

## Memo

**Date** 11 June 2015  
**To** Nicola Fry  
**From** Sean Daykin  
**Ref** 2268524B-WAT-MEM-001 RevC  
**Subject** Completion report - Glenlee monitoring bores (GLMB01 & 02) conversion to Vibrating Wire Piezometer (VWP)

### 1. Introduction

On 12 March 2015 monitoring bores GLMB01 and GLMB02 were converted to fully grouted Vibrating Wire Piezometers (VWP) to maintain borehole integrity. This memo report documents the installation and grout works methodology as well as the monitoring bore specifications.

### 2. Conversion and installation methodology

Installation of the VWP sensors and grouting works were undertaken by AGL Upstream Gas Camden Gas Project Production Team under the technical supervision of Parsons Brinckerhoff hydrogeologists and the AGL Upstream Gas Drilling and Completion Team on 12 March 2015.

The method used differs from the regular method of VWP installation in that the existing standpipe construction remained in situ and the VWP sensors were installed within. Each bore was installed with one Geokon VWP sensor (model 1200).

The installation program followed the methodology outlined in Parsons Brinckerhoff (2015) as summarised below:

- Gas (CH<sub>4</sub> and H<sub>2</sub>S) detection checks were performed prior to the start of the works. Argon flushing of GLMB01 was undertaken on 6 March 2015 and argon flushing of GLMB02 was undertaken on 12 March 2015. Continuous gas monitoring was maintained at the monitoring bores throughout the conversion and VWP installation program.
- Surface measure and mark up of VWP cables (by Parsons Brinckerhoff) and surface measure and mark up of poly cementing line (by AGL) was carried out. Stainless steel weights were cable tied to the VWP cables approximately 0.5 m above the VWP sensors to maintain sensor position.
- Parsons Brinckerhoff performed surface tests of the VWP sensors to confirm functionality and recorded manual water level measurements in the monitoring bores (Table 2.1).
- A T-piece was mounted on the bores to manage the grout injection and returns. The VWP sensors were fed though the top of the T-piece to the required depth (GLMB01: 93 metres below ground level (mbgl))

(GLMB02: 174 mbgl). The cables were secured at the ground surface to ensure no change in sensor depth prior and during grout injection.

- A polyethylene (poly) pipe was used as the cementing line and was lowered through the top of the T-piece to approximately 2 m above the VWP sensor.
- At least two bore volumes of water were flushed through each monitoring bore to ensure full circulation using the poly pipe.
- The grout was prepared onsite as per Parsons Brinckerhoff (2015). The grout density was measured at 13.5 pounds per gallon (ppg) prior to injection, which is consistent with AGL's Plug and Abandon requirements.
- The functionality of the VWP sensors was re-confirmed and grout was then injected through the poly pipe in one continuous event until grout was returning to surface. The displaced water was contained and removed from site.
- The poly pipe was then removed from the monitoring bore and the grout was topped up from the surface whilst ensuring the VWP cable was centralised in the PVC casing of the monitoring bore.
- The functionality of the VWP sensors was re-confirmed and the VWP cables were secured at the surface and temporarily weather proofed whilst the grout cured.
- Following curing the VWP cables from both bores were routed through conduit pipe to a central location where the data logger was installed on a mounting post and cemented into the ground. Both GLMB01 and GLMB02 were connected to the same data logger.
- The data logger was programmed to record temperature and pressure data at six hourly intervals.

Details of the monitoring bores immediately prior to their conversion are shown in Table 2.1 and schematics are shown in Attachment 1. Calibration sheets for individual VWP sensors are shown in Attachment 2.

**Table 2.1 Bore and VWP installation details**

Bore ID	Standing water level (mbTOC)	Total depth (mbgl)	Casing depth (mbgl)	Screened interval (mbgl)	Sensor installed depth (mbgl)	VWP serial number
GLMB01	10.33	102.0	102.0	87.0 – 99.0	93.0	21013
GLMB02	12.22	190.3	182.0	168.0 – 180.0	174.0	20231

mbTOC – metres below top of casing.

mbgl – metres below ground level.

