Fluoride	mg/L	0.02	ID	0.14	0.19	na	na	na	na	na
Sulfate	mg/L	0.5	ID	136	152	147	143	104	129	106
Silicon	mg/L	0.05	ID	na	na	9.78	na	na	na	na
Silica	mg/L	0.1	ID	na	na	21	na	na	na	na
Calcium	mg/L	1	ID	65	57	58	54	52	54	78
Magnesium	mg/L	1	ID	60	65	66	60	58	58	85
Sodium	mg/L	1	ID	272	274	312	292	280	253	341
Potassium	mg/L	1	ID	12	15	14	15	16	14	18
Dissolved Metals										
Aluminium	mg/L	0.01	0.055	<0.01	0.18	<0.01	<0.01	<0.01	<0.01	<0.01
Arsenic	mg/L	0.001	0.013 (As V)	<0.001	<0.001	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	0.089	0.112	0.108	0.103	0.109	0.121	0.162
Cadmium	mg/L	0.0001	0.0002	<0.0001	<0.0001	na	na	na	na	na
Chromium	mg/L	0.001	0.001	<0.001	<0.001	na	na	na	na	na
Cobalt	mg/L	0.001	ID	<0.001	0.002	0.003	0.002	0.002	0.002	0.004
Copper	mg/L	0.001	0.0014	0.001	0.004	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.001	1.9	0.758	1.37	1.37	1.13	0.788	1.42	2.02
Nickel	mg/L	0.001	0.011	0.003	0.002	na	na	na	na	na
Selenium	mg/L	0.01	0.011	<0.01	<0.01	na	na	na	na	na
Vanadium	mg/L	0.01	ID	<0.01	<0.01	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.009	0.008	0.011	0.011	0.024	<0.005	0.023
Boron	mg/L	0.05	0.37	0.05	<0.05	na	na	na	na	na
Iron	mg/L	0.05	ID	<0.05	0.14	<0.05	<0.05	<0.05	0.26	<0.05
Mercury	mg/L	0.0001	ID	<0.0001	<0.0001	na	na	na	na	na
Total Metals										
Total Iron	mg/L	0.05	ID	27.1	2.05	na	na	na	na	na
Nutrients										
Ammonia as N	mg/L	0.01	0.9	0.06	0.04	0.08	na	na	na	na
Nitrite as N	mg/L	0.01	ID	0.01	<0.01	<0.01	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	<0.01	0.03	0.03	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	<0.01	0.03	0.03	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1	na	0.4	0.4	1	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	0.4	0.4	1	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	0.54	0.38	0.38	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	0.06	<0.01	na	na	na	na	na
Biochemical Oxygen Demand	mg/L	2	na	5	na	na	na	na	na	na
Isotopes										
Oxygen-18	‰	0.01		na	na	na	na	na	na	-2.96
Deuterium	‰	0.1		na	na	na	na	na	na	-21.7
Carbon-13	‰	0.1		na	na	na	na	na	na	na
Radiocarbon	pMC	0.1		na	na	na	na	na	na	na
Radiocarbon Age (uncorrected)	yrs BP	1		na	na	na	na	na	na	na

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatoc ecosystems.

*ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatoc ecosystems, South-East Australia, low lying river ecosystems

ID - insufficient data to determine trigger value

na - not analysed

GW5TPB													Pump test
Analyte	Units	LOR	ANZECC 2000 Guidelines	30/09/2009	6/10/2009	3/12/2009	17/03/2010	16/06/2010	1/02/2011	12/05/2011	23/08/2011	19/09/2011	13/10/2011
Field Parameters													
Conductivity	µS/cm	1	125 - 2200*	1176	1162	1875	1295	1295	1200	1868	1187	1319	1172
pH	pH units	0.01	6.5-8*	6.38	5.95	6.65	7.75	6.42	6.4	6.65	6.33	6.4	5.71
Dissolved Oxygen	%sat	0.1	85-110*	24.7	36.1	na	3	21.6	10.2	46	10.1	20.6	na
Dissolved Oxygen	mg/L	0.01		2.08	3.56	5.31	0.25	1.86	0.89	4.14	0.88	na	1.72
Temperature	oC	0.01	ID	22.16	22.5	22.9	21.76	22.44	21.85	20.5	22.63	19.8	20.1
Redox	mV	0.1	ID	-2	1	-15	-71	-27	-9.4	-11.8	-26.8	167	-16
Total Dissolved Solids	mg/L	1	ID	800	700	na	800	na	780	853	772	na	na
CO ₂ Titration	mg/L	1	ID	95	na	83	130	84	58	50	90	93	0.79
Alkalinity													
Hydroxide Alkalinity as CaCO3	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	1	ID	<1	<1	19	<1	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	1	ID	292	172	253	268	294	271	265	274	267	240
Total Alkalinity as CaCO3	mg/L	1	ID	292	172	272	268	294	271	265	274	267	240
Major ions													
Chloride	mg/L	0.5	ID	205	213	229	246	242	219	250	252	260	218
Fluoride	mg/L	0.02	ID	0.32	0.32	0.43	na	na	na	na	na	na	na
Sulfate	mg/L	0.5	ID	11.4	15	17.9	28.5	23.5	19	27	25	23	16
Silicon	mg/L	0.05	ID	na	na	na	1.31	na	na	na	na	na	na
Silica	mg/L	0.1	ID	na	na	na	2.8	na	na	na	na	na	na
Calcium	mg/L	1	ID	24	19	23	24	26	20	23	25	24	19
Magnesium	mg/L	1	ID	20	17	21	23	25	21	23	23	25	18
Sodium	mg/L	1	ID	180	163	181	232	220	192	191	203	218	184
Potassium	mg/L	1	ID	39	40	42	40	44	42	40	41	44	41
Dissolved Metals													
Aluminium	mg/L	0.01	0.055	<0.01	0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.04
Arsenic	mg/L	0.001	0.013 (As V)	<0.001	<0.001	<0.001	na	na	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	0.312	0.298	0.347	0.32	0.351	0.339	0.362	0.353	0.353	<0.001
Cadmium	mg/L	0.0001	0.0002	<0.0001	<0.0001	<0.0001	na	na	na	na	na	na	na
Chromium	mg/L	0.001	0.001	<0.001	<0.001	<0.001	na	na	na	na	na	na	na
Cobalt	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	0.001	0.0014	<0.001	<0.001	<0.001	na	na	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	<0.001	<0.001	<0.001	0.093	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.001	1.9	0.107	0.146	0.121	0.124	0.116	0.116	0.115	0.104	0.132	0.126
Nickel	mg/L	0.001	0.011	0.002	<0.001	<0.001	na	na	na	na	na	na	na
Selenium	mg/L	0.01	0.011	<0.01	<0.01	<0.01	na	na	na	na	na	na	na
Vanadium	mg/L	0.01	ID	<0.01	<0.01	<0.01	na	na	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.014	0.02	<0.005	0.01	<0.005	<0.005	<0.005	0.007	0.02	0.021
Boron	mg/L	0.05	0.37	<0.05	<0.05	<0.05	na	na	na	na	na	na	na
Iron	mg/L	0.05	ID	1.97	4.26	2.8	3.21	2.01	2.3	2.07	1.88	<0.05	2.81
Mercury	mg/L	0.0001	ID	<0.0001	<0.0001	<0.0001	na	na	na	na	na	na	na
Total Metals													
Total Iron	mg/L	0.05	ID	2.28	4.72	3.15	na	na	na	na	na	na	na
Nutrients													
Ammonia as N	mg/L	0.01	0.9	0.49	0.49	0.38	0.58	na	na	na	na	na	na
Nitrite as N	mg/L	0.01	ID	<0.01	<0.01	<0.01	<0.01	na	na	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	0.05	<0.01	<0.01	0.04	na	na	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	0.05	<0.01	<0.01	0.04	na	na	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		0.6	0.5	0.4	1	na	na	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	0.6	0.5	0.4	1	na	na	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	<0.01	<0.01	0.07	<0.01	na	na	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	<0.01	<0.01	<0.01	na	na	na	na	na	na	na
Biochemical Oxygen Demand	mg/L	2		<2	na	na	na	na	na	na	na	na	na
Isotopes													
Oxygen-18	‰	0.01		na	na	na	na	na	na	na	na	-6.84	na
Deuterium	‰	0.1		na	na	na	na	na	na	na	na	42.2	na
Carbon-13	‰	0.1		na	na	na	na	na	na	na	na	-14	na
Radiocarbon	pMC	0.1		na	na	na	na	na	na	na	na	0.84±0.05	na
Radiocarbon Age (uncorrected)	yrs BP	1		na	na	na	na	na	na	na	na	38310±510	na

Guideline values

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ID - insufficient data to determine trigger value

na - not analysed

GW5A													Pump test
Analyte	Units	LOR	ANZECC 2000 Guidelines	30/09/2009	3/12/2009	25/02/2010	18/03/2010	16/06/2010	1/02/2011	12/05/2011	23/08/2011	19/09/2011	13/10/2011
Field Parameters													
Conductivity	µS/cm	1	125 - 2200*	3710	3010	2230	2330	1901	2114	2589	2279	1905	1951
pH	pH units	0.01	6.5-8*	7.02	7.12	6.21	7.96	7.05	6.86	6.85	7.03	7.03	6.48
Dissolved Oxygen	%sat	0.1	85-110*	44.4	na	22.6	43.5	13.8	10.5	6.7	5	15.6	na
Dissolved Oxygen	mg/L	0.01		3.87	3.78	2.03	4.1	1.3	1.05	0.66	0.47	na	1.99
Temperature	oC	0.01	ID	19.96	20.1	20.23	20.06	18.07	20.02	19.49	19.55	19.7	19.8
Redox	mV	0.1	ID	55	21	168	-57	91.9	75.1	225.7	38.2	232	94
Total Dissolved Solids	mg/L	1	ID	2300	na	1200	1500	na	1374	1682	1479	na	na
CO ₂ Titration	mg/L	1	ID	37	62	55	40	25	60	50	70	22	0.3
Alkalinity													
Hydroxide Alkalinity as CaCO3	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	1	ID	<1	33	<1	<1	<1	<1	<1	<1	<1	34
Bicarbonate Alkalinity as CaCO3	mg/L	1	ID	496	430	459	468	439	382	383	389	420	390
Total Alkalinity as CaCO3	mg/L	1	ID	496	463	459	468	439	382	383	389	420	424
Major ions													
Chloride	mg/L	0.5	ID	744	757	333	452	373	464	549	518	325	351
Fluoride	mg/L	0.02	ID	0.63	0.7	na	na	na	na	na	na	na	na
Sulfate	mg/L	0.5	ID	169	178	71.1	112	76.2	77	153	141	105	92
Silicon	mg/L	0.05	ID	na	na	na	12	na	na	na	na	na	na
Silica	mg/L	0.1	ID	na	na	na	25.8	na	na	na	na	na	na
Calcium	mg/L	1	ID	69	52	26	22	35	38	48	41	26	28
Magnesium	mg/L	1	ID	79	68	35	49	48	52	65	53	38	39
Sodium	mg/L	1	ID	617	561	391	493	380	365	452	429	384	394
Potassium	mg/L	1	ID	16	19	10	14	13	17	18	16	6	6
Dissolved Metals													
Aluminium	mg/L	0.01	0.055	<0.01	0.3	0.01	<0.01	0.04	<0.01	0.02	0.01	<0.01	<0.01
Arsenic	mg/L	0.001	0.013 (As V)	<0.001	<0.001	<0.001	na	na	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	0.104	0.071	0.049	0.056	0.066	0.115	0.097	0.075	0.059	0.066
Cadmium	mg/L	0.0001	0.0002	<0.0001	<0.0001	<0.0001	na	na	na	na	na	na	na
Chromium	mg/L	0.001	0.001	<0.005	<0.001	<0.001	na	na	na	na	na	na	na
Cobalt	mg/L	0.001	ID	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	0.001	0.0014	0.005	0.002	0.011	na	na	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.001	1.9	0.076	0.072	0.016	0.019	0.025	0.034	0.039	0.032	0.007	0.009
Nickel	mg/L	0.001	0.011	0.002	0.001	0.004	na	na	na	na	na	na	na
Selenium	mg/L	0.01	0.011	<0.01	<0.01	<0.01	na	na	na	na	na	na	na
Vanadium	mg/L	0.01	ID	<0.01	<0.01	<0.01	na	na	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.022	<0.005	0.072	0.032	<0.005	0.026	0.194	<0.005	0.007	0.008
Boron	mg/L	0.05	0.37	<0.05	<0.05	<0.05	na	na	na	na	na	na	na
Iron	mg/L	0.05	ID	<0.05	0.3	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.08
Mercury	mg/L	0.0001	ID	<0.0001	<0.0001	<0.0001	na	na	na	na	na	na	na
Total Metals													
Total Iron	mg/L	0.05	ID	167	2.2	0.26	na	na	na	na	na	na	na
Nutrients													
Ammonia as N	mg/L	0.01	0.9	0.08	<0.01	na	0.01	na	na	na	na	na	na
Nitrite as N	mg/L	0.01	ID	<0.01	<0.01	na	<0.01	na	na	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	0.16	0.02	na	<0.01	na	na	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	0.16	0.02	na	<0.01	na	na	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		0.4	<0.1	na	0.6	na	na	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	0.5	<0.1	na	0.6	na	na	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	2.02	0.08	na	0.85	na	na	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	<0.01	0.02	na	na	na	na	na	na	na	na
Biochemical Oxygen Demand	mg/L	2		<2		na	na	na	na	na	na	na	na
Isotopes													
Oxygen-18	‰	0.01		na	na	na	na	na	na	na	na	-3.77	na
Deuterium	‰	0.1		na	na	na	na	na	na	na	na	-25.6	na
Carbon-13	‰	0.1		na	na	na	na	na	na	na	na	-13.8	na
Radiocarbon	pMC	0.1		na	na	na	na	na	na	na	na	78.93±0.15	na
Radiocarbon Age (uncorrected)	yrs BP	1		na	na	na	na	na	na	na	na	1842±15	na

Guideline values

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na - not analysed

GW5B												Pump test
Analyte	Units	LOR	ANZECC 2000 Guidelines	30/09/2009	3/12/2009	18/03/2010	16/06/2010	1/02/2011	12/05/2011	23/08/2011	19/09/2011	13/10/2011
Field Parameters												
Conductivity	µS/cm	1	125 - 2200*	1111	1119	1154	1231	1155	1131	1142	1235	1107
pH	pH units	0.01	6.5-8*	6.25	6.45	7.41	6.43	6.35	6.37	6.32	6.18	5.51
Dissolved Oxygen	%sat	0.1	85-110*	10.6	na	4.9	9	6	10.2	6.8	23.5	na
Dissolved Oxygen	mg/L	0.01		0.9	1.71	0.38	0.84	0.54	0.93	0.62	na	1.58
Temperature	oC	0.01	ID	21.2	19.7	20.4	19.21	20.6	19.7	20.96	19.5	19.7
Redox	mV	0.1	ID	-26	-52	-92	-65.8	-44.9	-42.1	-43	2	51
Total Dissolved Solids	mg/L	1	ID	700	na	800	na	751	818	746	na	na
CO ₂ Titration	mg/L	1	ID	147	155	85	89	135	85	130	110	1.15
Alkalinity												
Hydroxide Alkalinity as CaCO ₃	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	mg/L	1	ID	<1	19	<1	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	mg/L	1	ID	221	221	220	245	235	236	237	207	142
Total Alkalinity as CaCO ₃	mg/L	1	ID	221	240	220	245	235	236	237	207	142
Major ions												
Chloride	mg/L	0.5	ID	189	223	220	233	221	240	252	253	230
Fluoride	mg/L	0.02	ID	0.23	0.32	na	na	na	na	na	na	na
Sulfate	mg/L	0.5	ID	13.4	17.8	20.8	19.8	20	23	23	22	23
Silicon	mg/L	0.05	ID	na	na	5.11	na	na	na	na	na	na
Silica	mg/L	0.1	ID	na	na	11	na	na	na	na	na	na
Calcium	mg/L	1	ID	18	19	20	21	19	20	23	18	16
Magnesium	mg/L	1	ID	17	19	19	19	19	20	21	19	16
Sodium	mg/L	1	ID	169	172	197	181	181	182	194	188	149
Potassium	mg/L	1	ID	45	46	41	42	47	45	44	49	49
Dissolved Metals												
Aluminium	mg/L	0.01	0.055	<0.01	0.06	<0.01	0.02	<0.01	0.02	<0.01	<0.01	0.01
Arsenic	mg/L	0.001	0.013 (As V)	<0.001	<0.001	na	na	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	0.164	0.217	0.192	0.212	0.212	0.218	0.215	0.18	0.155
Cadmium	mg/L	0.0001	0.0002	<0.0001	<0.0001	na	na	na	na	na	na	na
Chromium	mg/L	0.001	0.001	<0.001	<0.001	na	na	na	na	na	na	na
Cobalt	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	0.001	0.0014	<0.001	<0.001	na	na	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.001	1.9	0.303	0.288	0.297	0.281	0.283	0.262	0.253	0.35	0.336
Nickel	mg/L	0.001	0.011	0.002	<0.001	na	na	na	na	na	na	na
Selenium	mg/L	0.01	0.011	<0.01	<0.01	na	na	na	na	na	na	na
Vanadium	mg/L	0.01	ID	<0.01	<0.01	na	na	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.016	<0.005	0.051	<0.005	<0.005	<0.005	0.011	0.01	0.01
Boron	mg/L	0.05	0.37	<0.05	<0.05	na	na	na	na	na	na	na
Iron	mg/L	0.05	ID	9.92	10.1	14.2	13.4	13	11.5	10.5	11.7	16.4
Mercury	mg/L	0.0001	ID	<0.0001	<0.0001	na	na	na	na	na	na	na
Total Metals												
Total Iron	mg/L	0.05	ID	11.6	10.4	na	na	na	na	na	na	na
Nutrients												
Ammonia as N	mg/L	0.01	0.9	0.19	0.3	0.3	na	na	na	na	na	na
Nitrite as N	mg/L	0.01	ID	<0.01	<0.01	<0.01	na	na	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	0.05	<0.01	<0.01	na	na	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	0.05	<0.01	<0.01	na	na	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		0.4	0.3	0.7	na	na	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	0.5	0.3	0.7	na	na	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	0.04	<0.01	<0.01	na	na	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	<0.01	<0.01	na	na	na	na	na	na	na
Biochemical Oxygen Demand	mg/L	2		<2	na	na	na	na	na	na	na	na
Isotopes												
Oxygen-18	‰	0.01		na	na	na	na	na	na	na	-6.89	na
Deuterium	‰	0.1		na	na	na	na	na	na	na	-44	na
Carbon-13	‰	0.1		na	na	na	na	na	na	na	-14.4	na
Radiocarbon	pMC	0.1		na	na	na	na	na	na	na	0.81±0.05	na
Radiocarbon Age (uncorrected)	yrs BP	1		na	na	na	na	na	na	na	38650±530	na

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatoc ecosystems.

*ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatoc ecosystems, South-East Australia, low lying river ecosystems

ID - insufficient data to determine trigger value

na - not analysed

GW5C												Pump test
Analyte	Units	LOR	ANZECC 2000 Guidelines	30/09/2009	3/12/2009	18/03/2010	16/06/2010	1/02/2011	12/05/2011	23/08/2011	19/09/2011	13/10/2011
Field Parameters												
Conductivity	µS/cm	1	125 - 2200*	1004	1056	1082	1110	1010	1094	996	1091	1090
pH	pH units	0.01	6.5-8*	6.18	6.43	7.44	6.25	6.18	6.26	6.11	6.13	5.57
Dissolved Oxygen	%sat	0.1	85-110*	32.3	na	6.5	8.1	7.2	5.6	5.4	17.1	na
Dissolved Oxygen	mg/L	0.01		2.66	4.7	0.58	0.74	0.64	0.52	0.48	na	1.41
Temperature	oC	0.01	ID	22.08	21.3	21.04	19.85	21.36	20.33	21.43	19.4	19.8
Redox	mV	0.1	ID	-14	-50	-84	-25.9	-9.4	-31.1	-47.6	56	51
Total Dissolved Solids	mg/L	1	ID	700	na	700	na	657	711	648	na	na
CO ₂ Titration	mg/L	1	ID	127	120	90	86	95	130	>200	75	0.7
Alkalinity												
Hydroxide Alkalinity as CaCO ₃	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	mg/L	1	ID	<1	8	<1	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	mg/L	1	ID	181	169	205	193	184	186	184	176	169
Total Alkalinity as CaCO ₃	mg/L	1	ID	181	177	205	193	184	186	184	176	169
Major ions												
Chloride	mg/L	0.5	ID	192	214	203	216	205	199	228	232	225
Fluoride	mg/L	0.02	ID	0.17	0.26	na	na	na	na	na	na	na
Sulfate	mg/L	0.5	ID	19.4	14.3	21.2	22.1	22	23	23	21	21
Silicon	mg/L	0.05	ID	na	na	4.79	na	na	na	na	na	na
Silica	mg/L	0.1	ID	na	na	10.3	na	na	na	na	na	na
Calcium	mg/L	1	ID	14	13	16	16	14	15	16	15	13
Magnesium	mg/L	1	ID	13	13	15	15	14	15	16	16	14
Sodium	mg/L	1	ID	141	147	186	183	156	153	172	170	163
Potassium	mg/L	1	ID	40	45	41	46	45	42	43	46	45
Dissolved Metals												
Aluminium	mg/L	0.01	0.055	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01
Arsenic	mg/L	0.001	0.013 (As V)	<0.001	<0.001	na	na	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	0.101	0.148	0.14	0.134	0.133	0.135	0.13	0.133	0.14
Cadmium	mg/L	0.0001	0.0002	<0.0001	<0.0001	na	na	na	na	na	na	na
Chromium	mg/L	0.001	0.001	<0.001	<0.001	na	na	na	na	na	na	na
Cobalt	mg/L	0.001	ID	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	0.001	0.0014	0.003	<0.001	na	na	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.001	1.9	0.393	0.467	0.305	0.297	0.281	0.286	0.277	0.308	0.322
Nickel	mg/L	0.001	0.011	0.003	<0.001	na	na	na	na	na	na	na
Selenium	mg/L	0.01	0.011	<0.01	<0.01	na	na	na	na	na	na	na
Vanadium	mg/L	0.01	ID	<0.01	<0.01	na	na	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.018	<0.005	0.01	0.006	<0.005	0.009	0.005	0.029	0.015
Boron	mg/L	0.05	0.37	<0.05	<0.05	na	na	na	na	na	na	na
Iron	mg/L	0.05	ID	12.6	23.4	12.8	13	10.8	12.6	13	0.76	1.77
Mercury	mg/L	0.0001	ID	<0.0001	<0.0001	na	na	na	na	na	na	na
Total Metals												
Total Iron	mg/L	0.05	ID	22.1	21.9	na	na	na	na	na	na	na
Nutrients												
Ammonia as N	mg/L	0.01	0.9	0.43	0.22	0.33	na	na	na	na	na	na
Nitrite as N	mg/L	0.01	ID	0.01	<0.01	<0.01	na	na	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	<0.01	0.05	0.01	na	na	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	<0.01	0.05	0.01	na	na	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		0.7	0.4	0.9	na	na	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	0.7	0.5	0.9	na	na	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	0.14	0.05	<0.01	na	na	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	<0.01	<0.01	na	na	na	na	na	na	na
Biochemical Oxygen Demand	mg/L	2		2	na	na	na	na	na	na	na	na
Isotopes												
Oxygen-18	‰	0.01		na	na	na	na	na	na	na	-6.84	na
Deuterium	‰	0.1		na	na	na	na	na	na	na	-44.2	na
Carbon-13	‰	0.1		na	na	na	na	na	na	na	-14.3	na
Radiocarbon	pMC	0.1		na	na	na	na	na	na	na	1.05±0.05	na
Radiocarbon Age (uncorrected)	yrs BP	1		na	na	na	na	na	na	na	36580±410	na

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatoc ecosystems.

*ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatoc ecosystems, South-East Australia, low lying river ecosystems

ID - insufficient data to determine trigger value

na - not analysed

GW5D												Pump test
Analyte	Units	LOR	ANZECC 2000 Guidelines	30/09/2009	3/12/2009	17/03/2010	16/06/2010	1/02/2011	12/05/2011	23/08/2011	19/09/2011	13/10/2011
Field Parameters												
Conductivity	µS/cm	1	125 - 2200*	1242	1298	1344	1372	1255	1254	1248	1361	1352
pH	pH units	0.01	6.5-8*	6.41	6.63	7.72	6.42	6.4	6.45	6.36	6.33	5.8
Dissolved Oxygen	%sat	0.1	85-110*	23.2	na	3.8	17.1	8.2	6.4	14.6	21.9	na
Dissolved Oxygen	mg/L	0.01		1.95	4.05	0.38	1.5	0.71	0.57	1.39	na	1.61
Temperature	oC	0.01	ID	21.5	21.5	21.75	21.83	21.97	20.81	21.57	19.5	19.4
Redox	mV	0.1	ID	6	-21	-55	-27.3	1	-19.2	-30.1	44	111
Total Dissolved Solids	mg/L	1	ID	800	na	900	na	815	886	812	na	na
CO ₂ Titration	mg/L	1	ID	115	122	160	98	130	75	125	63	0.65
Alkalinity												
Hydroxide Alkalinity as CaCO ₃	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	mg/L	1	ID	<1	22	<1	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	mg/L	1	ID	295	278	308	311	274	276	280	276	266
Total Alkalinity as CaCO ₃	mg/L	1	ID	295	300	308	311	274	276	280	276	266
Major ions												
Chloride	mg/L	0.5	ID	219	252	245	268	240	252	272	268	252
Fluoride	mg/L	0.02	ID	0.35	0.44	na	na	na	na	na	na	na
Sulfate	mg/L	0.5	ID	11.6	17.8	24.6	30.8	27	28	30	25	21
Silicon	mg/L	0.05	ID	na	na	5.61	na	na	na	na	na	na
Silica	mg/L	0.1	ID	na	na	12	na	na	na	na	na	na
Calcium	mg/L	1	ID	28	24	27	30	24	25	28	26	23
Magnesium	mg/L	1	ID	23	24	26	29	24	25	26	26	23
Sodium	mg/L	1	ID	191	196	240	251	206	205	214	224	201
Potassium	mg/L	1	ID	39	43	39	45	44	41	42	45	42
Dissolved Metals												
Aluminium	mg/L	0.01	0.055	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Arsenic	mg/L	0.001	0.013 (As V)	<0.001	<0.001	na	na	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	0.461	0.504	0.455	0.472	0.464	0.472	0.443	0.432	0.445
Cadmium	mg/L	0.0001	0.0002	<0.0001	<0.0001	na	na	na	na	na	na	na
Chromium	mg/L	0.001	0.001	<0.001	<0.001	na	na	na	na	na	na	na
Cobalt	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	0.001	0.0014	0.003	<0.001	na	na	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.001	1.9	0.102	0.116	0.105	0.11	0.11	0.122	0.108	0.108	0.022
Nickel	mg/L	0.001	0.011	<0.001	<0.001	na	na	na	na	na	na	na
Selenium	mg/L	0.01	0.011	<0.01	<0.01	na	na	na	na	na	na	na
Vanadium	mg/L	0.01	ID	<0.01	<0.01	na	na	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.012	<0.005	0.014	<0.005	<0.005	<0.005	<0.005	0.009	0.005
Boron	mg/L	0.05	0.37	<0.05	<0.05	na	na	na	na	na	na	na
Iron	mg/L	0.05	ID	1.47	1.7	1.64	1.69	1.71	1.72	1.85	0.55	0.09
Mercury	mg/L	0.0001	ID	<0.0001	<0.0001	na	na	na	na	na	na	na
Total Metals												
Total Iron	mg/L	0.05	ID	1.53	1.89	na	na	na	na	na	na	na
Nutrients												
Ammonia as N	mg/L	0.01	0.9	0.29	0.36	0.62	na	na	na	na	na	na
Nitrite as N	mg/L	0.01	ID	<0.01	<0.01	<0.01	na	na	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	0.2	<0.01	<0.01	na	na	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	0.2	<0.01	<0.01	na	na	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		0.6	0.6	1.3	na	na	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	0.7	0.6	1.3	na	na	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	<0.01	0.02	<0.01	na	na	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	<0.01	<0.01		na	na	na	na	na	na
Biochemical Oxygen Demand	mg/L	2		2	na	na	na	na	na	na	na	na
Isotopes												
Oxygen-18	‰	0.01		na	na	na	na	na	na	na	-6.91	na
Deuterium	‰	0.1		na	na	na	na	na	na	na	-42.3	na
Carbon-13	‰	0.1		na	na	na	na	na	na	na	-13.5	na
Radiocarbon	pMC	0.1		na	na	na	na	na	na	na	0.81±0.05	na
Radiocarbon Age (uncorrected)	yrs BP	1		na	na	na	na	na	na	na	38630±530	na

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatoc ecosystems.

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ID - insufficient data to determine trigger value

na - not analysed

GW6TPB

Analyte	Units	LOR	ANZECC 2000 Guidelines	30/09/2009	2/12/2009	8/03/2010	15/06/2010	31/01/2011	9/05/2011	24/08/2011
Field Parameters										
Conductivity	µS/cm	1	125 - 2200*	2120	1931	3280	2076	1193	1560	1663
pH	pH units	0.01	6.5-8*	6.32	6.44	5.75	6.19	7.02	6.77	6.77
Dissolved Oxygen	%sat	0.1	85-110*	16.5	na	21.9	11	5.9	28.2	12.5
Dissolved Oxygen	mg/L	0.01		1.91	5.42	2.16	0.98	0.49	2.5	1.12
Temperature	oC	0.01	ID	21.89	21.5	20.88	20.95	23.86	21.34	22.43
Redox	mV	0.1	ID	-35	-68	-83	-98.1	-102.6	-92.4	-112.9
Total Dissolved Solids	mg/L	1	ID	1400	na	2100	na	775	1013	1081
CO ₂ Titration	mg/L	1	ID	111	130	na	104	40	62	50
Alkalinity										
Hydroxide Alkalinity as CaCO3	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	1	ID	<1	3	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	1	ID	212	179	139	186	173	134	80
Total Alkalinity as CaCO3	mg/L	1	ID	212	182	139	186	173	134	80
Major ions										
Chloride	mg/L	0.5	ID	470	438	854	602	260	374	512
Fluoride	mg/L	0.02	ID	0.12	0.1	na	na	na	na	na
Sulfate	mg/L	0.5	ID	139	123	133	175	30	50	48
Silicon	mg/L	0.05	ID	na	na	4.52	na	na	na	na
Silica	mg/L	0.1	ID	na	na	9.7	na	na	na	na
Calcium	mg/L	1	ID	92	54	33	56	20	28	26
Magnesium	mg/L	1	ID	44	45	72	52	27	33	32
Sodium	mg/L	1	ID	279	251	440	328	186	224	285
Potassium	mg/L	1	ID	33	35	20	33	11	16	17
Dissolved Metals										
Aluminium	mg/L	0.01	0.055	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Arsenic	mg/L	0.001	0.013 (As V)	<0.001	<0.001	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	0.047	0.048	0.058	0.04	0.168	0.038	0.039
Cadmium	mg/L	0.0001	0.0002	<0.0001	<0.0001	na	na	na	na	na
Chromium	mg/L	0.001	0.001	<0.001	<0.001	na	na	na	na	na
Cobalt	mg/L	0.001	ID	<0.001	<0.001	0.003	<0.001	0.002	<0.001	<0.001
Copper	mg/L	0.001	0.0014	<0.001	<0.001	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.001	1.9	0.411	0.525	1.06	0.475	0.341	0.303	0.285
Nickel	mg/L	0.001	0.011	0.003	<0.001	na	na	na	na	na
Selenium	mg/L	0.01	0.011	<0.01	<0.01	na	na	na	na	na
Vanadium	mg/L	0.01	ID	<0.01	<0.01	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.021	<0.005	0.022	0.076	0.031	0.007	0.006
Boron	mg/L	0.05	0.37	<0.05	<0.05	na	na	na	na	na
Iron	mg/L	0.05	ID	15.9	24	69.3	24	4	17.2	15.4
Mercury	mg/L	0.0001	ID	<0.0001	<0.0001	na	na	na	na	na
Total Metals										
Total Iron	mg/L	0.05	ID	17.4	24	na	na	na	na	na
Nutrients										
Ammonia as N	mg/L	0.01	0.9	0.28	0.24	0.18	na	na	na	na
Nitrite as N	mg/L	0.01	ID	<0.01	0.01	<0.01	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	0.05	<0.01	0.06	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	0.05	<0.01	0.06	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		0.4	0.3	0.6	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	0.5	0.3	0.7	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	<0.01	<0.01	<0.01	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	<0.01	<0.01		na	na	na	na
Biochemical Oxygen Demand	mg/L	2		4	na	na	na	na	na	na

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatoc ecosystems.

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ID - insufficient data to determine trigger value

na - not analysed

GW6A

Analyte	Units	LOR	ANZECC 2000 Guidelines	30/09/2009	2/12/2009	8/03/2010	15/06/2010	31/01/2011	9/05/2011	24/08/2011
Field Parameters										
Conductivity	µS/cm	1	125 - 2200*	3060	3060	3660	3027	2517	2517	2456
pH	pH units	0.01	6.5-8*	5.72	5.9	5.56	5.73	5.78	5.89	6.03
Dissolved Oxygen	%sat	0.1	85-110*	32.3	na	14.1	75.8	11.1	30.2	16.8
Dissolved Oxygen	mg/L	0.01		2.89	4.42	1.34	6.77	8.94	2.71	1.49
Temperature	oC	0.01	ID	20.03	19.6	21.36	20.35	22.4	20.28	21.61
Redox	mV	0.1	ID	62	45	14	21.9	113.7	110.1	58.1
Total Dissolved Solids	mg/L	1	ID	2000	na	2300	na	1637	1636	na
CO ₂ Titration	mg/L	1	ID	180	114	100	98	135	130	180
Alkalinity										
Hydroxide Alkalinity as CaCO ₃	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	mg/L	1	ID	86	68	84	115	81	73	78
Total Alkalinity as CaCO ₃	mg/L	1	ID	86	68	84	115	81	73	78
Major ions										
Chloride	mg/L	0.5	ID	825	929	925	960	663	707	755
Fluoride	mg/L	0.02	ID	0.22	0.2	na	na	na	na	na
Sulfate	mg/L	0.5	ID	154	166	159	254	114	154	156
Silicon	mg/L	0.05	ID	na	na	5.29	na	na	na	na
Silica	mg/L	0.1	ID	na	na	11.3	na	na	na	na
Calcium	mg/L	1	ID	41	33	32	44	22	27	28
Magnesium	mg/L	1	ID	83	87	98	90	58	65	69
Sodium	mg/L	1	ID	490	476	469	517	408	400	436
Potassium	mg/L	1	ID	27	27	24	30	18	20	20
Dissolved Metals										
Aluminium	mg/L	0.01	0.055	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Arsenic	mg/L	0.001	0.013 (As V)	0.008	0.007	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	0.106	0.094	0.058	0.075	0.051	0.046	0.05
Cadmium	mg/L	0.0001	0.0002	<0.0001	<0.0001	na	na	na	na	na
Chromium	mg/L	0.001	0.001	<0.001	<0.001	na	na	na	na	na
Cobalt	mg/L	0.001	ID	0.014	0.009	0.002	0.002	0.006	0.003	0.003
Copper	mg/L	0.001	0.0014	<0.001	0.006	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.001	1.9	1.15	1.1	0.718	0.803	0.534	0.688	0.681
Nickel	mg/L	0.001	0.011	0.014	0.008	na	na	na	na	na
Selenium	mg/L	0.01	0.011	<0.01	<0.01	na	na	na	na	na
Vanadium	mg/L	0.01	ID	<0.01	<0.01	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.022	0.036	0.014	0.024	0.062	0.03	0.068
Boron	mg/L	0.05	0.37	<0.05	<0.05	na	na	na	na	na
Iron	mg/L	0.05	ID	14.8	16.2	15	18	0.79	0.2	4.81
Mercury	mg/L	0.0001	ID	<0.0001	<0.0001	na	na	na	na	na
Total Metals										
Total Iron	mg/L	0.05	ID	44.7	21.7	na	na	na	na	na
Nutrients										
Ammonia as N	mg/L	0.01	0.9	0.56	0.5	0.25	na	na	na	na
Nitrite as N	mg/L	0.01	ID	0.08	<0.01	<0.01	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	<0.01	0.05	0.02	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	<0.01	0.05	0.02	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		6.6	1.1	1.5	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	6.6	1.1	1.5	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	1.56	0.19	0.3	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	<0.01	<0.01	na	na	na	na	na
Biochemical Oxygen Demand	mg/L	2		5	na	na	na	na	na	na
Isotopes										
Oxygen-18	‰	0.01		na	na	na	na	na	na	-5.67
Deuterium	‰	0.1		na	na	na	na	na	na	-37.2
Carbon-13	‰	0.1		na	na	na	na	na	na	-17.5
Radiocarbon	pMC	0.1		na	na	na	na	na	na	34.87±0.11
Radiocarbon Age (uncorrected)	yrs BP	1		na	na	na	na	na	na	8405±25

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatoc ecosystems.

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ID - insufficient data to determine trigger value

na - not analysed

GW6B

Analyte	Units	LOR	ANZECC 2000 Guidelines	30/09/2009	2/12/2009	8/03/2010	15/06/2010	31/01/2011	9/05/2011	24/08/2011
Field Parameters										
Conductivity	µS/cm	1	125 - 2200*	2060	1574	1550	1536	1487	1475	1312
pH	pH units	0.01	6.5-8*	6.03	6.44	6.27	6.1	6.23	6.37	6.41
Dissolved Oxygen	%sat	0.1	85-110*	30	na	42.4	51.5	21.2	34.8	14.1
Dissolved Oxygen	mg/L	0.01		2.66	5	4.04	4.57	1.77	3.05	1.22
Temperature	oC	0.01	ID	20.62	21.1	21.6	20.89	23.86	21.28	22.63
Redox	mV	0.1	ID	43	-18	24	15.4	40	47.6	31.2
Total Dissolved Solids	mg/L	1	ID	1300	na	1000	na	962	958	852
CO ₂ Titration	mg/L	1	ID	123	90	90	62	130	55	75
Alkalinity										
Hydroxide Alkalinity as CaCO ₃	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	mg/L	1	ID	182	170	162	184	167	152	146
Total Alkalinity as CaCO ₃	mg/L	1	ID	182	170	162	184	167	152	146
Major ions										
Chloride	mg/L	0.5	ID	479	392	327	388	297	313	321
Fluoride	mg/L	0.02	ID	0.16	0.17	na	na	na	na	na
Sulfate	mg/L	0.5	ID	188	136	105	185	99	118	111
Silicon	mg/L	0.05	ID	na	na	6.24	na	na	na	na
Silica	mg/L	0.1	ID	na	na	13.4	na	na	na	na
Calcium	mg/L	1	ID	65	42	37	41	32	33	39
Magnesium	mg/L	1	ID	46	29	31	28	22	23	25
Sodium	mg/L	1	ID	286	242	220	289	228	225	212
Potassium	mg/L	1	ID	25	27	23	25	24	23	26
Dissolved Metals										
Aluminium	mg/L	0.01	0.055	<0.01	0.13	<0.01	<0.01	<0.01	1.44	<0.01
Arsenic	mg/L	0.001	0.013 (As V)	0.003	0.001	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	0.105	0.084	0.078	0.086	0.083	0.078	0.069
Cadmium	mg/L	0.0001	0.0002	<0.0001	0.0002	na	na	na	na	na
Chromium	mg/L	0.001	0.001	<0.001	<0.001	na	na	na	na	na
Cobalt	mg/L	0.001	ID	0.01	0.006	0.005	0.008	0.007	0.008	0.006
Copper	mg/L	0.001	0.0014	<0.001	0.007	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001
Manganese	mg/L	0.001	1.9	0.78	0.587	0.501	0.739	0.703	0.647	0.525
Nickel	mg/L	0.001	0.011	0.011	0.008	na	na	na	na	na
Selenium	mg/L	0.01	0.011	<0.01	<0.01	na	na	na	na	na
Vanadium	mg/L	0.01	ID	<0.01	<0.01	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.032	0.018	0.018	0.025	0.042	0.071	0.065
Boron	mg/L	0.05	0.37	<0.05	<0.05	na	na	na	na	na
Iron	mg/L	0.05	ID	3.86	3.1	<0.05	1.98	3.29	0.85	1.95
Mercury	mg/L	0.0001	ID	<0.0001	<0.0001	na	na	na	na	na
Total Metals										
Total Iron	mg/L	0.05	ID	9.71	6.6	na	na	na	na	na
Nutrients										
Ammonia as N	mg/L	0.01	0.9	0.35	0.41	0.06	na	na	na	na
Nitrite as N	mg/L	0.01	ID	<0.01	<0.01	<0.01	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	0.16	0.12	0.11	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	0.16	0.12	0.11	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		1.7	0.8	0.3	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	1.8	0.9	0.4	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	0.33	0.11	<0.01	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	<0.01	<0.01	na	na	na	na	na
Biochemical Oxygen Demand	mg/L	2		4			na	na	na	na
Isotopes										
Oxygen-18	‰	0.01		na	na	na	na	na	na	-6.62
Deuterium	‰	0.1		na	na	na	na	na	na	-42
Carbon-13	‰	0.1		na	na	na	na	na	na	-14.8
Radiocarbon	pMC	0.1		na	na	na	na	na	na	1.18±0.05
Radiocarbon Age (uncorrected)	yrs BP	1		na	na	na	na	na	na	35580±370

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatoc ecosystems.

