

**Geotechnical Report**

**Appendix D**

**Groundwater Monitoring Results**



Project: Kenaston Underpass  
 UMA Job No.: 4231-040-09

This sheet is based on the formulas:

$$\text{Pressure} = AR^2 + BR + C$$

$$P_{\text{corrected}} = P + P_T - P_B = P + (T_1 - T_0) \times K - (S_1 - S_0)$$

Piezometer VW-04-29A  
 Location:  
 Depth of VW: 10.0 m  
 Ground Elev.: 234.07 m  
 Tip Elevation: 224.07 m  
 Baseline Reading (Atm, taken prior to installation with VW to be installed):  
 Date 10-Dec-04  
 Reading (R<sub>0</sub>) 8920.3  
 Temp. °C (T<sub>0</sub>) 25.1

**Installed VW Piezometer:**  
**Information from VW Calibration Report:**  
 Supplier: Geokon  
 Serial No.: 04-14194  
**Polynomial Gage Factors (metric):**  

A	B	C *	* Factory Value
7.59E-08	-0.1001	888.11	

**Thermal Factor (** -0.1209 kPa/°C  
**Calculated C:** 886.88 kPa, Based on P=0, Using R<sub>0</sub>

**Barometric VW Piezometer:**  
**Original Calibration information:**  
 Supplier:  
 Serial No.: 25976  
 Date: 18-Feb-94  
 R<sub>0</sub> = 8941.6 F<sup>2</sup>x10<sup>-3</sup>  
 T<sub>0</sub> = 15.0 C  
 G = 0.018184 psi/digit  
 C = -0.021039 psi/C rise  
 Pressure: 29.15 in. of Hg  
 98.71 kPa

Date	Installed Piezometer Reading R <sub>1</sub> (F <sup>2</sup> x10 <sup>-3</sup> )	Temperature T <sub>1</sub> (°C)	Barometric Piezometer Reading R <sub>1</sub> (F <sup>2</sup> x10 <sup>-3</sup> )	Temperature T <sub>1</sub> (°C)	Barometric S <sub>1</sub> P+P <sub>T</sub> +S <sub>0</sub> (kPa)	Barometric Correction P <sub>B</sub> (kPa)	Installed P+P <sub>T</sub> (kPa)	Uncorrected Ground Water above tip (m)	Uncorrected Depth Below Ground (m)	Installed P <sub>corrected</sub> P+P <sub>T</sub> -P <sub>B</sub> (kPa)	Height of Ground Water above tip (m)	Ground Water Elevation (m)	Depth Below Ground (m)	Comments:
<b>Baseline Reading (Atm, taken prior to installation, with VW to be installed):</b>														
10-Dec-04	8920.3	25.1	8935.7	-6.3	102.46		0.00							Prior to installation
<b>Readings after installation:</b>														
10-Dec-04	8130.0	7.3	8935.7	-6.3	102.46	0.00	80.24	8.18	1.82	80.24	8.18	232.25	1.82	Water in hole during installation, reading taken after piezometer backfilled.
16-Dec-04	8467.3	6.8	8930.5	-12.3	103.91	1.45	46.96	4.79	5.21	45.51	4.64	228.71	5.36	
23-Dec-04	8452.0	6.7	8928.1	-17.1	104.88	2.41	48.48	4.94	5.06	46.07	4.70	228.77	5.30	
6-Jan-05	8496.7	6.7	8944.3	-20.9	103.62	1.16	44.07	4.49	5.51	42.91	4.38	228.45	5.62	
26-Jan-05	8462.5	6.7	8906.7	-12.6	106.61	4.15	47.45	4.84	5.16	43.30	4.41	228.48	5.59	
4-Feb-05	8473.6	6.7	8891.9	-0.1	106.45	3.99	46.35	4.73	5.27	42.36	4.32	228.39	5.68	

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$$\text{Pressure} = AR^2 + BR + C$$

$$P_{\text{corrected}} = P + P_T - P_B = P + (T - T_0) \times K - (S_1 - S_0)$$

Piezometer: VW-04-29B  
 Location:  
 Depth of VW: 6.7 m  
 Ground Elev.: 234.07 m  
 Tip Elevation: 227.37 m  
 Baseline Reading (Atm, taken prior to installation with VW to be installed):  
 Date: 13-Dec-04  
 Reading (R<sub>0</sub>): 8747.6  
 Temp. °C (T<sub>0</sub>): 20.5

Installed VW Piezometer:  
 Information from VW Calibration Report:  
 Supplier: Geokon  
 Serial No.: 04-13873  
 Polynomial Gage Factors (metric):  
 A            B            C \*    \* Factory Value  
 -8.33E-08    -0.1092    963.27  
 Thermal Factor (    -0.0073 kPa/°C  
 Calculated C: 961.61 kPa, Based on P=0, Using R<sub>0</sub>