Yours sincerely



**Sean Daykin**  
Senior Hydrogeologist

## **Attachments**

Attachment 1 – GLMB01 and GLMB02 bore logs

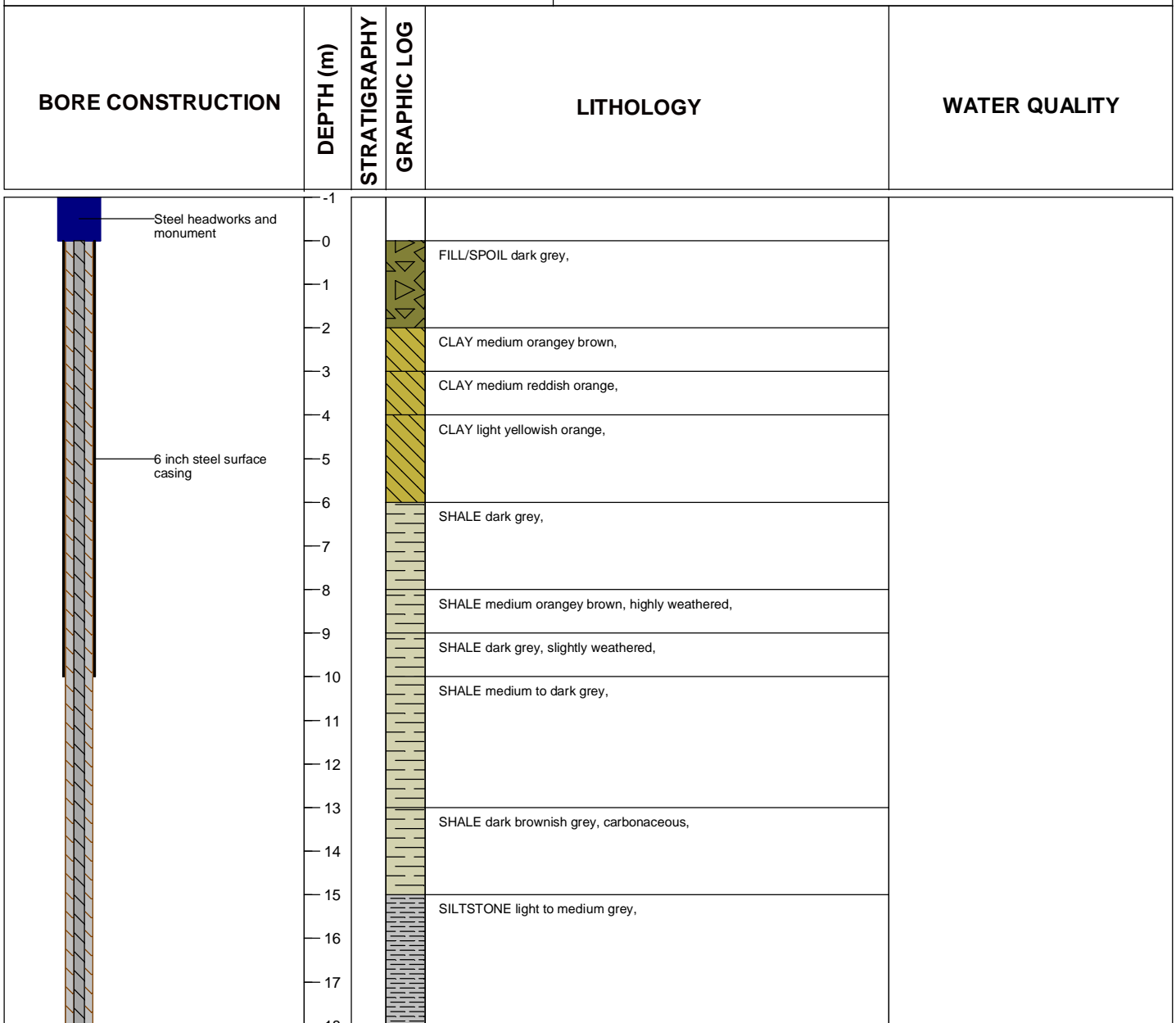
Attachment 2 – VWP calibration sheets

## **References**

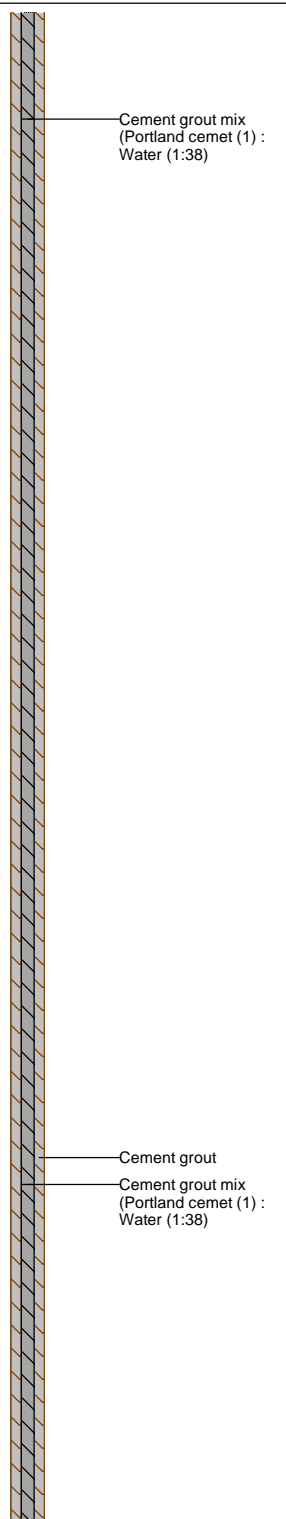

Parsons Brinckerhoff 2015, Glenlee monitoring bore conversion to Vibrating Wire Piezometer (VWP), 2268524B-WAT-LTR-001-RevA, dated 10 March 2015.