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ID - insufficient data to determine trigger value

na - not analysed

GW6C

Analyte	Units	LOR	ANZECC 2000 Guidelines	30/09/2009	3/12/2009	8/03/2010	15/06/2010	31/01/2011	9/05/2011	24/08/2011
Field Parameters										
Conductivity	µS/cm	1	125 - 2200*	1660	1582	1590	1566	1546	1636	1516
pH	pH units	0.01	6.5-8*	5.88	6.25	5.67	5.93	6.14	6.32	6.43
Dissolved Oxygen	%sat	0.1	85-110*	9.7	na	24.5	21.3	8.8	22.7	13
Dissolved Oxygen	mg/L	0.01		0.97	3.32	2.48	1.89	0.78	2	1.16
Temperature	oC	0.01	ID	20.28	21.6	23.15	21.44	22.03	21.37	22.22
Redox	mV	0.1	ID	47	-13	-42	6.1	33.3	-10	-4.3
Total Dissolved Solids	mg/L	1	ID	1100	na	1000	na	988	1064	986
CO ₂ Titration	mg/L	1	ID	138	na	55	116	170	80	100
Alkalinity										
Hydroxide Alkalinity as CaCO ₃	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	mg/L	1	ID	185	184	180	184	187	171	172
Total Alkalinity as CaCO ₃	mg/L	1	ID	185	184	180	184	187	171	172
Major ions										
Chloride	mg/L	0.5	ID	314	408	333	397	331	357	371
Fluoride	mg/L	0.02	ID	0.12	0.17	na	na	na	na	na
Sulfate	mg/L	0.5	ID	89.3	118	91	157	97	121	124
Silicon	mg/L	0.05	ID	na	na	5.3	na	na	na	na
Silica	mg/L	0.1	ID	na	na	11.4	na	na	na	na
Calcium	mg/L	1	ID	52	50	43	52	48	55	56
Magnesium	mg/L	1	ID	35	35	34	36	33	38	37
Sodium	mg/L	1	ID	223	219	191	240	206	209	225
Potassium	mg/L	1	ID	32	38	29	34	33	32	34
Dissolved Metals										
Aluminium	mg/L	0.01	0.055	<0.01	0.15	<0.01	0.02	<0.01	0.02	<0.01
Arsenic	mg/L	0.001	0.013 (As V)	<0.001	<0.001	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	0.054	0.058	0.044	0.044	0.049	0.044	0.045
Cadmium	mg/L	0.0001	0.0002	<0.0001	<0.0001	na	na	na	na	na
Chromium	mg/L	0.001	0.001	<0.001	<0.001	na	na	na	na	na
Cobalt	mg/L	0.001	ID	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	0.001	0.0014	<0.001	<0.001	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.001	1.9	0.325	0.33	0.257	0.269	0.263	0.259	0.267
Nickel	mg/L	0.001	0.011	0.003	<0.001	na	na	na	na	na
Selenium	mg/L	0.01	0.011	<0.01	<0.01	na	na	na	na	na
Vanadium	mg/L	0.01	ID	<0.01	<0.01	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.023	<0.005	0.007	0.005	0.099	0.01	0.023
Boron	mg/L	0.05	0.37	<0.05	<0.05	na	na	na	na	na
Iron	mg/L	0.05	ID	7.04	9.17	7.94	7.93	7.44	7.1	7.28
Mercury	mg/L	0.0001	ID	<0.0001	<0.0001	na	na	na	na	na
Total Metals										
Total Iron	mg/L	0.05	ID	9.91	10.1	na	na	na	na	na
Nutrients										
Ammonia as N	mg/L	0.01	0.9	0.34	0.34	0.32	na	na	na	na
Nitrite as N	mg/L	0.01	ID	0.01	<0.01	<0.01	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	0.08	<0.01	<0.01	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	0.09	<0.01	<0.01	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		0.4	0.5	0.6	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	0.5	0.5	0.6	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	0.07	0.06	0.1	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	<0.01	<0.01	na	na	na	na	na
Biochemical Oxygen Demand	mg/L	2		4	na	na	na	na	na	na
Isotopes										
Oxygen-18	‰	0.01		na	na	na	na	na	na	-6.75
Deuterium	‰	0.1		na	na	na	na	na	na	-43
Carbon-13	‰	0.1		na	na	na	na	na	na	-14.7
Radiocarbon	pMC	0.1		na	na	na	na	na	na	0.33±0.05
Radiocarbon Age (uncorrected)	yrs BP	1		na	na	na	na	na	na	45800±1300

Guideline values

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ID - insufficient data to determine trigger value

na - not analysed

GW6D

Analyte	Units	LOR	ANZECC 2000 Guidelines	29/09/2009	3/12/2009	8/03/2010	15/06/2010	31/01/2011	9/05/2011	24/08/2011
Field Parameters										
Conductivity	µS/cm	1	125 - 2200*	2920	1970	1810	1698	1540	1601	1446
pH	pH units	0.01	6.5-8*	6.01	6.59	6.98	6.31	6.51	6.64	6.97
Dissolved Oxygen	%sat	0.1	85-110*	34.1	na	51.6	13.5	9.2	23.6	9.2
Dissolved Oxygen	mg/L	0.01		3.3	4.5	4.5	1.2	0.73	2	0.76
Temperature	oC	0.01	ID	21.7	23.7	23.8	21.45	25.32	23.54	25.16
Redox	mV	0.1	ID	57	13	-25	7.3	29.5	-25.1	-21.6
Total Dissolved Solids	mg/L	1	ID	1900	na	1100	na	1001	1041	940
CO ₂ Titration	mg/L	1	ID	138	na	95	149	200	130	>200
Alkalinity										
Hydroxide Alkalinity as CaCO ₃	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	mg/L	1	ID	<1	23	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	mg/L	1	ID	229	381	472	520	504	484	501
Total Alkalinity as CaCO ₃	mg/L	1	ID	229	404	472	520	504	484	501
Major ions										
Chloride	mg/L	0.5	ID	771	400	300	267	211	220	224
Fluoride	mg/L	0.02	ID	0.14	0.28	na	na	na	na	na
Sulfate	mg/L	0.5	ID	104	42	20.8	23	8	7	4
Silicon	mg/L	0.05	ID	na	na	7.14	na	na	na	na
Silica	mg/L	0.1	ID	na	na	15.3	na	na	na	na
Calcium	mg/L	1	ID	75	50	41	46	39	43	42
Magnesium	mg/L	1	ID	66	39	35	34	28	30	29
Sodium	mg/L	1	ID	418	312	282	322	266	262	275
Potassium	mg/L	1	ID	24	31	26	33	36	34	36
Dissolved Metals										
Aluminium	mg/L	0.01	0.055	<0.01	0.1	<0.01	<0.01	0.03	0.04	0.07
Arsenic	mg/L	0.001	0.013 (As V)	0.004	0.002	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	0.29	0.284	0.248	0.328	0.448	0.442	0.508
Cadmium	mg/L	0.0001	0.0002	<0.0001	<0.0001	na	na	na	na	na
Chromium	mg/L	0.001	0.001	<0.001	<0.001	na	na	na	na	na
Cobalt	mg/L	0.001	ID	0.006	0.002	0.002	0.004	0.004	0.005	0.004
Copper	mg/L	0.001	0.0014	0.011	<0.001	na	na	na	na	na
Lead	mg/L	0.001	0.0034	0.001	<0.001	<0.001	0.015	<0.001	<0.001	<0.001
Manganese	mg/L	0.001	1.9	0.562	0.329	0.335	0.568	0.665	0.801	0.839
Nickel	mg/L	0.001	0.011	0.017	0.007	na	na	na	na	na
Selenium	mg/L	0.01	0.011	<0.01	<0.01	na	na	na	na	na
Vanadium	mg/L	0.01	ID	<0.01	<0.01	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.082	0.005	0.022	0.011	0.03	0.03	0.014
Boron	mg/L	0.05	0.37	<0.05	<0.05	na	na	na	na	na
Iron	mg/L	0.05	ID	2.52	0.4	0.38	0.38	0.94	1.3	2.01
Mercury	mg/L	0.0001	ID	<0.0001	<0.0001	na	na	na	na	na
Total Metals										
Total Iron	mg/L	0.05	ID	3.12	0.43	na	na	na	na	na
Nutrients										
Ammonia as N	mg/L	0.01	0.9	0.24	0.47	0.4	na	na	na	na
Nitrite as N	mg/L	0.01	ID	<0.01	<0.01	<0.01	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	0.08	0.03	0.03	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	0.08	0.03	0.03	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		1	0.6	0.6	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	1.1	0.6	0.6	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	0.02	0.01	<0.01	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	<0.01	<0.01		na	na	na	na
Biochemical Oxygen Demand	mg/L	2		3	na	na	na	na	na	na
Isotopes										
Oxygen-18	‰	0.01		na	na	na	na	na	na	-7.18
Deuterium	‰	0.1		na	na	na	na	na	na	-43.9
Carbon-13	‰	0.1		na	na	na	na	na	na	-9.6
Radiocarbon	pMC	0.1		na	na	na	na	na	na	0.48±0.05
Radiocarbon Age (uncorrected)	yrs BP	1		na	na	na	na	na	na	42770±870

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatoc ecosystems.

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ID - insufficient data to determine trigger value

na - not analysed

GW7TPB

GW7TPB												Pump test	Pump test	Pump test
Analyte	Units	LOR	ANZECC 2000	2/10/2009	16/10/2009	3/12/2009	16/03/2010	21/06/2010	1/02/2011	10/05/2011	26/08/2011	25/11/2011	7/12/2011	15/12/2011
Field Parameters														
Conductivity	µS/cm	1	125 - 2200*	952	na	720	960	961	960	1020	982	1184	899	na
pH	pH units	0.01	6.5-8*	6.02	na	6.58	7.5	6.65	6.58	6.78	6.24	6.59	6.03	na
Dissolved Oxygen	%sat	0.1	85-110*	26.6	na	na	na	40.9	13.6	21.1	7.8	158.1	na	na
Dissolved Oxygen	mg/L	0.01		2.28	na	2.36	2.29	4.02	1.2	2.02	0.79	na	4.68	na
Temperature	oC	0.01	ID	25.98	na	22.6	19.44	17.02	20.65	17.44	15.38	19.91	nd	na
Redox	mV	0.1	ID	-61	na	-114	-106	-112.2	-114.2	-109.3	-102.4	-71.6	-59	na
Total Dissolved Solids	mg/L	1	ID	600	na	na	600	na	625	663	639	na	na	na
CO ₂ Titration	mg/L	1	ID	151	na	200	20	190	170	200	>200	na	na	na
Alkalinity														
Hydroxide Alkalinity as CaCO3	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	1	ID	258	202	228	234	260	255	263	276	221	206	202
Total Alkalinity as CaCO3	mg/L	1	ID	258	202	228	234	260	255	263	276	221	206	202
Major ions														
Chloride	mg/L	0.5	ID	91.7	111	98.2	99.6	88.3	97	104	126	123	126	126
Fluoride	mg/L	0.02	ID	0.27	0.24	<0.02	na	na	na	na	na	na	na	na
Sulfate	mg/L	0.5	ID	9.19	22.6	0.91	0.81	<0.50	<1	<1	30	74	49	37
Silicon	mg/L	0.05	ID	na	na	na	3.65	na	na	na	na	na	na	na
Silica	mg/L	0.1	ID	na	na	na	7.8	na	na	na	na	na	na	na
Calcium	mg/L	1	ID	17	13	13	14	16	15	17	22	17	12	16
Magnesium	mg/L	1	ID	15	14	14	14	15	15	17	21	19	14	15
Sodium	mg/L	1	ID	102	99	96	112	105	113	111	131	133	132	116
Potassium	mg/L	1	ID	44	42	44	40	39	49	45	48	50	57	44
Dissolved Metals														
Aluminium	mg/L	0.01	0.055	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.07	<0.01	<0.01	0.03	0.02
Arsenic	mg/L	0.001	0.013 (As V)	<0.001	<0.001	<0.001	na	na	na	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	0.189	0.082	0.205	0.195	0.178	0.217	0.217	0.217	<0.001	0.209	0.205
Cadmium	mg/L	0.0001	0.0002	<0.0001	<0.0001	<0.0001	na	na	na	na	na	na	na	na
Chromium	mg/L	0.001	0.001	<0.005	<0.001	<0.001	na	na	na	na	na	na	na	na
Cobalt	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.004	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	0.001	0.0014	<0.001	<0.001	<0.001	na	na	na	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.001	1.9	0.655	0.079	0.857	0.776	0.853	0.642	0.608	0.671	0.378	0.254	0.341
Nickel	mg/L	0.001	0.011	0.027	<0.001	0.001	na	na	na	na	na	na	na	na
Selenium	mg/L	0.01	0.011	<0.01	<0.01	<0.01	na	na	na	na	na	na	na	na
Vanadium	mg/L	0.01	ID	<0.01	<0.01	<0.01	na	na	na	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.035	0.01	<0.005	<0.005	0.015	0.006	0.011	0.033	0.047	0.024	0.035
Boron	mg/L	0.05	0.37	<0.05	<0.05	<0.05	na	na	na	na	na	na	na	na
Iron	mg/L	0.05	ID	59.7	3.03	91.1	83.4	76.5	68.8	61.8	67.9	17.5	10.6	0.16
Mercury	mg/L	0.0001	ID	<0.0001	<0.0001	<0.0001	na	na	na	na	na	na	na	na
Total Metals														
Total Iron	mg/L	0.05	ID	66.8	3.37	97.1	na	na	na	na	na	na	na	na
Nutrients														
Ammonia as N	mg/L	0.01	0.9	0.55	0.41	0.16	0.65	na	na	na	na	na	na	na
Nitrite as N	mg/L	0.01	ID	0.03	<0.01	<0.01	0.01	na	na	na	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	<0.01	<0.01	0.01	<0.01	na	na	na	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	<0.01	<0.01	0.01	<0.01	na	na	na	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		1	0.5	0.2	1	na	na	na	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	1	0.5	0.2	1	na	na	na	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	<0.01	<0.01	0.11	<0.01	na	na	na	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	<0.01	<0.01	0.08	na	na	na	na	na	na	na	na
Biochemical Oxygen Demand	mg/L	2		5	na	na	na	na	na	na	na	na	na	na
Isotopes														
Oxygen-18	‰	0.01		na	na	na	na	na	na	na	na	-6.45	-6.5	-6.39
Deuterium	‰	0.1		na	na	na	na	na	na	na	na	-40.4	-40.79	-40.16
Carbon-13	‰	0.1		na	na	na	na	na	na	na	na	-11.5	-12.9	-13.3
Radiocarbon	pMC	0.1		na	na	na	na	na	na	na	na	0.58±0.05	0.69±0.05	2.46±0.05
Radiocarbon Age (uncorrected)	ys BP	1		na	na	na	na	na	na	na	na	41320±740	39880±610	29700±180

Guideline values

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ID - insufficient data to determine trigger value

na - not analysed

GW7A											Pump test
Analyte	Units	LOR	ANZECC 2000 Guidelines	1/10/2009	2/12/2009	16/03/2010	21/06/2010	1/02/2011	10/05/2011	25/08/2011	25/11/2011
Field Parameters											
Conductivity	µS/cm	1	125 - 2200*	4870	4530	4700	4538	4395	4193	4110	4125
pH	pH units	0.01	6.5-8*	6.63	6.75	7.75	6.44	6.44	6.44	6.64	6.62
Dissolved Oxygen	%sat	0.1	85-110*	32.5	na	16.2	28.4	6.4	10.2	14.6	96
Dissolved Oxygen	mg/L	0.01		2.88	4.65	1.55	2.4	0.58	0.93	1.4	na
Temperature	oC	0.01	ID	19.38	18	19.45	19.16	19.52	19.31	17.39	17.47
Redox	mV	0.1	ID	47	33	-27	14.7	4.1	-22.1	12.3	-25.2
Total Dissolved Solids	mg/L	1	ID	3100	na	3000	na	2857	3058	2671	na
CO ₂ Titration	mg/L	1	ID	85	140	na	na	85	85	70	na
Alkalinity											
Hydroxide Alkalinity as CaCO ₃	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1	na
Carbonate Alkalinity as CaCO ₃	mg/L	1	ID	<1	29	<1	<1	<1	<1	<1	na
Bicarbonate Alkalinity as CaCO ₃	mg/L	1	ID	378	314	342	357	311	292	292	na
Total Alkalinity as CaCO ₃	mg/L	1	ID	378	343	342	357	311	292	292	na
Major ions											
Chloride	mg/L	0.5	ID	1220	1300	1390	1180	1300	1300	1250	1330
Fluoride	mg/L	0.02	ID	0.26	0.36	na	na	na	na	na	na
Sulfate	mg/L	0.5	ID	97	94.8	132	88.4	118	128	120	124
Silicon	mg/L	0.05	ID	na	na	6.34	na	na	na	na	na
Silica	mg/L	0.1	ID	na	na	13.6	na	na	na	na	na
Calcium	mg/L	1	ID	68	64	56	63	56	61	58	52
Magnesium	mg/L	1	ID	103	113	105	103	106	113	108	107
Sodium	mg/L	1	ID	914	813	969	797	800	754	851	841
Potassium	mg/L	1	ID	2	2	2	2	2	2	2	3
Dissolved Metals											
Aluminium	mg/L	0.01	0.055	<0.01	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	3.6
Arsenic	mg/L	0.001	0.013 (As V)	<0.001	<0.001	na	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	0.07	0.063	0.065	0.052	0.054	0.053	0.049	0.083
Cadmium	mg/L	0.0001	0.0002	<0.0001	0.0002	na	na	na	na	na	na
Chromium	mg/L	0.001	0.001	<0.001	<0.001	na	na	na	na	na	na
Cobalt	mg/L	0.001	ID	0.002	<0.001	0.008	0.001	0.006	0.007	0.002	0.006
Copper	mg/L	0.001	0.0014	0.002	0.008	na	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.006
Manganese	mg/L	0.001	1.9	0.266	0.096	0.751	0.332	0.464	0.637	0.36	0.398
Nickel	mg/L	0.001	0.011	0.012	0.003	na	na	na	na	na	na
Selenium	mg/L	0.01	0.011	<0.01	<0.01	na	na	na	na	na	na
Vanadium	mg/L	0.01	ID	<0.01	<0.01	na	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.028	<0.005	0.021	0.015	0.023	0.022	0.02	0.023
Boron	mg/L	0.05	0.37	0.07	0.06	na	na	na	na	na	na
Iron	mg/L	0.05	ID	<0.05	0.13	0.77	<0.05	0.39	0.59	0.06	1.48
Mercury	mg/L	0.0001	ID	<0.0001	<0.0001	na	na	na	na	na	na
Total Metals											
Total Iron	mg/L	0.05	ID	0.69	0.26	na	na	na	na	na	na
Nutrients											
Ammonia as N	mg/L	0.01	0.9	0.05	0.04	0.01	na	na	na	na	na
Nitrite as N	mg/L	0.01	ID	<0.01	<0.01	<0.01	na	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	0.01	0.02	0.01	na	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	0.01	0.02	0.01	na	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		0.2	0.2	0.5	na	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	0.2	0.2	0.5	na	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	0.02	0.05	<0.01	na	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	0.01	0.01	na	na	na	na	na	na
Biochemical Oxygen Demand	mg/L	2		3	na	na	na	na	na	na	na
Isotopes											
Oxygen-18	‰	0.01		na	na	na	na	na	na	-5.54	na
Deuterium	‰	0.1		na	na	na	na	na	na	-35.8	na
Carbon-13	‰	0.1		na	na	na	na	na	na	-12.3	na
Radiocarbon	pMC	0.1		na	na	na	na	na	na	87.58±0.17	na
Radiocarbon Age (uncorrected)	yrs BP	1		na	na	na	na	na	na	1006±15	na

Guideline values

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na - not analysed

GW7B											Pump test
Analyte	Units	LOR	ANZECC 2000 Guidelines	1/10/2009	3/12/2009	12/03/2010	21/06/2010	1/02/2011	10/05/2011	25/08/2011	25/11/2011
Field Parameters											
Conductivity	µS/cm	1	125 - 2200*	992	832	845	819	881	938	734	797
pH	pH units	0.01	6.5-8*	6.02	6.07	8.16	5.97	6.29	6.69	6.03	5.86
Dissolved Oxygen	%sat	0.1	85-110*	29.9	na	44	13.8	24.7	32.4	13.8	17
Dissolved Oxygen	mg/L	0.01		2.66	1.95	4	1.2	1.98	3.14	1.24	na
Temperature	oC	0.01	ID	21.94	21	21.17	20.38	22.75	17.59	20.48	21.69
Redox	mV	0.1	ID	-36	3	-59	18.7	-63	-94.6	8.9	7.6
Total Dissolved Solids	mg/L	1	ID	600	na	500	na	572	610	477	na
CO ₂ Titration	mg/L	1	ID	158	188	135	140	190	160	120	na
Alkalinity											
Hydroxide Alkalinity as CaCO ₃	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	mg/L	1	ID	144	131	137	127	137	161	108	106
Total Alkalinity as CaCO ₃	mg/L	1	ID	144	131	137	127	137	161	108	106
Major ions											
Chloride	mg/L	0.5	ID	151	160	168	154	147	163	173	176
Fluoride	mg/L	0.02	ID	0.13	0.17	na	na	na	na	na	na
Sulfate	mg/L	0.5	ID	24.6	23.7	29.6	23.5	23	16	31	32
Silicon	mg/L	0.05	ID	na	na	5.33	na	na	na	na	na
Silica	mg/L	0.1	ID	na	na	11.4	na	na	na	na	na
Calcium	mg/L	1	ID	19	14	16	15	13	14	15	13
Magnesium	mg/L	1	ID	18	18	19	18	17	17	18	18
Sodium	mg/L	1	ID	102	104	119	105	107	91	107	110
Potassium	mg/L	1	ID	29	31	30	28	34	28	34	33
Dissolved Metals											
Aluminium	mg/L	0.01	0.055	<0.01	2.18	0.02	0.3	<0.01	<0.01	1.3	0.17
Arsenic	mg/L	0.001	0.013 (As V)	<0.001	<0.001	na	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	0.092	0.102	0.093	0.093	0.103	0.095	0.106	0.117
Cadmium	mg/L	0.0001	0.0002	<0.0001	<0.0001	na	na	na	na	na	na
Chromium	mg/L	0.001	0.001	<0.001	0.001	na	na	na	na	na	na
Cobalt	mg/L	0.001	ID	0.003	0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	0.001	0.0014	<0.001	0.002	na	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.001	1.9	0.74	0.382	0.335	0.352	0.531	0.641	0.298	0.354
Nickel	mg/L	0.001	0.011	0.022	0.001	na	na	na	na	na	na
Selenium	mg/L	0.01	0.011	<0.01	<0.01	na	na	na	na	na	na
Vanadium	mg/L	0.01	ID	<0.01	<0.01	na	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.223	<0.005	0.039	0.008	0.008	0.008	<0.005	0.042
Boron	mg/L	0.05	0.37	<0.05	<0.05	na	na	na	na	na	na
Iron	mg/L	0.05	ID	33.9	11.2	10.6	12.1	33.7	49	10.3	11
Mercury	mg/L	0.0001	ID	<0.0001	<0.0001	na	na	na	na	na	na
Total Metals											
Total Iron	mg/L	0.05	ID	40.1	12.6	na	na	na	na	na	na
Nutrients											
Ammonia as N	mg/L	0.01	0.9	0.45	0.35	0.27	na	na	na	na	na
Nitrite as N	mg/L	0.01	ID	<0.01	<0.01	<0.01	na	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	0.08	0.09	<0.01	na	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	0.08	0.09	<0.01	na	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		1.5	0.6	1.4	na	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	1.6	0.6	1.4	na	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	<0.01	0.05	<0.01	na	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	<0.01	<0.01	na	na	na	na	na	na
Biochemical Oxygen Demand	mg/L	2		6	na	na	na	na	na	na	na
Isotopes											
Oxygen-18	‰	0.01		na	na	na	na	na	na	-6.48	na
Deuterium	‰	0.1		na	na	na	na	na	na	-42	na
Carbon-13	‰	0.1		na	na	na	na	na	na	-15.4	na
Radiocarbon	pMC	0.1		na	na	na	na	na	na	0.24±0.05	na
Radiocarbon Age (uncorrected)	yrs BP	1		na	na	na	na	na	na	48500±1800	na

Guideline values

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na - not analysed

GW7C											Pump test
Analyte	Units	LOR	ANZECC 2000 Guidelines	1/10/2009	3/12/2009	12/03/2010	21/06/2010	1/02/2011	10/05/2011	25/08/2011	25/11/2011
Field Parameters											
Conductivity	µS/cm	1	125 - 2200*	802	798	858	791	855	813	710	780
pH	pH units	0.01	6.5-8*	6.02	6.25	8.21	6.23	6.4	6.39	6.2	6.12
Dissolved Oxygen	%sat	0.1	85-110*	25.6	na	30	20.1	22.8	22.5	11.7	32
Dissolved Oxygen	mg/L	0.01		2.02	2.48	2.89	1.6	1.94	2	1.04	na
Temperature	oC	0.01	ID	22.3	21.8	19.61	21.26	23.41	21.25	21.18	22.28
Redox	mV	0.1	ID	20	-11	-95	0.8	-62.6	-14.7	-13	-19.5
Total Dissolved Solids	mg/L	1	ID	500	na	600	na	556	528	461	na
CO ₂ Titration	mg/L	1	ID	154	131	120	59	>200	95	>200	na
Alkalinity											
Hydroxide Alkalinity as CaCO ₃	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	mg/L	1	ID	<1	7	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	mg/L	1	ID	228	189	190	189	172	183	169	160
Total Alkalinity as CaCO ₃	mg/L	1	ID	228	196	190	189	172	183	169	160
Major ions											
Chloride	mg/L	0.5	ID	113	122	145	120	142	118	135	131
Fluoride	mg/L	0.02	ID	0.14	0.2	na	na	na	na	na	na
Sulfate	mg/L	0.5	ID	13.6	15.1	30.3	16	21	20	23	23
Silicon	mg/L	0.05	ID	na	na	0.92	na	na	na	na	na
Silica	mg/L	0.1	ID	na	na	2	na	na	na	na	na
Calcium	mg/L	1	ID	14	14	18	14	12	13	14	9
Magnesium	mg/L	1	ID	14	15	16	13	13	14	15	12
Sodium	mg/L	1	ID	105	110	129	108	126	109	123	111
Potassium	mg/L	1	ID	34	36	32	31	37	32	37	36
Dissolved Metals											
Aluminium	mg/L	0.01	0.055	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	0.04
Arsenic	mg/L	0.001	0.013 (As V)	<0.001	<0.001	na	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	0.096	0.111	0.085	0.097	0.08	0.094	0.082	0.039
Cadmium	mg/L	0.0001	0.0002	<0.0001	<0.0001	na	na	na	na	na	na
Chromium	mg/L	0.001	0.001	<0.001	<0.001	na	na	na	na	na	na
Cobalt	mg/L	0.001	ID	0.001	0.002	0.009	0.003	0.004	0.002	0.002	<0.001
Copper	mg/L	0.001	0.0014	<0.001	<0.001	na	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.001	1.9	0.262	0.366	0.654	0.447	0.617	0.393	0.321	0.116
Nickel	mg/L	0.001	0.011	0.002	0.001	na	na	na	na	na	na
Selenium	mg/L	0.01	0.011	<0.01	<0.01	na	na	na	na	na	na
Vanadium	mg/L	0.01	ID	<0.01	<0.01	na	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.017	<0.005	0.011	<0.005	<0.005	<0.005	<0.005	0.007
Boron	mg/L	0.05	0.37	<0.05	<0.05	na	na	na	na	na	na
Iron	mg/L	0.05	ID	6.04	7.08	3.82	6.9	24.5	9.44	7.97	2.58
Mercury	mg/L	0.0001	ID	<0.0001	<0.0001	na	na	na	na	na	na
Total Metals											
Total Iron	mg/L	0.05	ID	6.66	7.02	na	na	na	na	na	na
Nutrients											
Ammonia as N	mg/L	0.01	0.9	0.38	0.49	0.55	na	na	na	na	na
Nitrite as N	mg/L	0.01	ID	<0.01	<0.01	<0.01	na	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	0.03	<0.01	<0.01	na	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	0.03	<0.01	<0.01	na	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		0.7	0.5	0.8	na	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	0.8	0.5	0.8	na	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	0.05	0.02	<0.01	na	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	0.02	<0.01	na	na	na	na	na	na
Biochemical Oxygen Demand	mg/L	2		3	na	na	na	na	na	na	na
Isotopes											
Oxygen-18	‰	0.01		na	na	na	na	na	na	-6.46	na
Deuterium	‰	0.1		na	na	na	na	na	na	-41.7	na
Carbon-13	‰	0.1		na	na	na	na	na	na	-14.7	na
Radiocarbon	pMC	0.1		na	na	na	na	na	na	0.23±0.05	na
Radiocarbon Age (uncorrected)	yrs BP	1		na	na	na	na	na	na	48700±1800	na

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatoc ecosystems.

*ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatoc ecosystems, South-East Australia, low lying river ecosystems

ID - insufficient data to determine trigger value

na - not analysed

GW7D											Pump test
Analyte	Units	LOR	ANZECC 2000 Guidelines	30/09/2009	2/12/2009	12/03/2010	21/06/2010	1/02/2011	10/05/2011	25/08/2011	25/11/2011
Field Parameters											
Conductivity	µS/cm	1	125 - 2200*	779	802	855	775	775	847	737	779
pH	pH units	0.01	6.5-8*	6.23	6.4	8.89	6.58	6.39	6.66	6.48	6.37
Dissolved Oxygen	%sat	0.1	85-110*	30.4	na	91	59.9	11.3	31.7	11.5	89.1
Dissolved Oxygen	mg/L	0.01		3.01	5.1	11.7	5.72	1.01	2.91	0.97	na
Temperature	oC	0.01	ID	20.34	22.6	19.95	17.36	21.39	19.95	18.82	20.24
Redox	mV	0.1	ID	8	-38	-99	-69.3	-60.4	-86	-90.1	-84.2
Total Dissolved Solids	mg/L	1	ID	500	na	600	na	500	551	479	na
CO ₂ Titration	mg/L	1	ID	111	100	65	59	>150	140	170	na
Alkalinity											
Hydroxide Alkalinity as CaCO ₃	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	mg/L	1	ID	<1	13	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	mg/L	1	ID	218	206	228	225	214	211	207	196
Total Alkalinity as CaCO ₃	mg/L	1	ID	218	219	228	225	214	211	207	196
Major ions											
Chloride	mg/L	0.5	ID	98	105	107	90.9	95	90	107	105
Fluoride	mg/L	0.02	ID	0.14	0.22	na	na	na	na	na	na
Sulfate	mg/L	0.5	ID	10.8	11.5	8.94	8.6	10	7	8	7
Silicon	mg/L	0.05	ID	na	na	6.03	na	na	na	na	na
Silica	mg/L	0.1	ID	na	na	12.9	na	na	na	na	na
Calcium	mg/L	1	ID	16	15	16	15	14	14	16	10
Magnesium	mg/L	1	ID	14	15	15	14	14	14	15	12
Sodium	mg/L	1	ID	99	99	115	95	100	90	102	97
Potassium	mg/L	1	ID	43	44	40	39	44	40	43	43
Dissolved Metals											
Aluminium	mg/L	0.01	0.055	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01
Arsenic	mg/L	0.001	0.013 (As V)	<0.001	<0.001	na	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	0.186	0.194	0.154	0.182	0.193	0.188	0.198	0.119
Cadmium	mg/L	0.0001	0.0002	<0.0001	<0.0001	na	na	na	na	na	na
Chromium	mg/L	0.001	0.001	<0.001	<0.001	na	na	na	na	na	na
Cobalt	mg/L	0.001	ID	<0.001	<0.001	0.002	0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	0.001	0.0014	<0.001	<0.001	na	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.001	1.9	0.168	0.167	0.49	0.314	0.36	0.371	0.33	0.328
Nickel	mg/L	0.001	0.011	0.002	<0.001	na	na	na	na	na	na
Selenium	mg/L	0.01	0.011	<0.01	<0.01	na	na	na	na	na	na
Vanadium	mg/L	0.01	ID	<0.01	<0.01	na	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.022	0.012	0.08	<0.005	0.018	0.007	<0.005	0.011
Boron	mg/L	0.05	0.37	<0.05	<0.05	na	na	na	na	na	na
Iron	mg/L	0.05	ID	4.51	4.48	18.5	10.7	19.5	25.6	27	0.4
Mercury	mg/L	0.0001	ID	<0.0001	<0.0001	na	na	na	na	na	na
Total Metals											
Total Iron	mg/L	0.05	ID	4.95	5.08	na	na	na	na	na	na
Nutrients											
Ammonia as N	mg/L	0.01	0.9	0.2	0.28	0.31	na	na	na	na	na
Nitrite as N	mg/L	0.01	ID	<0.01	<0.01	<0.01	na	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	0.45	<0.01	0.02	na	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	0.45	<0.01	0.02	na	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		0.7	0.4	1.2	na	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	1.1	0.4	1.2	na	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	0.04	<0.01	<0.01	na	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	<0.01	<0.01	na	na	na	na	na	na
Biochemical Oxygen Demand	mg/L	2		3	na	na	na	na	na	na	na
Isotopes											
Oxygen-18	‰	0.01		na	na	na	na	na	na	-6.45	na
Deuterium	‰	0.1		na	na	na	na	na	na	-42.3	na
Carbon-13	‰	0.1		na	na	na	na	na	na	-13.4	na
Radiocarbon	pMC	0.1		na	na	na	na	na	na	0.87±0.05	na
Radiocarbon Age (uncorrected)	yrs BP	1		na	na	na	na	na	na	38020±490	na

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatoc ecosystems.