**Barometric VW Piezometer:**  
 Original Calibration Information:  
 Supplier:  
 Serial No.: 25976  
 Date: 18-Feb-94  
 R<sub>0</sub> = 8941.6 F<sup>2</sup>x10<sup>-3</sup>  
 T<sub>0</sub> = 15.0 C  
 G = 0.016184 psi/digit  
 C = -0.021039 psi/C rise  
 Pressure: 29.15 in. of Hg  
 98.71 kPa

Date	Installed Piezometer		Barometric Piezometer		Barometric S <sub>1</sub> P+P <sub>T</sub> +S <sub>0</sub> (kPa)	Barometric Correction P <sub>B</sub> (kPa)	Installed P+P <sub>T</sub> (kPa)	Uncorrected Ground Water above tip (m)	Uncorrected Depth Below Ground (m)	Installed P <sub>corrected</sub> P+P <sub>T</sub> -P <sub>B</sub> (kPa)	Height of Ground Water above tip (m)	Ground Water Elevation (m)	Depth Below Ground (m)	Comments:
	Reading R <sub>1</sub> (F <sup>2</sup> x10 <sup>-3</sup> )	Temperature T <sub>1</sub> (°C)	Reading R <sub>1</sub> (F <sup>2</sup> x10 <sup>-3</sup> )	Temperature T <sub>1</sub> (°C)										
Baseline Reading (Atm, taken prior to installation, with VW to be installed):														
13-Dec-04	8747.6	20.5	8935.7	-8.3	102.46		0.00							Prior to installation
Readings after installation:														
13-Dec-04	8265.7	8.2	8935.7	-8.3	102.46	0.00	53.40	5.44	1.26	53.40	5.44	232.81	1.26	Water in hole during installation, reading taken after piezometer backfilled.
16-Dec-04	8434.8	7.1	8930.5	-12.3	103.91	1.45	34.70	3.54	3.16	33.25	3.39	230.76	3.31	
23-Dec-04	8425.3	7.1	8928.1	-17.1	104.88	2.41	35.75	3.65	3.05	33.34	3.40	230.77	3.30	
6-Jan-05	8469.0	7.2	8944.3	-20.9	103.62	1.16	30.92	3.15	3.55	29.76	3.03	230.40	3.67	
26-Jan-05	8437.8	7.3	8906.7	-12.6	106.61	4.15	34.37	3.50	3.20	30.22	3.08	230.45	3.62	



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$$\text{Pressure} = AR^2 + BR + C$$

$$P_{\text{corrected}} = P + P_T - P_B = P + (T_1 - T_0) \times K - (S_1 - S_0)$$

Piezometer VW-04-30B  
 Location:  
 Depth of VW: 8.4 m  
 Ground Elev.: 234.16 m  
 Tip Elevation: 225.76 m  
 Baseline Reading (Atm, taken prior to  
 Installation with VW to be installed):  
 Date 10-Dec-04  
 Reading (R<sub>0</sub>) 8616.8  
 Temp. °C (T<sub>0</sub>) 22.8

**Installed VW Piezometer:**  
**Information from VW Calibration Report:**  
 Supplier: Geokon  
 Serial No.: 04-13874  
**Polynomial Gage Factors (metric):**  
 A B C \* Factory Value  
 -2.48E-07 -0.1163 1022.69  
**Thermal Factor (** -0.0253 kPa/°C  
**Calculated C:** 1020.56 kPa, Based on P=0, Using R<sub>0</sub>

**Barometric VW Piezometer:**  
**Original Calibration Information:**  
 Supplier:  
 Serial No.: 25976  
 Date: 18-Feb-94  
 R<sub>0</sub> = 8941.6 F<sup>2</sup>x10<sup>-3</sup>  
 T<sub>0</sub> = 15.0 C  
 G = 0.016184 psi/digit  
 C = -0.021039 psi/C rise  
 Pressure: 29.15 in. of Hg  
 98.71 kPa