# BORE COMPLETION REPORT - GLMB01

<b>Project:</b> AGL Camden Gas Project <b>Location:</b> Glenlee <b>Easting:</b> 293339.7 <b>Northing:</b> 6226185.5 <b>Top of casing elevation:</b> 86.6 m AHD (PVC casing) <b>Grid system:</b> MGA 94 Zone 56 <b>Stick-up height:</b> 0.49 m	<b>Drilling contractor:</b> Highland Drilling <b>Driller:</b> I. Palk <b>Rig:</b> Rig 20 <b>Drilling method:</b> Air Rotary <b>Total drilled depth:</b> 102 m <hr/> <b>Borehole diameter:</b> 205 mm                      0 - 10 m <b>Bit:</b> Blade <b>Borehole diameter:</b> 127 mm                      10 - 102 m <b>Bit:</b> PCD
<b>Purpose of bore:</b> Groundwater monitoring bore <b>Screened Formation:</b> Hawkesbury Sandstone <b>Logged by:</b> K. Maher <b>Start date:</b> 30/1/14 <b>Completion date:</b> 31/1/14	<b>Plain casing:</b> 0-87.0m: Class 18 50mm PVC <b>Screen:</b> 87.0-99.0m: 50mm PVC Class 18 (0.5mm slot) <b>Sump:</b> 99.0-102.0m: 50mm PVC Class 18 <b>Cement grout:</b> 0-79.0m: 0.8m3 <b>Gravel backfill:</b> NA <b>Bentonite seal:</b> 79.0-84.0m <b>Gravel pack:</b> 84-100.5m: 5mm washed gravel <b>Bentonite plug:</b> 100.5-102.0m
<b>Static WL:</b> 74.2 mAHD                      11.9 mbtoc  <b>Water level date:</b> 3/2/14	



	Drawing No.: GLMB01 - Bore Construction		AGL Upstream Investments Pty Ltd	
	Revision: A		Date drawn: 5/2/14	GLMB01
	Drawn by: K. Maher		Checked by: S. Daykin	Glenlee VWP Conversion
	Project No. 2114759B			

BORE CONSTRUCTION	DEPTH (m)	STRATIGRAPHY	GRAPHIC LOG	LITHOLOGY	WATER QUALITY
	<p>18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46</p>			<p>SHALE medium to dark grey,</p> <p>SHALE dark brownish grey,</p> <p>SILTSTONE light to medium grey,</p> <p>SHALE medium to dark grey,</p> <p>SHALE medium to dark grey,</p> <p>SHALE medium to dark grey,</p>	<p>Water Cut: &lt;0.1 L/s, Temp: 25.7 °C, EC: 5751 μS/cm, TDS: 3.738 g/L, DO: 69.5 %, DO: 5.58 ppm, pH: 8.06, ORP: 88.4 mV</p> <p>Water Cut: 0.1 L/s, Temp: 27.11 °C, EC: 5345 μS/cm, TDS: 3.474 g/L, DO: 58.1 %, DO: 4.55 ppm, pH: 8.11, ORP: 70.5 mV</p> <p>Water Cut: 0.35 L/s, Temp: 25.45 °C, EC: 6218 μS/cm, TDS: 4.042 g/L, DO: 75.4 %, DO: 6.2 ppm, pH: 8.07, ORP: 48.9 mV</p>

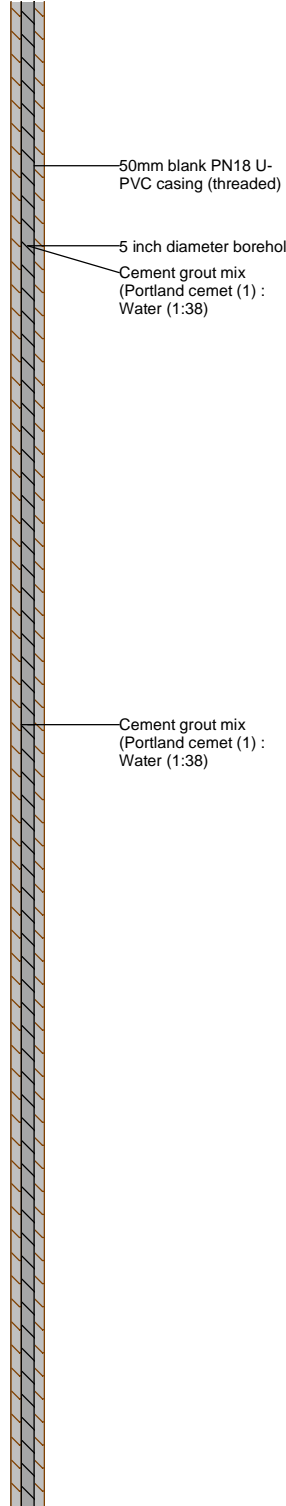



Drawing No.: GLMB01 - Bore Construction	
Revision: A	Date drawn: 5/2/14
Drawn by: K. Maher	Checked by: S. Daykin
Project No. 2114759B	