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ID - insufficient data to determine trigger value

na - not analysed

GW7E

Pump test

Analyte	Units	LOR	ANZECC 2000 Guidelines	30/09/2009	2/12/2009	12/03/2010	21/06/2010	1/02/2011	10/05/2011	25/08/2011	25/11/2011
Field Parameters											
Conductivity	µS/cm	1	125 - 2200*	822	813	899	890	761	908	784	761
pH	pH units	0.01	6.5-8*	6.34	6.55	8.2	6.6	6.5	6.64	6.72	6.68
Dissolved Oxygen	%sat	0.1	85-110*	51.7	na	28.8	42.8	22.4	41.1	10.9	140
Dissolved Oxygen	mg/L	0.01		4.34	5.75	1.99	3.9	1.75	3.41	0.93	na
Temperature	oC	0.01	ID	19.34	20.9	23.5	19.16	27.9	24.86	24.46	20.68
Redox	mV	0.1	ID	-7	-42	-105	-100.3	-81	-108.7	-121	-99.3
Total Dissolved Solids	mg/L	1	ID	500	na	600	na	494	590	510	na
CO ₂ Titration	mg/L	1	ID	112	130	130	160	150	170	125	na
Alkalinity											
Hydroxide Alkalinity as CaCO3	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	1	ID	<1	14	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	1	ID	259	222	248	237	229	231	214	201
Total Alkalinity as CaCO3	mg/L	1	ID	259	236	248	237	229	231	214	201
Major ions											
Chloride	mg/L	0.5	ID	103	102	98.8	91.1	90	94	98	98
Fluoride	mg/L	0.02	ID	0.15	0.22						
Sulfate	mg/L	0.5	ID	15.8	16.2	3.76	1.43	4	<1	<1	<1
Silicon	mg/L	0.05	ID	na	na	6.73	na	na	na	na	na
Silica	mg/L	0.1	ID	na	na	14.4	na	na	na	na	na
Calcium	mg/L	1	ID	15	13	14	13	9	10	12	7
Magnesium	mg/L	1	ID	11	10	10	9	8	8	9	7
Sodium	mg/L	1	ID	124	122	132	116	124	123	110	111
Potassium	mg/L	1	ID	37	36	34	33	38	36	38	40
Dissolved Metals											
Aluminium	mg/L	0.01	0.055	<0.01	<0.01	0.01	0.01	<0.01	<0.01	0.02	0.08
Arsenic	mg/L	0.001	0.013 (As V)	<0.001	<0.001	na	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	0.204	0.146	0.115	0.107	0.098	0.095	0.093	0.101
Cadmium	mg/L	0.0001	0.0002	<0.0001	<0.0001	na	na	na	na	na	na
Chromium	mg/L	0.001	0.001	<0.001	<0.001	na	na	na	na	na	na
Cobalt	mg/L	0.001	ID	0.001	0.003	0.003	0.001	0.002	<0.001	0.001	0.001
Copper	mg/L	0.001	0.0014	<0.001	<0.001	na	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001
Manganese	mg/L	0.001	1.9	0.218	0.438	0.634	1.04	0.612	0.969	1.23	0.906
Nickel	mg/L	0.001	0.011	0.006	0.007	na	na	na	na	na	na
Selenium	mg/L	0.01	0.011	<0.01	<0.01	na	na	na	na	na	na
Vanadium	mg/L	0.01	ID	<0.01	<0.01	na	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.021	<0.005	0.03	<0.005	<0.005	<0.005	<0.005	0.152
Boron	mg/L	0.05	0.37	<0.05	<0.05	na	na	na	na	na	na
Iron	mg/L	0.05	ID	6.07	9.12	36.9	58.9	23.1	47.5	55.8	38
Mercury	mg/L	0.0001	ID	<0.0001	<0.0001	na	na	na	na	na	na
Total Metals											
Total Iron	mg/L	0.05	ID	6.75	10.2	na	na	na	na	na	na
Nutrients											
Ammonia as N	mg/L	0.01	0.9	0.53	0.35	0.1	na	na	na	na	na
Nitrite as N	mg/L	0.01	ID	<0.01	<0.01	<0.01	na	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	0.26	<0.01	0.02	na	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	0.26	<0.01	0.02	na	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		0.6	1.7	0.6	na	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	0.9	1.7	0.6	na	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	0.03	1.39	0.04	na	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	<0.01	<0.01	na	na	na	na	na	na
Biochemical Oxygen Demand	mg/L	2		3	na	na	na	na	na	na	na
Isotopes											
Oxygen-18	‰	0.01		na	na	na	na	na	na	-6.58	na
Deuterium	‰	0.1		na	na	na	na	na	na	-43.7	na
Carbon-13	‰	0.1		na	na	na	na	na	na	-10.2	na
Radiocarbon	pMC	0.1		na	na	na	na	na	na	0.66±0.05	na
Radiocarbon Age (uncorrected)	yrs BP	1		na	na	na	na	na	na	40320±650	na

Guideline values

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ID - insufficient data to determine trigger value

na - not analysed

GW8A

Analyte	Units	LOR	ANZECC 2000 Guidelines	1/10/2009	1/12/2009	18/03/2010	16/06/2010	2/02/2011	10/05/2011	23/08/2011
Field Parameters										
Conductivity	µS/cm	1	125 - 2200*	1850	1914	2930	2865	2066	2191	2320
pH	pH units	0.01	6.5-8*	6.96	6.96	7.48	7.07	7.01	7.13	6.81
Dissolved Oxygen	%sat	0.1	85-110*	66.2	na	72.5	49.7	18.1	29	14.5
Dissolved Oxygen	mg/L	0.01		6.11	7.24	6.7	4.6	1.63	2.73	1.44
Temperature	oC	0.01	ID	17.68	17.8	20.6	18.8	20.19	18.16	16.64
Redox	mV	0.1	ID	119	-57	-75	-71.7	-75.7	-60.1	-41.4
Total Dissolved Solids	mg/L	1	ID	1200	na	1900	na	1343	1424	na
CO ₂ Titration	mg/L	1	ID	13	26	na	35	18	15	40
Alkalinity										
Hydroxide Alkalinity as CaCO3	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	1	ID	<1	14	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	1	ID	256	251	231	240	220	218	229
Total Alkalinity as CaCO3	mg/L	1	ID	256	265	231	240	220	218	229
Major ions										
Chloride	mg/L	0.5	ID	400	475	801	797	538	561	675
Fluoride	mg/L	0.02	ID	0.14	0.19	na	na	na	na	na
Sulfate	mg/L	0.5	ID	45.2	36.3	79.1	84.1	80	77	82
Silicon	mg/L	0.05	ID	na	na	9.3	na	na	na	na
Silica	mg/L	0.1	ID	na	na	19.9	na	na	na	na
Calcium	mg/L	1	ID	54	50	70	91	58	62	75
Magnesium	mg/L	1	ID	56	63	86	104	64	63	77
Sodium	mg/L	1	ID	241	230	436	402	313	282	337
Potassium	mg/L	1	ID	13	13	19	19	18	16	18
Dissolved Metals										
Aluminium	mg/L	0.01	0.055	<0.01	<0.01	<0.01	<0.01	<0.01	0.1	<0.01
Arsenic	mg/L	0.001	0.013 (As V)	<0.001	0.001	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	0.138	0.353	0.248	0.478	0.256	0.161	0.186
Cadmium	mg/L	0.0001	0.0002	<0.0001	<0.0001	na	na	na	na	na
Chromium	mg/L	0.001	0.001	<0.001	<0.001	na	na	na	na	na
Cobalt	mg/L	0.001	ID	0.007	0.028	0.008	0.015	0.007	0.004	0.005
Copper	mg/L	0.001	0.0014	<0.001	<0.001	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.001	1.9	1.11	5.7	1.69	3.2	1.87	0.941	1.08
Nickel	mg/L	0.001	0.011	0.007	0.008	na	na	na	na	na
Selenium	mg/L	0.01	0.011	<0.01	<0.01	na	na	na	na	na
Vanadium	mg/L	0.01	ID	<0.01	<0.01	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.051	0.018	0.019	0.009	0.021	<0.005	0.029
Boron	mg/L	0.05	0.37	<0.05	<0.05	na	na	na	na	na
Iron	mg/L	0.05	ID	<0.05	2.65	1.33	1	1.88	0.66	0.73
Mercury	mg/L	0.0001	ID	<0.0001	<0.0001	na	na	na	na	na
Total Metals										
Total Iron	mg/L	0.05	ID	109	99.7	na	na	na	na	na
Nutrients										
Ammonia as N	mg/L	0.01	0.9	0.06	0.03	0.14	na	na	na	na
Nitrite as N	mg/L	0.01	ID	<0.01	<0.01	<0.01	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	0.03	0.04	0.25	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	0.03	0.04	0.25	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		1.5	0.9	1	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	1.5	1	1.2	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	1.48	0.95	0.14	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	0.04	<0.01	na	na	na	na	na
Biochemical Oxygen Demand	mg/L	2		14	na	na	na	na	na	na
Isotopes										
Oxygen-18	‰	0.01		na	na	na	na	na	na	-2
Deuterium	‰	0.1		na	na	na	na	na	na	-13.5
Carbon-13	‰	0.1		na	na	na	na	na	na	na
Radiocarbon	pMC	0.1		na	na	na	na	na	na	na
Radiocarbon Age (uncorrected)	yrs BP	1		na	na	na	na	na	na	na

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatoc ecosystems.

*ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatoc ecosystems, South-East Australia, low lying river ecosystems

ID - insufficient data to determine trigger value

na - not analysed

GW8B

Analyte	Units	LOR	ANZECC 2000 Guidelines	1/10/2009	1/12/2009	18/03/2010	16/06/2010	2/02/2011	10/05/2011	23/08/2011
Field Parameters										
Conductivity	µS/cm	1	125 - 2200*	2310	2280	1770	2065	827	1333	1604
pH	pH units	0.01	6.5-8*	6.7	6.81	7.55	6.37	6.62	6.62	6.32
Dissolved Oxygen	%sat	0.1	85-110*	46	na	18.5	11.3	7	16.3	12.5
Dissolved Oxygen	mg/L	0.01		4.33	4.8	1.8	1.04	0.64	1.52	1.18
Temperature	oC	0.01	ID	18.51	17.5	20.49	19.36	19.43	18.44	18.4
Redox	mV	0.1	ID	133	1	-73	-0.2	-41.3	-33.4	-21.5
Total Dissolved Solids	mg/L	1	ID	1500	na	1100	na	537	866	na
CO ₂ Titration	mg/L	1	ID	80	100	135	56	65	45	100
Alkalinity										
Hydroxide Alkalinity as CaCO3	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	1	ID	<1	24	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	1	ID	324	309	300	317	127	177	226
Total Alkalinity as CaCO3	mg/L	1	ID	324	333	300	317	127	177	226
Major ions										
Chloride	mg/L	0.5	ID	481	558	447	510	185	301	460
Fluoride	mg/L	0.02	ID	0.16	0.21	na	na	na	na	na
Sulfate	mg/L	0.5	ID	53.6	65.7	26.8	53.5	12	23	25
Silicon	mg/L	0.05	ID	na	na	19.6	na	na	na	na
Silica	mg/L	0.1	ID	na	na	42.1	na	na	na	na
Calcium	mg/L	1	ID	83	71	55	66	18	29	38
Magnesium	mg/L	1	ID	64	64	67	66	33	49	69
Sodium	mg/L	1	ID	325	311	289	337	103	143	214
Potassium	mg/L	1	ID	9	10	6	8	6	5	5
Dissolved Metals										
Aluminium	mg/L	0.01	0.055	<0.01	0.04	<0.01	0.02	<0.01	0.02	<0.01
Arsenic	mg/L	0.001	0.013 (As V)	<0.001	<0.001	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	0.103	0.115	0.141	0.111	0.158	0.234	0.336
Cadmium	mg/L	0.0001	0.0002	<0.0001	<0.0001	na	na	na	na	na
Chromium	mg/L	0.001	0.001	<0.001	<0.001	na	na	na	na	na
Cobalt	mg/L	0.001	ID	0.002	0.002	0.009	0.004	0.019	0.031	0.042
Copper	mg/L	0.001	0.0014	<0.001	<0.001	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	<0.001	<0.001	0.008	<0.001	<0.001	<0.001
Manganese	mg/L	0.001	1.9	0.376	0.534	2.82	0.958	3.29	4.65	6.27
Nickel	mg/L	0.001	0.011	0.006	0.006	na	na	na	na	na
Selenium	mg/L	0.01	0.011	<0.01	<0.01	na	na	na	na	na
Vanadium	mg/L	0.01	ID	<0.01	<0.01	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.027	0.009	0.013	0.006	0.02	0.008	0.126
Boron	mg/L	0.05	0.37	<0.05	<0.05	na	na	na	na	na
Iron	mg/L	0.05	ID	<0.05	0.18	0.62	0.18	1.4	1.43	1.93
Mercury	mg/L	0.0001	ID	<0.0001	<0.0001	na	na	na	na	na
Total Metals										
Total Iron	mg/L	0.05	ID	0.45	1.59	na	na	na	na	na
Nutrients										
Ammonia as N	mg/L	0.01	0.9	0.04	<0.01	0.07	na	na	na	na
Nitrite as N	mg/L	0.01	ID	<0.01	<0.01	<0.01	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	0.05	0.04	0.02	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	0.05	0.04	0.02	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		0.2	0.1	0.3	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	0.3	0.2	0.3	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	0.06	0.06	0.05	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	<0.01	0.01	na	na	na	na	na
Biochemical Oxygen Demand	mg/L	2		3	na	na	na	na	na	na
Isotopes										
Oxygen-18	‰	0.01		na	na	na	na	na	na	-4.02
Deuterium	‰	0.1		na	na	na	na	na	na	-25.1
Carbon-13	‰	0.1		na	na	na	na	na	na	na
Radiocarbon	pMC	0.1		na	na	na	na	na	na	na
Radiocarbon Age (uncorrected)	yrs BP	1		na	na	na	na	na	na	na

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatoc ecosystems.

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ID - insufficient data to determine trigger value

na - not analysed

GW9

Analyte	Units	LOR	ANZECC 2000 Guidelines	10/09/2009	1/10/2009	2/12/2009	9/03/2010	21/06/2010	2/02/2011	8/05/2011	25/08/2011
Field Parameters											
Conductivity	µS/cm	1	125 - 2200*	1580	4630	5300	5890	5473	6107	6879	5788
pH	pH units	0.01	6.5-8*	6.54	6.29	6.25	6.21	5.83	5.87	5.89	6.01
Dissolved Oxygen	%sat	0.1	85-110*	20.4	40	na	58.8	46.5	47.7	23	26.8
Dissolved Oxygen	mg/L	0.01		1.88	3.27	3.99	4.78	4.3	4.13	2.08	2.28
Temperature	oC	0.01	ID	19.04	21.24	20.5	20.34	20.1	20.29	19.36	20.15
Redox	mV	0.1	ID	16	-5	-21	16	3.9	73	192.8	19
Total Dissolved Solids	mg/L	1	ID	1000	3000	na	3800	na	3973	4471	3762
CO ₂ Titration	mg/L	1	ID	na	na	95	35	73	90	130	90
Alkalinity											
Hydroxide Alkalinity as CaCO3	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	1	ID	278	167	137	103	97	84	87	90
Total Alkalinity as CaCO3	mg/L	1	ID	278	167	137	103	97	84	87	90
Major ions											
Chloride	mg/L	0.5	ID	331	1200	1580	1720	1620	2100	2010	1770
Fluoride	mg/L	0.02	ID	0.31	0.13	0.22	na	na	na	na	na
Sulfate	mg/L	0.5	ID	99.4	163	213	217	211	275	312	315
Silicon	mg/L	0.05	ID	na	na	na	6.22	na	na	na	na
Silica	mg/L	0.1	ID	na	na	na	13.3	na	na	na	na
Calcium	mg/L	1	ID	51	96	57	41	45	51	62	60
Magnesium	mg/L	1	ID	51	99	144	142	153	172	197	179
Sodium	mg/L	1	ID	181	749	935	926	941	1080	1100	1130
Potassium	mg/L	1	ID	33	12	14	10	11	14	13	14
Dissolved Metals											
Aluminium	mg/L	0.01	0.055	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.08	<0.01
Arsenic	mg/L	0.001	0.013 (As V)	<0.001	0.001	0.002	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	0.094	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	0.082	0.209	0.199	0.134	<0.001	0.098	0.107	0.116
Cadmium	mg/L	0.0001	0.0002	<0.0001	<0.0001	<0.0001	na	na	na	na	na
Chromium	mg/L	0.001	0.001	<0.001	<0.001	<0.001	na	na	na	na	na
Cobalt	mg/L	0.001	ID	<0.001	0.027	0.02	0.013	0.006	0.005	0.006	0.007
Copper	mg/L	0.001	0.0014	0.011	0.001	0.002	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.001	1.9	0.093	3.18	2.14	0.772	0.313	0.212	0.174	0.251
Nickel	mg/L	0.001	0.011	<0.001	0.024	0.031	na	na	na	na	na
Selenium	mg/L	0.01	0.011	<0.01	<0.01	<0.01	na	na	na	na	na
Vanadium	mg/L	0.01	ID	<0.01	<0.01	<0.01	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.033	0.039	0.021	0.037	0.042	0.071	0.09	0.083
Boron	mg/L	0.05	0.37	<0.05	<0.05	<0.05	na	na	na	na	na
Iron	mg/L	0.05	ID	3.53	1.08	6.3	1.66	2.97	0.85	0.19	0.41
Mercury	mg/L	0.0001	ID	<0.0001	<0.0001	<0.0001	na	na	na	na	na
Total Metals											
Total Iron	mg/L	0.05	ID	na	89.5	66.8	na	na	na	na	na
Nutrients											
Ammonia as N	mg/L	0.01	0.9	na	0.22	0.14	0.13	na	na	na	na
Nitrite as N	mg/L	0.01	ID	<0.01	0.02	0.02	0.02	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	0.02	<0.01	0.23	0.5	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	0.02	0.03	0.25	0.52	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		na	2.6	4.8	3.5	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	na	2.6	5	4	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	na	2.76	6.01	4.94	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	<0.01	0.03	<0.01	na	na	na	na	na
Biochemical Oxygen Demand	mg/L	2		na	68	na	na	na	na	na	na
Isotopes											
Oxygen-18	‰	0.01		na	na	na	na	na	na	na	-5.71
Deuterium	‰	0.1		na	na	na	na	na	na	na	-34.6
Carbon-13	‰	0.1		na	na	na	na	na	na	na	na
Radiocarbon	pMC	0.1		na	na	na	na	na	na	na	na
Radiocarbon Age (uncorrected)	yrs BP	1		na	na	na	na	na	na	na	na

Guideline values

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ID - insufficient data to determine trigger value

na - not analysed

GW10

Analyte	Units	LOR	ANZECC 2000 Guidelines	1/10/2009	2/12/2009	18/03/2010	16/06/2010	2/02/2011	10/05/2011	22/08/2011
Field Parameters										
Conductivity	µS/cm	1	125 - 2200*	3980	4820	5170	4426	3011	3980	3850
pH	pH units	0.01	6.5-8*	7.39	7.34	8.01	7.22	7.31	7.32	7.1
Dissolved Oxygen	%sat	0.1	85-110*	27	na	10.1	39.4	13.2	42.6	16.7
Dissolved Oxygen	mg/L	0.01		2.86	6.88	1.14	3.53	1.18	3.91	1.55
Temperature	oC	0.01	ID	18.84	18.2	19.5	20	19.47	18.94	18.48
Redox	mV	0.1	ID	85	-61	-151	-41.2	-47.3	-69.4	64.9
Total Dissolved Solids	mg/L	1	ID	2500	na	3300	na	1957	2587	2502
CO ₂ Titration	mg/L	1	ID	41	35	65	55	32	35	20
Alkalinity										
Hydroxide Alkalinity as CaCO3	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	1	ID	556	538	590	565	420	423	430
Total Alkalinity as CaCO3	mg/L	1	ID	556	538	590	565	420	423	430
Major ions										
Chloride	mg/L	0.5	ID	823	1400	1390	1140	741	987	1080
Fluoride	mg/L	0.02	ID	0.59	0.94	na	na	na	na	na
Sulfate	mg/L	0.5	ID	131	249	253	192	114	160	166
Silicon	mg/L	0.05	ID	na	na	15.2	na	na	na	na
Silica	mg/L	0.1	ID	na	na	32.7	na	na	na	na
Calcium	mg/L	1	ID	88	126	38	90	58	78	86
Magnesium	mg/L	1	ID	109	197	193	150	89	122	130
Sodium	mg/L	1	ID	644	790	984	746	506	597	652
Potassium	mg/L	1	ID	8	13	11	9	9	9	9
Dissolved Metals										
Aluminium	mg/L	0.01	0.055	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01
Arsenic	mg/L	0.001	0.013 (As V)	<0.001	<0.001	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	0.119	0.248	0.377	0.148	0.096	0.145	0.13
Cadmium	mg/L	0.0001	0.0002	<0.0001	<0.0001	na	na	na	na	na
Chromium	mg/L	0.001	0.001	<0.005	<0.001	na	na	na	na	na
Cobalt	mg/L	0.001	ID	0.005	0.009	0.007	0.004	0.002	0.003	0.003
Copper	mg/L	0.001	0.0014	0.001	0.006	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.001	1.9	0.718	3.1	2.65	1.42	0.45	0.765	0.544
Nickel	mg/L	0.001	0.011	0.004	0.004	na	na	na	na	na
Selenium	mg/L	0.01	0.011	<0.01	<0.01	na	na	na	na	na
Vanadium	mg/L	0.01	ID	<0.01	<0.01	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.02	0.023	0.037	0.01	0.024	0.008	0.079
Boron	mg/L	0.05	0.37	0.09	0.05	na	na	na	na	na
Iron	mg/L	0.05	ID	<0.05	0.1	3.2	0.12	<0.05	<0.05	<0.05
Mercury	mg/L	0.0001	ID	<0.0001	<0.0001	na	na	na	na	na
Total Metals										
Total Iron	mg/L	0.05	ID	41.1	34.3	na	na	na	na	na
Nutrients										
Ammonia as N	mg/L	0.01	0.9	0.05	0.09	0.04	na	na	na	na
Nitrite as N	mg/L	0.01	ID	<0.01	<0.01	<0.01	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	0.08	0.2	0.06	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	0.08	0.2	0.06	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		0.8	0.5	4	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	0.8	0.6	4.1	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	1.13	1.83	5.54	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	0.06	0.04	na	na	na	na	na
Biochemical Oxygen Demand	mg/L	2		<2	na	na	na	na	na	na
Isotopes										
Oxygen-18	‰	0.01		na	na	na	na	na	na	-5.26
Deuterium	‰	0.1		na	na	na	na	na	na	-33.7
Carbon-13	‰	0.1		na	na	na	na	na	na	na
Radiocarbon	pMC	0.1		na	na	na	na	na	na	na
Radiocarbon Age (uncorrected)	yrs BP	1		na	na	na	na	na	na	na

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatoc ecosystems.

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ID - insufficient data to determine trigger value

na - not analysed

GW12

Analyte	Units	LOR	ANZECC 2000 Guidelines	16/03/2010	17/06/2010	10/02/2011	11/05/2011	26/08/2011
Field Parameters								
Conductivity	µS/cm	1	125 - 2200*	2000	1937	1936	553	1606
pH	pH units	0.01	6.5-8*	7.97	6.85	6.96	6.75	7.05
Dissolved Oxygen	%sat	0.1	85-110*	5.9	11.3	13.8	9.8	10.4
Dissolved Oxygen	mg/L	0.01		0.75	1	1.18	0.87	0.9
Temperature	oC	0.01	ID	22.2	20.83	22.4	21.4	22.66
Redox	mV	0.1	ID	-111	-127.2	-156.1	-81.8	-86.1
Total Dissolved Solids	mg/L	1	ID	1300	na	1258	1223	1045
CO ₂ Titration	mg/L	1	ID	185	81	135	62	155
Alkalinity								
Hydroxide Alkalinity as CaCO ₃	mg/L	1	ID	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	mg/L	1	ID	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	mg/L	1	ID	873	906	873	819	823
Total Alkalinity as CaCO ₃	mg/L	1	ID	873	906	873	819	823
Major ions								
Chloride	mg/L	0.5	ID	145	144	134	135	137
Fluoride	mg/L	0.02	ID	1.05	na	na	na	na
Sulfate	mg/L	0.5	ID	32.9	6.85	4	2	4
Silicon	mg/L	0.05	ID	5.6	na	na	na	na
Silica	mg/L	0.1	ID	12	na	na	na	na
Calcium	mg/L	1	ID	9	53	52	53	54
Magnesium	mg/L	1	ID	31	36	30	32	32
Sodium	mg/L	1	ID	474	402	341	369	385
Potassium	mg/L	1	ID	36	41	35	38	39
Dissolved Metals								
Aluminium	mg/L	0.01	0.055	0.01	0.03	0.01	<0.01	<0.01
Arsenic	mg/L	0.001	0.013 (As V)	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	0.79	0.821	0.854	0.852	0.878
Cadmium	mg/L	0.0001	0.0002	na	na	na	na	na
Chromium	mg/L	0.001	0.001	na	na	na	na	na
Cobalt	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	0.001	0.0014	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.001	1.9	0.039	0.042	0.018	0.025	0.014
Nickel	mg/L	0.001	0.011	na	na	na	na	na
Selenium	mg/L	0.01	0.011	na	na	na	na	na
Vanadium	mg/L	0.01	ID	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.009	0.014	<0.005	<0.005	0.028
Boron	mg/L	0.05	0.37	na	na	na	na	na
Iron	mg/L	0.05	ID	0.82	0.59	0.55	0.57	0.82
Mercury	mg/L	0.0001	ID	na	na	na	na	na
Total Metals								
Total Iron	mg/L	0.05	ID	0.84	na	na	na	na
Nutrients								
Ammonia as N	mg/L	0.01	0.9	0.27	na	na	na	na
Nitrite as N	mg/L	0.01	ID	<0.01	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	0.02	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	0.02	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		0.5	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	0.5	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	<0.01	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	na	na	na	na	na
Biochemical Oxygen Demand	mg/L	2		na	na	na	na	na

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatoc ecosystems.

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ID - insufficient data to determine trigger value

na - not analysed

GW13A

Analyte	Units	LOR	ANZECC 2000 Guidelines	17/03/2010	24/06/2010	10/02/2011	11/05/2011	26/08/2011
Field Parameters								
Conductivity	µS/cm	1	125 - 2200*	9030	4627	3595	6274	2116
pH	pH units	0.01	6.5-8*	8.03	6.67	6.35	6.59	5.99
Dissolved Oxygen	%sat	0.1	85-110*	29.9	31.6	15.8	26.4	11.2
Dissolved Oxygen	mg/L	0.01		2.92	2.92	1.36	2.44	0.96
Temperature	oC	0.01	ID	22.75	18.82	22	18.91	23.6
Redox	mV	0.1	ID	-8	-134.8	-82.2	-56.2	-5.9
Total Dissolved Solids	mg/L	1	ID	5600	na	2337	4078	1374
CO ₂ Titration	mg/L	1	ID	na	56	190	70	130
Alkalinity								
Hydroxide Alkalinity as CaCO ₃	mg/L	1	ID	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	mg/L	1	ID	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	mg/L	1	ID	679	391	238	364	106
Total Alkalinity as CaCO ₃	mg/L	1	ID	679	391	238	364	106
Major ions								
Chloride	mg/L	0.5	ID	2690	1270	974	1800	716
Fluoride	mg/L	0.02	ID	na	na	na	na	na
Sulfate	mg/L	0.5	ID	352	110	79	207	54
Silicon	mg/L	0.05	ID	na	na	na	na	na
Silica	mg/L	0.1	ID	na	na	na	na	na
Calcium	mg/L	1	ID	332	167	119	180	81
Magnesium	mg/L	1	ID	427	154	99	259	51
Sodium	mg/L	1	ID	1020	509	435	764	310
Potassium	mg/L	1	ID	55	44	47	44	47
Dissolved Metals								
Aluminium	mg/L	0.01	0.055	na	<0.01	<0.01	0.05	<0.01
Arsenic	mg/L	0.001	0.013 (As V)	na	na	na	na	na
Beryllium	mg/L	0.001	ID	na	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	na	0.264	0.172	0.132	0.117
Cadmium	mg/L	0.0001	0.0002	na	na	na	na	na
Chromium	mg/L	0.001	0.001	na	na	na	na	na
Cobalt	mg/L	0.001	ID	na	0.002	<0.001	0.002	0.001
Copper	mg/L	0.001	0.0014	na	na	na	na	na
Lead	mg/L	0.001	0.0034	na	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.001	1.9	na	0.493	0.46	0.375	0.375
Nickel	mg/L	0.001	0.011	na	na	na	na	na
Selenium	mg/L	0.01	0.011	na	na	na	na	na
Vanadium	mg/L	0.01	ID	na	na	na	na	na
Zinc	mg/L	0.005	0.008	na	<0.005	0.018	0.063	0.018
Boron	mg/L	0.05	0.37	na	na	na	na	na
Iron	mg/L	0.05	ID	na	2.58	13.8	9.06	18.6
Mercury	mg/L	0.0001	ID	na	na	na	na	na
Total Metals								
Total Iron	mg/L	0.05	ID	na	na	na	na	na
Nutrients								
Ammonia as N	mg/L	0.01	0.9	na	na	na	na	na
Nitrite as N	mg/L	0.01	ID	na	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	na	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	na	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		na	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	na	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	na	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	na	na	na	na	na
Biochemical Oxygen Demand	mg/L	2		na	na	na	na	na

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatoc ecosystems.

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ID - insufficient data to determine trigger value

na - not analysed

GW13B

Analyte	Units	LOR	ANZECC 2000 Guidelines	17/03/2010	23/06/2010	3/02/2011	11/05/2011	26/08/2011
Field Parameters								
Conductivity	µS/cm	1	125 - 2200*	2590	2561	2180	2373	2021
pH	pH units	0.01	6.5-8*	7.4	6.06	5.94	5.92	6.05
Dissolved Oxygen	%sat	0.1	85-110*	1.5	27.6	7.5	13.5	9.5
Dissolved Oxygen	mg/L	0.01		0.11	2.35	0.64	1.18	0.8
Temperature	oC	0.01	ID	23.3	23.08	23.63	22.34	23.64
Redox	mV	0.1	ID	-61	-49.2	-2.6	-14.5	-27.8
Total Dissolved Solids	mg/L	1	ID	1700	na	1417	1541	1313
CO ₂ Titration	mg/L	1	ID	na	145	>200	120	190
Alkalinity								
Hydroxide Alkalinity as CaCO ₃	mg/L	1	ID	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	mg/L	1	ID	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	mg/L	1	ID	95	110	89	105	84
Total Alkalinity as CaCO ₃	mg/L	1	ID	95	110	89	105	84
Major ions								
Chloride	mg/L	0.5	ID	749	690	629	680	648
Fluoride	mg/L	0.02	ID	0.12	na	na	na	na
Sulfate	mg/L	0.5	ID	73.9	62	68	74	72
Silicon	mg/L	0.05	ID	0.95	na	na	na	na
Silica	mg/L	0.1	ID	2	na	na	na	na
Calcium	mg/L	1	ID	73	74	63	64	58
Magnesium	mg/L	1	ID	59	60	53	54	48
Sodium	mg/L	1	ID	399	326	296	306	300
Potassium	mg/L	1	ID	40	37	41	40	39
Dissolved Metals								
Aluminium	mg/L	0.01	0.055	0.01	0.01	<0.01	<0.01	<0.01
Arsenic	mg/L	0.001	0.013 (As V)	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	0.11	0.122	0.085	0.082	0.083
Cadmium	mg/L	0.0001	0.0002	na	na	na	na	na
Chromium	mg/L	0.001	0.001	na	na	na	na	na
Cobalt	mg/L	0.001	ID	0.002	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	0.001	0.0014	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.001	1.9	0.934	0.985	0.904	0.949	0.994
Nickel	mg/L	0.001	0.011	na	na	na	na	na
Selenium	mg/L	0.01	0.011	na	na	na	na	na
Vanadium	mg/L	0.01	ID	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.048	0.028	0.006	0.008	<0.005
Boron	mg/L	0.05	0.37	na	na	na	na	na
Iron	mg/L	0.05	ID	31.2	36.3	30.3	31.4	32.4
Mercury	mg/L	0.0001	ID	na	na	na	na	na
Total Metals								
Total Iron	mg/L	0.05	ID	33.3	na	na	na	na
Nutrients								
Ammonia as N	mg/L	0.01	0.9	0.13	na	na	na	na
Nitrite as N	mg/L	0.01	ID	<0.01	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	<0.01	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	<0.01	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		0.5	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	0.5	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	<0.01	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	na	na	na	na	na
Biochemical Oxygen Demand	mg/L	2		na	na	na	na	na

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatoc ecosystems.

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ID - insufficient data to determine trigger value

na - not analysed

GW13C

Analyte	Units	LOR	ANZECC 2000 Guidelines	16/03/2010	23/06/2010	3/02/2011	11/05/2011	26/08/2011
Field Parameters								
Conductivity	µS/cm	1	125 - 2200*	1610	1703	2013	1968	1754
pH	pH units	0.01	6.5-8*	7.27	6	6.12	5.98	6.15
Dissolved Oxygen	%sat	0.1	85-110*	3.2	40.1	6.2	12	7.9
Dissolved Oxygen	mg/L	0.01		0.23	3.5	0.52	1.02	0.66
Temperature	oC	0.01	ID	23.62	21.53	24.2	22.59	23.86
Redox	mV	0.1	ID	-36	-47.6	-15.1	-14.5	-22.7
Total Dissolved Solids	mg/L	1	ID	1000	na	1309	1280	1140
CO ₂ Titration	mg/L	1	ID	na	125	180	125	200
Alkalinity								
Hydroxide Alkalinity as CaCO ₃	mg/L	1	ID	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	mg/L	1	ID	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	mg/L	1	ID	74	82	128	119	114
Total Alkalinity as CaCO ₃	mg/L	1	ID	74	82	128	119	114
Major ions								
Chloride	mg/L	0.5	ID	413	427	552	546	570
Fluoride	mg/L	0.02	ID	0.08	na	na	na	na
Sulfate	mg/L	0.5	ID	63.8	45	53	57	58
Silicon	mg/L	0.05	ID	1.03	na	na	na	na
Silica	mg/L	0.1	ID	2.2	na	na	na	na
Calcium	mg/L	1	ID	37	42	60	52	52
Magnesium	mg/L	1	ID	30	33	46	44	44
Sodium	mg/L	1	ID	241	207	257	246	258
Potassium	mg/L	1	ID	44	42	50	50	49
Dissolved Metals								
Aluminium	mg/L	0.01	0.055	<0.01	0.02	<0.01	<0.01	<0.01
Arsenic	mg/L	0.001	0.013 (As V)	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	0.084	0.105	0.175	0.111	0.113
Cadmium	mg/L	0.0001	0.0002	na	na	na	na	na
Chromium	mg/L	0.001	0.001	na	na	na	na	na
Cobalt	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	0.001	0.0014	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.001	1.9	0.747	0.943	0.75	0.922	0.975
Nickel	mg/L	0.001	0.011	na	na	na	na	na
Selenium	mg/L	0.01	0.011	na	na	na	na	na
Vanadium	mg/L	0.01	ID	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.046	0.023	0.007	0.009	0.005
Boron	mg/L	0.05	0.37	na	na	na	na	na
Iron	mg/L	0.05	ID	25.6	33.9	24.6	28.4	30.5
Mercury	mg/L	0.0001	ID	na	na	na	na	na
Total Metals								
Total Iron	mg/L	0.05	ID	26.5	na	na	na	na
Nutrients								
Ammonia as N	mg/L	0.01	0.9	0.15	na	na	na	na
Nitrite as N	mg/L	0.01	ID	<0.01	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	0.01	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	0.01	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		1	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	1	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	<0.01	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	na	na	na	na	na
Biochemical Oxygen Demand	mg/L	2		na	na	na	na	na

Guideline values

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ID - insufficient data to determine trigger value

na - not analysed

GW13D

Analyte	Units	LOR	ANZECC 2000 Guidelines	16/03/2010	23/06/2010	10/02/2011	11/05/2011	26/08/2011
Field Parameters								
Conductivity	µS/cm	1	125 - 2200*	2410	2021	1316	1144	864
pH	pH units	0.01	6.5-8*	7.26	5.91	5.9	5.95	6.18
Dissolved Oxygen	%sat	0.1	85-110*	1.9	23.5	12.6	13.4	21.8
Dissolved Oxygen	mg/L	0.01		0.16	2.1	1.05	1.17	1.87
Temperature	oC	0.01	ID	23.54	22.52	23.99	22.62	23.27
Redox	mV	0.1	ID	-58	-39.9	-61.4	-2.4	-25.2
Total Dissolved Solids	mg/L	1	ID	1500	na	855	744	561
CO ₂ Titration	mg/L	1	ID	>200	130	>200	170	>200
Alkalinity								
Hydroxide Alkalinity as CaCO3	mg/L	1	ID	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	1	ID	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	1	ID	64	82	125	112	117
Total Alkalinity as CaCO3	mg/L	1	ID	64	82	125	112	117
Major ions								
Chloride	mg/L	0.5	ID	680	528	309	258	215
Fluoride	mg/L	0.02	ID	0.12	na	na	na	na
Sulfate	mg/L	0.5	ID	89.4	62.3	63	67	68
Silicon	mg/L	0.05	ID	0.84	na	na	na	na
Silica	mg/L	0.1	ID	1.8	na	na	na	na
Dissolved Major Cations								
Calcium	mg/L	1	ID	58	56	26	22	21
Magnesium	mg/L	1	ID	52	48	22	20	17
Sodium	mg/L	1	ID	372	260	155	143	120
Potassium	mg/L	1	ID	42	47	44	44	41
Dissolved Metals								
Aluminium	mg/L	0.01	0.055	0.01	<0.01	0.01	0.02	<0.01
Arsenic	mg/L	0.001	0.013 (As V)	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	0.109	0.103	0.074	0.061	0.055
Cadmium	mg/L	0.0001	0.0002	na	na	na	na	na
Chromium	mg/L	0.001	0.001	na	na	na	na	na
Cobalt	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	0.001	0.0014	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.001	1.9	1.16	1.22	0.702	0.686	0.601
Nickel	mg/L	0.001	0.011	na	na	na	na	na
Selenium	mg/L	0.01	0.011	na	na	na	na	na
Vanadium	mg/L	0.01	ID	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.017	0.018	0.013	0.015	0.007
Boron	mg/L	0.05	0.37	na	na	na	na	na
Iron	mg/L	0.05	ID	35.9	42.8	21.6	19.8	17.9
Mercury	mg/L	0.0001	ID	na	na	na	na	na
Total Metals								
Total Iron	mg/L	0.05	ID	39.1	na	na	na	na
Nutrients								
Ammonia as N	mg/L	0.01	0.9	0.12	na	na	na	na
Nitrite as N	mg/L	0.01	ID	<0.01	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	<0.01	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	<0.01	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		0.8	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	0.8	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	<0.01	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	na	na	na	na	na
Biochemical Oxygen Demand	mg/L	2		na	na	na	na	na

Guideline values

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ID - insufficient data to determine trigger value

na - not analysed

GW14

Analyte	Units	LOR	ANZECC 2000 Guidelines	24/02/2010	12/03/2010	17/06/2010	3/02/2011	10/05/2011	27/08/2011
Field Parameters									
Conductivity	µS/cm	1	125 - 2200*	6060	5980	6026	6174	7188	6572
pH	pH units	0.01	6.5-8*	7.79	8.21	6.99	6.13	6.04	5.9
Dissolved Oxygen	%sat	0.1	85-110*	na	15	11.5	6.5	12.5	6.9
Dissolved Oxygen	mg/L	0.01		4.74	2.15	1.07	0.58	1.15	0.64
Temperature	oC	0.01	ID	26.41	18.8	18.11	20	18.76	18.49
Redox	mV	0.1	ID	-148	-68	-8.3	3.4	-6.6	43.4
Total Dissolved Solids	mg/L	1	ID	na	3800	na	4013	4672	4281
CO ₂ Titration	mg/L	1	ID	50	135	>200	>200	>200	>200
Alkalinity									
Hydroxide Alkalinity as CaCO3	mg/L	1	ID	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	1	ID	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	1	ID	399	521	481	305	244	170
Total Alkalinity as CaCO3	mg/L	1	ID	399	521	481	305	244	170
Major ions									
Chloride	mg/L	0.5	ID	1440	1300	1450	1550	1620	1790
Fluoride	mg/L	0.02	ID	na	0.73	na	na	na	na
Sulfate	mg/L	0.5	ID	947	911	1100	1040	1230	1340
Silicon	mg/L	0.05	ID	na	5.65	na	na	na	na
Silica	mg/L	0.1	ID	na	12.1	na	na	na	na
Calcium	mg/L	1	ID	254	188	269	228	235	210
Magnesium	mg/L	1	ID	220	235	249	237	267	254
Sodium	mg/L	1	ID	810	928	844	908	1050	1080
Potassium	mg/L	1	ID	60	57	64	65	65	67
Dissolved Metals									
Aluminium	mg/L	0.01	0.055	0.19	0.29	0.54	0.99	1.43	2.02
Arsenic	mg/L	0.001	0.013 (As V)	<0.001	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	0.002	0.003	0.007	0.009	0.014
Barium	mg/L	0.001	ID	0.013	0.024	0.026	0.031	0.034	0.035
Cadmium	mg/L	0.0001	0.0002	0.0005	na	na	na	na	na
Chromium	mg/L	0.001	0.001	<0.001	na	na	na	na	na
Cobalt	mg/L	0.001	ID	0.144	0.109	0.148	0.301	0.404	0.499
Copper	mg/L	0.001	0.0014	0.003	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	<0.001	0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.001	1.9	0.705	0.255	0.306	0.567	0.838	0.885
Nickel	mg/L	0.001	0.011	0.114	na	na	na	na	na
Selenium	mg/L	0.01	0.011	<0.01	na	na	na	na	na
Vanadium	mg/L	0.01	ID	<0.01	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.086	0.233	0.331	0.668	0.976	1.16
Boron	mg/L	0.05	0.37	0.16	na	na	na	na	na
Iron	mg/L	0.05	ID	3.15	7.97	11.9	23.6	33.3	35.4
Mercury	mg/L	0.0001	ID	<0.0001	na	na	na	na	na
Total Metals									
Total Iron	mg/L	0.05	ID	14.8	8.43	na	na	na	na
Nutrients									
Ammonia as N	mg/L	0.01	0.9	na	1.35	na	na	na	na
Nitrite as N	mg/L	0.01	ID	na	<0.01	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	na	<0.01	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	na	<0.01	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1	na	na	1.4	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	na	1.4	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	na	<0.01	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	na	na	na	na	na	na
Biochemical Oxygen Demand	mg/L	2	na	na	na	na	na	na	na

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatoc ecosystems.