Date	Installed Piezometer Reading R <sub>1</sub> (F <sup>2</sup> x10 <sup>-3</sup> )	Temperature T <sub>1</sub> (°C)	Barometric Piezometer Reading R <sub>1</sub> (F <sup>2</sup> x10 <sup>-3</sup> )	Temperature T <sub>1</sub> (°C)	Barometric S <sub>1</sub> P+P <sub>T</sub> +S <sub>0</sub> (kPa)	Barometric Correction P <sub>B</sub> (kPa)	Installed P+P <sub>T</sub> (kPa)	Uncorrected Ground Water above tip (m)	Uncorrected Depth Below Ground (m)	Installed P <sub>corrected</sub> P+P <sub>T</sub> -P <sub>B</sub> (kPa)	Height of Ground Water above tip (m)	Ground Water Elevation (m)	Depth Below Ground (m)	Comments:
<b>Baseline Reading (Atm, taken prior to installation, with VW to be installed):</b>														
10-Dec-04	8616.8	22.8	8935.7	-6.3	102.46		0.00							Prior to Installation
<b>Readings after installation:</b>														
10-Dec-04	8624.7	3.2	8935.7	-6.3	102.46	0.00	-0.46	-0.05	8.45	-0.46	-0.05	225.71	8.45	Water in hole during installation, reading taken after piezometer backfilled.
16-Dec-04	8549.2	6.9	8930.5	-12.3	103.91	1.45	8.55	0.87	7.53	7.10	0.72	226.48	7.68	
23-Dec-04	8462.4	6.8	8928.1	-17.1	104.88	2.41	19.02	1.94	6.46	16.60	1.69	227.45	6.71	
6-Jan-05	8375.3	6.8	8944.3	-20.9	103.62	1.16	29.51	3.01	5.39	28.35	2.89	228.65	5.51	
26-Jan-05	8170.2	7.0	8906.7	-12.6	106.61	4.15	54.20	5.53	2.87	50.05	5.10	230.86	3.30	

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This sheet is based on the formula:  

$$P_{corrected} = ((R_0 - R_1) \times G) + ((T_1 - T_0) \times K) - (S_1 - S_0)$$
  

$$P_{corrected} = P + P_T - P_B$$

**Barometric VW Piezometer:**  
**Original Calibration Information:**  
 Supplier:  
 Serial No.: 25976  
 Date: 18-Feb-94  
 $R_0 = 8941.6 \text{ F}^2 \times 10^{-3}$   
 $T_0 = 15.0 \text{ C}$   
 $G = 0.016184 \text{ psi/digit}$   
 $C = -0.021039 \text{ psi/C rise}$   
 Pressure: 29.15 in. of Hg  
 98.71 kPa

Piezometer VW-04-30C  
 Location:  
 Depth of VW: 4.5 m  
 Ground Elev.: 234.16 m  
 Tip Elevation: 229.66 m  
 Baseline Readings:  
 Date 4-Dec-93  
 Reading ( $R_0$ ) 9735  
 Temp. ( $T_0$ ) 0.0  
 Bar. ( $S_0$ ) 100.1

**Installed VW Piezometer:**  
**Information from VW Calibration Report:**  
 Supplier:  
 Serial No.: 24459  
 Linear Gage Factor (G) = 0.00274 psi/digit  
 Thermal Factor (K) = -0.00274 psi/C

Date	Installed Piezometer Reading $R_1$ ( $F^2 \times 10^{-3}$ )	Temperature $T_1$ (°C)	Barometric Piezometer Reading $R_1$ ( $F^2 \times 10^{-3}$ )	Temperature $T_1$ (°C)	Barometric $S_0$ (kPa)	Barometric Correction $P_B$ (kPa)	Installed $P + P_T$ (kPa)	Uncorrected Ground Water above tip (m)	Uncorrected Depth Below Ground (m)	Installed $P_{corrected}$ $P + P_T - P_B$ (kPa)	Height of Ground Water above tip (m)	Ground Water Elevation (m)	Depth Below Ground (m)	Comments:
<b>Baseline Reading (Atm. taken prior to installation, with VW to be installed):</b>														
9-Dec-04	9611.9	10.0	8939.1	-7.5	102.26									Prior to Installation
<b>Readings after installation:</b>														
9-Dec-04	9635.7	7.8	8939.1	-7.5	102.26	0.00	-0.41	-0.04	4.54	-0.41	-0.04	229.62	4.54	No water in hole during installation, reading taken after piezometer backfilled.
16-Dec-04	9521.5	8.1	8930.5	-12.3	103.91	1.66	1.74	0.18	4.32	0.09	0.01	229.67	4.49	
23-Dec-04	8578.6	8.1	8928.1	-17.1	104.88	2.62	19.56	1.99	2.51	16.94	1.73	231.39	2.77	
6-Jan-05	8595.4	8.0	8944.3	-20.9	103.62	1.36	19.24	1.96	2.54	17.88	1.82	231.48	2.68	
26-Jan-05	8200.4	7.8	8906.7	-12.6	106.61	4.36	26.71	2.72	1.78	22.35	2.28	231.94	2.22	







**Project:** Kenaston Underpass  
**UMA Job No.:** 4231-040-09

**Location:**

**Piezometer** PN-04-35  
**Ground Elevation (m)** 233.51

**I.D.** **Gnd Elev** **Tip Depth** **Tip Elevation**  
(m) (m) (m)  
PN-04-35 9.2 224.31

Date	Time	Pneumatic	
		Reading (psi)	Ground Water Elev. (m)
January 26, 2005		8.70	230.43