**AGL Upstream Investments Pty Ltd**  
**GLMB01**

Glenlee VWP Conversion

BORE CONSTRUCTION	DEPTH (m)	STRATIGRAPHY	GRAPHIC LOG	LITHOLOGY	WATER QUALITY
 <p>50mm blank PN18 U-PVC casing (threaded)</p> <p>5 inch diameter borehole</p> <p>Cement grout mix (Portland cement (1) : Water (1:38))</p> <p>Cement grout mix (Portland cement (1) : Water (1:38))</p>	<p>47</p> <p>48</p> <p>49</p> <p>50</p> <p>51</p> <p>52</p> <p>53</p> <p>54</p> <p>55</p> <p>56</p> <p>57</p> <p>58</p> <p>59</p> <p>60</p> <p>61</p> <p>62</p> <p>63</p> <p>64</p> <p>65</p> <p>66</p> <p>67</p> <p>68</p> <p>69</p> <p>70</p> <p>71</p> <p>72</p> <p>73</p> <p>74</p> <p>75</p>			<p>SILTSTONE medium grey,</p> <p>SILTSTONE medium grey,</p>	<p>Water Cut: 0.2 L/s, Temp: 24.44 °C, EC: 6318 µS/cm, TDS: 4.107 g/L, DO: 59.9 %, DO: 4.9 ppm, pH: 8, ORP: 26.6 mV</p> <p>Water Cut: 0.2 L/s, Temp: 24.86 °C, EC: 5975 µS/cm, TDS: 3.884 g/L, DO: 52.6 %, DO: 4.28 ppm, pH: 7.99, ORP: 31.5 mV</p> <p>Water Cut: 0.42 L/s, Temp: 25.25 °C, EC: 5126 µS/cm, TDS: 3.332 g/L, DO: 68.6 %, DO: 4.76 ppm, pH: 8.01, ORP: 33.4 mV</p> <p>Water Cut: 0.53 L/s, Temp: 24.9 °C, EC: 6463 µS/cm, TDS: 4.201 g/L, DO: 58.4 %, DO: 4.74 ppm, pH: 7.94, ORP: 15.2 mV</p> <p>Water Cut: 0.5 L/s, Temp: 24.8 °C, EC: 5319 µS/cm, TDS: 3.457 g/L, DO: 61.6 %, DO: 5 ppm, pH: 7.97, ORP: 27.7 mV</p>

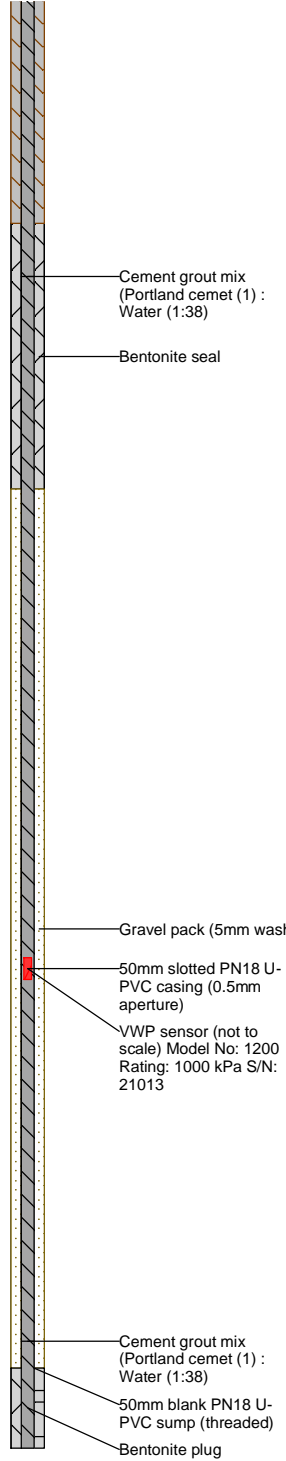




Drawing No.: GLMB01 - Bore Construction	
Revision: A	Date drawn: 5/2/14
Drawn by: K. Maher	Checked by: S. Daykin
Project No. 2114759B	



**AGL Upstream Investments Pty Ltd**  
**GLMB01**

Glenlee VWP Conversion

BORE CONSTRUCTION	DEPTH (m)	STRATIGRAPHY	GRAPHIC LOG	LITHOLOGY	WATER QUALITY	
 <p>Cement grout mix (Portland cemet (1) : Water (1:38))</p> <p>Bentonite seal</p> <p>Gravel pack (5mm wash)</p> <p>50mm slotted PN18 U-PVC casing (0.5mm aperture)</p> <p>VWP sensor (not to scale) Model No: 1200 Rating: 1000 kPa S/N: 21013</p> <p>Cement grout mix (Portland cemet (1) : Water (1:38))</p> <p>50mm blank PN18 U-PVC sump (threaded)</p> <p>Bentonite plug</p>	75			SANDSTONE very fine grained, light grey, quartzose,	Water Cut: 0.43 L/s, Temp: 25.17 °C, EC: 6399 µS/cm, TDS: 4.159 g/L, DO: 60.9 %, DO: 4.92 ppm, pH: 7.89, ORP: 20.2 mV	
	76			SANDSTONE very fine grained , light to medium grey, quartzose,		
	77			SANDSTONE very fine grained , light grey, quartzose,		
	78				SANDSTONE very fine to fine grained , light grey, quartzose,	Water Cut: 0.55 L/s, Temp: 25.18 °C, EC: 4425 µS/cm, TDS: 2.876 g/L, DO: 57.8 %, DO: 5.02 ppm, pH: 8, ORP: 19.5 mV
	79					
	80					
	81					
	82					
	83					Water Cut: 0.65 L/s, Temp: 27.4 °C, EC: 6622 µS/cm, TDS: 4.303 g/L, DO: 55.6 %, DO: 4.31 ppm, pH: 7.87, ORP: 26.7 mV
	84					
	85					
	86					Water Cut: 0.62 L/s, Temp: 26.31 °C, EC: 6470 µS/cm, TDS: 4.206 g/L, DO: 55.9 %, DO: 4.43 ppm, pH: 7.81, ORP: 23.3 mV
	87					
	88			SANDSTONE very fine grained , light creamy grey, quartzose,		
	89			SILTSTONE medium grey, quartzose,		
90						
91			SANDSTONE fine grained, light to medium grey, quartzose,			
92						
93			SANDSTONE very fine grained , light creamy grey, quartzose,			
94			SANDSTONE fine grained, light to medium grey, quartzose,			
95			SANDSTONE very fine to fine grained , light to medium grey, quartzose,			
96						
97			SANDSTONE fine grained, light creamy grey, quartzose,			
98			SANDSTONE very fine grained , light creamy grey, quartzose,			
99			SANDSTONE very fine to fine grained , light to medium grey, quartzose,			
100			SANDSTONE very fine to fine grained , light to medium grey,			
101			SANDSTONE fine to medium grained, light creamy white, quartzose,			
102					Water Cut: 0.55 L/s, Temp: 27.33 °C, EC: 6812 µS/cm, TDS: 4.428 g/L, DO: 61.4 %, DO: 4.57 ppm, pH: 7.84, ORP: 12 mV	
103						