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ID - insufficient data to determine trigger value

na - not analysed

GW15

Analyte	Units	LOR	ANZECC 2000 Guidelines	17/03/2010	17/06/2010	2/02/2011	9/05/2011	25/08/2011
Field Parameters								
Conductivity	µS/cm	1	125 - 2200*	2070	1480	2266	1296	1118
pH	pH units	0.01	6.5-8*	7.63	6.25	6.36	6.5	6.52
Dissolved Oxygen	%sat	0.1	85-110*	2.6	14.1	11.3	24.9	12.9
Dissolved Oxygen	mg/L	0.01		0.24	1.29	1.85	2.25	1.15
Temperature	oC	0.01	ID	20.8	19.05	21.16	20.47	21.2
Redox	mV	0.1	ID	-66	-31.8	-45.8	-36.2	-41.2
Total Dissolved Solids	mg/L	1	ID	1300	na	1469	842	727
CO ₂ Titration	mg/L	1	ID	135	87	130	105	90
Alkalinity								
Hydroxide Alkalinity as CaCO ₃	mg/L	1	ID	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	mg/L	1	ID	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	mg/L	1	ID	272	255	270	239	241
Total Alkalinity as CaCO ₃	mg/L	1	ID	272	255	270	239	241
Major ions								
Chloride	mg/L	0.5	ID	518	310	536	259	268
Fluoride	mg/L	0.02	ID	0.62	na	na	na	na
Sulfate	mg/L	0.5	ID	72.8	40.4	86	40	45
Silicon	mg/L	0.05	ID	5.79	na	na	na	na
Silica	mg/L	0.1	ID	12.4	na	na	na	na
Dissolved Major Cations								
Calcium	mg/L	1	ID	39	25	41	23	24
Magnesium	mg/L	1	ID	106	72	108	66	62
Sodium	mg/L	1	ID	289	154	283	133	124
Potassium	mg/L	1	ID	9	6	9	6	7
Dissolved Metals								
Aluminium	mg/L	0.01	0.055	0.01	0.02	<0.01	0.01	<0.01
Arsenic	mg/L	0.001	0.013 (As V)	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	0.167	0.115	0.108	0.12	0.111
Cadmium	mg/L	0.0001	0.0002	na	na	na	na	na
Chromium	mg/L	0.001	0.001	na	na	na	na	na
Cobalt	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	0.001	0.0014	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.001	1.9	0.304	0.268	0.248	0.243	0.224
Nickel	mg/L	0.001	0.011	na	na	na	na	na
Selenium	mg/L	0.01	0.011	na	na	na	na	na
Vanadium	mg/L	0.01	ID	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.012	<0.005	0.029	0.007	0.008
Boron	mg/L	0.05	0.37	na	na	na	na	na
Iron	mg/L	0.05	ID	9.29	7.92	7.34	7.58	7.29
Mercury	mg/L	0.0001	ID	na	na	na	na	na
Total Metals								
Total Iron	mg/L	0.05	ID	11.9	na	na	na	na
Nutrients								
Ammonia as N	mg/L	0.01	0.9	0.1	na	na	na	na
Nitrite as N	mg/L	0.01	ID	<0.01	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	<0.01	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	<0.01	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		0.4	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	0.4	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	0.07	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	na	na	na	na	na
Biochemical Oxygen Demand	mg/L	2		na	na	na	na	na

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatoc ecosystems.

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ID - insufficient data to determine trigger value

na - not analysed

GW16

Analyte	Units	LOR	ANZECC 2000 Guidelines	22/06/2010	3/02/2011	10/05/2011	27/08/2011
Field Parameters							
Conductivity	µS/cm	1	125 - 2200*	556	701	809	646
pH	pH units	0.01	6.5-8*	5.66	5.76	5.63	5.72
Dissolved Oxygen	%sat	0.1	85-110*	37.4	30	35.7	21.6
Dissolved Oxygen	mg/L	0.01		3.52	2.71	3.52	2.06
Temperature	oC	0.01	ID	18.1	20.95	16.38	17.65
Redox	mV	0.1	ID	-13.9	26.5	6	11.5
Total Dissolved Solids	mg/L	1	ID	na	456	526	419
CO ₂ Titration	mg/L	1	ID	140	40	145	70
Alkalinity							
Hydroxide Alkalinity as CaCO3	mg/L	1	ID	na	<1	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	1	ID	na	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	1	ID	na	38	36	30
Total Alkalinity as CaCO3	mg/L	1	ID	na	38	36	30
Major ions							
Chloride	mg/L	0.5	ID	na	176	157	214
Fluoride	mg/L	0.02	ID	na	na	na	na
Sulfate	mg/L	0.5	ID	na	31	28	32
Silicon	mg/L	0.05	ID	na	na	na	na
Silica	mg/L	0.1	ID	na	na	na	na
Calcium	mg/L	1	ID	na	15	7	13
Magnesium	mg/L	1	ID	na	16	15	23
Sodium	mg/L	1	ID	na	90	83	99
Potassium	mg/L	1	ID	na	17	14	14
Dissolved Metals							
Aluminium	mg/L	0.01	0.055	na	0.02	0.02	0.02
Arsenic	mg/L	0.001	0.013 (As V)	na	na	na	na
Beryllium	mg/L	0.001	ID	na	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	na	0.193	0.116	0.163
Cadmium	mg/L	0.0001	0.0002	na	na	na	na
Chromium	mg/L	0.001	0.001	na	na	na	na
Cobalt	mg/L	0.001	ID	na	0.04	0.026	0.023
Copper	mg/L	0.001	0.0014	na	na	na	na
Lead	mg/L	0.001	0.0034	na	<0.001	<0.001	<0.001
Manganese	mg/L	0.001	1.9	na	1.71	1	1.13
Nickel	mg/L	0.001	0.011	na	na	na	na
Selenium	mg/L	0.01	0.011	na	na	na	na
Vanadium	mg/L	0.01	ID	na	na	na	na
Zinc	mg/L	0.005	0.008	na	0.112	0.016	0.031
Boron	mg/L	0.05	0.37	na	na	na	na
Iron	mg/L	0.05	ID	na	8.75	15	13.9
Mercury	mg/L	0.0001	ID	na	na	na	na
Total Metals							
Total Iron	mg/L	0.05	ID	na	na	na	na
Nutrients							
Ammonia as N	mg/L	0.01	0.9	na	na	na	na
Nitrite as N	mg/L	0.01	ID	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1	na	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	na	na	na	na
Biochemical Oxygen Demand	mg/L	2	na	na	na	na	na
Isotopes							
Oxygen-18	‰	0.01	na	na	na	na	-6.66
Deuterium	‰	0.1	na	na	na	na	-44.5
Carbon-13	‰	0.1	na	na	na	na	-18.2
Radiocarbon	pMC	0.1	na	na	na	na	15.99±0.08
Radiocarbon Age (uncorrected)	yrs BP	1	na	na	na	na	14665±40

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatoc ecosystems.

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ID - insufficient data to determine trigger value

na - not analysed

GW17

Analyte	Units	LOR	ANZECC 2000 Guidelines	16/03/2010	23/06/2010	2/02/2011	12/05/2011	24/08/2011
Field Parameters								
Conductivity	µS/cm	1	125 - 2200*	2870	2912	2694	2831	2534
pH	pH units	0.01	6.5-8*	7.41	6.3	6.36	6.6	6.7
Dissolved Oxygen	%sat	0.1	85-110*	10	21.1	10.4	22.3	12.1
Dissolved Oxygen	mg/L	0.01		1.19	1.93	0.9	2.06	1.09
Temperature	oC	0.01	ID	20.85	19.27	21.53	18.79	20.63
Redox	mV	0.1	ID	-65	-90.2	-57.9	-52.7	-75.7
Total Dissolved Solids	mg/L	1	ID	1900	na	1751	1842	1647
CO ₂ Titration	mg/L	1	ID	>200	65	>200	120	120
Alkalinity								
Hydroxide Alkalinity as CaCO3	mg/L	1	ID	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	1	ID	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	1	ID	372	368	336	362	381
Total Alkalinity as CaCO3	mg/L	1	ID	372	368	336	362	381
Major ions								
Chloride	mg/L	0.5	ID	627	633	593	627	642
Fluoride	mg/L	0.02	ID	0.25	na	na	na	na
Sulfate	mg/L	0.5	ID	246	215	228	224	214
Silicon	mg/L	0.05	ID	1.7	na	na	na	na
Silica	mg/L	0.1	ID	3.6	na	na	na	na
Calcium	mg/L	1	ID	68	71	62	70	68
Magnesium	mg/L	1	ID	137	141	126	141	128
Sodium	mg/L	1	ID	366	386	349	360	325
Potassium	mg/L	1	ID	15	14	16	15	14
Dissolved Metals								
Aluminium	mg/L	0.01	0.055	0.02	0.02	0.02	<0.01	<0.01
Arsenic	mg/L	0.001	0.013 (As V)	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	0.039	0.031	0.032	0.033	0.031
Cadmium	mg/L	0.0001	0.0002	na	na	na	na	na
Chromium	mg/L	0.001	0.001	na	na	na	na	na
Cobalt	mg/L	0.001	ID	0.039	0.021	0.019	0.022	0.018
Copper	mg/L	0.001	0.0014	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.001	1.9	0.024	0.021	0.01	0.011	0.012
Nickel	mg/L	0.001	0.011	na	na	na	na	na
Selenium	mg/L	0.01	0.011	na	na	na	na	na
Vanadium	mg/L	0.01	ID	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.04	0.02	0.023	0.036	0.098
Boron	mg/L	0.05	0.37	na	na	na	na	na
Iron	mg/L	0.05	ID	2.46	5.44	3.3	2.3	2.03
Mercury	mg/L	0.0001	ID	na	na	na	na	na
Total Metals								
Total Iron	mg/L	0.05	ID	5.52	na	na	na	na
Nutrients								
Ammonia as N	mg/L	0.01	0.9	<0.01	na	na	na	na
Nitrite as N	mg/L	0.01	ID	na	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	na	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	na	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		3	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	3	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	0.45	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	na	na	na	na	na
Biochemical Oxygen Demand	mg/L	2		na	na	na	na	na

Guideline values

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ID - insufficient data to determine trigger value

na - not analysed

GW18

Analyte	Units	LOR	ANZECC 2000 Guidelines	10/03/2010	23/06/2010	2/02/2011	12/05/2011	23/08/2011
Field Parameters								
Conductivity	µS/cm	1	125 - 2200*	2260	2305	2516	2252	2195
pH	pH units	0.01	6.5-8*	7.23	7.17	6.95	7.16	7.09
Dissolved Oxygen	%sat	0.1	85-110*	55.1	54.5	6.6	22.7	12.8
Dissolved Oxygen	mg/L	0.01		5.28	5.03	0.59	2.17	1.15
Temperature	oC	0.01	ID	20.53	19.41	20.82	19.77	20.32
Redox	mV	0.1	ID	-87	-16.9	-13.7	-35.7	-9.8
Total Dissolved Solids	mg/L	1	ID	1500	na	1636	1675	1427
CO ₂ Titration	mg/L	1	ID	30	57	58	40	60
Alkalinity								
Hydroxide Alkalinity as CaCO3	mg/L	1	ID	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	1	ID	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	1	ID	510	541	519	484	489
Total Alkalinity as CaCO3	mg/L	1	ID	510	541	519	484	489
Major ions								
Chloride	mg/L	0.5	ID	515	451	555	556	546
Fluoride	mg/L	0.02	ID	0.27	na	na	na	na
Sulfate	mg/L	0.5	ID	42.2	33.1	53	44	45
Silicon	mg/L	0.05	ID	18.8	na	na	na	na
Silica	mg/L	0.1	ID	40.3	na	na	na	na
Calcium	mg/L	1	ID	80	86	98	93	85
Magnesium	mg/L	1	ID	115	114	126	123	113
Sodium	mg/L	1	ID	227	247	291	283	269
Potassium	mg/L	1	ID	1	<1	<1	<1	<1
Dissolved Metals								
Aluminium	mg/L	0.01	0.055	<0.01	<0.01	<0.01	<0.01	<0.01
Arsenic	mg/L	0.001	0.013 (As V)	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	0.214	0.183	0.204	0.197	0.174
Cadmium	mg/L	0.0001	0.0002	na	na	na	na	na
Chromium	mg/L	0.001	0.001	na	na	na	na	na
Cobalt	mg/L	0.001	ID	0.013	0.001	<0.001	<0.001	<0.001
Copper	mg/L	0.001	0.0014	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.001	1.9	0.632	0.046	0.048	0.04	0.011
Nickel	mg/L	0.001	0.011	na	na	na	na	na
Selenium	mg/L	0.01	0.011	na	na	na	na	na
Vanadium	mg/L	0.01	ID	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.016	0.012	0.02	0.019	0.013
Boron	mg/L	0.05	0.37	na	na	na	na	na
Iron	mg/L	0.05	ID	0.82	<0.05	<0.05	0.09	<0.05
Mercury	mg/L	0.0001	ID	na	na	na	na	na
Total Metals								
Total Iron	mg/L	0.05	ID	3.46	na	na	na	na
Nutrients								
Ammonia as N	mg/L	0.01	0.9	<0.01	na	na	na	na
Nitrite as N	mg/L	0.01	ID	<0.01	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	0.42	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	0.42	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		1.3	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	1.7	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	2.73	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	na	na	na	na	na
Biochemical Oxygen Demand	mg/L	2		na	na	na	na	na
Isotopes								
Oxygen-18	‰	0.01		na	na	na	na	-5.4
Deuterium	‰	0.1		na	na	na	na	-32.4
Carbon-13	‰	0.1		na	na	na	na	na
Radiocarbon	pMC	0.1		na	na	na	na	na
Radiocarbon Age (uncorrected)	yrs BP	1		na	na	na	na	na

Guideline values

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ID - insufficient data to determine trigger value

na - not analysed

GW19

Analyte	Units	LOR	ANZECC 2000 Guidelines	10/03/2010	23/06/2010	2/02/2011	12/05/2011	23/08/2011
Field Parameters								
Conductivity	µS/cm	1	125 - 2200*	1366	1369	1269	1352	1243
pH	pH units	0.01	6.5-8*	6.97	6.31	6.49	6.69	6.37
Dissolved Oxygen	%sat	0.1	85-110*	25.3	35.4	15.3	27	15.8
Dissolved Oxygen	mg/L	0.01		2.63	3.16	1.34	2.56	1.52
Temperature	oC	0.01	ID	20.46	20.73	20.99	18.74	19.2
Redox	mV	0.1	ID	-54	-16.5	-33.4	-20.2	-15.1
Total Dissolved Solids	mg/L	1	ID	900	na	820	879	808
CO ₂ Titration	mg/L	1	ID	137	72	78	70	180
Alkalinity								
Hydroxide Alkalinity as CaCO3	mg/L	1	ID	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	1	ID	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	1	ID	208	210	194	189	191
Total Alkalinity as CaCO3	mg/L	1	ID	208	210	194	189	191
Major ions								
Chloride	mg/L	0.5	ID	318	295	314	324	346
Fluoride	mg/L	0.02	ID	0.66	na	na	na	na
Sulfate	mg/L	0.5	ID	8.97	9.44	13	13	13
Silicon	mg/L	0.05	ID	1.98	na	na	na	na
Silica	mg/L	0.1	ID	4.2	na	na	na	na
Calcium	mg/L	1	ID	48	58	50	53	51
Magnesium	mg/L	1	ID	28	33	31	31	30
Sodium	mg/L	1	ID	156	161	158	152	150
Potassium	mg/L	1	ID	42	36	43	39	38
Dissolved Metals								
Aluminium	mg/L	0.01	0.055	0.01	<0.01	<0.01	<0.01	<0.01
Arsenic	mg/L	0.001	0.013 (As V)	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	0.251	0.28	0.291	0.285	0.282
Cadmium	mg/L	0.0001	0.0002	na	na	na	na	na
Chromium	mg/L	0.001	0.001	na	na	na	na	na
Cobalt	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	0.001	0.0014	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.001	1.9	0.095	0.104	0.103	0.094	0.093
Nickel	mg/L	0.001	0.011	na	na	na	na	na
Selenium	mg/L	0.01	0.011	na	na	na	na	na
Vanadium	mg/L	0.01	ID	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.057	0.008	<0.005	0.022	<0.005
Boron	mg/L	0.05	0.37	na	na	na	na	na
Iron	mg/L	0.05	ID	3.14	4.01	3.53	3.43	3.31
Mercury	mg/L	0.0001	ID	na	na	na	na	na
Total Metals								
Total Iron	mg/L	0.05	ID	67	na	na	na	na
Nutrients								
Ammonia as N	mg/L	0.01	0.9	0.59	na	na	na	na
Nitrite as N	mg/L	0.01	ID	<0.01	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	0.05	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	0.05	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		0.7	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	0.8	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	<0.01	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	na	na	na	na	na
Biochemical Oxygen Demand	mg/L	2		na	na	na	na	na
Isotopes								
Oxygen-18	‰	0.01		na	na	na	na	-6.87
Deuterium	‰	0.1		na	na	na	na	-43
Carbon-13	‰	0.1		na	na	na	na	na
Radiocarbon	pMC	0.1		na	na	na	na	na
Radiocarbon Age (uncorrected)	yrs BP	1		na	na	na	na	na

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatoc ecosystems.

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ID - insufficient data to determine trigger value

na - not analysed

GW20

Analyte	Units	LOR	ANZECC 2000 Guidelines	19/02/2010	22/02/2010	9/03/2010	22/06/2010	2/02/2011	12/05/2011	25/08/2011
Field Parameters										
Conductivity	µS/cm	1	125 - 2200*	2380	2270	2370	2186	2155	2334	2002
pH	pH units	0.01	6.5-8*	7.64	7.3	5.84	6.94	6.96	7.04	7.01
Dissolved Oxygen	%sat	0.1	85-110*	na	na	30.9	38	14.7	14.7	16.6
Dissolved Oxygen	mg/L	0.01		2.94	1.88	3.09	3.4	1.22	1.39	1.49
Temperature	oC	0.01	ID	23.46	28.43	20.61	20.62	23.4	17.57	21.13
Redox	mV	0.1	ID	-96	-87	140	-64.7	-49.4	-33.3	-37.3
Total Dissolved Solids	mg/L	1	ID	na	na	1500	na	1402	1517	1302
CO ₂ Titration	mg/L	1	ID	na	na	45	84	45	15	55
Alkalinity										
Hydroxide Alkalinity as CaCO3	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	1	ID	<1	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	1	ID	394	393	398	423	388	375	381
Total Alkalinity as CaCO3	mg/L	1	ID	394	393	398	423	388	375	381
Major ions										
Chloride	mg/L	0.5	ID	538	537	536	499	487	546	569
Fluoride	mg/L	0.02	ID	na	na	2.68	na	na	na	na
Sulfate	mg/L	0.5	ID	<0.50	<0.50	<0.50	<0.50	<1	<1	<1
Silicon	mg/L	0.05	ID	na	na	4.93	na	na	na	na
Silica	mg/L	0.1	ID	na	na	10.6	na	na	na	na
Calcium	mg/L	1	ID	68	65	58	72	60	65	63
Magnesium	mg/L	1	ID	42	39	43	43	38	42	40
Sodium	mg/L	1	ID	361	370	344	373	353	359	345
Potassium	mg/L	1	ID	41	42	40	39	46	43	41
Dissolved Metals										
Aluminium	mg/L	0.01	0.055	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Arsenic	mg/L	0.001	0.013 (As V)	0.001	0.001	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	0.867	0.84	0.827	0.895	0.903	0.949	0.882
Cadmium	mg/L	0.0001	0.0002	<0.0001	<0.0001	na	na	na	na	na
Chromium	mg/L	0.001	0.001	<0.001	<0.001	na	na	na	na	na
Cobalt	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	0.001	0.0014	<0.001	0.002	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.001	1.9	0.01	0.016	0.009	0.027	0.039	0.025	0.031
Nickel	mg/L	0.001	0.011	0.001	0.001	na	na	na	na	na
Selenium	mg/L	0.01	0.011	<0.01	<0.01	na	na	na	na	na
Vanadium	mg/L	0.01	ID	<0.01	<0.01	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.017	0.046	0.028	<0.005	<0.005	<0.005	<0.005
Boron	mg/L	0.05	0.37	0.17	0.18	na	na	na	na	na
Iron	mg/L	0.05	ID	0.88	0.54	0.58	0.67	0.83	0.84	0.76
Mercury	mg/L	0.0001	ID	<0.0001	<0.0001	na	na	na	na	na
Total Metals										
Total Iron	mg/L	0.05	ID	0.92	0.65	0.62	na	na	na	na
Nutrients										
Ammonia as N	mg/L	0.01	0.9	na	na	0.98	na	na	na	na
Nitrite as N	mg/L	0.01	ID	na	na	<0.01	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	na	na	0.17	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	na	na	0.17	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		na	na	1.3	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	na	na	1.5	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	na	na	<0.01	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	na	na	na	na	na	na	na
Biochemical Oxygen Demand	mg/L	2		na	na	na	na	na	na	na

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatoc ecosystems.

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ID - insufficient data to determine trigger value

na - not analysed

GW21

Analyte	Units	LOR	ANZECC 2000 Guidelines	10/03/2010	22/06/2010	2/02/2011	12/05/2011	25/08/2011
Field Parameters								
Conductivity	µS/cm	1	125 - 2200*	5150	5076	1166	3274	3489
pH	pH units	0.01	6.5-8*	6.8	6.51	6.8	6.94	6.57
Dissolved Oxygen	%sat	0.1	85-110*	42.9	19.8	15	29.1	49.8
Dissolved Oxygen	mg/L	0.01		2.94	1.86	1.36	2.84	4.74
Temperature	oC	0.01	ID	20.45	17.89	20.78	17.1	17.48
Redox	mV	0.1	ID	-93	-57.8	59.3	-11.8	56.6
Total Dissolved Solids	mg/L	1	ID	3300	na	758	2128	2268
CO ₂ Titration	mg/L	1	ID	85	185	28	70	55
Alkalinity								
Hydroxide Alkalinity as CaCO ₃	mg/L	1	ID	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	mg/L	1	ID	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	mg/L	1	ID	639	780	143	395	480
Total Alkalinity as CaCO ₃	mg/L	1	ID	639	780	143	395	480
Major ions								
Chloride	mg/L	0.5	ID	1400	1350	282	859	1080
Fluoride	mg/L	0.02	ID	1.98	na	na	na	na
Sulfate	mg/L	0.5	ID	10.3	25.4	35	21	17
Silicon	mg/L	0.05	ID	4.42	na	na	na	na
Silica	mg/L	0.1	ID	9.5	na	na	na	na
Calcium	mg/L	1	ID	131	185	33	117	137
Magnesium	mg/L	1	ID	100	144	19	77	93
Sodium	mg/L	1	ID	672	864	188	476	556
Potassium	mg/L	1	ID	33	38	13	28	33
Dissolved Metals								
Aluminium	mg/L	0.01	0.055	0.02	0.01	<0.01	<0.01	<0.01
Arsenic	mg/L	0.001	0.013 (As V)	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	0.626	0.8	0.183	0.539	0.643
Cadmium	mg/L	0.0001	0.0002	na	na	na	na	na
Chromium	mg/L	0.001	0.001	na	na	na	na	na
Cobalt	mg/L	0.001	ID	0.044	0.007	0.002	0.013	0.013
Copper	mg/L	0.001	0.0014	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.001	1.9	0.487	0.488	0.05	0.185	0.195
Nickel	mg/L	0.001	0.011	na	na	na	na	na
Selenium	mg/L	0.01	0.011	na	na	na	na	na
Vanadium	mg/L	0.01	ID	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.04	0.01	0.031	0.034	0.08
Boron	mg/L	0.05	0.37	na	na	na	na	na
Iron	mg/L	0.05	ID	<0.05	7.16	<0.05	0.29	0.56
Mercury	mg/L	0.0001	ID	na	na	na	na	na
Total Metals								
Total Iron	mg/L	0.05	ID	109	na	na	na	na
Nutrients								
Ammonia as N	mg/L	0.01	0.9	0.05	na	na	na	na
Nitrite as N	mg/L	0.01	ID	<0.01	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	0.03	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	0.03	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		11	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	11	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	4.9	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	na	na	na	na	na
Biochemical Oxygen Demand	mg/L	2		na	na	na	na	na
Isotopes								
Oxygen-18	‰	0.01		na	na	na	na	-5.78
Deuterium	‰	0.1		na	na	na	na	-33
Carbon-13	‰	0.1		na	na	na	na	na
Radiocarbon	pMC	0.1		na	na	na	na	na
Radiocarbon Age (uncorrected)	yrs BP	1		na	na	na	na	na

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatoc ecosystems.

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ID - insufficient data to determine trigger value

na - not analysed

GW22TPB					Pump test							Pump test	Pump test
Analyte	Units	LOR	ANZECC 2000 Guidelines	10/02/2010	23/02/2010	8/03/2010	18/03/2010	16/06/2010	1/02/2011	12/05/2011	23/08/2011	22/09/2011	13/10/2011
Field Parameters													
Conductivity	µS/cm	1	125 - 2200*	903	1191	1104	na	1184	1160	2227	1184	1221	1194
pH	pH units	0.01	6.5-8*	7.96	5.66	6.2	na	6.38	6.44	6.64	6.61	6.41	5.61
Dissolved Oxygen	%sat	0.1	85-110*	na	8.8	20.1	na	22.5	5.9	33.1	11.5	30.6	na
Dissolved Oxygen	mg/L	0.01		3.01	0.8	2.58	na	2.1	0.5	3.07	1.04	na	2.13
Temperature	oC	0.01	ID	25.45	21.64	21.2	na	18.56	22.26	18.63	21.12	23.4	21.2
Redox	mV	0.1	ID	-95	-44	-33	na	-59.4	-52.4	-43.95	-82.8	-34	-16
Total Dissolved Solids	mg/L	1	ID	na	800	700	na	na	754	863	770	na	na
CO ₂ Titration	mg/L	1	ID	na	na	na	na	79	125	30	125	na	0.95
Alkalinity													
Hydroxide Alkalinity as CaCO3	mg/L	1	ID	<1	<1	<1	na	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	1	ID	<1	<1	<1	na	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	1	ID	156	179	211	na	260	246	261	262	214	183
Total Alkalinity as CaCO3	mg/L	1	ID	156	179	211	na	260	246	261	262	214	183
Major ions													
Chloride	mg/L	0.5	ID	200	194	204	na	224	222	242	248	223	240
Fluoride	mg/L	0.02	ID	na	na	0.42	na	na	na	na	na	na	na
Sulfate	mg/L	0.5	ID	23.4	19.4	25.5	na	25.2	18	24	<1	22	27
Silicon	mg/L	0.05	ID	na	na	5.52	na	na	na	na	na	na	na
Silica	mg/L	0.1	ID	na	na	<0.1	na	na	na	na	na	na	na
Calcium	mg/L	1	ID	16	16	15	na	23	18	21	20	21	18
Magnesium	mg/L	1	ID	15	15	17	na	23	20	22	21	18	18
Sodium	mg/L	1	ID	151	149	159	na	209	185	185	182	173	180
Potassium	mg/L	1	ID	42	41	43	na	45	46	41	42	43	46
Dissolved Metals													
Aluminium	mg/L	0.01	0.055	<0.01	na	<0.01	na	<0.01	<0.01	<0.01	0.01	<0.01	0.07
Arsenic	mg/L	0.001	0.013 (As V)	<0.001	na	na	na	na	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	na	<0.001	na	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	0.13	na	0.119	na	0.179	0.192	0.204	0.152	0.176	0.204
Cadmium	mg/L	0.0001	0.0002	<0.0001	na	na	na	na	na	na	na	na	na
Chromium	mg/L	0.001	0.001	<0.001	na	na	na	na	na	na	na	na	na
Cobalt	mg/L	0.001	ID	<0.001	na	<0.001	na	<0.001	<0.001	<0.001	0.001	<0.001	<0.001
Copper	mg/L	0.001	0.0014	0.001	na	na	na	na	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	na	<0.001	na	<0.001	<0.001	<0.001	<0.001	<0.001	0.001
Manganese	mg/L	0.001	1.9	0.209	0.085	0.136	na	0.152	0.193	0.175	0.357	0.17	0.214
Nickel	mg/L	0.001	0.011	0.005	na	na	na	na	na	na	na	na	na
Selenium	mg/L	0.01	0.011	<0.01	na	na	na	na	na	na	na	na	na
Vanadium	mg/L	0.01	ID	<0.01	na	na	na	na	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.03	na	0.044	na	<0.005	<0.005	0.018	0.008	0.114	0.028
Boron	mg/L	0.05	0.37	<0.05	na	na	na	na	na	na	na	na	na
Iron	mg/L	0.05	ID	1.59	3.01	5.1	na	5.87	11.3	8.86	35.4	7.58	6.94
Mercury	mg/L	0.0001	ID	<0.0001	na	na	na	na	na	na	na	na	na
Total Metals													
Total Iron	mg/L	0.05	ID	4.5	3.58	na	na	na	na	na	na	na	na
Nutrients													
Ammonia as N	mg/L	0.01	0.9	na	na	0.4	0.65	na	na	na	na	na	na
Nitrite as N	mg/L	0.01	ID	na	na	na	na	na	na	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	na	na	na	na	na	na	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	na	na	0.03	0.02	na	na	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		na	na	0.4	0.9	na	na	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	na	na	0.4	0.9	na	na	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	na	na	0.06	<0.01	na	na	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	na	na	na	na	na	na	na	na	na	na
Biochemical Oxygen Demand	mg/L	2		na	na	na	na	na	na	na	na	na	na
Isotopes													
Oxygen-18	‰	0.01		na	na	na	na	na	na	na	na	-6.81	-6.8
Deuterium	‰	0.1		na	na	na	na	na	na	na	na	-43.4	-42.4
Carbon-13	‰	0.1		na	na	na	na	na	na	na	na	-14.6	-14
Radiocarbon	pMC	0.1		na	na	na	na	na	na	na	na	0.6±0.05	0.75±0.05
Radiocarbon Age (uncorrected)	yrs BP	1		na	na	na	na	na	na	na	na	41010±710	39200±580

Guideline values

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ID - insufficient data to determine trigger value

na - not analysed

GW23

Analyte	Units	LOR	ANZECC 2000 Guidelines	10/03/2010	17/06/2010	4/02/2011	11/05/2011	26/08/2011
Field Parameters								
Conductivity	µS/cm	1	125 - 2200*	9060	9044	8099	8535	7582
pH	pH units	0.01	6.5-8*	7.67	6.32	6.37	6.42	6.35
Dissolved Oxygen	%sat	0.1	85-110*	31.2	13.1	7.4	10.4	11
Dissolved Oxygen	mg/L	0.01		2.83	1.24	0.64	0.96	0.94
Temperature	oC	0.01	ID	20.74	16.37	20.5	19.23	22.46
Redox	mV	0.1	ID	-45	-124	-36.7	-90	-32.7
Total Dissolved Solids	mg/L	1	ID	5800	na	5264	5552	4929
CO ₂ Titration	mg/L	1	ID	180	84	190	85	>200
Alkalinity								
Hydroxide Alkalinity as CaCO ₃	mg/L	1	ID	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	mg/L	1	ID	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	mg/L	1	ID	534	556	512	532	485
Total Alkalinity as CaCO ₃	mg/L	1	ID	534	556	512	532	485
Major ions								
Chloride	mg/L	0.5	ID	2920	2830	2800	2680	2930
Fluoride	mg/L	0.02	ID	<0.02	na	na	na	na
Sulfate	mg/L	0.5	ID	230	261	234	232	254
Silicon	mg/L	0.05	ID	6.72	na	na	na	na
Silica	mg/L	0.1	ID	14.4	na	na	na	na
Calcium	mg/L	1	ID	264	302	290	324	272
Magnesium	mg/L	1	ID	262	298	271	263	257
Sodium	mg/L	1	ID	1220	1440	1210	1260	1220
Potassium	mg/L	1	ID	45	41	38	53	36
Dissolved Metals								
Aluminium	mg/L	0.01	0.055	<0.01	0.09	0.04	0.03	<0.01
Arsenic	mg/L	0.001	0.013 (As V)	na	na	na	na	na
Beryllium	mg/L	0.001	ID	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	ID	0.38	0.11	0.121	0.385	0.092
Cadmium	mg/L	0.0001	0.0002	na	na	na	na	na
Chromium	mg/L	0.001	0.001	na	na	na	na	na
Cobalt	mg/L	0.001	ID	0.013	0.001	0.001	<0.001	<0.001
Copper	mg/L	0.001	0.0014	na	na	na	na	na
Lead	mg/L	0.001	0.0034	<0.001	0.002	<0.001	<0.001	<0.001
Manganese	mg/L	0.001	1.9	0.713	0.604	0.582	0.267	0.651
Nickel	mg/L	0.001	0.011	na	na	na	na	na
Selenium	mg/L	0.01	0.011	na	na	na	na	na
Vanadium	mg/L	0.01	ID	na	na	na	na	na
Zinc	mg/L	0.005	0.008	0.06	0.016	0.007	0.005	0.005
Boron	mg/L	0.05	0.37	na	na	na	na	na
Iron	mg/L	0.05	ID	0.68	2.54	2.64	4.21	2.5
Mercury	mg/L	0.0001	ID	na	na	na	na	na
Total Metals								
Total Iron	mg/L	0.05	ID	1.49	na	na	na	na
Nutrients								
Ammonia as N	mg/L	0.01	0.9	<0.10	na	na	na	na
Nitrite as N	mg/L	0.01	ID	<0.01	na	na	na	na
Nitrate as N	mg/L	0.01	0.7	0.04	na	na	na	na
Nitrite + Nitrate as N	mg/L	0.01	0.04*	0.04	na	na	na	na
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1		1.1	na	na	na	na
Total Nitrogen as N	mg/L	0.1	0.5*	1.1	na	na	na	na
Total Phosphorous as P	mg/L	0.01	0.05*	0.05	na	na	na	na
Reactive Phosphorous as P	mg/L	0.01	0.02*	na	na	na	na	na
Biochemical Oxygen Demand	mg/L	2		na	na	na	na	na

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatic ecosystems.

*ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatic ecosystems,

South-East Australia, low lying river ecosystems

ID - insufficient data to determine trigger value

na - not analysed

GW24A

Analyte	Units	LOR	ANZECC 2000 Guidelines	24/11/2011
Field Parameters				
Conductivity	µS/cm	1	125 - 2200*	1343
pH	pH units	0.01	6.5-8*	5.89
Dissolved Oxygen	%sat	0.1	85-110*	99.1
Dissolved Oxygen	mg/L	0.01		na
Temperature	oC	0.01	ID	21.62
Redox	mV	0.1	ID	2.1
Total Dissolved Solids	mg/L	1	ID	na
CO ₂ Titration	mg/L	1	ID	na
Alkalinity				
Hydroxide Alkalinity as CaCO ₃	mg/L	1	ID	<1
Carbonate Alkalinity as CaCO ₃	mg/L	1	ID	<1
Bicarbonate Alkalinity as CaCO ₃	mg/L	1	ID	56
Total Alkalinity as CaCO ₃	mg/L	1	ID	56
Major ions				
Chloride	mg/L	0.5	ID	308
Fluoride	mg/L	0.02	ID	na
Sulfate	mg/L	0.5	ID	51
Silicon	mg/L	0.05	ID	na
Silica	mg/L	0.1	ID	na
Calcium	mg/L	1	ID	10
Magnesium	mg/L	1	ID	22
Sodium	mg/L	1	ID	172
Potassium	mg/L	1	ID	15
Dissolved Metals				
Aluminium	mg/L	0.01	0.055	0.04
Arsenic	mg/L	0.001	0.013 (As V)	na
Beryllium	mg/L	0.001	ID	<0.001
Barium	mg/L	0.001	ID	0.072
Cadmium	mg/L	0.0001	0.0002	na
Chromium	mg/L	0.001	0.001	na
Cobalt	mg/L	0.001	ID	0.003
Copper	mg/L	0.001	0.0014	na
Lead	mg/L	0.001	0.0034	<0.001
Manganese	mg/L	0.001	1.9	0.44
Nickel	mg/L	0.001	0.011	na
Selenium	mg/L	0.01	0.011	na
Vanadium	mg/L	0.01	ID	na
Zinc	mg/L	0.005	0.008	0.058
Boron	mg/L	0.05	0.37	na
Iron	mg/L	0.05	ID	7.36
Mercury	mg/L	0.0001	ID	na

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatic ecosystems.

* ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatic ecosystems, South-East Australia, low lying river ecosystems

ID - insufficient data to determine trigger value

na - not analysed

GW24B

Analyte	Units	LOR	ANZECC 2000 Guidelines	24/11/2011
Field Parameters				
Conductivity	µS/cm	1	125 - 2200*	718
pH	pH units	0.01	6.5-8*	5.84
Dissolved Oxygen	%sat	0.1	85-110*	28.5
Dissolved Oxygen	mg/L	0.01		na
Temperature	oC	0.01	ID	22.4
Redox	mV	0.1	ID	1
Total Dissolved Solids	mg/L	1	ID	na
CO ₂ Titration	mg/L	1	ID	na
Alkalinity				
Hydroxide Alkalinity as CaCO ₃	mg/L	1	ID	<1
Carbonate Alkalinity as CaCO ₃	mg/L	1	ID	<1
Bicarbonate Alkalinity as CaCO ₃	mg/L	1	ID	89
Total Alkalinity as CaCO ₃	mg/L	1	ID	89
Major ions				
Chloride	mg/L	0.5	ID	110
Fluoride	mg/L	0.02	ID	na
Sulfate	mg/L	0.5	ID	22
Silicon	mg/L	0.05	ID	na
Silica	mg/L	0.1	ID	na
Calcium	mg/L	1	ID	5
Magnesium	mg/L	1	ID	11
Sodium	mg/L	1	ID	90
Potassium	mg/L	1	ID	12
Dissolved Metals				
Aluminium	mg/L	0.01	0.055	0.04
Arsenic	mg/L	0.001	0.013 (As V)	na
Beryllium	mg/L	0.001	ID	<0.001
Barium	mg/L	0.001	ID	0.072
Cadmium	mg/L	0.0001	0.0002	na
Chromium	mg/L	0.001	0.001	na
Cobalt	mg/L	0.001	ID	0.002
Copper	mg/L	0.001	0.0014	na
Lead	mg/L	0.001	0.0034	<0.001
Manganese	mg/L	0.001	1.9	0.266
Nickel	mg/L	0.001	0.011	na
Selenium	mg/L	0.01	0.011	na
Vanadium	mg/L	0.01	ID	na
Zinc	mg/L	0.005	0.008	0.039
Boron	mg/L	0.05	0.37	na
Iron	mg/L	0.05	ID	4.35
Mercury	mg/L	0.0001	ID	na

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatic ecosystems.

* ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatic ecosystems, South-East Australia, low lying river ecosystems

ID - insufficient data to determine trigger value

na - not analysed

GW24C

Analyte	Units	LOR	ANZECC 2000 Guidelines	24/11/2011
Field Parameters				
Conductivity	µS/cm	1	125 - 2200*	3834
pH	pH units	0.01	6.5-8*	12.24
Dissolved Oxygen	%sat	0.1	85-110*	207
Dissolved Oxygen	mg/L	0.01		na
Temperature	oC	0.01	ID	18.92
Redox	mV	0.1	ID	-48.2
Total Dissolved Solids	mg/L	1	ID	na
CO ₂ Titration	mg/L	1	ID	na
Alkalinity				
Hydroxide Alkalinity as CaCO ₃	mg/L	1	ID	107
Carbonate Alkalinity as CaCO ₃	mg/L	1	ID	412
Bicarbonate Alkalinity as CaCO ₃	mg/L	1	ID	<1
Total Alkalinity as CaCO ₃	mg/L	1	ID	520
Major ions				
Chloride	mg/L	0.5	ID	152
Fluoride	mg/L	0.02	ID	na
Sulfate	mg/L	0.5	ID	44
Silicon	mg/L	0.05	ID	na
Silica	mg/L	0.1	ID	na
Calcium	mg/L	1	ID	<1
Magnesium	mg/L	1	ID	<1
Sodium	mg/L	1	ID	250
Potassium	mg/L	1	ID	236
Dissolved Metals				
Aluminium	mg/L	0.01	0.055	0.18
Arsenic	mg/L	0.001	0.013 (As V)	na
Beryllium	mg/L	0.001	ID	<0.001
Barium	mg/L	0.001	ID	0.048
Cadmium	mg/L	0.0001	0.0002	na
Chromium	mg/L	0.001	0.001	na
Cobalt	mg/L	0.001	ID	<0.001
Copper	mg/L	0.001	0.0014	na
Lead	mg/L	0.001	0.0034	<0.001
Manganese	mg/L	0.001	1.9	0.019
Nickel	mg/L	0.001	0.011	na
Selenium	mg/L	0.01	0.011	na
Vanadium	mg/L	0.01	ID	na
Zinc	mg/L	0.005	0.008	0.018
Boron	mg/L	0.05	0.37	na
Iron	mg/L	0.05	ID	0.22
Mercury	mg/L	0.0001	ID	na

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatic ecosystems.

* ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatic ecosystems, South-East Australia, low lying river ecosystems

ID - insufficient data to determine trigger value

na - not analysed

GW24D

Analyte	Units	LOR	ANZECC 2000 Guidelines	24/11/2011
Field Parameters				
Conductivity	µS/cm	1	125 - 2200*	4709
pH	pH units	0.01	6.5-8*	5.99
Dissolved Oxygen	%sat	0.1	85-110*	21
Dissolved Oxygen	mg/L	0.01		na
Temperature	oC	0.01	ID	23.6
Redox	mV	0.1	ID	-41.2
Total Dissolved Solids	mg/L	1	ID	na
CO ₂ Titration	mg/L	1	ID	na
Alkalinity				
Hydroxide Alkalinity as CaCO ₃	mg/L	1	ID	<1
Carbonate Alkalinity as CaCO ₃	mg/L	1	ID	<1
Bicarbonate Alkalinity as CaCO ₃	mg/L	1	ID	66
Total Alkalinity as CaCO ₃	mg/L	1	ID	66
Major ions				
Chloride	mg/L	0.5	ID	419
Fluoride	mg/L	0.02	ID	na
Sulfate	mg/L	0.5	ID	166
Silicon	mg/L	0.05	ID	na
Silica	mg/L	0.1	ID	na
Calcium	mg/L	1	ID	24
Magnesium	mg/L	1	ID	42
Sodium	mg/L	1	ID	230
Potassium	mg/L	1	ID	34
Dissolved Metals				
Aluminium	mg/L	0.01	0.055	0.08
Arsenic	mg/L	0.001	0.013 (As V)	na
Beryllium	mg/L	0.001	ID	<0.001
Barium	mg/L	0.001	ID	0.076
Cadmium	mg/L	0.0001	0.0002	na
Chromium	mg/L	0.001	0.001	na
Cobalt	mg/L	0.001	ID	0.001
Copper	mg/L	0.001	0.0014	na
Lead	mg/L	0.001	0.0034	0.003
Manganese	mg/L	0.001	1.9	2.05
Nickel	mg/L	0.001	0.011	na
Selenium	mg/L	0.01	0.011	na
Vanadium	mg/L	0.01	ID	na
Zinc	mg/L	0.005	0.008	0.103
Boron	mg/L	0.05	0.37	na
Iron	mg/L	0.05	ID	34.8
Mercury	mg/L	0.0001	ID	na

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatic ecosystems.

* ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatic ecosystems, South-East Australia, low lying river ecosystems

ID - insufficient data to determine trigger value

na - not analysed

GW24E

Analyte	Units	LOR	ANZECC 2000 Guidelines	25/11/2011
Field Parameters				
Conductivity	µS/cm	1	125 - 2200*	4244
pH	pH units	0.01	6.5-8*	8.79
Dissolved Oxygen	%sat	0.1	85-110*	62.9
Dissolved Oxygen	mg/L	0.01		na
Temperature	oC	0.01	ID	24.23
Redox	mV	0.1	ID	4.8
Total Dissolved Solids	mg/L	1	ID	na
CO ₂ Titration	mg/L	1	ID	na
Alkalinity				
Hydroxide Alkalinity as CaCO ₃	mg/L	1	ID	<1
Carbonate Alkalinity as CaCO ₃	mg/L	1	ID	<1
Bicarbonate Alkalinity as CaCO ₃	mg/L	1	ID	81
Total Alkalinity as CaCO ₃	mg/L	1	ID	81
Major ions				
Chloride	mg/L	0.5	ID	971
Fluoride	mg/L	0.02	ID	na
Sulfate	mg/L	0.5	ID	252
Silicon	mg/L	0.05	ID	na
Silica	mg/L	0.1	ID	na
Calcium	mg/L	1	ID	55
Magnesium	mg/L	1	ID	77
Sodium	mg/L	1	ID	493
Potassium	mg/L	1	ID	49
Dissolved Metals				
Aluminium	mg/L	0.01	0.055	0.01
Arsenic	mg/L	0.001	0.013 (As V)	na
Beryllium	mg/L	0.001	ID	<0.001
Barium	mg/L	0.001	ID	0.046
Cadmium	mg/L	0.0001	0.0002	na
Chromium	mg/L	0.001	0.001	na
Cobalt	mg/L	0.001	ID	0.013
Copper	mg/L	0.001	0.0014	na
Lead	mg/L	0.001	0.0034	<0.001
Manganese	mg/L	0.001	1.9	1.46
Nickel	mg/L	0.001	0.011	na
Selenium	mg/L	0.01	0.011	na
Vanadium	mg/L	0.01	ID	na
Zinc	mg/L	0.005	0.008	0.154
Boron	mg/L	0.05	0.37	na
Iron	mg/L	0.05	ID	21.6
Mercury	mg/L	0.0001	ID	na

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatic ecosystems.

* ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatic ecosystems, South-East Australia, low lying river ecosystems

ID - insufficient data to determine trigger value

na - not analysed

GW25

Analyte	Units	LOR	ANZECC 2000 Guidelines	23/11/2011
Field Parameters				
Conductivity	µS/cm	1	125 - 2200*	3101
pH	pH units	0.01	6.5-8*	6.19
Dissolved Oxygen	%sat	0.1	85-110*	13.1
Dissolved Oxygen	mg/L	0.01		na
Temperature	oC	0.01	ID	22.13
Redox	mV	0.1	ID	-16.6
Total Dissolved Solids	mg/L	1	ID	na
CO ₂ Titration	mg/L	1	ID	na
Alkalinity				
Hydroxide Alkalinity as CaCO ₃	mg/L	1	ID	<1
Carbonate Alkalinity as CaCO ₃	mg/L	1	ID	<1
Bicarbonate Alkalinity as CaCO ₃	mg/L	1	ID	82
Total Alkalinity as CaCO ₃	mg/L	1	ID	82
Major ions				
Chloride	mg/L	0.5	ID	431
Fluoride	mg/L	0.02	ID	na
Sulfate	mg/L	0.5	ID	125
Silicon	mg/L	0.05	ID	na
Silica	mg/L	0.1	ID	na
Calcium	mg/L	1	ID	27
Magnesium	mg/L	1	ID	39
Sodium	mg/L	1	ID	285
Potassium	mg/L	1	ID	17
Dissolved Metals				
Aluminium	mg/L	0.01	0.055	0.03
Arsenic	mg/L	0.001	0.013 (As V)	na
Beryllium	mg/L	0.001	ID	<0.001
Barium	mg/L	0.001	ID	0.029
Cadmium	mg/L	0.0001	0.0002	na
Chromium	mg/L	0.001	0.001	na
Cobalt	mg/L	0.001	ID	0.022
Copper	mg/L	0.001	0.0014	na
Lead	mg/L	0.001	0.0034	<0.001
Manganese	mg/L	0.001	1.9	0.459
Nickel	mg/L	0.001	0.011	na
Selenium	mg/L	0.01	0.011	na
Vanadium	mg/L	0.01	ID	na
Zinc	mg/L	0.005	0.008	0.043
Boron	mg/L	0.05	0.37	na
Iron	mg/L	0.05	ID	5.39
Mercury	mg/L	0.0001	ID	na

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatic ecosystems.

* ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatic ecosystems, South-East Australia, low lying river ecosystems

ID - insufficient data to determine trigger value

na - not analysed

GW28A

Analyte	Units	LOR	ANZECC 2000 Guidelines	23/11/2011
Field Parameters				
Conductivity	µS/cm	1	125 - 2200*	3005
pH	pH units	0.01	6.5-8*	6.72
Dissolved Oxygen	%sat	0.1	85-110*	77
Dissolved Oxygen	mg/L	0.01		na
Temperature	oC	0.01	ID	16.3
Redox	mV	0.1	ID	39.6
Total Dissolved Solids	mg/L	1	ID	na
CO ₂ Titration	mg/L	1	ID	na
Alkalinity				
Hydroxide Alkalinity as CaCO ₃	mg/L	1	ID	<1
Carbonate Alkalinity as CaCO ₃	mg/L	1	ID	<1
Bicarbonate Alkalinity as CaCO ₃	mg/L	1	ID	90
Total Alkalinity as CaCO ₃	mg/L	1	ID	90
Major ions				
Chloride	mg/L	0.5	ID	654
Fluoride	mg/L	0.02	ID	na
Sulfate	mg/L	0.5	ID	285
Silicon	mg/L	0.05	ID	na
Silica	mg/L	0.1	ID	na
Calcium	mg/L	1	ID	35
Magnesium	mg/L	1	ID	64
Sodium	mg/L	1	ID	416
Potassium	mg/L	1	ID	7
Dissolved Metals				
Aluminium	mg/L	0.01	0.055	0.77
Arsenic	mg/L	0.001	0.013 (As V)	na
Beryllium	mg/L	0.001	ID	<0.001
Barium	mg/L	0.001	ID	0.034
Cadmium	mg/L	0.0001	0.0002	na
Chromium	mg/L	0.001	0.001	na
Cobalt	mg/L	0.001	ID	0.042
Copper	mg/L	0.001	0.0014	na
Lead	mg/L	0.001	0.0034	0.002
Manganese	mg/L	0.001	1.9	0.781
Nickel	mg/L	0.001	0.011	na
Selenium	mg/L	0.01	0.011	na
Vanadium	mg/L	0.01	ID	na
Zinc	mg/L	0.005	0.008	0.103
Boron	mg/L	0.05	0.37	na
Iron	mg/L	0.05	ID	1.35
Mercury	mg/L	0.0001	ID	na

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatic ecosystems.

* ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatic ecosystems, South-East Australia, low lying river ecosystems

ID - insufficient data to determine trigger value

na - not analysed

GW28B

Analyte	Units	LOR	ANZECC 2000 Guidelines	23/11/2011
Field Parameters				
Conductivity	µS/cm	1	125 - 2200*	6201
pH	pH units	0.01	6.5-8*	6.77
Dissolved Oxygen	%sat	0.1	85-110*	83.6
Dissolved Oxygen	mg/L	0.01		na
Temperature	oC	0.01	ID	16.99
Redox	mV	0.1	ID	10.8
Total Dissolved Solids	mg/L	1	ID	na
CO ₂ Titration	mg/L	1	ID	na
Alkalinity				
Hydroxide Alkalinity as CaCO ₃	mg/L	1	ID	<1
Carbonate Alkalinity as CaCO ₃	mg/L	1	ID	<1
Bicarbonate Alkalinity as CaCO ₃	mg/L	1	ID	201
Total Alkalinity as CaCO ₃	mg/L	1	ID	201
Major ions				
Chloride	mg/L	0.5	ID	979
Fluoride	mg/L	0.02	ID	na
Sulfate	mg/L	0.5	ID	305
Silicon	mg/L	0.05	ID	na
Silica	mg/L	0.1	ID	na
Calcium	mg/L	1	ID	41
Magnesium	mg/L	1	ID	80
Sodium	mg/L	1	ID	607
Potassium	mg/L	1	ID	5
Dissolved Metals				
Aluminium	mg/L	0.01	0.055	0.03
Arsenic	mg/L	0.001	0.013 (As V)	na
Beryllium	mg/L	0.001	ID	<0.001
Barium	mg/L	0.001	ID	0.028
Cadmium	mg/L	0.0001	0.0002	na
Chromium	mg/L	0.001	0.001	na
Cobalt	mg/L	0.001	ID	0.056
Copper	mg/L	0.001	0.0014	na
Lead	mg/L	0.001	0.0034	<0.001
Manganese	mg/L	0.001	1.9	0.936
Nickel	mg/L	0.001	0.011	na
Selenium	mg/L	0.01	0.011	na
Vanadium	mg/L	0.01	ID	na
Zinc	mg/L	0.005	0.008	0.057
Boron	mg/L	0.05	0.37	na
Iron	mg/L	0.05	ID	0.46
Mercury	mg/L	0.0001	ID	na

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatic ecosystems.

* ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatic ecosystems, South-East Australia, low lying river ecosystems

ID - insufficient data to determine trigger value

na - not analysed

GW28C

Analyte	Units	LOR	ANZECC 2000 Guidelines	23/11/2011
Field Parameters				
Conductivity	µS/cm	1	125 - 2200*	2129
pH	pH units	0.01	6.5-8*	6.19
Dissolved Oxygen	%sat	0.1	85-110*	70
Dissolved Oxygen	mg/L	0.01		na
Temperature	oC	0.01	ID	20.9
Redox	mV	0.1	ID	3.6
Total Dissolved Solids	mg/L	1	ID	na
CO ₂ Titration	mg/L	1	ID	na
Alkalinity				
Hydroxide Alkalinity as CaCO ₃	mg/L	1	ID	<1
Carbonate Alkalinity as CaCO ₃	mg/L	1	ID	<1
Bicarbonate Alkalinity as CaCO ₃	mg/L	1	ID	140
Total Alkalinity as CaCO ₃	mg/L	1	ID	140
Major ions				
Chloride	mg/L	0.5	ID	617
Fluoride	mg/L	0.02	ID	na
Sulfate	mg/L	0.5	ID	171
Silicon	mg/L	0.05	ID	na
Silica	mg/L	0.1	ID	na
Calcium	mg/L	1	ID	48
Magnesium	mg/L	1	ID	51
Sodium	mg/L	1	ID	339
Potassium	mg/L	1	ID	32
Dissolved Metals				
Aluminium	mg/L	0.01	0.055	0.07
Arsenic	mg/L	0.001	0.013 (As V)	na
Beryllium	mg/L	0.001	ID	<0.001
Barium	mg/L	0.001	ID	0.043
Cadmium	mg/L	0.0001	0.0002	na
Chromium	mg/L	0.001	0.001	na
Cobalt	mg/L	0.001	ID	0.006
Copper	mg/L	0.001	0.0014	na
Lead	mg/L	0.001	0.0034	<0.001
Manganese	mg/L	0.001	1.9	0.367
Nickel	mg/L	0.001	0.011	na
Selenium	mg/L	0.01	0.011	na
Vanadium	mg/L	0.01	ID	na
Zinc	mg/L	0.005	0.008	0.034
Boron	mg/L	0.05	0.37	na
Iron	mg/L	0.05	ID	6.09
Mercury	mg/L	0.0001	ID	na

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatic ecosystems.

* ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatic ecosystems, South-East Australia, low lying river ecosystems

ID - insufficient data to determine trigger value

na - not analysed

GW28D

Analyte	Units	LOR	ANZECC 2000 Guidelines	23/11/2011
Field Parameters				
Conductivity	µS/cm	1	125 - 2200*	1967
pH	pH units	0.01	6.5-8*	6.19
Dissolved Oxygen	%sat	0.1	85-110*	74
Dissolved Oxygen	mg/L	0.01		na
Temperature	oC	0.01	ID	22.19
Redox	mV	0.1	ID	17.9
Total Dissolved Solids	mg/L	1	ID	na
CO ₂ Titration	mg/L	1	ID	na
Alkalinity				
Hydroxide Alkalinity as CaCO ₃	mg/L	1	ID	<1
Carbonate Alkalinity as CaCO ₃	mg/L	1	ID	<1
Bicarbonate Alkalinity as CaCO ₃	mg/L	1	ID	156
Total Alkalinity as CaCO ₃	mg/L	1	ID	156
Major ions				
Chloride	mg/L	0.5	ID	512
Fluoride	mg/L	0.02	ID	na
Sulfate	mg/L	0.5	ID	162
Silicon	mg/L	0.05	ID	na
Silica	mg/L	0.1	ID	na
Calcium	mg/L	1	ID	49
Magnesium	mg/L	1	ID	40
Sodium	mg/L	1	ID	294
Potassium	mg/L	1	ID	44
Dissolved Metals				
Aluminium	mg/L	0.01	0.055	0.68
Arsenic	mg/L	0.001	0.013 (As V)	na
Beryllium	mg/L	0.001	ID	<0.001
Barium	mg/L	0.001	ID	0.05
Cadmium	mg/L	0.0001	0.0002	na
Chromium	mg/L	0.001	0.001	na
Cobalt	mg/L	0.001	ID	0.011
Copper	mg/L	0.001	0.0014	na
Lead	mg/L	0.001	0.0034	0.003
Manganese	mg/L	0.001	1.9	0.356
Nickel	mg/L	0.001	0.011	na
Selenium	mg/L	0.01	0.011	na
Vanadium	mg/L	0.01	ID	na
Zinc	mg/L	0.005	0.008	0.079
Boron	mg/L	0.05	0.37	na
Iron	mg/L	0.05	ID	5.85
Mercury	mg/L	0.0001	ID	na

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatic ecosystems.

* ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatic ecosystems, South-East Australia, low lying river ecosystems

ID - insufficient data to determine trigger value

na - not analysed

GW29A

Analyte	Units	LOR	ANZECC 2000 Guidelines	24/11/2011
Field Parameters				
Conductivity	µS/cm	1	125 - 2200*	3186
pH	pH units	0.01	6.5-8*	6.91
Dissolved Oxygen	%sat	0.1	85-110*	118.4
Dissolved Oxygen	mg/L	0.01		na
Temperature	oC	0.01	ID	18.82
Redox	mV	0.1	ID	-10.3
Total Dissolved Solids	mg/L	1	ID	na
CO ₂ Titration	mg/L	1	ID	na
Alkalinity				
Hydroxide Alkalinity as CaCO ₃	mg/L	1	ID	<1
Carbonate Alkalinity as CaCO ₃	mg/L	1	ID	<1
Bicarbonate Alkalinity as CaCO ₃	mg/L	1	ID	335
Total Alkalinity as CaCO ₃	mg/L	1	ID	335
Major ions				
Chloride	mg/L	0.5	ID	723
Fluoride	mg/L	0.02	ID	na
Sulfate	mg/L	0.5	ID	176
Silicon	mg/L	0.05	ID	na
Silica	mg/L	0.1	ID	na
Calcium	mg/L	1	ID	69
Magnesium	mg/L	1	ID	75
Sodium	mg/L	1	ID	454
Potassium	mg/L	1	ID	6
Dissolved Metals				
Aluminium	mg/L	0.01	0.055	0.02
Arsenic	mg/L	0.001	0.013 (As V)	na
Beryllium	mg/L	0.001	ID	<0.001
Barium	mg/L	0.001	ID	0.149
Cadmium	mg/L	0.0001	0.0002	na
Chromium	mg/L	0.001	0.001	na
Cobalt	mg/L	0.001	ID	0.034
Copper	mg/L	0.001	0.0014	na
Lead	mg/L	0.001	0.0034	0.001
Manganese	mg/L	0.001	1.9	1.24
Nickel	mg/L	0.001	0.011	na
Selenium	mg/L	0.01	0.011	na
Vanadium	mg/L	0.01	ID	na
Zinc	mg/L	0.005	0.008	0.049
Boron	mg/L	0.05	0.37	na
Iron	mg/L	0.05	ID	0.12
Mercury	mg/L	0.0001	ID	na

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatic ecosystems.

* ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatic ecosystems, South-East Australia, low lying river ecosystems

ID - insufficient data to determine trigger value

na - not analysed

GW29B

Analyte	Units	LOR	ANZECC 2000 Guidelines	24/11/2011
Field Parameters				
Conductivity	µS/cm	1	125 - 2200*	2864
pH	pH units	0.01	6.5-8*	6.34
Dissolved Oxygen	%sat	0.1	85-110*	50
Dissolved Oxygen	mg/L	0.01		na
Temperature	oC	0.01	ID	22.37
Redox	mV	0.1	ID	-32.2
Total Dissolved Solids	mg/L	1	ID	na
CO ₂ Titration	mg/L	1	ID	na
Alkalinity				
Hydroxide Alkalinity as CaCO ₃	mg/L	1	ID	<1
Carbonate Alkalinity as CaCO ₃	mg/L	1	ID	<1
Bicarbonate Alkalinity as CaCO ₃	mg/L	1	ID	234
Total Alkalinity as CaCO ₃	mg/L	1	ID	234
Major ions				
Chloride	mg/L	0.5	ID	690
Fluoride	mg/L	0.02	ID	na
Sulfate	mg/L	0.5	ID	14
Silicon	mg/L	0.05	ID	na
Silica	mg/L	0.1	ID	na
Calcium	mg/L	1	ID	128
Magnesium	mg/L	1	ID	63
Sodium	mg/L	1	ID	226
Potassium	mg/L	1	ID	57
Dissolved Metals				
Aluminium	mg/L	0.01	0.055	0.01
Arsenic	mg/L	0.001	0.013 (As V)	na
Beryllium	mg/L	0.001	ID	<0.001
Barium	mg/L	0.001	ID	0.54
Cadmium	mg/L	0.0001	0.0002	na
Chromium	mg/L	0.001	0.001	na
Cobalt	mg/L	0.001	ID	0.003
Copper	mg/L	0.001	0.0014	na
Lead	mg/L	0.001	0.0034	<0.001
Manganese	mg/L	0.001	1.9	0.129
Nickel	mg/L	0.001	0.011	na
Selenium	mg/L	0.01	0.011	na
Vanadium	mg/L	0.01	ID	na
Zinc	mg/L	0.005	0.008	0.029
Boron	mg/L	0.05	0.37	na
Iron	mg/L	0.05	ID	1.87
Mercury	mg/L	0.0001	ID	na

Guideline values

ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatic ecosystems.

* ANZECC 2000 - Water Quality Guidelines: 95% protection levels (trigger values) for the protection of freshwater aquatic ecosystems, South-East Australia, low lying river ecosystems

ID - insufficient data to determine trigger value

na - not analysed

Appendix

E

Hydrographs



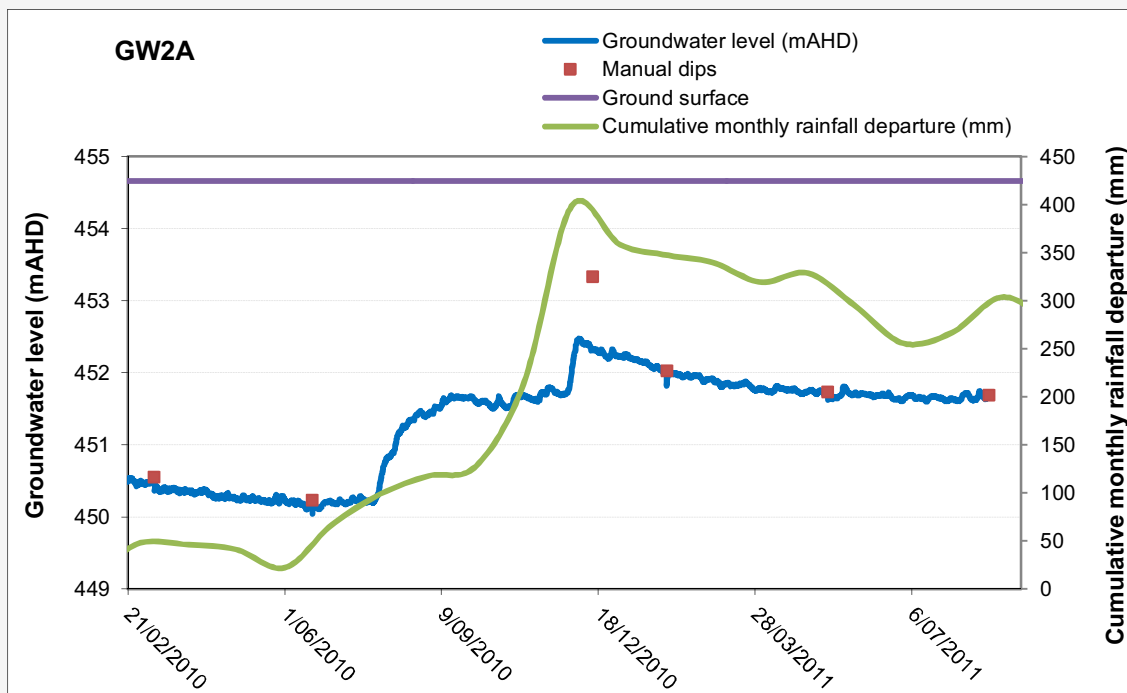
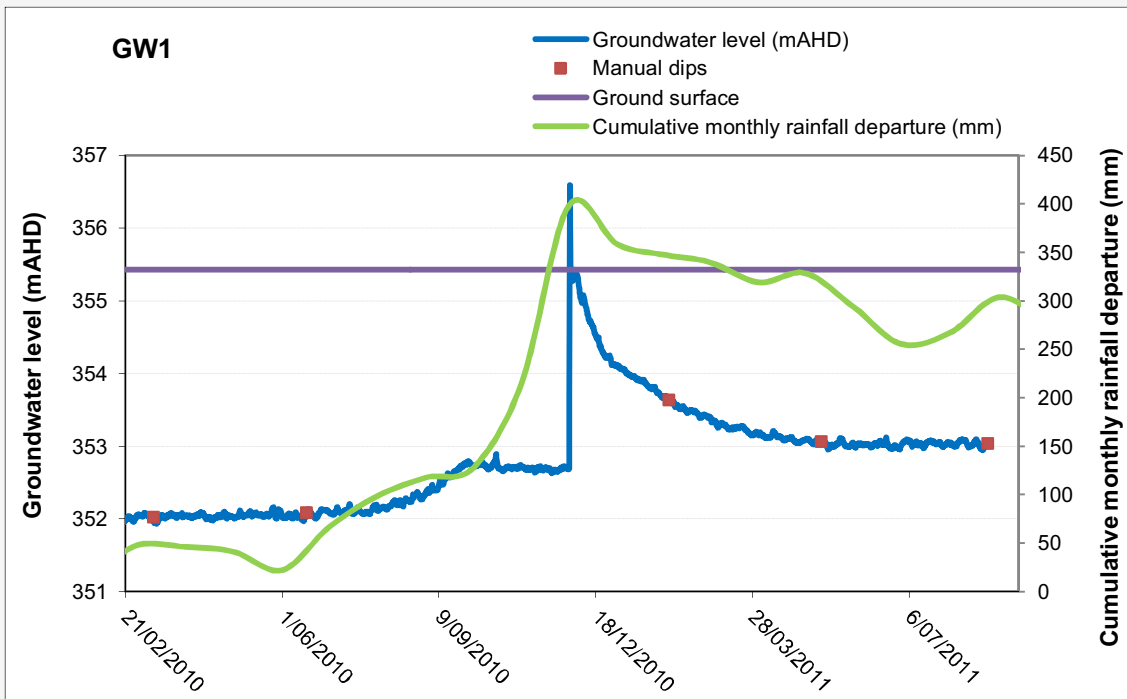


Figure E-1 Groundwater levels with cumulative monthly rainfall departure - GW1 & GW2A

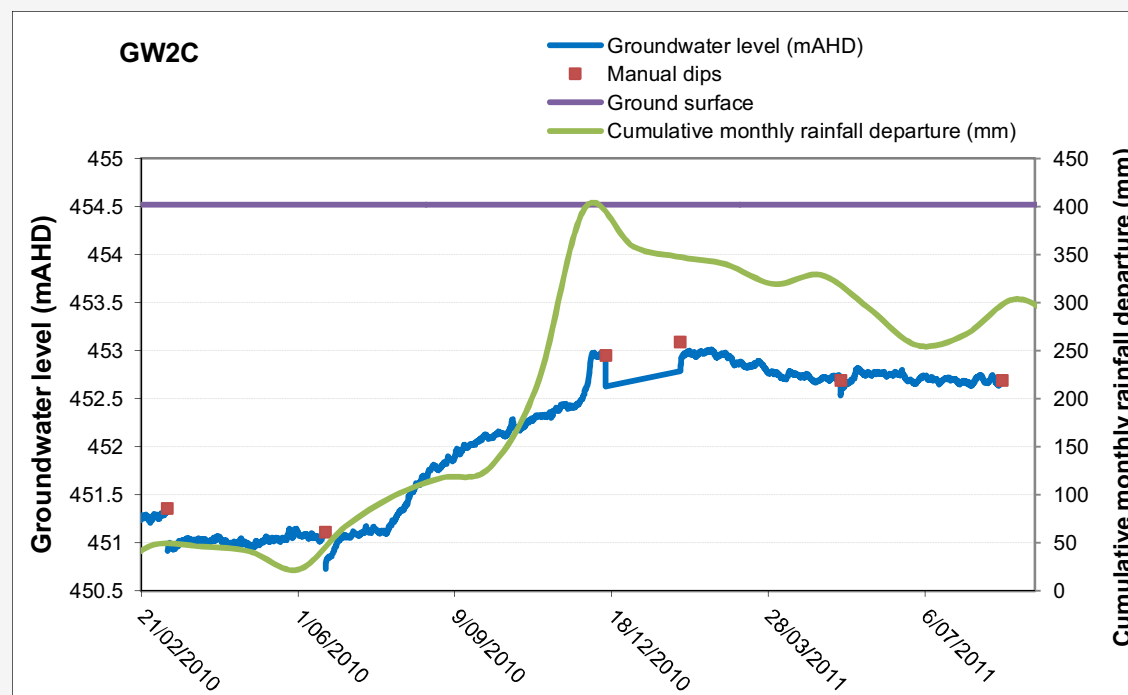
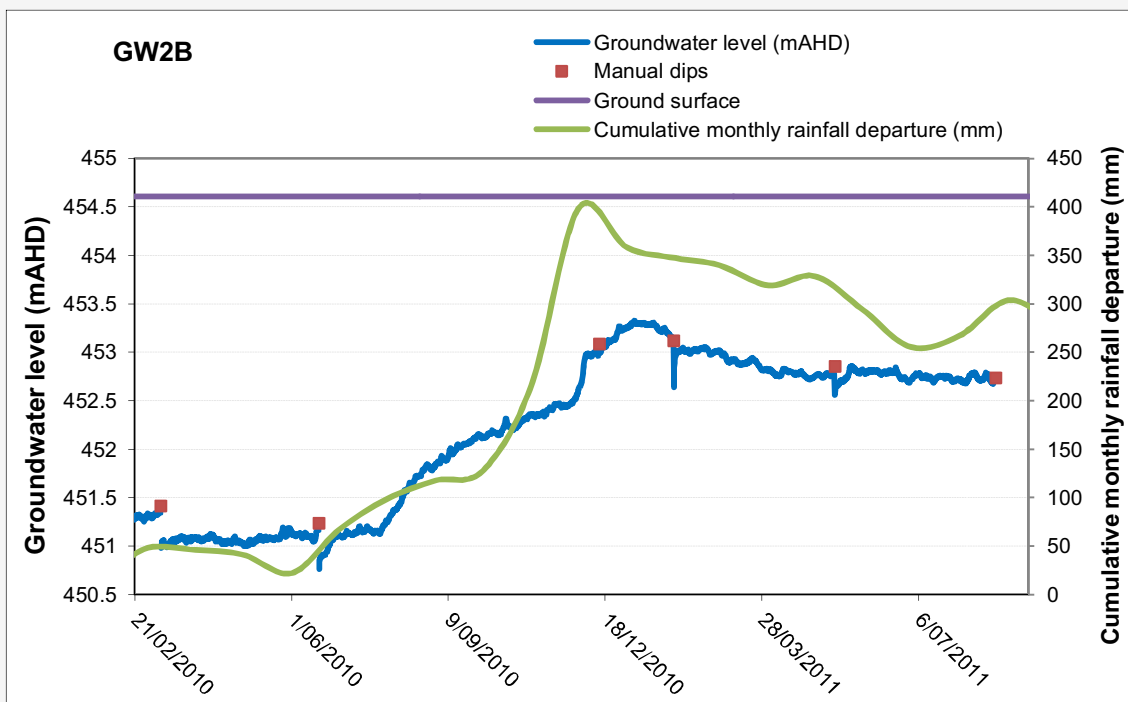


Figure E-2 Groundwater levels with cumulative monthly rainfall departure - GW2B & GW2C

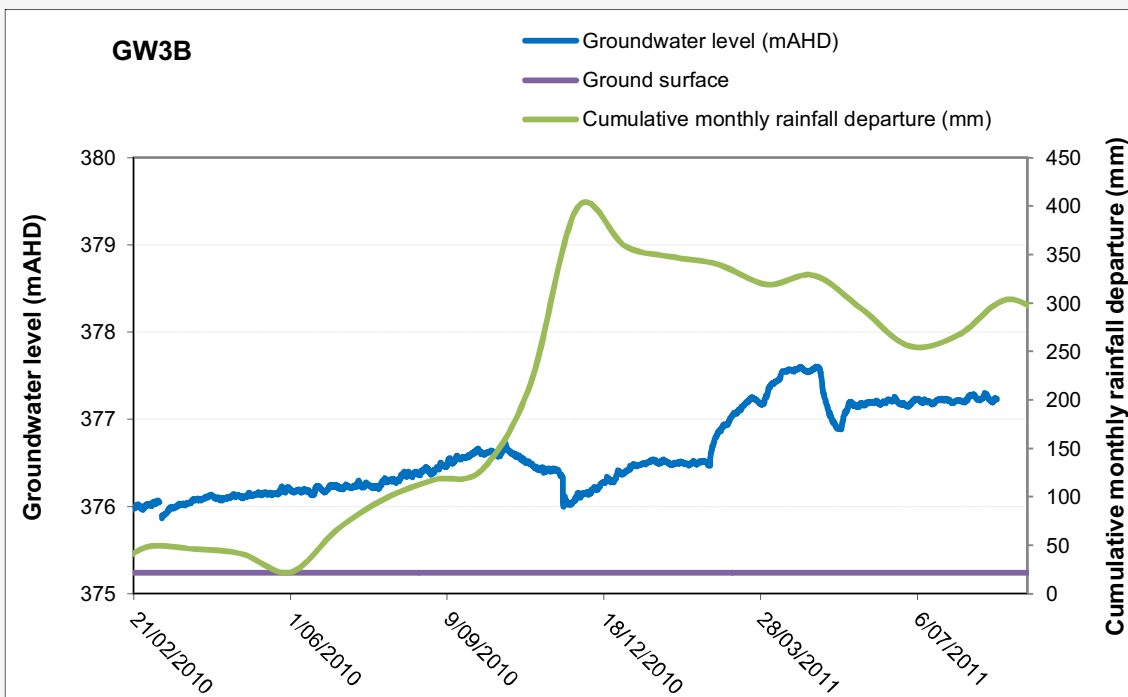
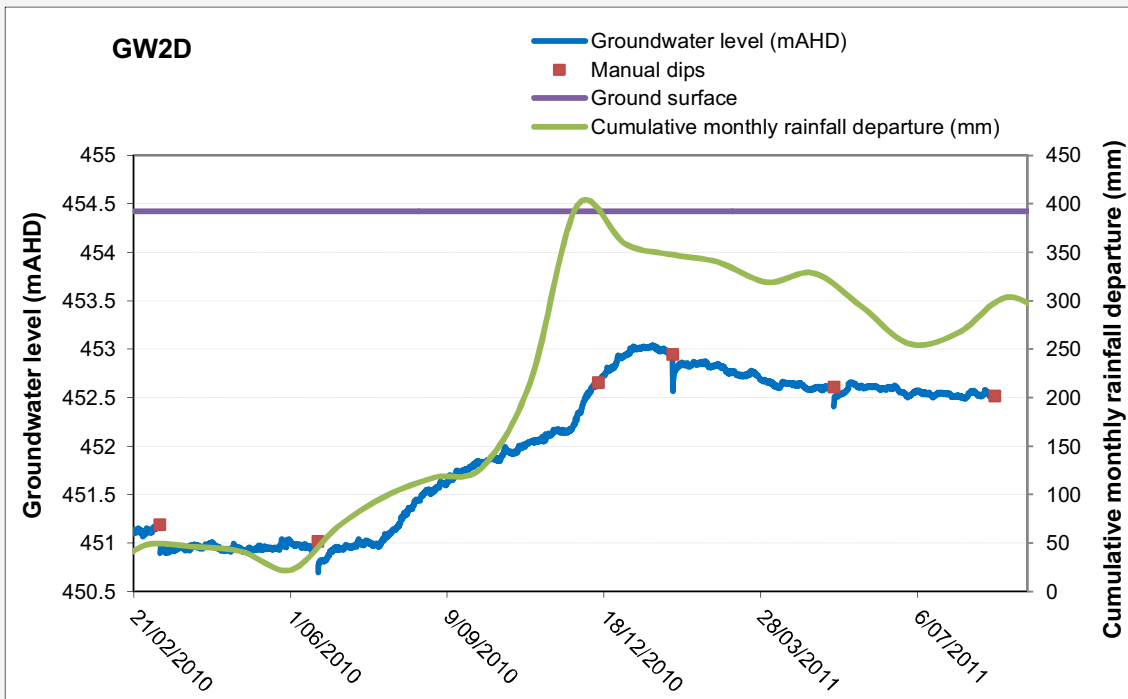


Figure E-3 Groundwater levels with cumulative monthly rainfall departure - GW2D & GW3B

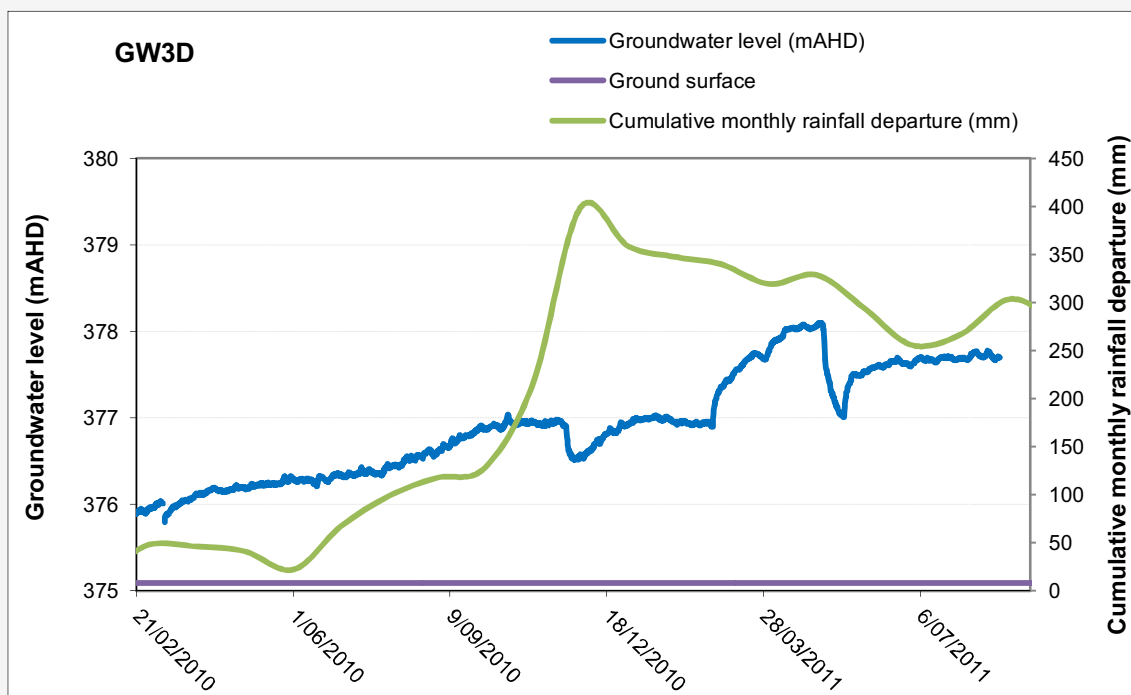
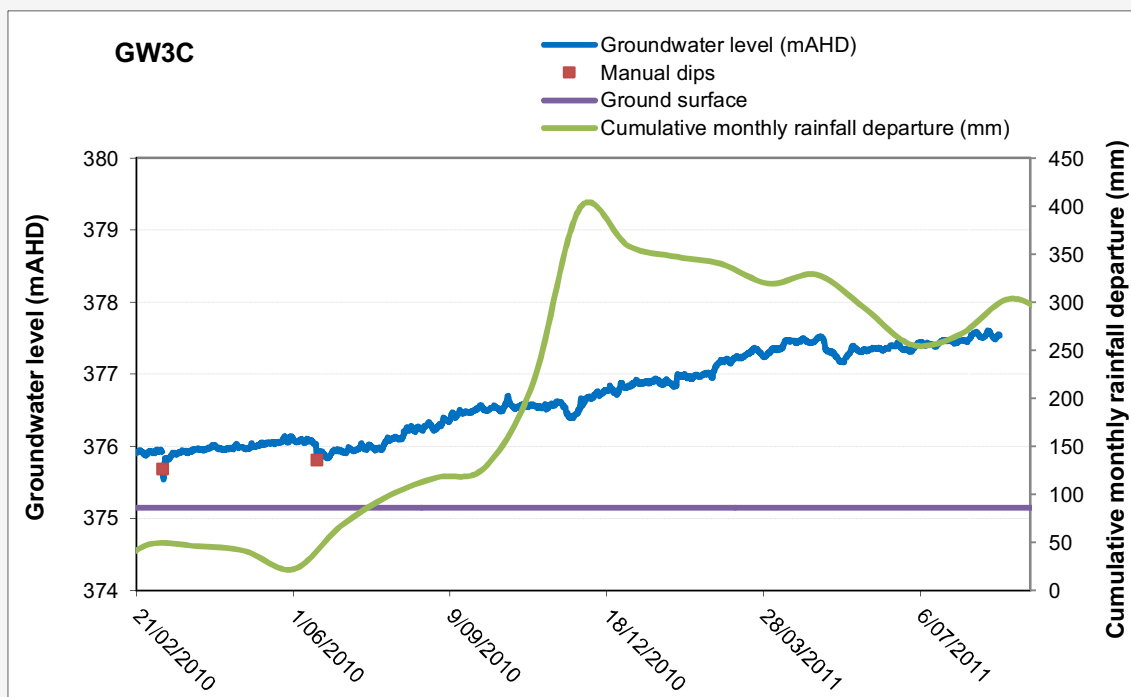