	Drawing No.: GLMB01 - Bore Construction			<b>AGL Upstream Investments Pty Ltd</b> <b>GLMB01</b>  Glenlee VWP Conversion
	Revision: A	Date drawn: 5/2/14		
	Drawn by: K. Maher	Checked by: S. Daykin		
	Project No. 2114759B			

# BORE COMPLETION REPORT - GLMB02

**Project:** AGL Camden Gas Project  
**Location:** Glenlee  
**Easting:** 293339.6     **Northing:** 6226177.3  
**Top of casing elevation:** 86.6 m AHD (PVC casing)  
**Grid system:** MGA 94 Zone 56     **Stick-up height:** 0.49 m

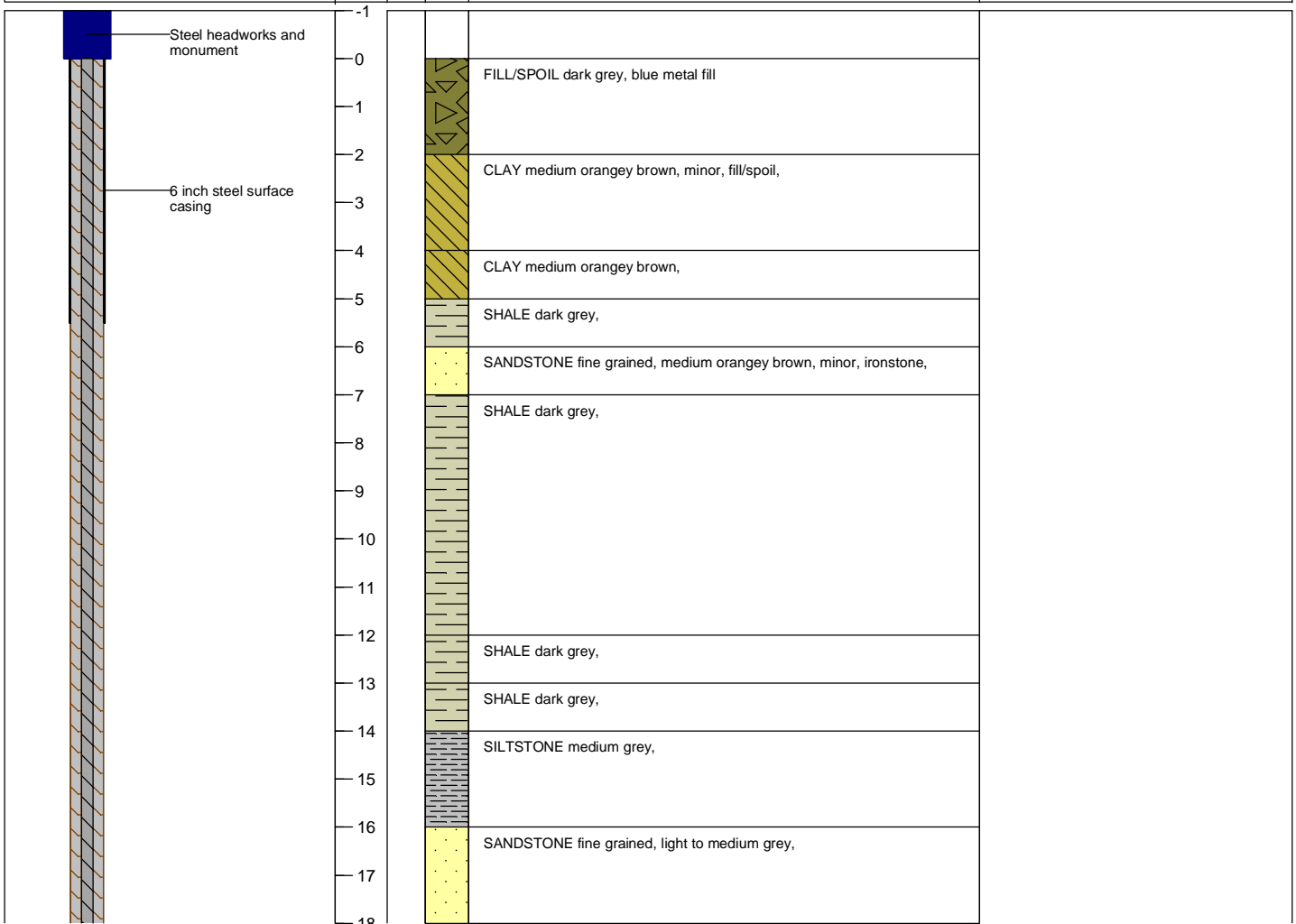
**Drilling contractor:** Highland Drilling  
**Driller:** I. Palk     **Rig:** Rig 12  
**Drilling method:** Air Rotary     **Total drilled depth:** 190.3 m  
**Borehole diameter:** 205 mm     0 - 5.5 m     **Bit:** Blade  
**Borehole diameter:** 139 mm     5.0 - 190.3 m     **Bit:** DHH

**Purpose of bore:** Groundwater monitoring bore  
**Screened Formation:** Hawkesbury Sandstone  
**Logged by:** K. Maher  
**Start date:** 21/1/14  
**Completion date:** 22/1/14

**Plain casing:** 0-168.0m: Class 18 50mm PVC  
**Screen:** 168.0-180.0: 50mm PVC Class 18 (0.5mm slot)  
**Sump:** 180.0-182.0m: 50mm PVC Class 18  
**Cement grout:** 0-100.0m: 1.26m3  
**Gravel backfill:** 100.0-160.0m: 5-8mm washed blue metal gravel  
**Bentonite seal:** 160-165m  
**Gravel pack:** 165.0-182.0m: 5mm washed gravel  
**Bentonite plug:** 182-185m

**Static WL:** 73.7 mAHD     12.4 mbtoc  
**Water level date:** 3/2/14

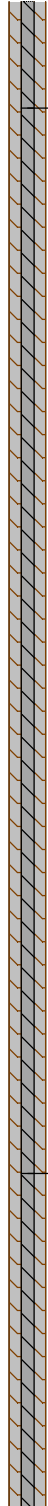
BORE CONSTRUCTION	DEPTH (m)	STRATIGRAPHY	GRAPHIC LOG	LITHOLOGY	WATER QUALITY
-------------------	-----------	--------------	-------------	-----------	---------------



	Drawing No.: GLMB02 - Bore Construction			<b>AGL Upstream Investments Pty Ltd</b> <b>GLMB02</b>  Glenlee VWP Conversion
	Revision: A	Date drawn: 5/2/14		
	Drawn by: K. Maher	Checked by: S. Daykin		
	Project No. 2114759B			



# BORE COMPLETION REPORT - GLMB02

BORE CONSTRUCTION	DEPTH (m)	STRATIGRAPHY	GRAPHIC LOG	LITHOLOGY	WATER QUALITY	
 <p style="margin-left: 20px;">Cement grout mix (Portland cemet (1) : Water (1:38)</p> <p style="margin-left: 20px;">Cement grout mix (Portland cemet (1) : Water (1:38)</p>	18			SANDSTONE fine grained, medium grey,		
	19					
	20					
	21				SANDSTONE fine grained, light to medium brownish grey,	
	22				SANDSTONE medium grained , light grey, altered,	
	23				SANDSTONE fine grained, medium grey,	
	24				SHALE medium to dark grey,	
	25					
	26					
	27				SANDSTONE fine grained, medium grey,	
	28					
	29				SHALE dark grey,	
	30				SHALE medium to dark grey,	
	31					
	32					
	33					
	34					
	35					
36				SHALE medium to dark grey,		
37				SHALE dark grey,		
38						
39						
40						
41						
42				SHALE medium to dark grey,		
43						
44						
45						
46						

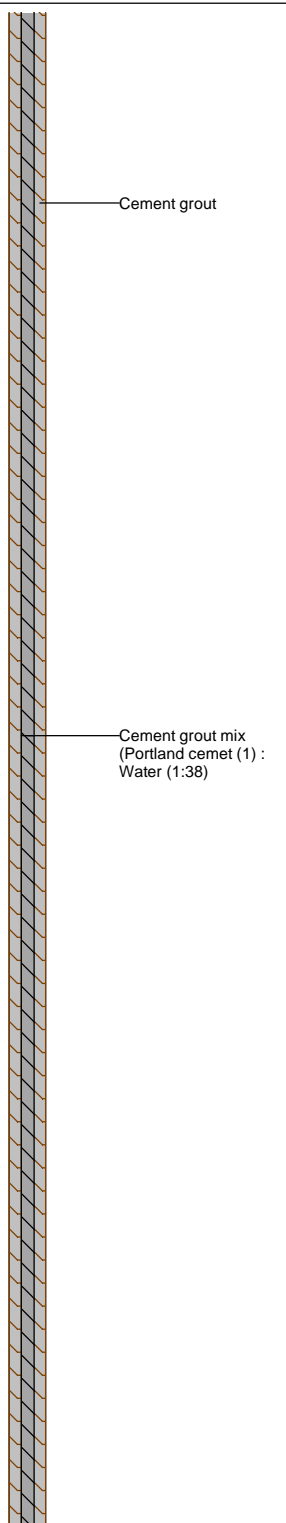



Drawing No.: GLMB02 - Bore Construction	
Revision: A	Date drawn: 5/2/14
Drawn by: K. Maher	Checked by: S. Daykin
Project No. 2114759B	