Figure E-4 Groundwater levels with cumulative monthly rainfall departure - GW3C & GW3D

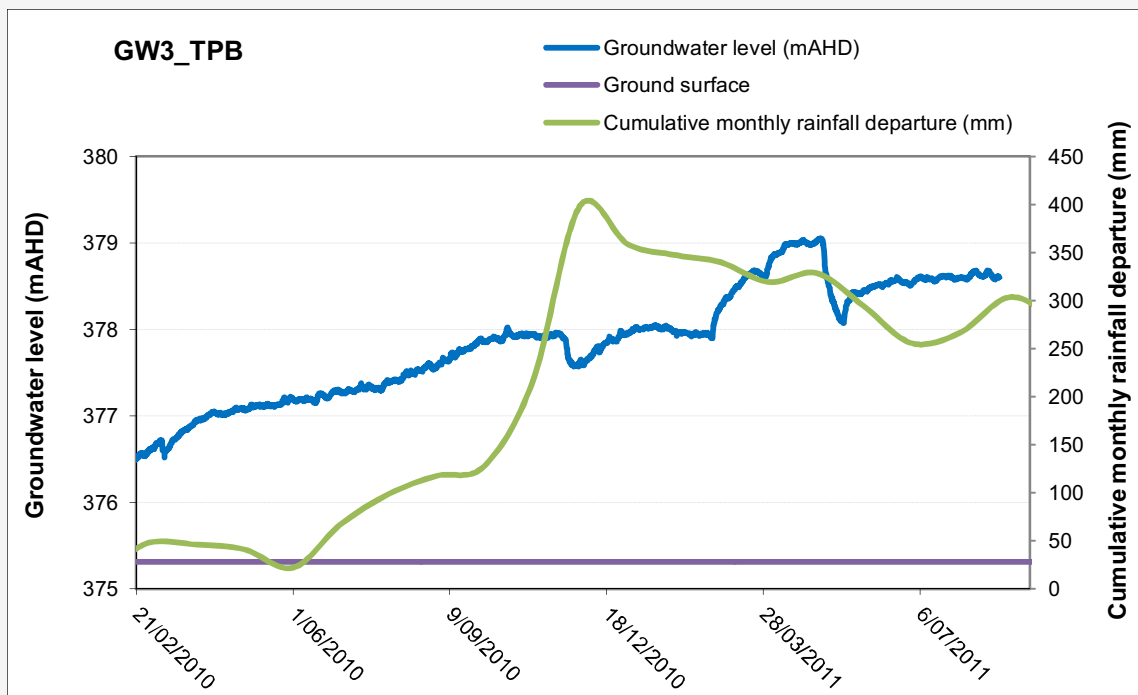
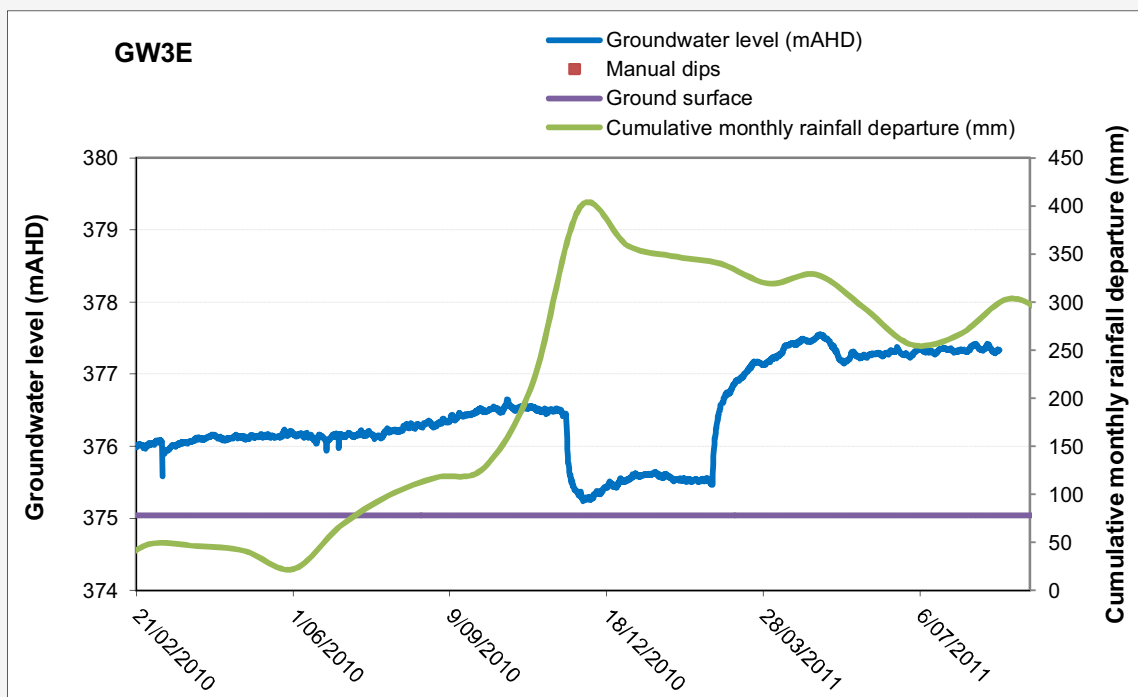


Figure E-5 Groundwater levels with cumulative monthly rainfall departure - GW3E & GW3_TPB

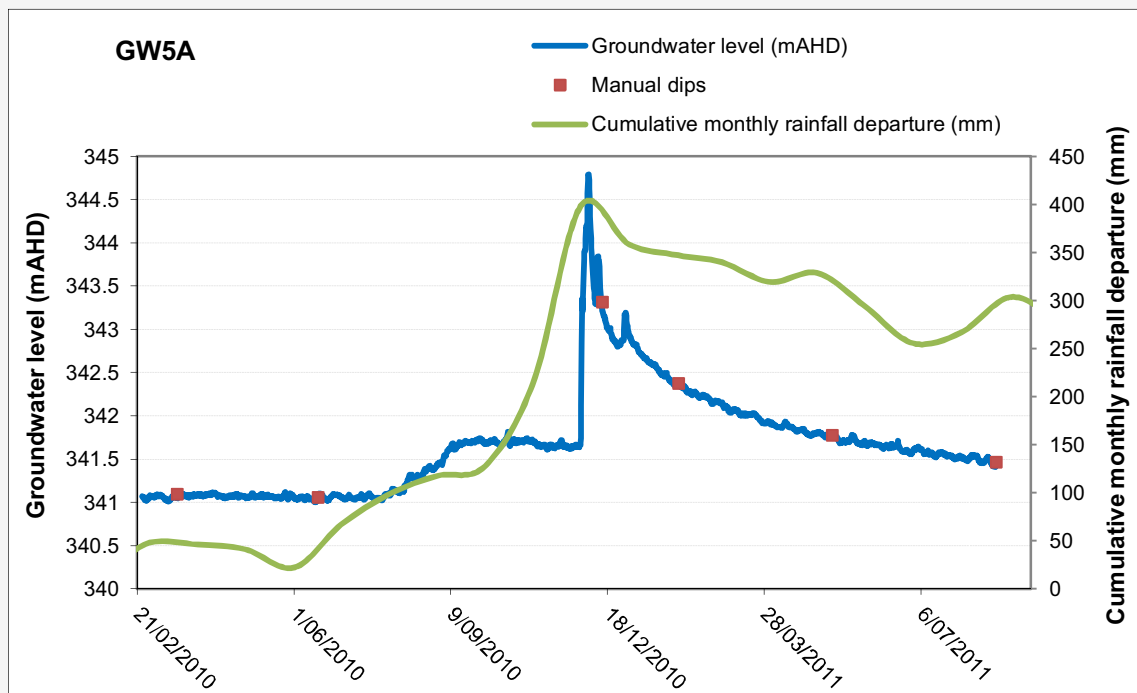
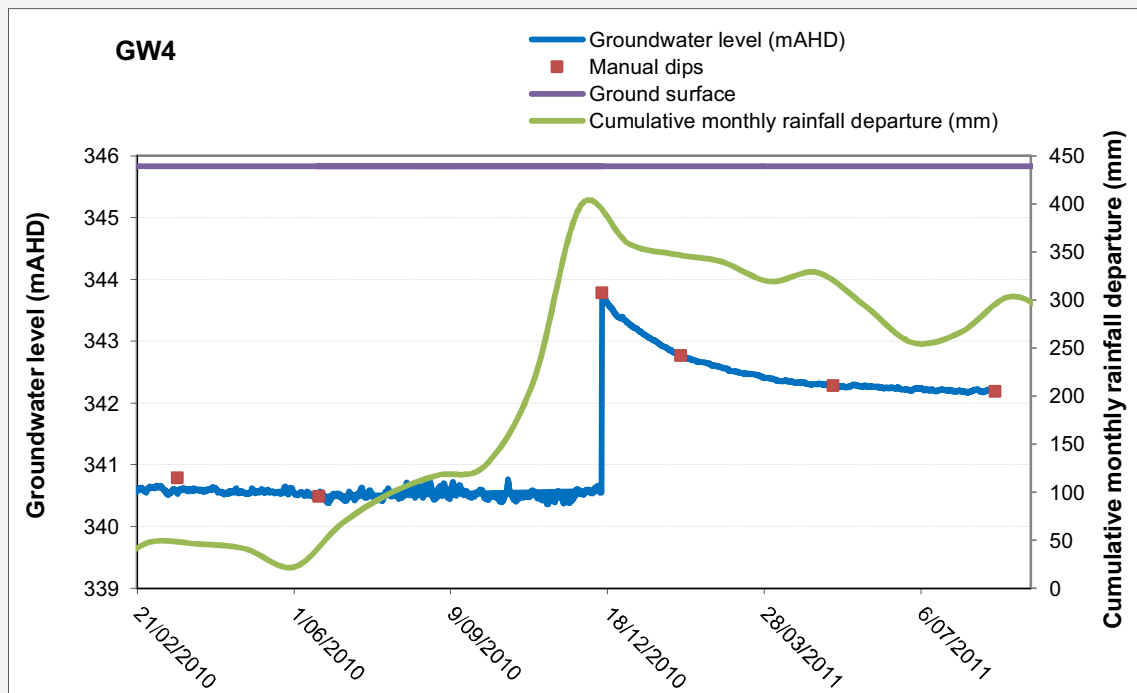


Figure E-6 Groundwater levels with cumulative monthly rainfall departure - GW4 & GW5A

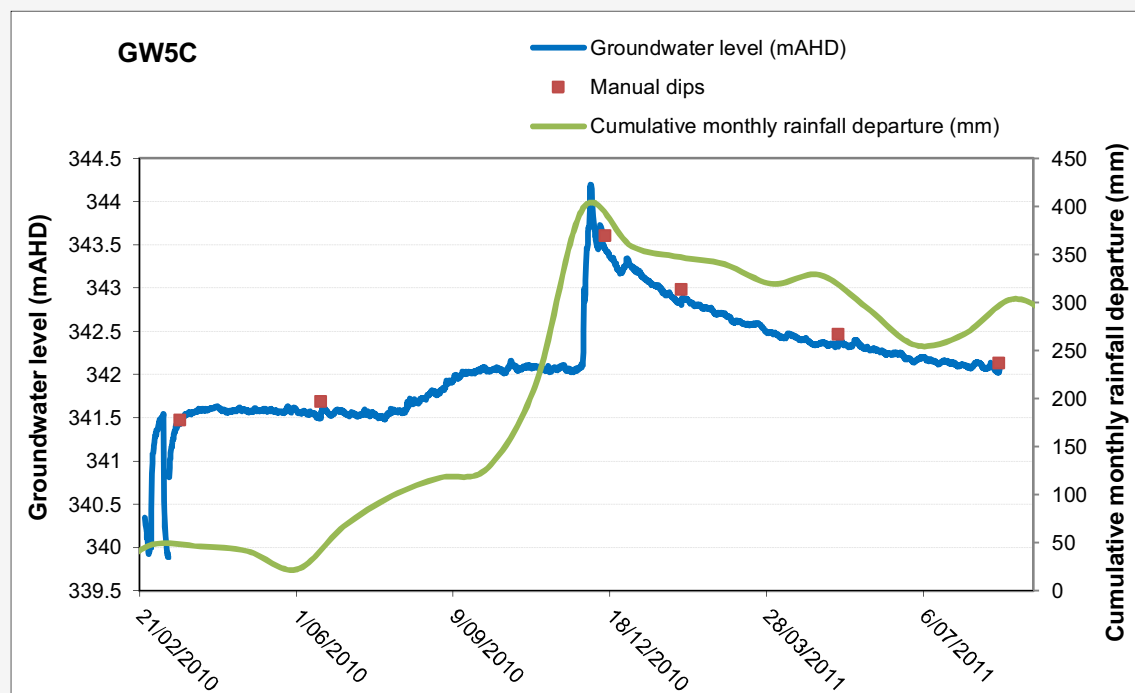
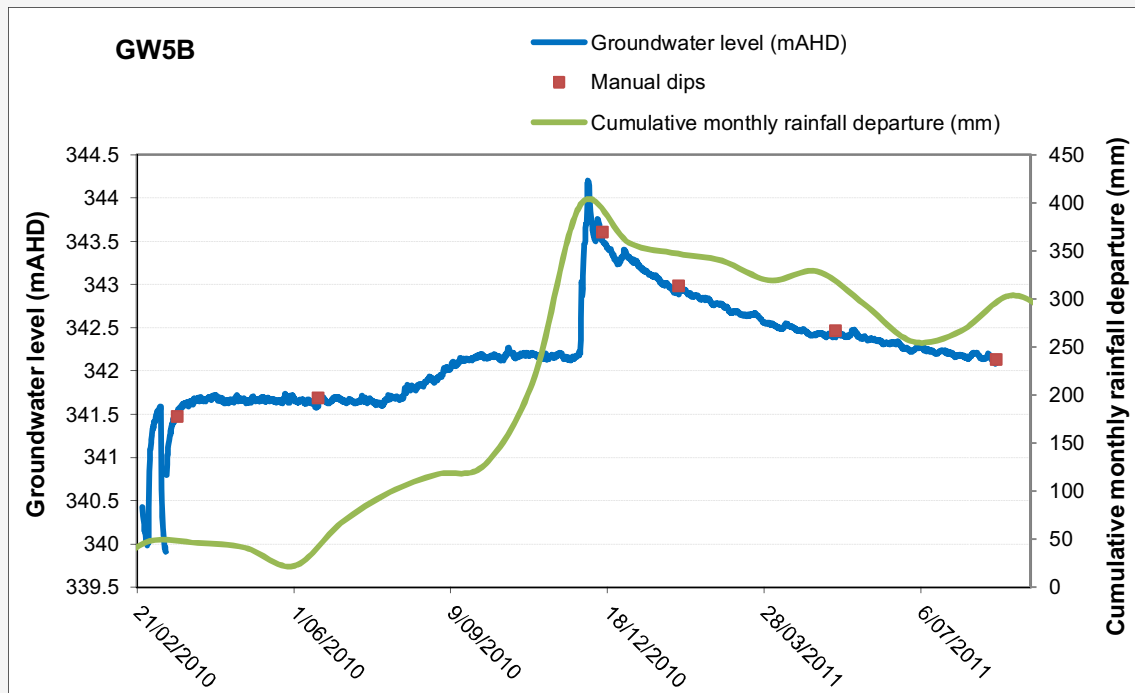


Figure E-7 Groundwater levels with cumulative monthly rainfall departure - GW5B & GW5C

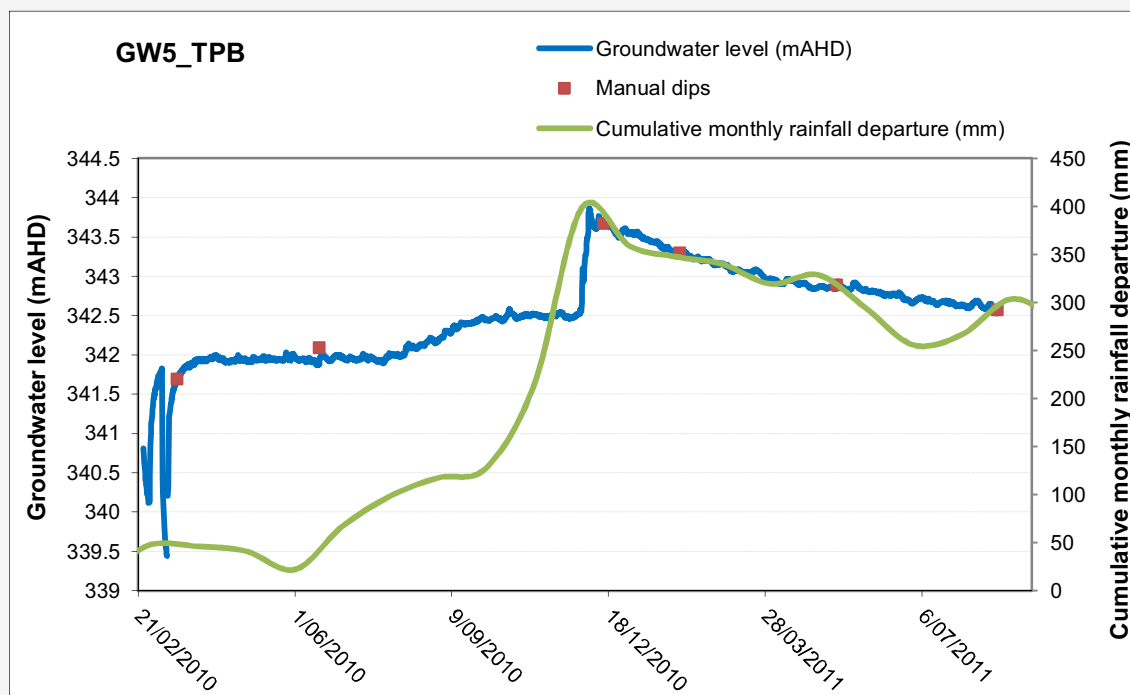
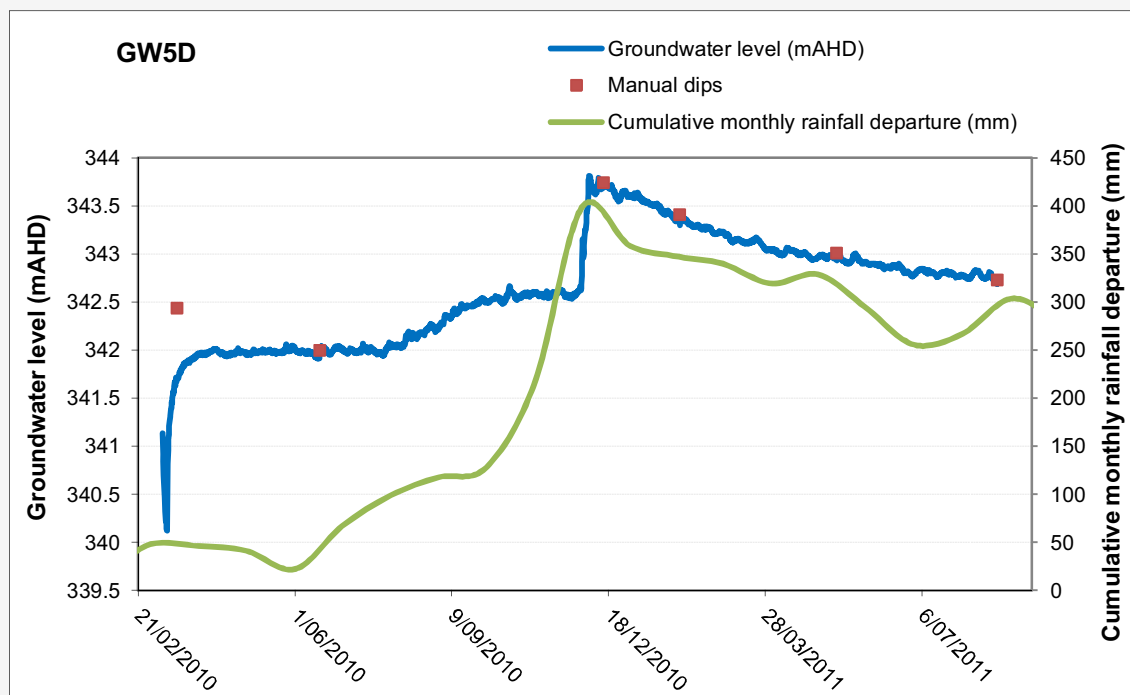


Figure E-8 Groundwater levels with cumulative monthly rainfall departure - GW5D & GW5_TPB

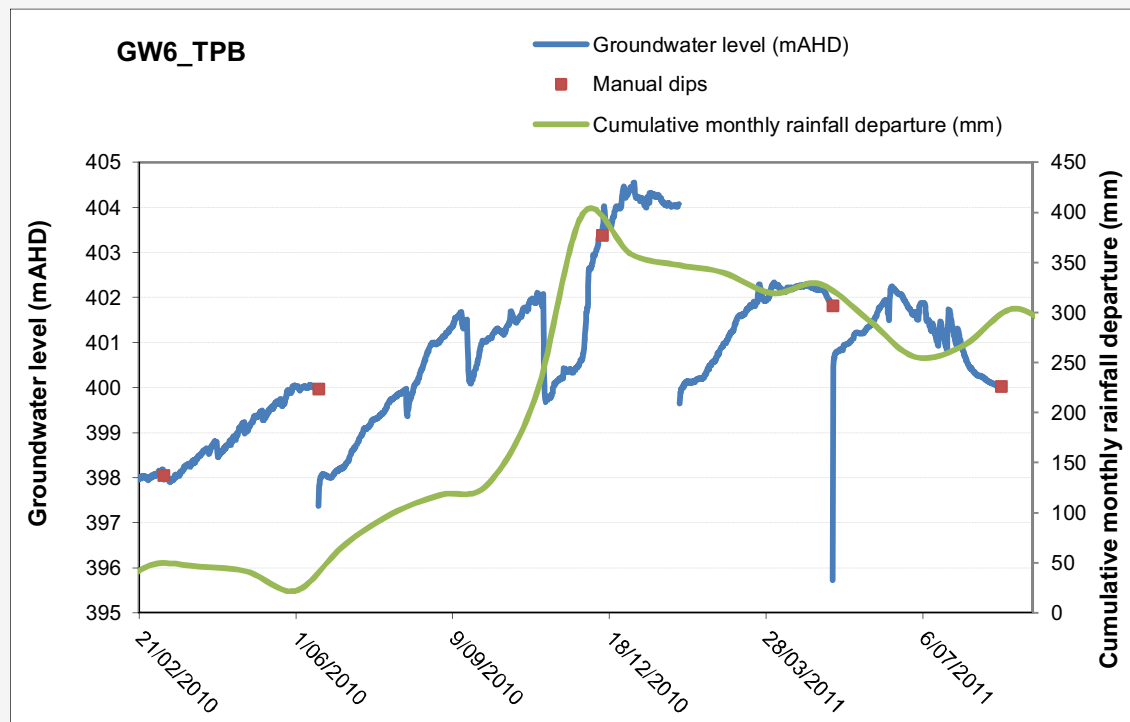


Figure E-9 Groundwater levels with cumulative monthly rainfall departure - GW6_TPB

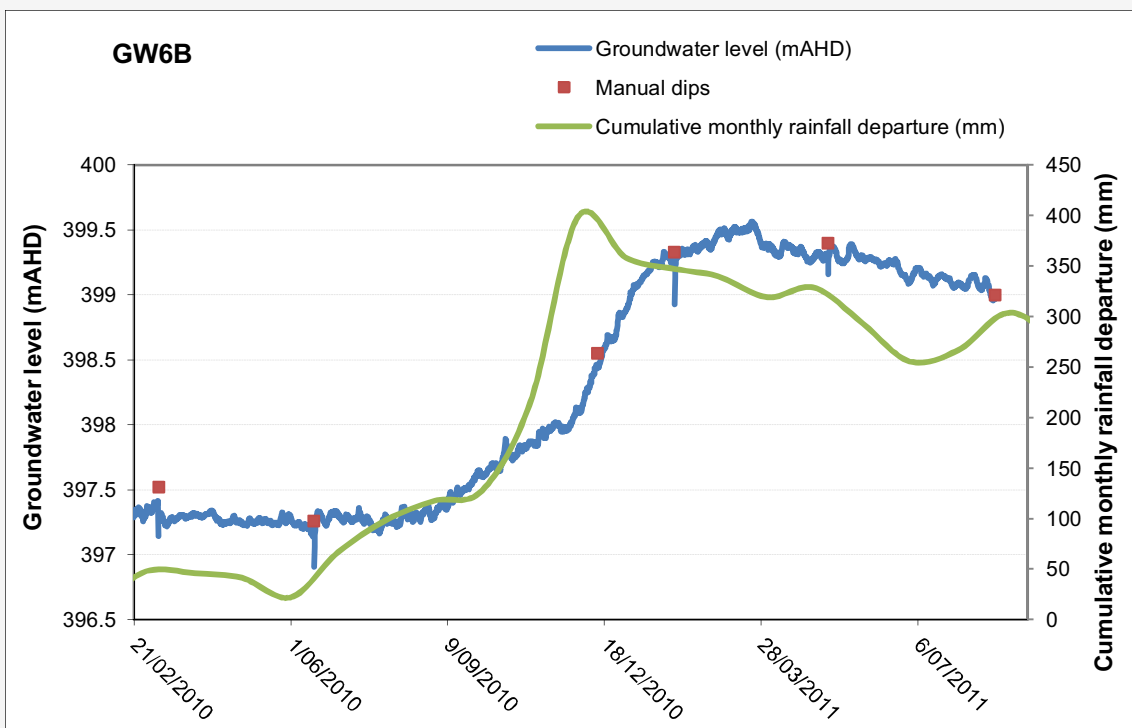
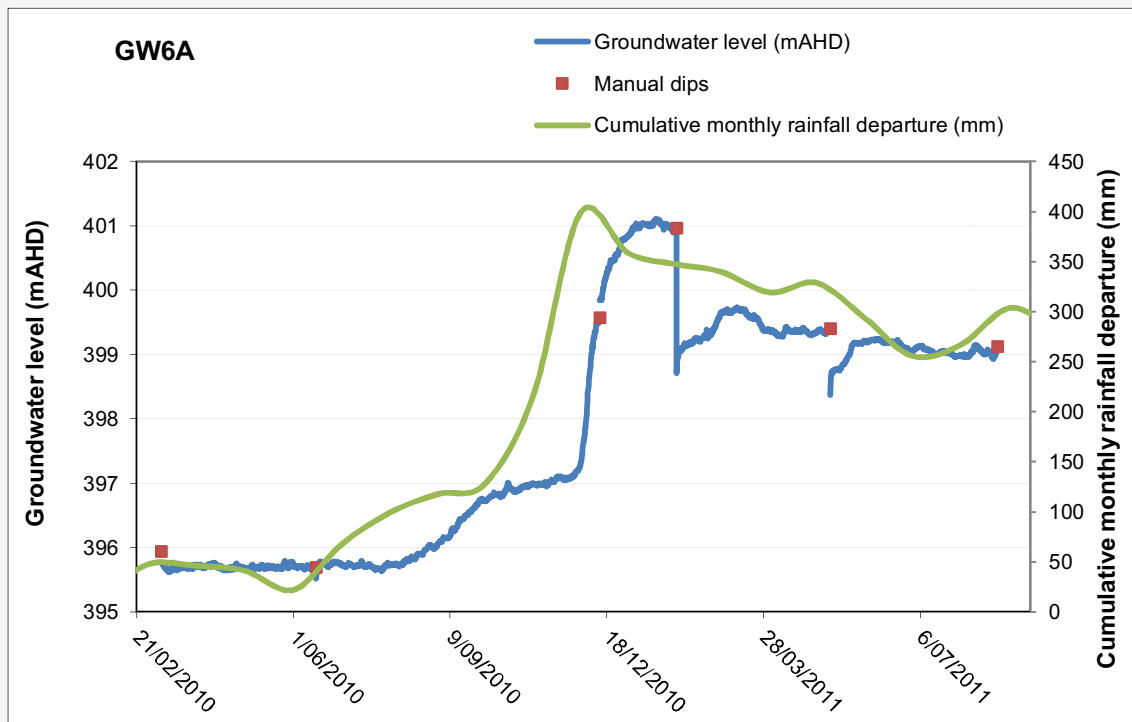


Figure E-10 Groundwater levels with cumulative monthly rainfall departure - GW6A & GW6B

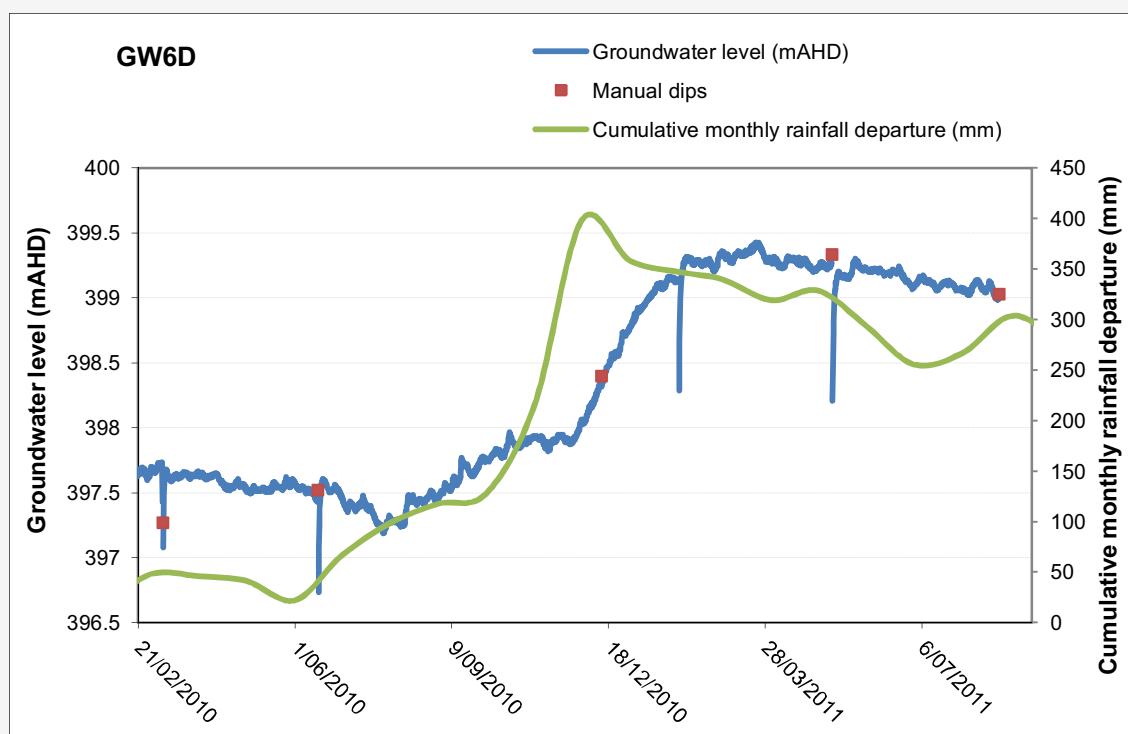
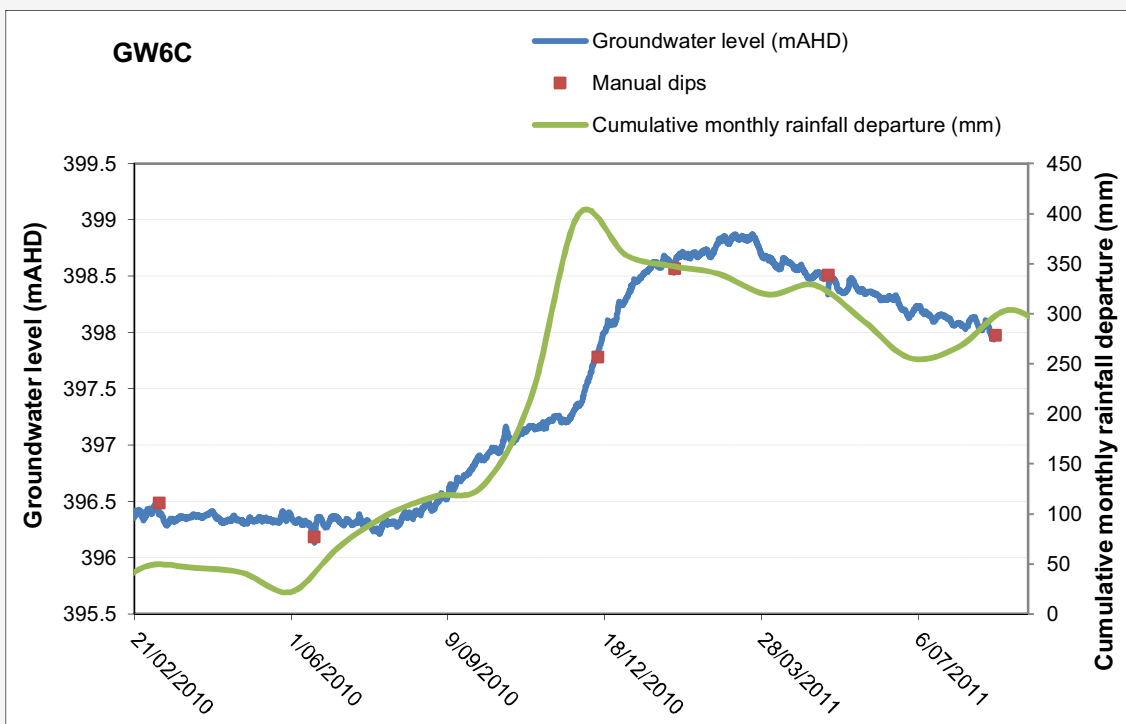


Figure E-11 Groundwater levels with cumulative monthly rainfall departure - GW6C & GW6D

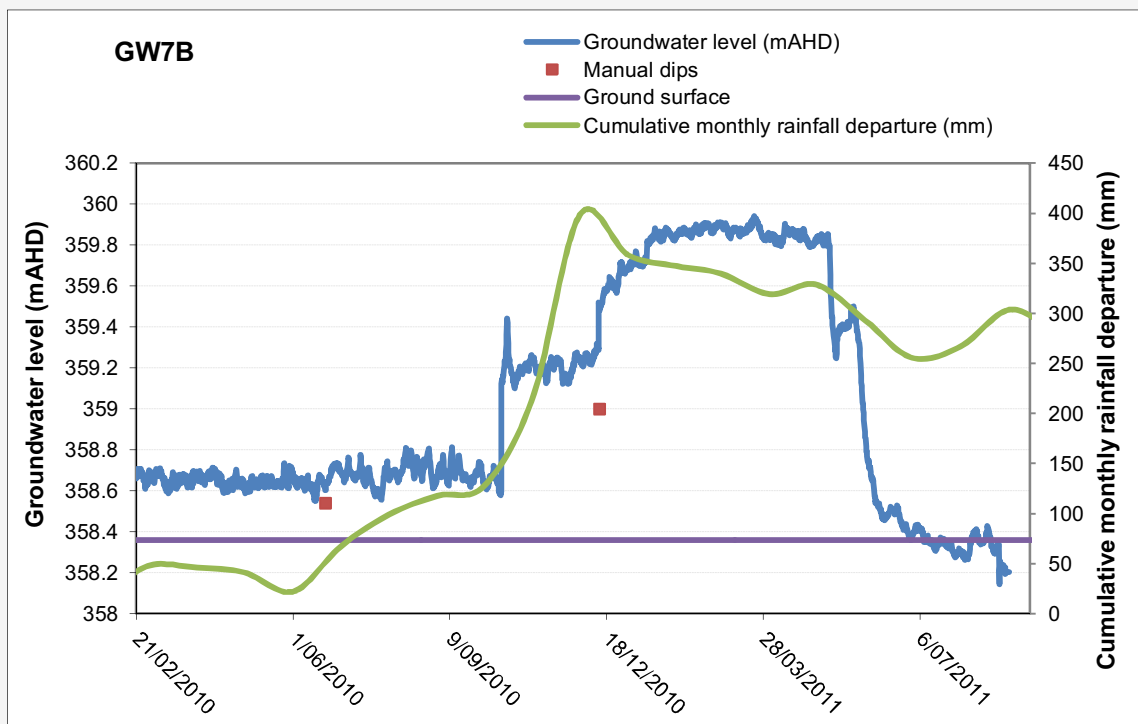
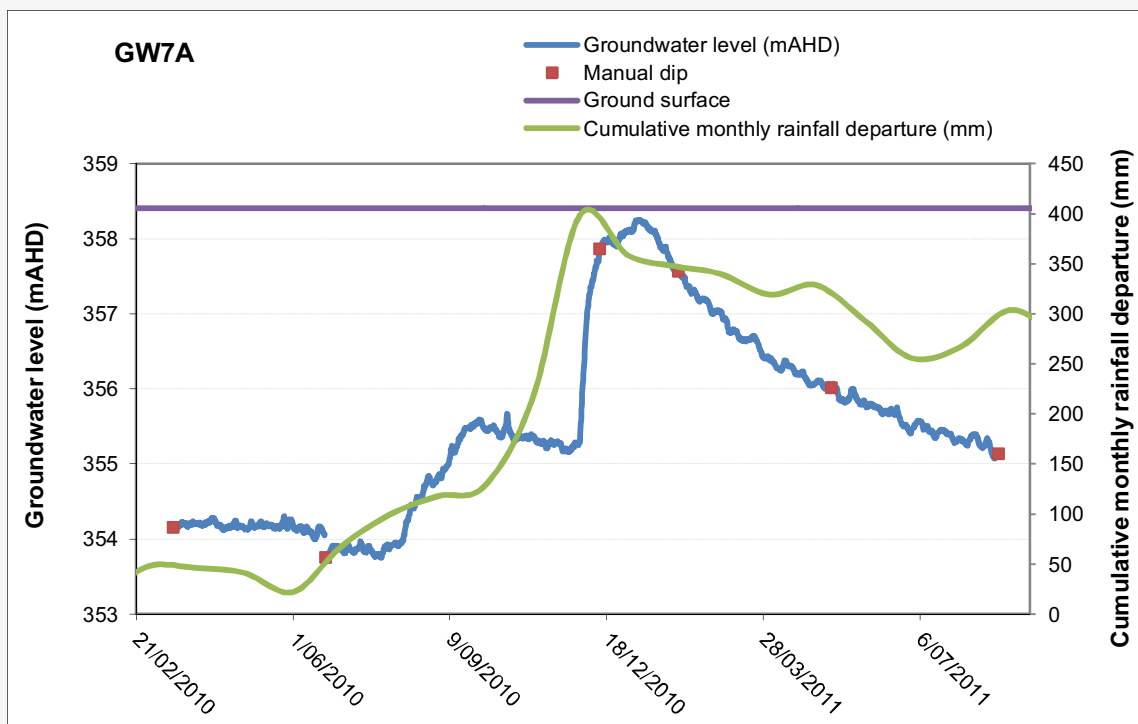