**AGL Upstream Investments Pty Ltd**  
**GLMB02**

Glenlee VWP Conversion

BORE CONSTRUCTION	DEPTH (m)	STRATIGRAPHY	GRAPHIC LOG	LITHOLOGY	WATER QUALITY
 <p>Cement grout</p> <p>Cement grout mix (Portland cement (1) : Water (1:38))</p>	<p>47</p> <p>48</p> <p>49</p> <p>50</p> <p>51</p> <p>52</p> <p>53</p> <p>54</p> <p>55</p> <p>56</p> <p>57</p> <p>58</p> <p>59</p> <p>60</p> <p>61</p> <p>62</p> <p>63</p> <p>64</p> <p>65</p> <p>66</p> <p>67</p> <p>68</p> <p>69</p> <p>70</p> <p>71</p> <p>72</p> <p>73</p> <p>74</p> <p>75</p>			<p>SHALE medium to dark grey,</p> <p>SHALE medium to dark grey,</p> <p>SANDSTONE fine grained, medium grey,</p> <p>SANDSTONE fine grained, medium grey,</p>	



Drawing No.: GLMB02 - Bore Construction

Revision: A      Date drawn: 5/2/14

Drawn by: K. Maher      Checked by: S. Daykin

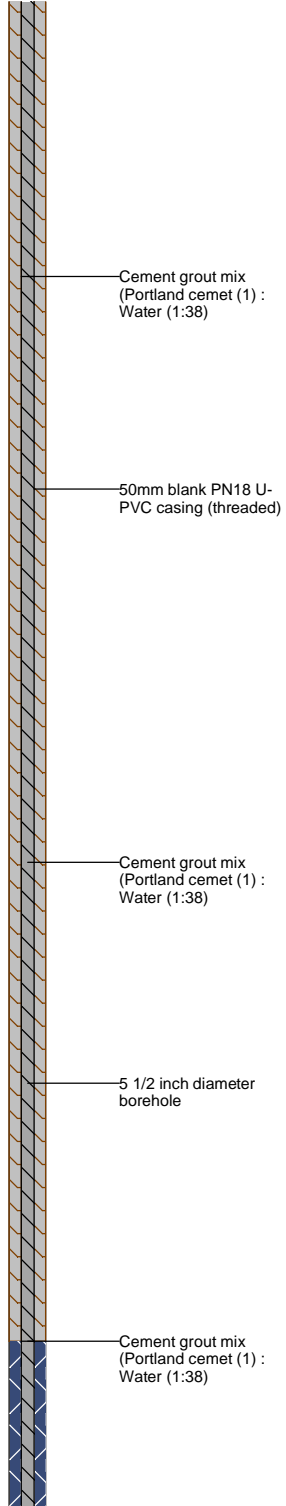





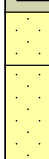
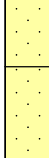
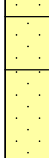
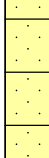

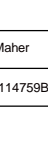

Project No. 2114759B



**AGL Upstream Investments Pty Ltd**  
**GLMB02**

Glenlee VWP Conversion

# BORE COMPLETION REPORT - GLMB02

BORE CONSTRUCTION	DEPTH (m)	STRATIGRAPHY	GRAPHIC LOG	LITHOLOGY	WATER QUALITY
 <p>Cement grout mix (Portland cemet (1) : Water (1:38))</p> <p>50mm blank PN18 U-PVC casing (threaded)</p> <p>Cement grout mix (Portland cemet (1) : Water (1:38))</p> <p>5 1/2 inch diameter borehole</p> <p>Cement grout mix (Portland cemet (1) : Water (1:38))</p>	75			SANDSTONE fine grained, light to medium grey,	
	76				
	77				
	78				
	79				
	80				
	81				
	82				
	83				
	84				
	85				
	86				
	87				
	88				
89				SHALE dark grey,	
90				SANDSTONE fine grained, light grey,	Water Cut: <0.1 L/s, Temp: 29.3 °C, EC: 8617 µS/cm, TDS: 5.601 g/L, DO: 51.9 %, DO: 3.87 ppm, pH: 8.07, ORP: 59.6 mV
91				SANDSTONE coarse grained , light cream, quartzose,	
92					
93					
94					
95				SANDSTONE fine grained, light cream, quartzose,	
96					
97				SANDSTONE medium grained , light creamy brown, quartzose,	Water Cut: 0.37 L/s, Temp: 27.87 °C, EC: 6698 µS/cm, TDS: 4.353 g/L, DO: 51 %, DO: 3.92 ppm, pH: 7.97, ORP: 45.4 mV
98				SANDSTONE medium grained , light cream, quartzose,	
99					
100				SANDSTONE fine to medium grained, light creamy grey, quartzose,	
101				SANDSTONE fine grained, light grey,	
102				SANDSTONE fine to medium grained, light creamy white, quartzose,	
103				SANDSTONE fine to medium grained, light creamy white, quartzose,	Water Cut: 0.07 L/s, Temp: 29.32 °C, EC: 8623 µS/cm, TDS: 5.604 g/L, DO: 50.8 %, DO: 3.78 ppm, pH: 8.01, ORP: 59.1 mV