Figure E-12 Groundwater levels with cumulative monthly rainfall departure - GW7A & GW7B

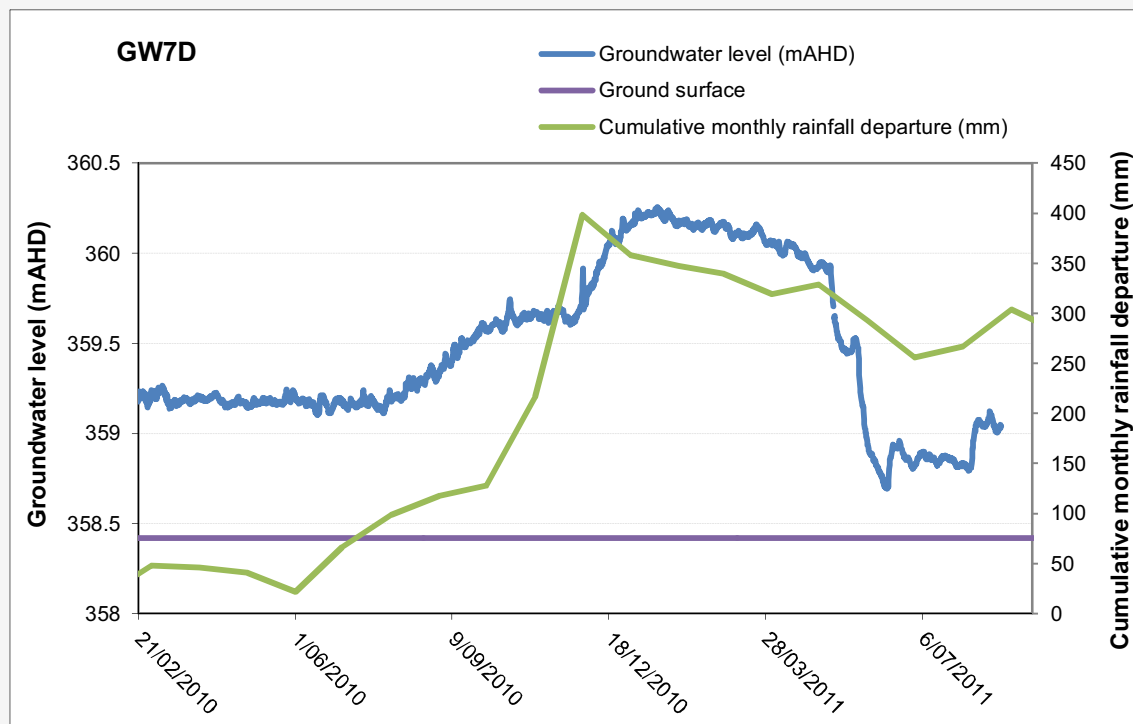
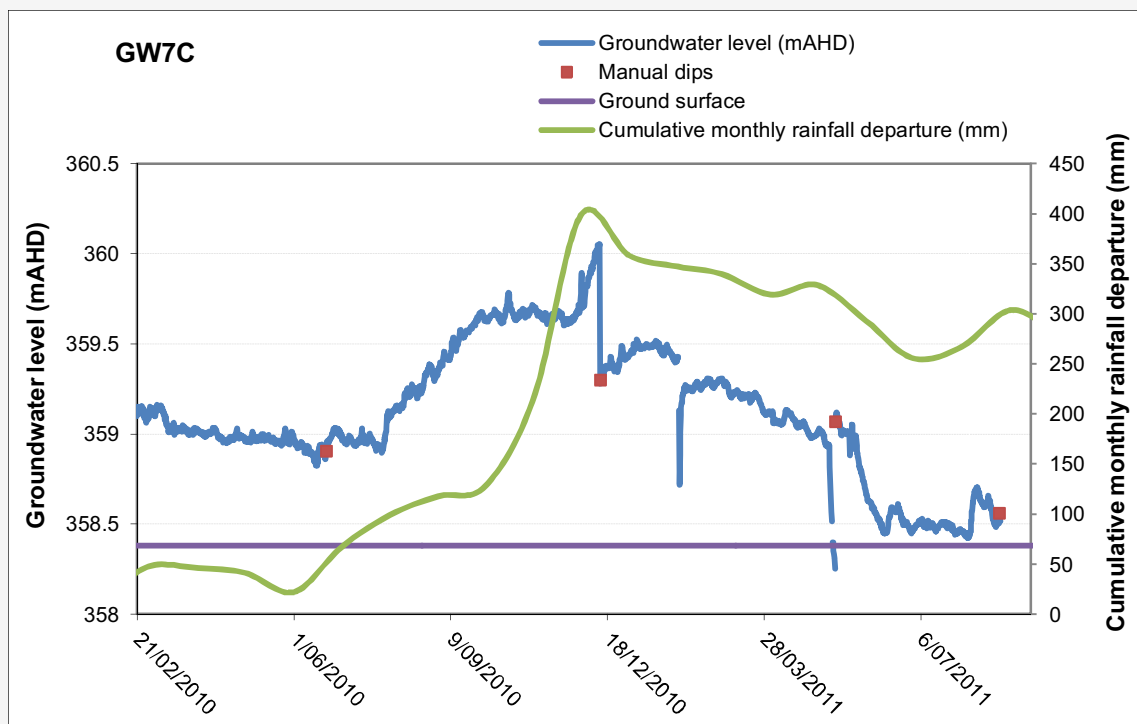


Figure E-13 Groundwater levels with cumulative monthly rainfall departure - GW7C & GW7D

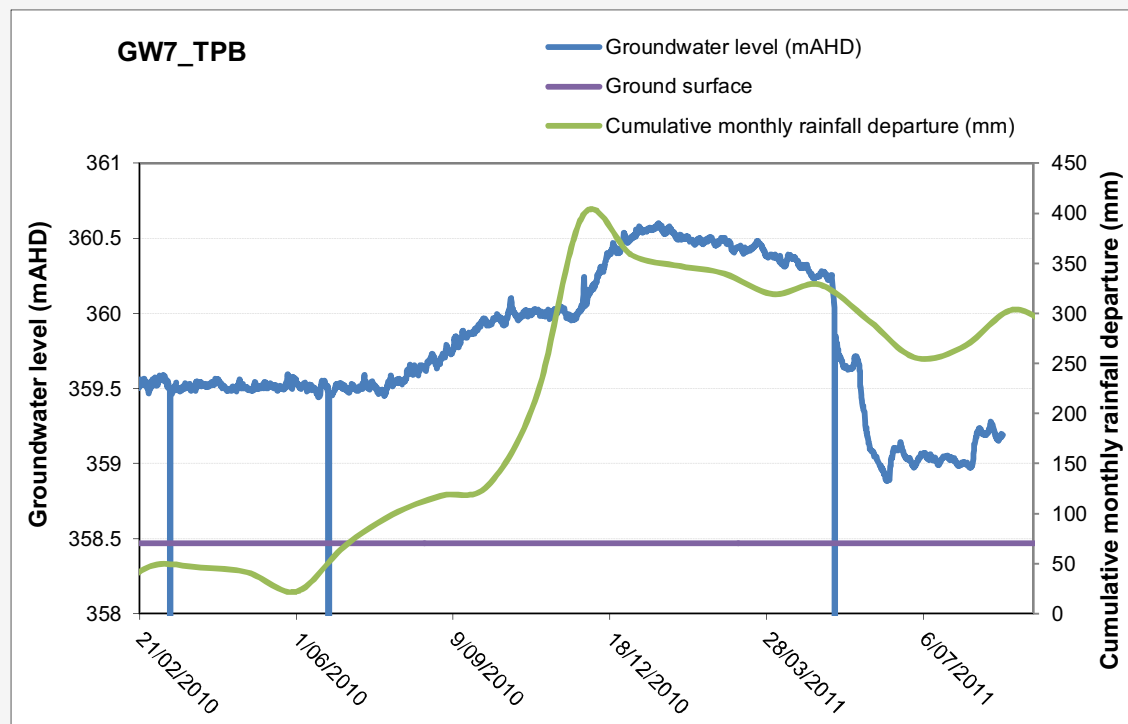
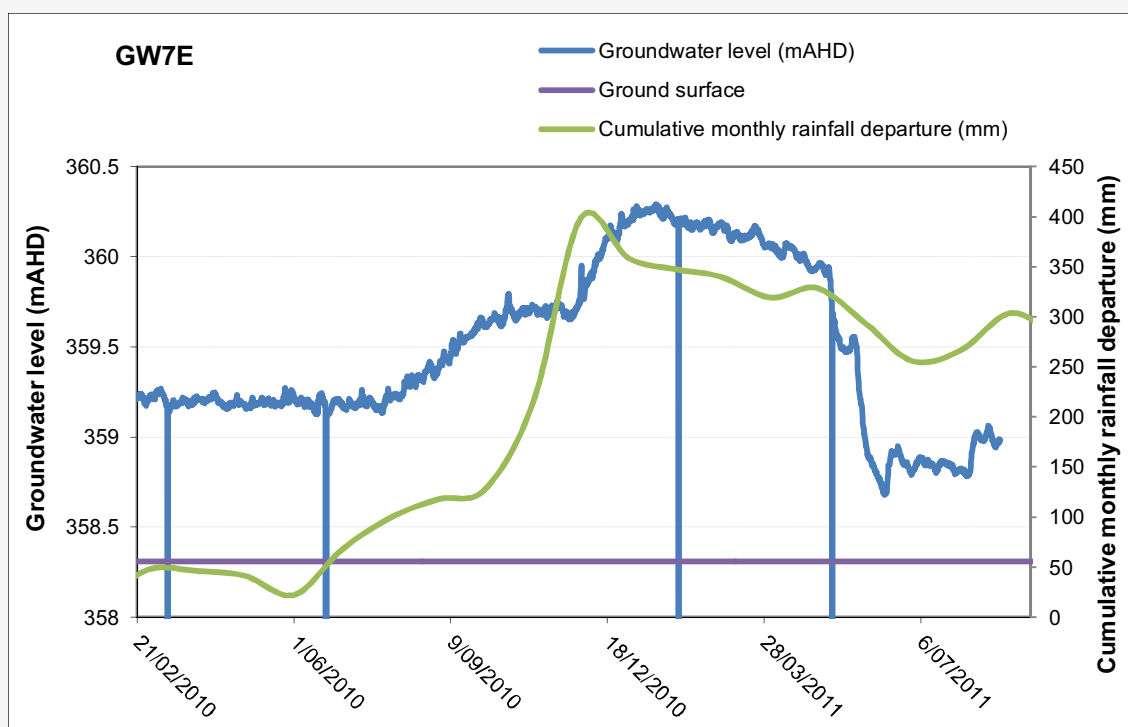


Figure E-14 Groundwater levels with cumulative monthly rainfall departure - GW7E & GW7_TPB

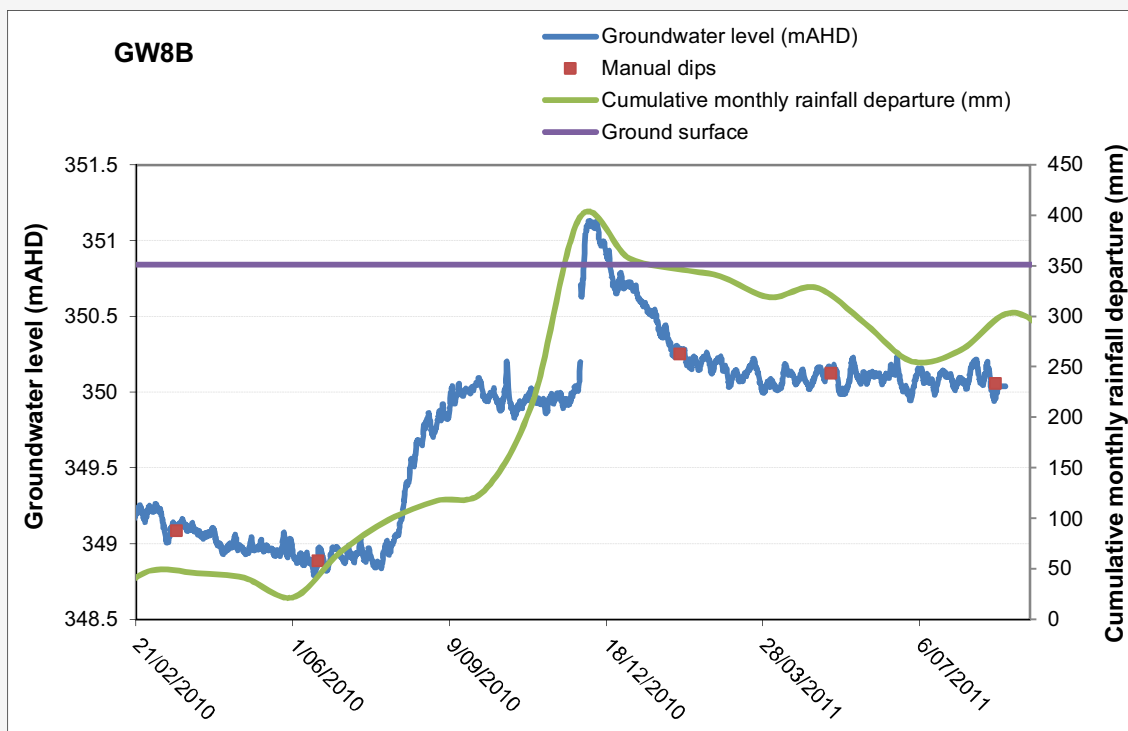
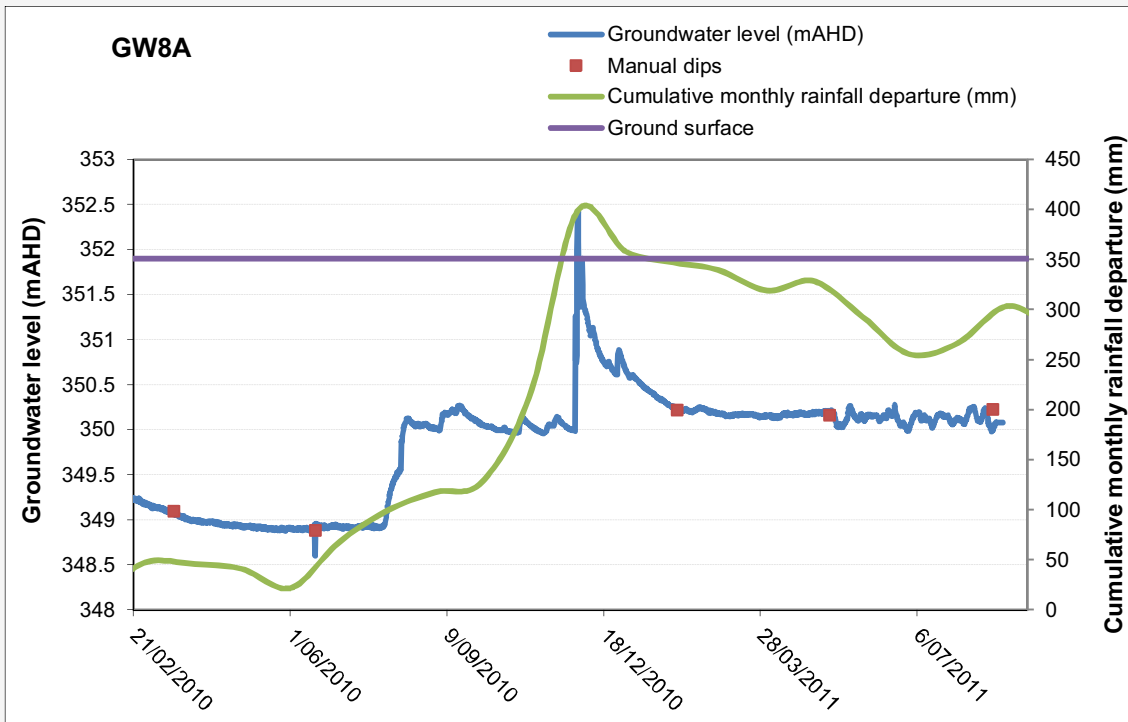


Figure E-15 Groundwater levels with cumulative monthly rainfall departure - GW8A & GW8B

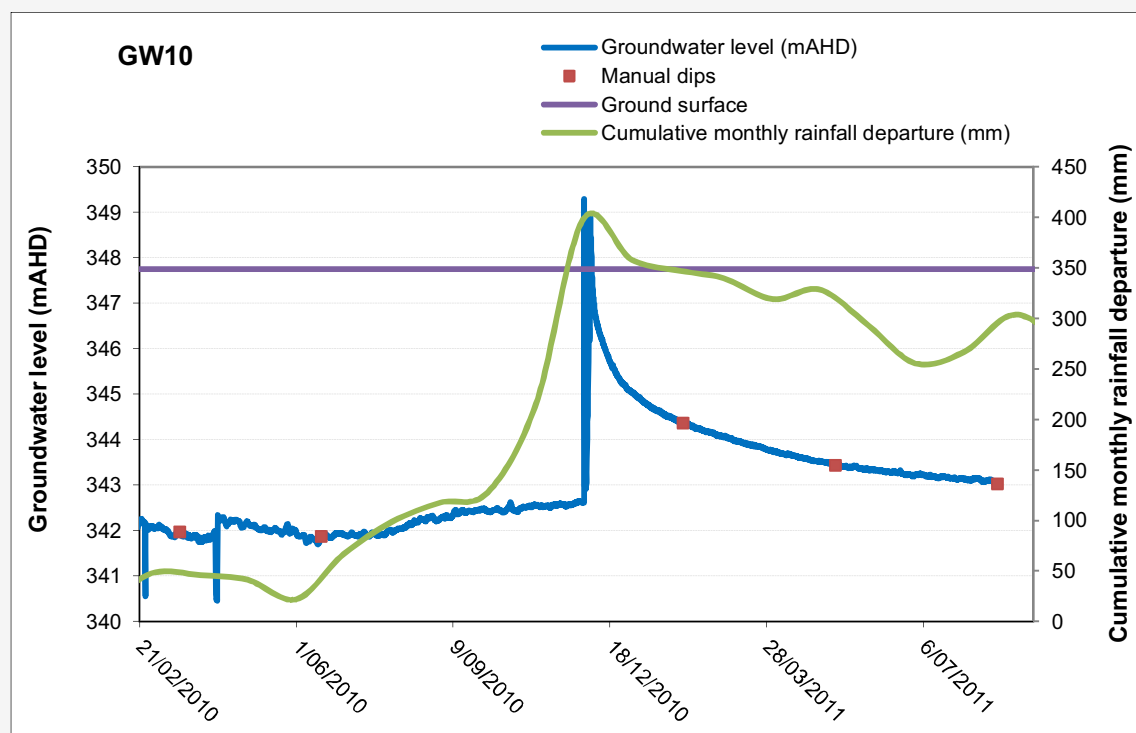
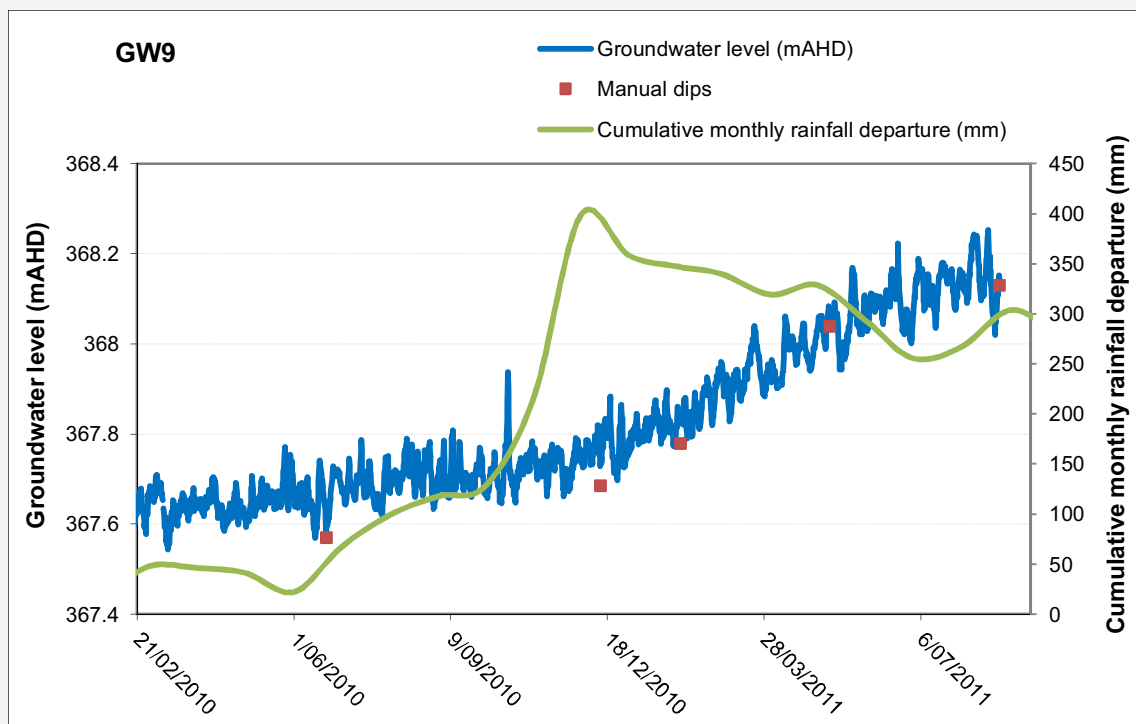


Figure E-16 Groundwater levels with cumulative monthly rainfall departure - GW9 & GW10

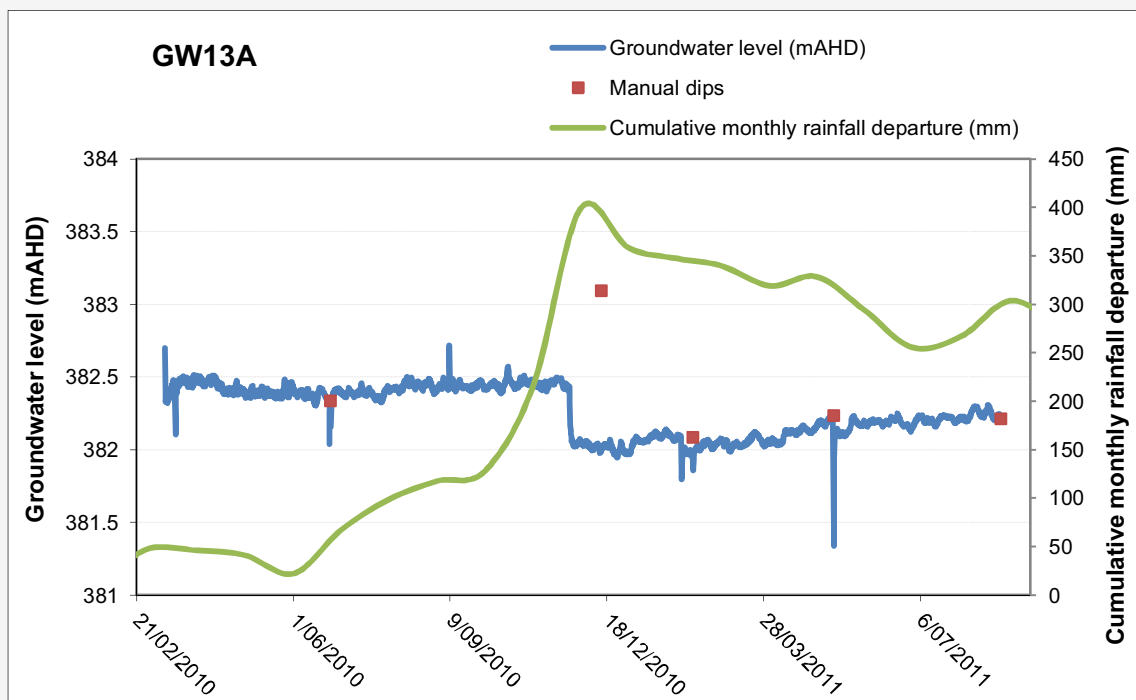
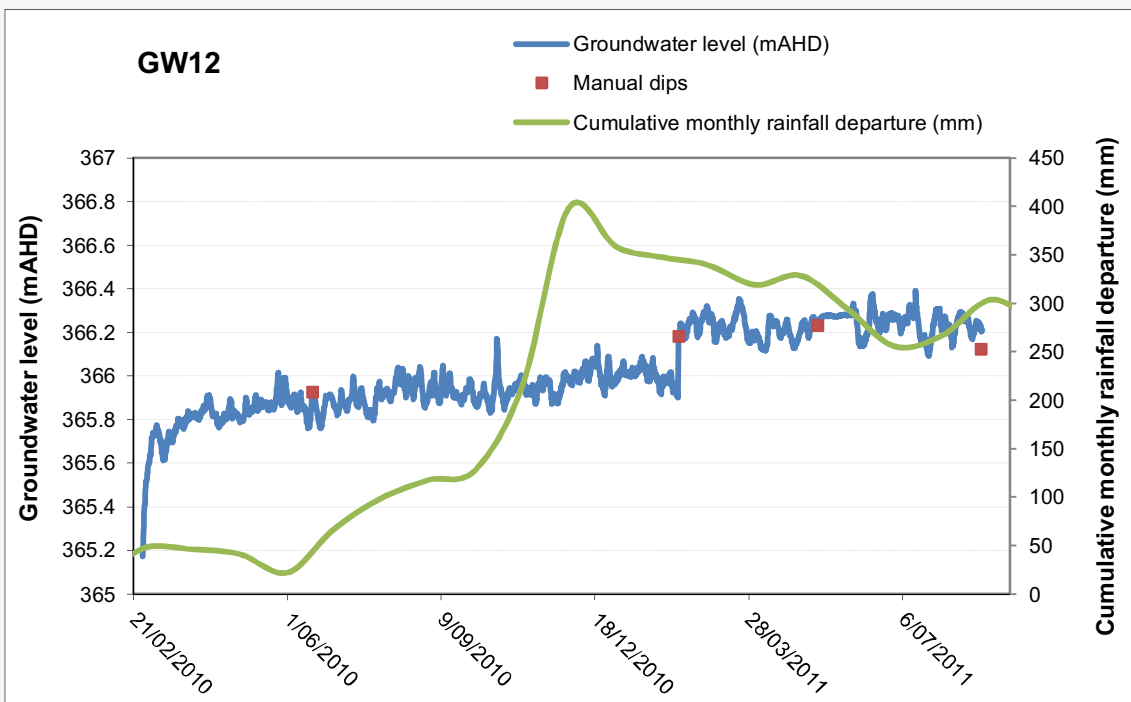


Figure E-17 Groundwater levels with cumulative monthly rainfall departure - GW12 & GW13A

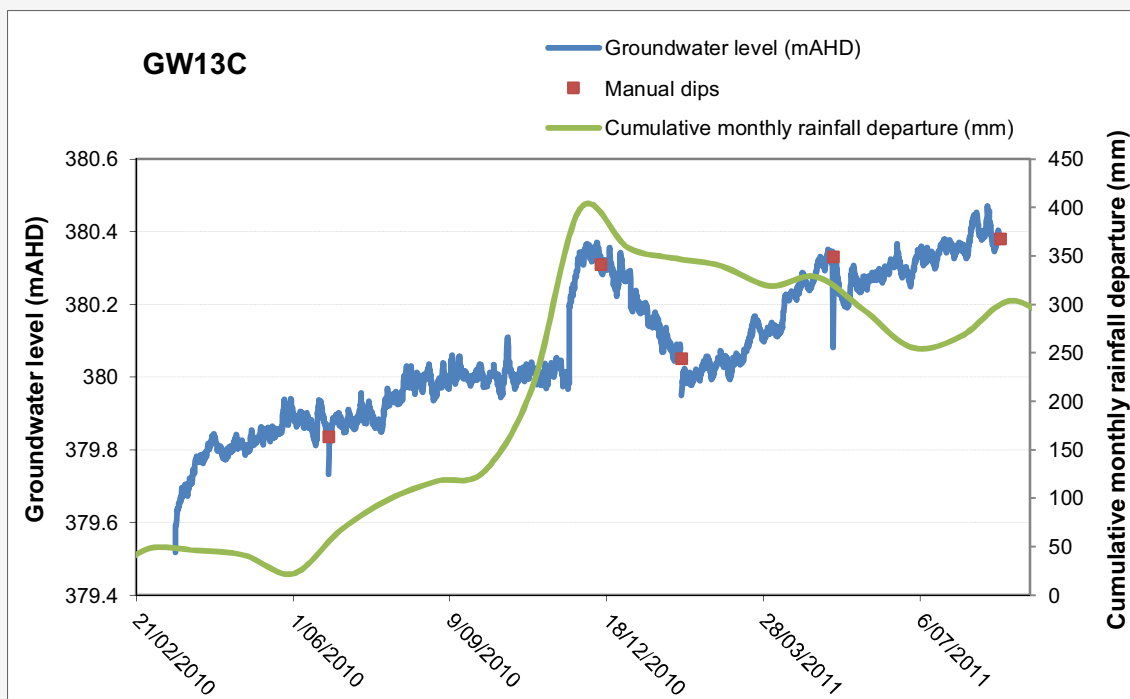
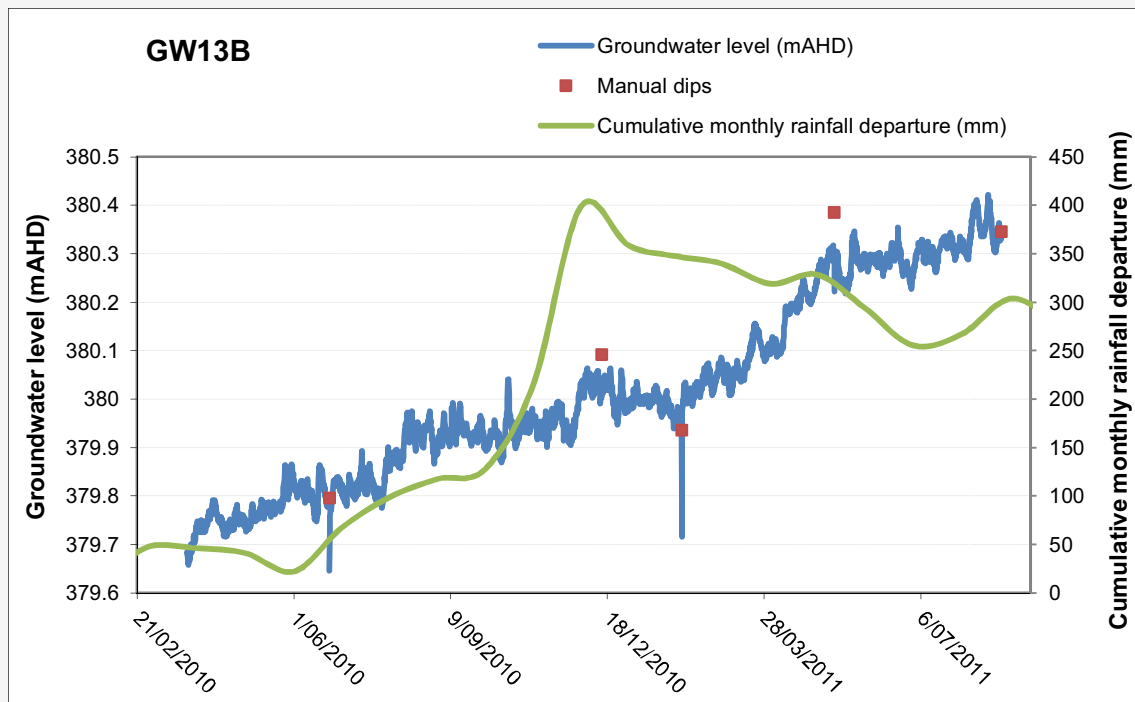


Figure E-18 Groundwater levels with cumulative monthly rainfall departure - GW13B & GW13C

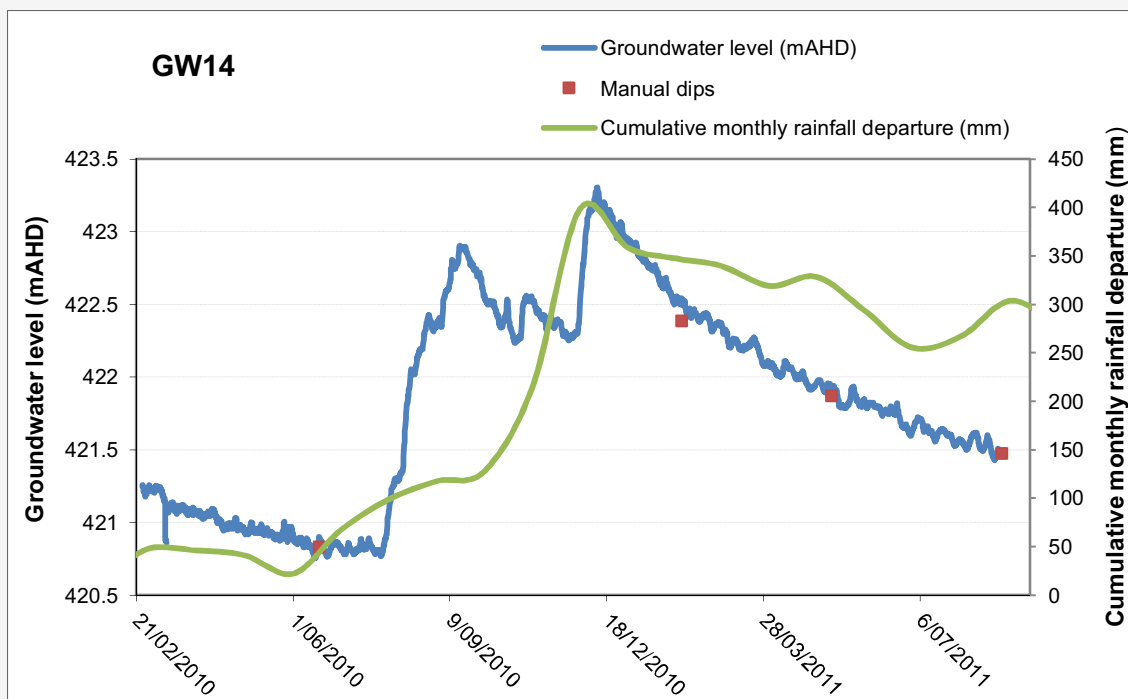
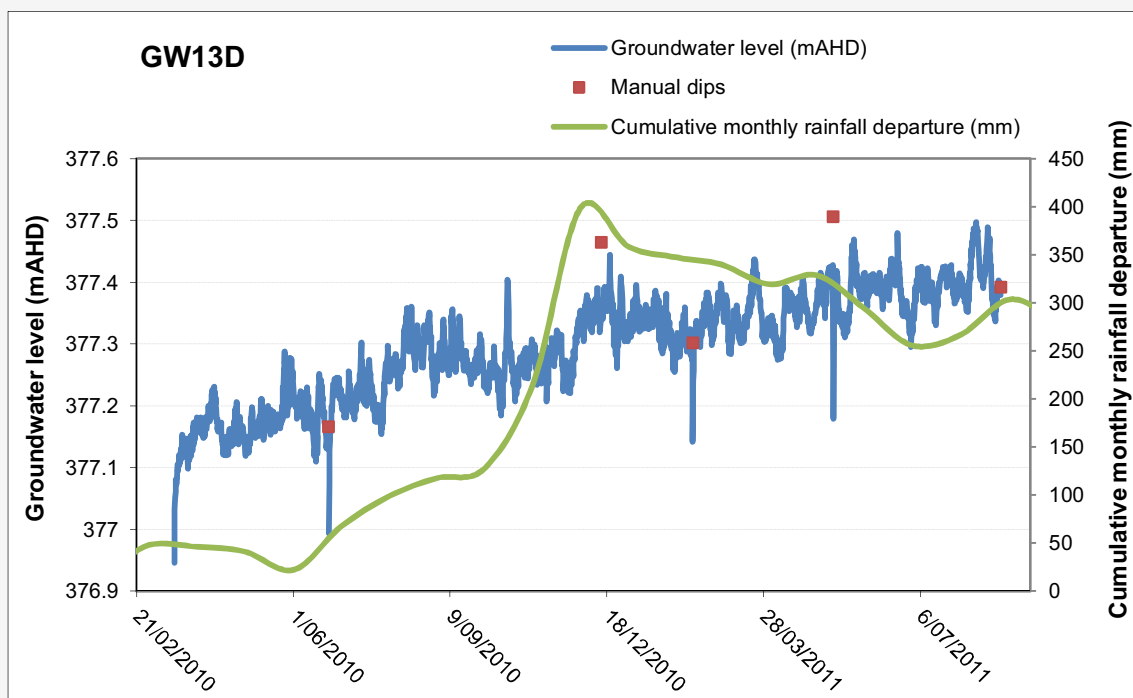


Figure E-19 Groundwater levels with cumulative monthly rainfall departure - GW13D & GW14

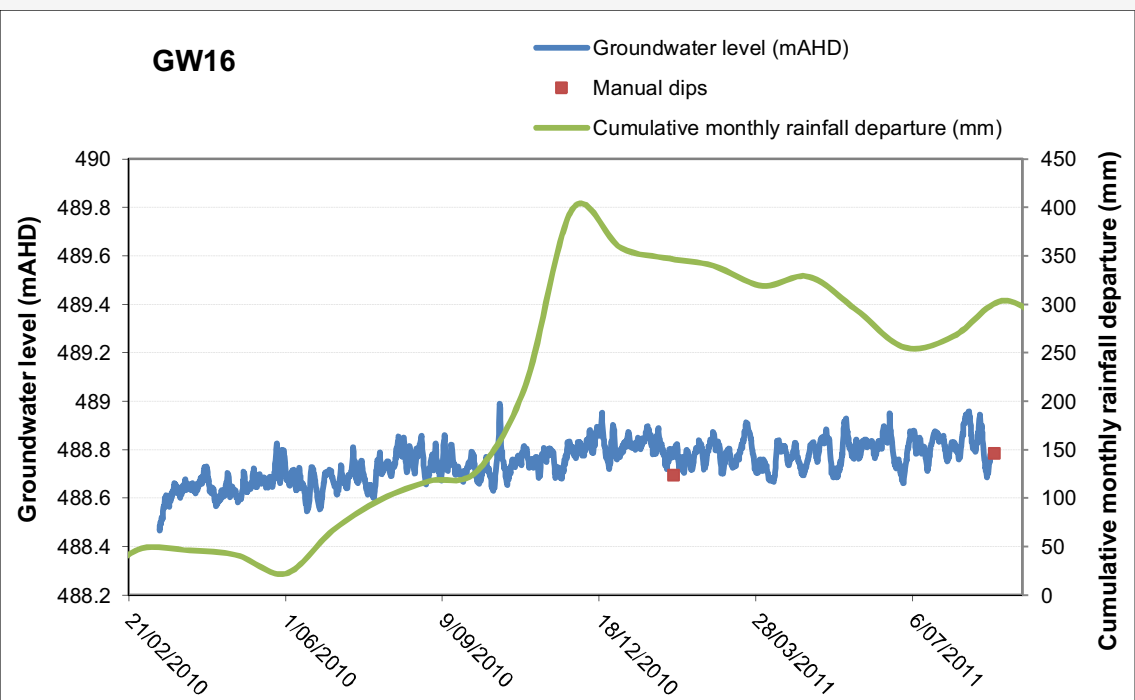
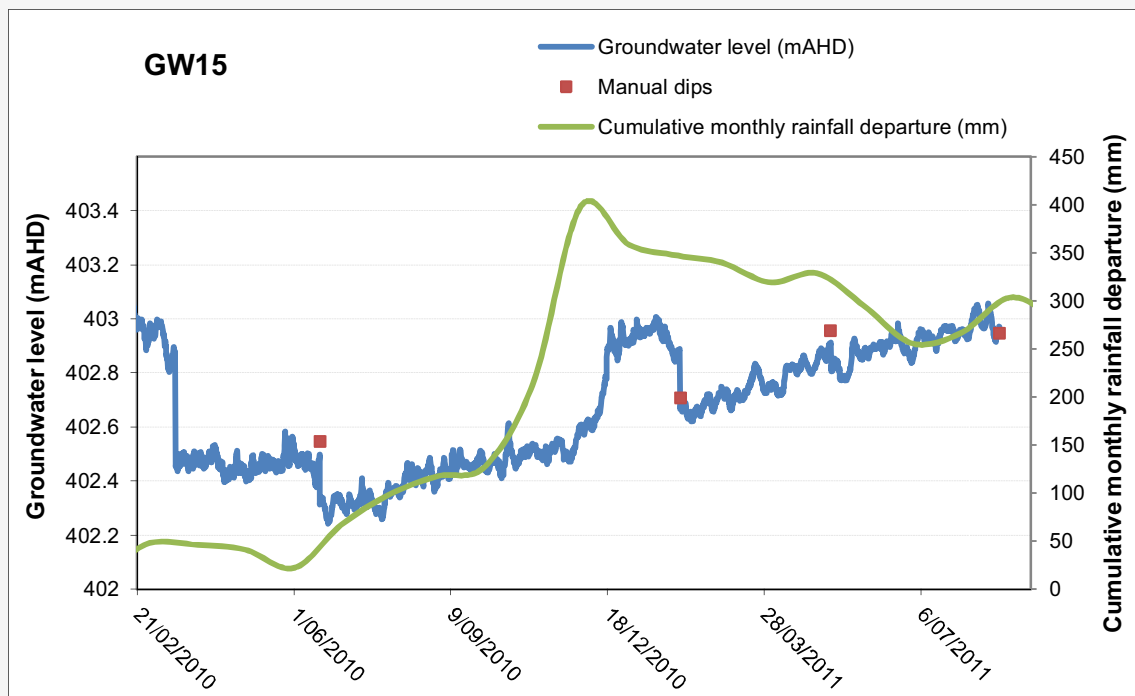


Figure E-20 Groundwater levels with cumulative monthly rainfall departure - GW15 & GW16

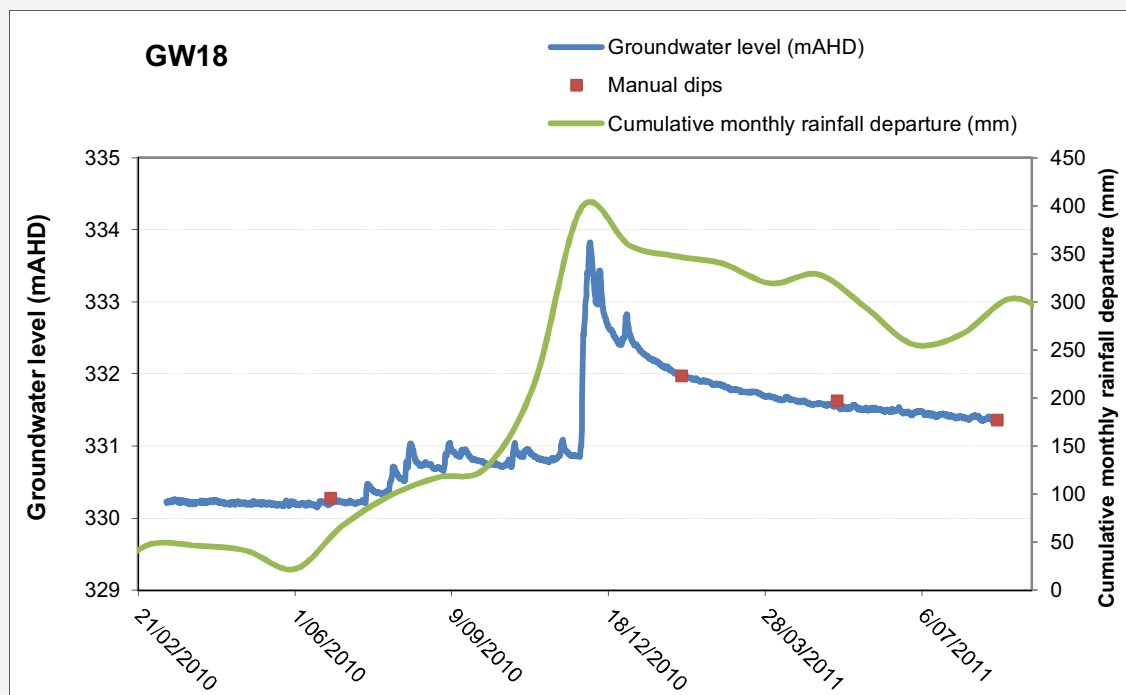
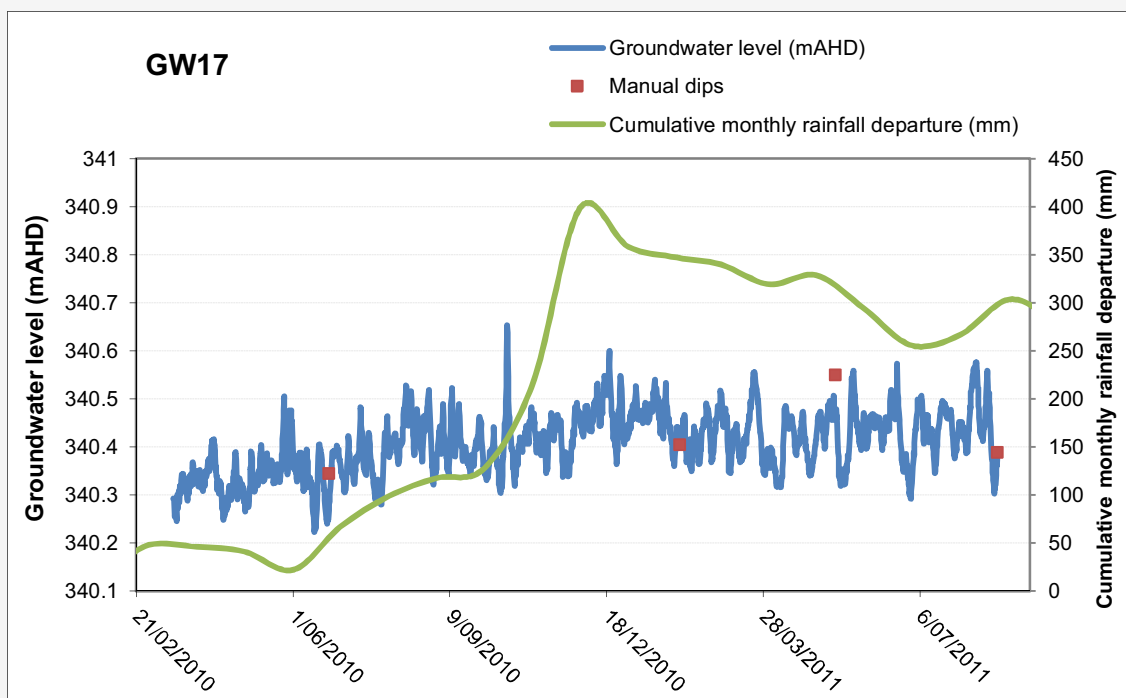


Figure E-21 Groundwater levels with cumulative monthly rainfall departure - GW17 & GW18

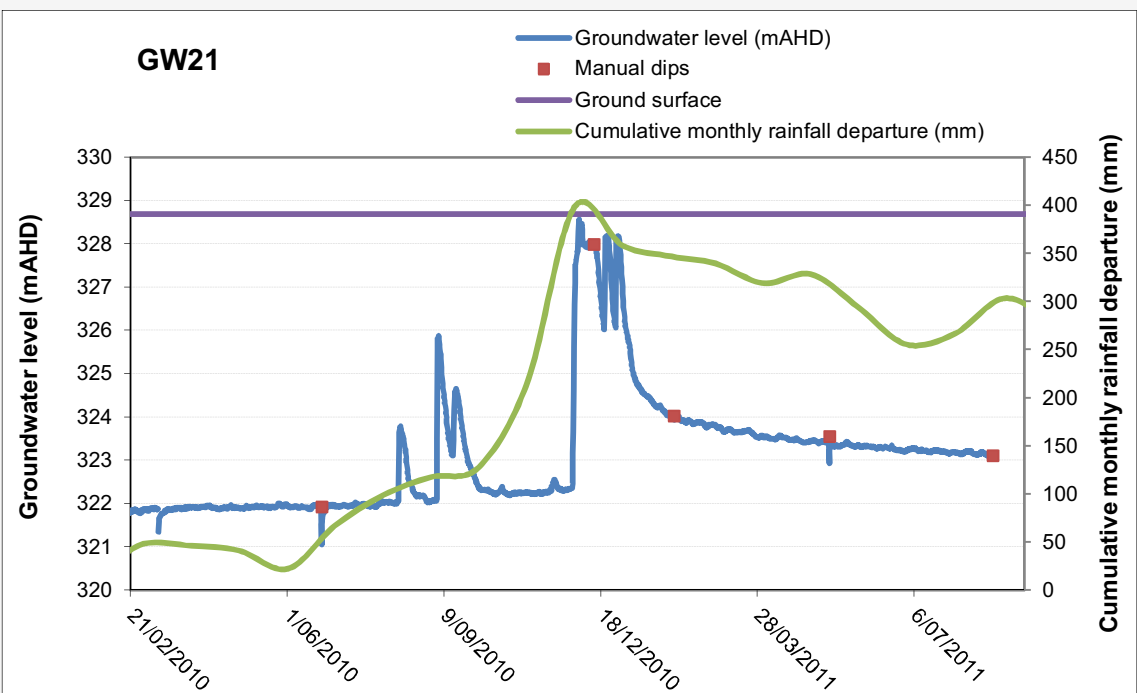
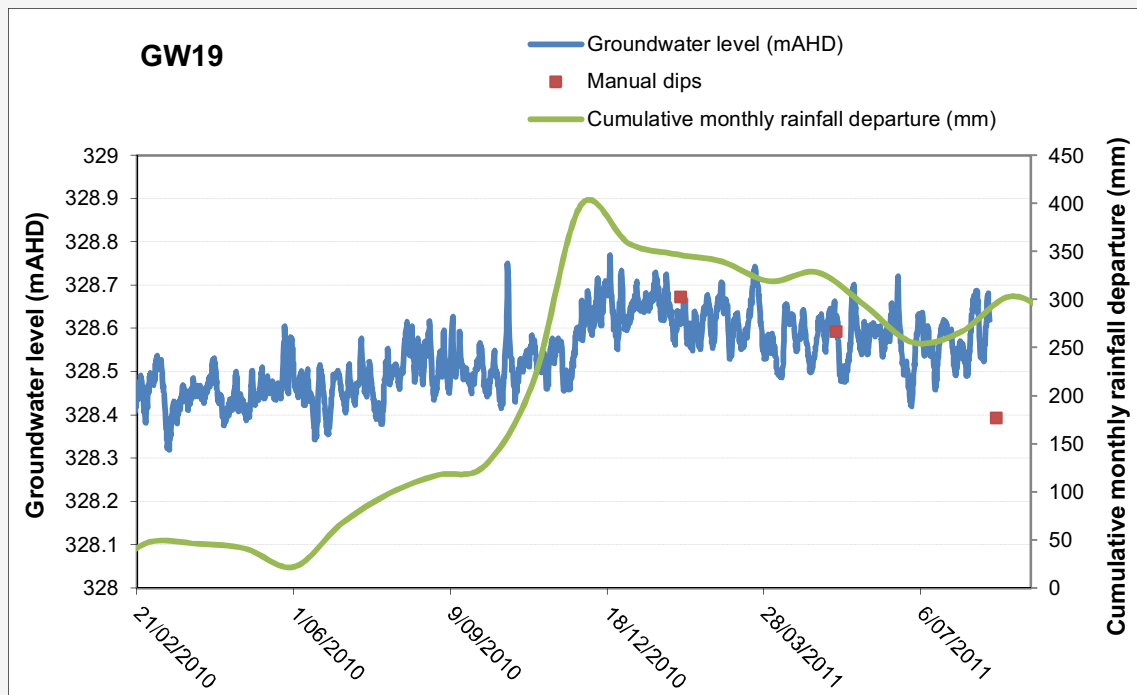


Figure E- 22 Groundwater levels with cumulative monthly rainfall departure - GW19 & GW21

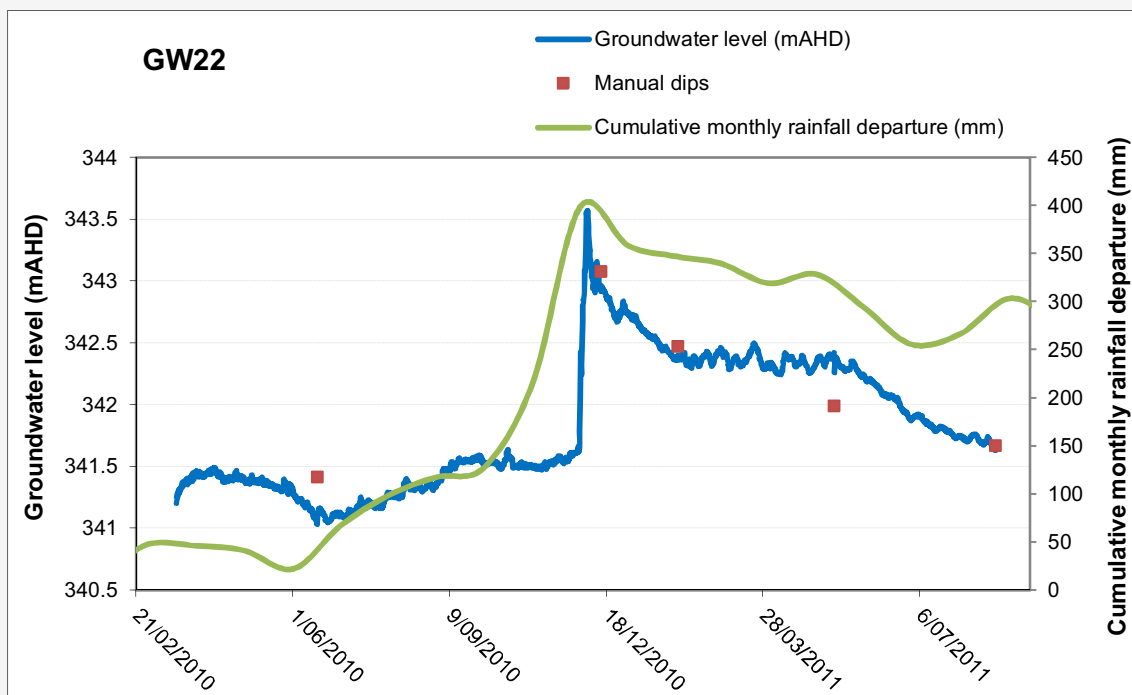
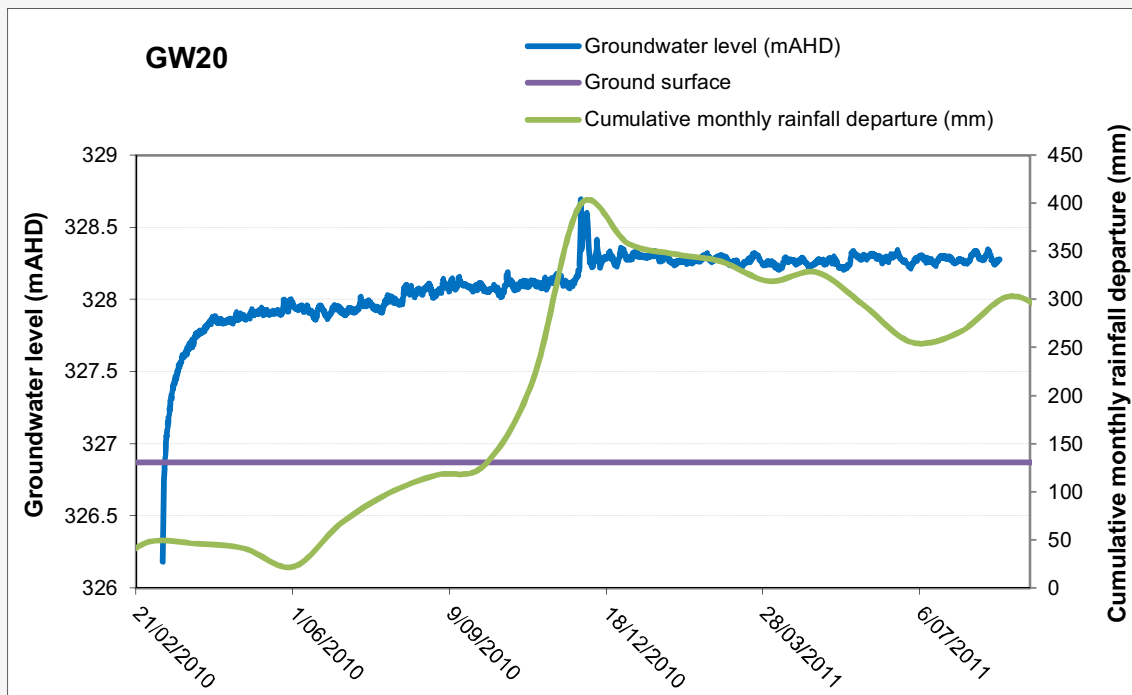


Figure E-23 Groundwater levels with cumulative monthly rainfall departure - GW20 & GW22

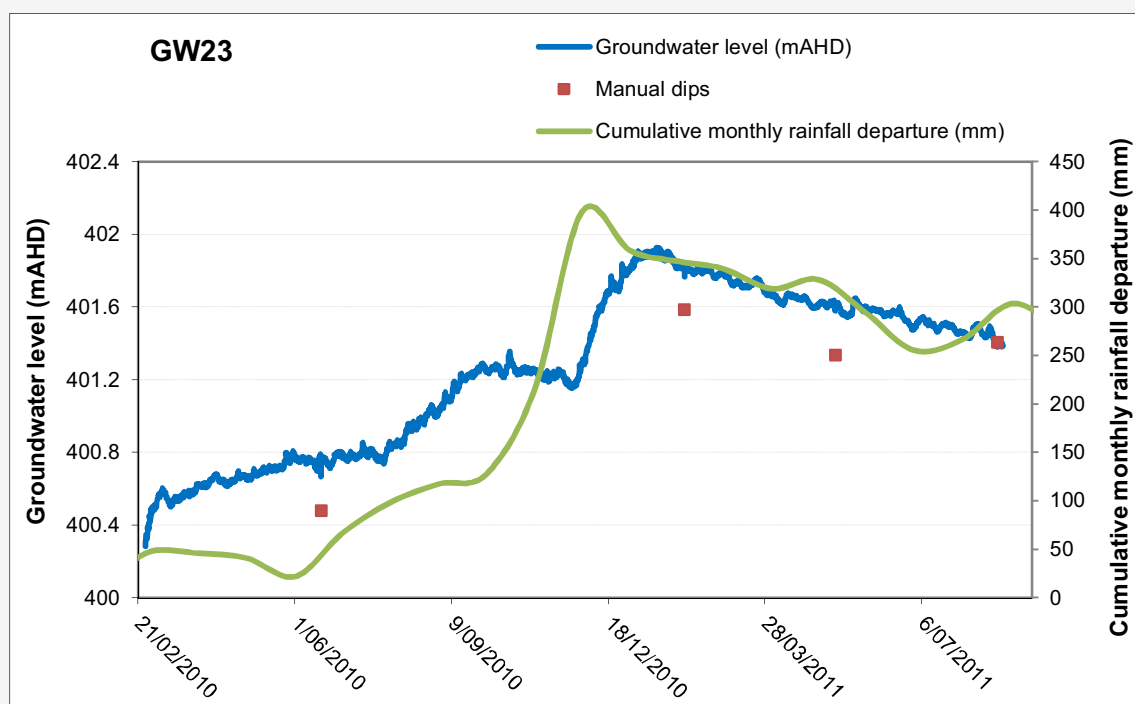


Figure E-24 Groundwater levels with cumulative monthly rainfall departure - GW23

Appendix

F

Hydrocensus



Client: CHC Pty Ltd Project: Groundwater Assessment - Cobbora Coal Project Location: Cobbora, NSW							Registered groundwater bores (NOW, 2011) Table: 1 of 2				
Table F-2 Registered groundwater bores											
Work No.	License No.	Easting	Northing	Owner type	Bore depth (mBGL)	Completion date	Salinity	Yield	Standing water level (mBGL)	Intended purpose	Likely screened aquifer*
GW000333		704268	6429193	Private	86.2	01/03/19	Good			STOCK	Dunedoo Formation
GW000343		704003	6427781	Private	40.5	01/03/19	Good			STOCK	Dunedoo Formation
GW001041		723211	6442815	Private	153.3	01/11/22	Fresh			STOCK	Tucklan Formation
GW001065		721962	6444445	Private	78	01/01/23	Fresh			STOCK	Tucklan Formation
GW001122		705507	6436071	Private	48.4	01/01/23	Fresh			STOCK	Napperby Formation
GW001140	80BL239944	703924	6435548	Private	21.6	01/02/23	Fresh			STOCK	Napperby Formation, Pilliga Sandstone
GW001142		709000	6435198	Private	56.3	01/02/23	Fresh			STOCK	Napperby Formation
GW001146		711270	6438510	Private	18.8	01/02/23	Fresh			NOT KNOWN	Dunedoo Formation
GW001147		708980	6439327	Private	17.9	01/02/23	Fresh			NOT KNOWN	Digby Formation
GW001204		716675	6443696	Private	58.5	01/09/23	Fresh			NOT KNOWN	Dunedoo Formation, Oakdale Formation
GW001222		702465	6428090	Private	53.3	01/07/23	Fresh			NOT KNOWN	Dunedoo Formation
GW001240		712038	6427647	Private	32.9	01/08/23	Fresh			STOCK	Dungeree Volcanics
GW001242		713638	6427798	Private	52.1	01/08/23	Fresh			GENERAL USE	Dunedoo Formation
GW001265		715570	6439837	Private	108.5	01/11/23	Unknown			NOT KNOWN	Dungeree Volcanics
GW001280		720165	6446240	Private	70.8	Unknown	Fresh			NOT KNOWN	Tucklan Formation
GW001303		723029	6442850	Private	57.9	01/03/24	Fresh			STOCK	Tucklan Formation
GW001307	80BL106668	722268	6442866	Private	85.9	01/03/24	Hard			NOT KNOWN	Tucklan Formation
GW001381		722689	6445322	Private	75.2	Unknown	Fresh			GENERAL USE	Tucklan Formation
GW001389		724110	6445507	Private	72.6	01/07/24	Unknown			NOT KNOWN	Tucklan Formation
GW001430		723625	6447336	Private	42.6	01/08/24	Unknown			NOT KNOWN	Tucklan Formation
GW001449		724178	6446245	Private	43.2	01/09/24	Unknown			NOT KNOWN	Tucklan Formation
GW001620		701356	6443425	Private	37.7	01/06/25	Fresh			NOT KNOWN	Napperby Formation or Digby Formation
GW001628		712593	6450407	Private	43.2	01/07/25	Good			NOT KNOWN	Napperby Formation
GW001650		714270	6452806	Private	39.9	01/08/25	Good Stock			STOCK	Alluvium
GW001784		715408	6449516	Private	62.1	01/03/26	Fair			NOT KNOWN	Dunedoo Formation
GW001794		709254	6446255	Private	32.3	01/05/26	Good			NOT KNOWN	Napperby Formation
GW007404	80BL002249	713493	6450789	Private	56.3	01/06/47	Brackish			IRRIGATION	Alluvium, Napperby Formation
GW007567	80BL002296	713502	6452483	Private	38.1	01/06/47	Brackish			STOCK	Napperby Formation
GW010049	80BL003196	721060	6443971	Private	82.2	01/03/52	1001-3000 ppm			STOCK	Tucklan Formation
GW010083	80BL003338	717334	6448766	Private	84.7	01/10/52	Soft			STOCK	Dunedoo Formation
GW010113	80BL003348	719333	6447799	Private	62.4	01/10/52	Good			STOCK	Tucklan Formation
GW010439	80BL003563	709089	6428078	Private	24.3	01/07/53	Good			STOCK	Devonian intrusions
GW010645	80BL003564	708933	6430670	Private	56.5	01/07/53	Good			STOCK	Dunedoo Formation
GW010689	80BL003565	709879	6429602	Private	55.7	01/06/53	Good			STOCK	Dunedoo Formation
GW011385	80BL004577	700968	6445035	Private	17.5	01/10/55	1001-3000 ppm			IRRIGATION	Alluvium
GW011402	80BL004700	721387	6445751	Private	94.4	01/02/56	Unknown			STOCK	Tucklan Formation
GW011442	80BL004400	706349	6444003	Private	14.6	01/09/55	Unknown			STOCK	Napperby Formation
GW012551	80BL004853	709649	6431117	Private	36.8	01/06/55	Unknown			STOCK	Napperby Formation, Digby Formation
GW012552	80BL004852	707640	6432761	Private	42.6	01/07/55	Unknown			STOCK	Napperby Formation, Digby Formation
GW013327	80BL005653	711720	6446265	Private	50.2	01/06/56	Unknown			GENERAL USE	Dunedoo Formation
GW015209	80BL006176	717846	6450635	Private	79.2	Unknown	Unknown			STOCK	Tucklan Formation
GW015858	80BL007643	700364	6439686	Private	20.1	01/06/58	Brackish			STOCK	Gleneski Formation
GW015862	80BL006839	718380	6451055	Private	36.5	01/10/57	Unknown			STOCK	Tucklan Formation
GW016842	80BL007329	717447	6447932	Private	62.1	01/01/58	Unknown			STOCK	Colluvium, Napperby Formation
GW018752	80BL010964	724696	6442381	Private	97.5	01/09/55	Poor			STOCK	Tucklan Formation
GW019018		703640	6444890	Private	7.9	Unknown	Unknown			NOT KNOWN	Alluvium
GW019643	80BL013098	708029	6433831	Private	19.2	01/05/52	Unknown			STOCK	Tertiary Basalt
GW019644	80BL013099	708219	6434166	Private	76.2	01/04/52	Unknown			STOCK	Napperby Formation
GW019645	80BL013100	709188	6432914	Private	47.2	01/06/52	Unknown			STOCK	Alluvium or Napperby Formation
GW023059	80BL016927	723462	6438711	Private	50.3	01/11/65	Unknown			STOCK	Tucklan Formation
GW023060		723639	6440802	Private	73.1	01/01/65	Unknown			STOCK	Tucklan Formation
GW023752	80BL017016	704264	6440687	Private	121.9	01/02/66	Unknown			GENERAL USE	Napperby Formation, Digby Formation
GW024055	80BL018352	724222	6442269	Private	67	Unknown	Unknown			STOCK	Tucklan Formation
GW024301	80BL016317	713055	6448672	Private	91.4	01/11/65	Unknown			STOCK	Napperby Formation, Dunedoo Formation
GW024349	80BL017425	704777	6434945	Private	45.7	01/11/65	Unknown			STOCK	Napperby Formation
GW024350	80BL017426	705247	6434874	Private	45.7	01/11/65	Unknown			STOCK	Napperby Formation
GW024537	80BL018486	723568	6439972	Private	67	01/10/66	Unknown			STOCK	Tucklan Formation
GW025153		712681	6450837	Other Govt	65.5	01/03/68	501-1000 ppm			DOMESTIC	Napperby Formation, Digby Formation
GW026780	80BL019701	707252	6434279	Private	9.1	Unknown	501-1000 ppm			GENERAL USE	Purlawaugh Formation
GW027150	80BL016442	712551	6450932	Private	55.1	01/11/65	Unknown			STOCK	Napperby Formation, Digby Formation
GW027151	80BL016441	710713	6452110	Private	16.1	01/09/66	Unknown			STOCK	Alluvium
GW027388		707035	6433944	Private	26.8	01/05/66	Unknown			STOCK	Purlawaugh Formation
GW027389	80BL016349	706577	6433276	Private	115.8	01/11/65	3001-7000 ppm			STOCK	Dunedoo Formation
GW028265	80BL021037	701845	6444309	Private	91.4	01/01/68	Good			STOCK	Purlawaugh Formation, Napperby Formation
GW029416	80BL022891	726708	6439686	Private	47.2	01/05/65	Unknown			STOCK	Tucklan Formation
GW030525	80BL025159	712968	6450769	Private	70.1	01/08/70	1001-3000 ppm			IRRIGATION	Alluvium, Napperby Formation
GW032051	80BL024695	711315	6450773	Private	30.4	Unknown	Unknown			STOCK	Alluvium, Digby Formation
GW032052	80BL024700	710933	6448808	Private	33.5	Unknown	Unknown			STOCK	Alluvium, Digby Formation
GW032053	80BL024699	711034	6451179	Private	24.3	Unknown	Unknown			STOCK	Alluvium, Digby Formation
GW032054	80BL024698	710289	6450671	Private	7.9	01/01/08	Unknown			STOCK	Alluvium
GW032055	80BL024697	709539	6448622	Private	21	Unknown	Unknown			STOCK	Napperby Formation
GW032056	80BL024696	709668	6449821	Private	21	Unknown	Unknown			STOCK	Alluvium
Notes:* The likely screened aquifer is based on information from the drill log information from NOW and the geology map (Meakin et al., 1999)											
Bold indicates licence now held by CHC mBGL - metres below ground level											
Shaded cell indicates bore identified in Hydrocensus (Table F-1)											
 Parsons Brinckerhoff Ernst & Young Centre, Level 27 680 George Street Sydney NSW 2000											

Client: CHC Pty Ltd Project: Groundwater Assessment - Cobbora Coal Project Location: Cobbora, NSW							Registered groundwater bores (NOW, 2011) Table: 2 of 2				
Table F-2 Registered groundwater bores											
Work No.	License No.	Easting	Northing	Owner type	Bore depth (mBGL)	Completion date	Salinity	Yield	Standing water level (mBGL)	Intended purpose	Likely screened aquifer*
GW033221		712762	6452221	Local Govt	24.3	01/08/70	Unknown			ENG.INVEST.	Alluvium
GW033222		712708	6452161	Local Govt	24.3	01/08/70	Unknown			ENG.INVEST.	Alluvium
GW033255		712654	6452070	Local Govt	24.3	01/08/70	Unknown			ENG.INVEST.	Alluvium
GW038721	80BL118815	708784	6451472	Private	96.9	Unknown	Unknown			STOCK	Purlawaugh Formation
GW042597	80BL103229	703529	6444584	Private	10.6	01/02/76	Unknown			IRRIGATION	Alluvium
GW043945	80BL101997	720263	6447132	Private	53.3	01/04/75	Good			STOCK	Tucklan Formation
GW044158	80BL102755	714084	6450191	Private	39.6	01/01/55	3001-7000 ppm			STOCK	Napperby Formation
GW044739	80BL104664	703643	6445044	Private	25.9	01/02/76	Good			STOCK	Alluvium or Purlawaugh Formation
GW044740	80BL104663	703558	6444737	Private	15.2	01/01/76	Good			STOCK	Alluvium or Purlawaugh Formation
GW045087	80BL104352	722441	6434018	Private	23	01/04/76	Unknown			STOCK	Tucklan Formation
GW045140	80BL105300	711805	6451656	Private	18	01/01/39	Unknown			STOCK	Napperby Formation
GW045410	80BL105338	710854	6447547	Private	25	01/01/77	0-500 ppm			STOCK	Napperby Formation
GW045440	80BL104161	726524	6439690	Private	33.5	01/05/76	Good			STOCK	Tucklan Formation
GW045722	80BL103797	700330	6444586	Private	36.6	01/01/76	Good			STOCK	Napperby Formation
GW045893	80BL106667	723573	6440187	Private	15	Unknown	Good			STOCK	Colluvium
GW047906		706145	6445548	Private	18.5	01/09/79	Unknown			IRRIGATION	Alluvium
GW047907	80BL112584	706386	6445820	Private	9.3	01/09/79	Unknown			IRRIGATION	Digby Formation
GW047908		705967	6445860	Private	22	01/09/79	Unknown	2	9.5	IRRIGATION	Napperby Formation
GW048324	80BL108146	726692	6442491	Private	76.2	01/05/78	Unknown			STOCK	Tucklan Formation
GW049596		705789	6446141	Private	20	01/08/79	Fair			IRRIGATION	Alluvium
GW049797		704456	6445058	Private	20	01/09/79	Unknown			IRRIGATION	Purlawaugh Formation
GW049798		705042	6444214	Private	9.3	01/10/79	Unknown			IRRIGATION	Purlawaugh Formation
GW049799		704686	6444745	Private	9.5	01/10/79	Unknown			IRRIGATION	Alluvium
GW051359	80BL111040	713155	6450919	Private	61	01/12/79	Fresh			DOMESTIC	Napperby Formation
GW051376	80BL112965	699230	6444638	Private	29	01/11/80	Unknown			STOCK	Napperby Formation
GW051724	80BL115134	715790	6431728	Private	77.5	01/07/80	Fresh			STOCK	Napperby Formation or Digby Formation
GW051915	80BL124429	721762	6426914	Private	31.4	01/01/81	Fresh			STOCK	Dunedoo Formation, underlying LFB
GW052033	80BL116265	707836	6448749	Private	14	01/01/81	Unknown			STOCK	Alluvium
GW052231	80BL134390	705141	6438728	Private	143.2	01/08/80	Unknown			STOCK	Pilliga Sandstone, Purlawaugh Formation, Napperby Formation or Digby Formation
GW052246	80BL116260	724638	6439732	Private	68.6	01/02/81	Good			STOCK	Tucklan Formation
GW052249	80BL116317	721118	6428592	Private	30.5	01/03/81	Unknown			STOCK	Napperby Formation
GW052777	80BL115135	715506	6431888	Private	77.5	01/07/80	Fresh			STOCK	Napperby Formation, Digby Formation
GW054129	80BL113289	724879	6434057	Private	50	01/01/81	1001-3000 ppm			STOCK	Colluvium
GW054393	80BL115891	723853	6438640	Private	46.1	01/08/81	Fresh			STOCK	Colluvium
GW054474	80BL116256	704660	6439539	Private	129.5	01/08/81	Good			GENERAL USE	Napperby Formation, Ellismayne Formation
GW054483	80BL116227	720648	6433472	Private	38.7	01/01/81	Fresh			STOCK	Dungeree Volcanics
GW054484	80BL116228	707097	6434374	Private	84.7	01/01/81	Unknown			STOCK	Purlawaugh Formation, Tertiary Basalt
GW055781	80BL121298	702850	6439452	Private	36.6	01/01/82	Unknown			NOT KNOWN	Dunedoo Formation
GW055801	80BL121347	700508	6445661	Private	13.3	01/10/82	Good			STOCK	Alluvium
GW057144	80BL124768	727034	6437861	Private	43.3	01/05/83	Unknown			STOCK	Tucklan Formation
GW057154	80BL124795	723666	6440832	Private	63.6	01/08/83	Unknown			STOCK	Tucklan Formation
GW058162	80BL121356	710926	6448470	Private	37	01/01/84	Unknown			STOCK	Napperby Formation
GW058583	80BL128340	710907	6438733	Private	53.3	01/02/83	1001-3000 ppm			STOCK	Dunedoo Formation
GW059582	80BL128883	723801	6438641	Private	33.3	01/05/83	Unknown			STOCK	Colluvium
GW060916	80BL132386	722533	6445357	Private	75.6	01/03/85	Good			STOCK	Tucklan Formation
GW061145	80BL132826	709939	6452773	Private	76.2	01/06/85	1001-3000 ppm			STOCK	Purlawaugh Formation
GW061219		715105	6435224	Private	30	01/04/85	3001-7000 ppm			G/WATER XPLORE	Alluvium, Dungeree Volcanics
GW062589	80BL134371	715558	6451670	Private	12.2	Unknown	Unknown			STOCK	Alluvium
GW064228		706679	6440854	Private	64	01/05/87	Unknown			STOCK	Napperby Formation, Digby Formation
GW064832	80BL134312	712789	6450852	Private	45	04/05/89		0.5	25	DOMESTIC	Alluvium, Napperby Formation
GW066094	80BL143580	717365	6429444	Private	29	10/07/91				DOMESTIC	Dunedoo Formation
GW800935	80BL238676	709863	6452709	Private	85	30/07/99	Good	1.516	30	STOCK	Purlawaugh Formation
GW800937	80BL238677	711463	6452784	Private	61	28/07/99	Good	2.27	15	STOCK	Purlawaugh Formation
GW800974	80BL236106	725963	6441334	Private	54	31/05/93		0.75	15	STOCK	Colluvium, Dungeree Volcanics
GW801006	80BL236113	726938	6441384	Private	75	03/11/94		0.5		DOMESTIC	Tucklan Formation
GW801030	80BL238752	709463	6450584	Private	28.5	20/08/99		9.0936	8.5	DOMESTIC	Alluvium
GW801293	80BL238915	713543	6452984	Private	46	14/06/00		0.8	27	DOMESTIC	Alluvium or Colluvium
GW801469	80BL242138	724300	6430312	Private	45	16/02/99		2.52	0.6	IRRIGATION	Dungeree Volcanics
GW801512	80BL239625	706863	6434450	Private	48	10/01/02	Unknown	1	13	DOMESTIC	Purlawaugh Formation, Napperby Formation
GW801560	80BL241692	716054	6452272	Private	43.6	20/02/02	Unknown			IRRIGATION	Alluvium or Colluvium
GW801735		707198	6434204	Private	120	04/12/02				TEST BORE	Napperby Formation
GW801746	80BL239684	714713	6451134	Private	39	13/04/03	Unknown	63	6.7	IRRIGATION	Alluvium, Napperby Formation
GW801750	80BL241194	714125	6448580	Private	48	13/02/03	Unknown	3	24	DOMESTIC	Dunedoo Formation
GW801896	80BL239610	721692	6430306	Private	80	24/07/02				STOCK	Tucklan Formation, Dunedoo Formation
GW801988		708983	6449244	Private	27.4	29/05/03				TEST BORE	Alluvium or Napperby Formation
GW801989		709448	6448834	Private	27.4	29/05/03				TEST BORE	Napperby Formation
GW802258	80BL242451	718343	6427884	Private	136	29/09/04		0.61	30	DOMESTIC	Pilliga Sandstone
GW802476	80BL239595	725018	6434257	Private	66	17/01/04	Unknown	1.1	38	DOMESTIC	Dungeree Volcanics
GW802762	80BL238293	703645	6429962	Private	176	17/05/96				DOMESTIC	Napperby Formation, Dunedoo Formation, LFB
GW802844	80BL238633	710559	6450470	Private	14	01/07/01		1.263	7	IRRIGATION	Alluvium
GW803440	80BL244428	722138	6430348	Private	80	13/10/07		0.568		DOMESTIC	Dapper Formation, Tucklan Formation
Notes:* The likely screened aquifer is based on information from the drill log information from NOW and the geology map (Meakin et al., 1999) Bold indicates licence now held by CHC mBGL - metres below ground level Shaded cell indicates bore identified in Hydrocensus (Table F-1)											
				Parsons Brinckerhoff Ernst & Young Centre, Level 27 680 George Street Sydney NSW 2000					Job No: 2162570A		