Drawing No.: GLMB02 - Bore Construction

Revision: A      Date drawn: 5/2/14

Drawn by: K. Maher      Checked by: S. Daykin


Project No. 2114759B

























**AGL Upstream Investments Pty Ltd**  
**GLMB02**

Glenlee VWP Conversion

# BORE COMPLETION REPORT - GLMB02

BORE CONSTRUCTION	DEPTH (m)	STRATIGRAPHY	GRAPHIC LOG	LITHOLOGY	WATER QUALITY	
 <p style="margin-left: 20px;">Cement grout mix (Portland cemet (1) : Water (1:38)</p> <p style="margin-left: 20px;">Blue metal gravel backfill (5-8mm wash)</p>	104			SANDSTONE medium to coarse grained , light creamy white, quartzose,		
	105					
	106					
	107					
	108					
	109				SANDSTONE coarse to very coarse grained , light creamy white, quartzose,	Water Cut: 0.08 L/s, Temp: 27.09 °C, EC: 8412 µS/cm, TDS: 5.468 g/L, DO: 50.5 %, DO: 3.91 ppm, pH: 7.94, ORP: 46.2 mV
	110			SANDSTONE medium to coarse grained , light creamy white, quartzose,		
	111			SANDSTONE coarse to very coarse grained , white, quartzose,		
	112			SANDSTONE medium to coarse grained , white, quartzose,		
	113				SANDSTONE medium to coarse grained , light whitish grey, quartzose,	
	114				SANDSTONE fine grained, light grey, quartzose,	Water Cut: 0.94 L/s, Temp: 24.05 °C, EC: 8555 µS/cm, TDS: 5.561 g/L, DO: 61.6 %, DO: 4.99 ppm, pH: 7.9, ORP: 31.7 mV
	115			SANDSTONE fine grained, white, quartzose,		
	116				SANDSTONE fine grained, light grey,	
	117				SANDSTONE medium grained , light greyish white, quartzose,	
	118					
	119					
	120				SANDSTONE medium to coarse grained , light creamy white, quartzose,	Water Cut: 0.5 L/s, Temp: 22.9 °C, EC: 8494 µS/cm, TDS: 5.521 g/L, DO: 61.6 %, DO: 5.15 ppm, pH: 7.92, ORP: 12.2 mV
	121					
	122				SANDSTONE medium to coarse grained , light creamy red, quartzose,	
	123				SANDSTONE fine grained, light to medium grey,	
124				SANDSTONE fine to medium grained, light creamy white,		
125						
126				SANDSTONE fine grained, medium brownish grey,	Water Cut: 0.6 L/s, Temp: 26.97 °C, EC: 8689 µS/cm, TDS: 5.649 g/L, DO: 72.5 %, DO: 5.55 ppm, pH: 7.97, ORP: 15.6 mV	
127				SANDSTONE fine grained, light creamy white,		
128				SANDSTONE coarse to very coarse grained , light creamy white, quartzose,		
129				SANDSTONE medium to coarse grained , light creamy white, quartzose,		
130						
131				SANDSTONE fine to medium grained, light creamy white, quartzose,		

	Drawing No.: GLMB02 - Bore Construction			AGL Upstream Investments Pty Ltd
	Revision: A	Date drawn: 5/2/14		GLMB02
	Drawn by: K. Maher	Checked by: S. Daykin		Glenlee VWP Conversion
	Project No. 2114759B			

BORE CONSTRUCTION	DEPTH (m)	STRATIGRAPHY	GRAPHIC LOG	LITHOLOGY	WATER QUALITY	
 <p>Cement grout mix (Portland cemet (1) : Water (1:38))</p> <p>Cement grout mix (Portland cemet (1) : Water (1:38))</p>	132			SANDSTONE medium grained , light creamy tonstein, quartzose,	Water Cut: 0.86 L/s, Temp: 25.54 °C, EC: 8598 µS/cm, TDS: 5.589 g/L, DO: 81.3 %, DO: 6.28 ppm, pH: 7.89, ORP: 39.7 mV	
	133			SANDSTONE medium grained , light greyish white, quartzose,		
	134			SANDSTONE medium grained , light creamy brown,		
	135			SANDSTONE fine grained, light grey		
	136			SANDSTONE medium grained , light creamy white, quartzose,		
	137					Water Cut: 1.39 L/s, Temp: 22.2 °C, EC: 7088 µS/cm, TDS: 4.607 g/L, DO: 71.2 %, DO: 6.06 ppm, pH: 7.91, ORP: 90.8 mV
	138			SANDSTONE medium grained , light creamy brown, quartzose,		
	139					
	140					
	141					
	142					
	143			SANDSTONE coarse to very coarse grained , light creamy white, quartzose,		
	144			SANDSTONE medium to coarse grained , light creamy white, quartzose,		
	145					
	146			SANDSTONE fine grained, light to medium grey,		
	147			SANDSTONE medium grained , light creamy brown, quartzose,		
	148					
	149			SANDSTONE medium to coarse grained , white, quartzose,		
	150			SANDSTONE medium grained , light orangey grey, quartzose,	Water Cut: 1 L/s, Temp: 22.52 °C, EC: 7148 µS/cm, TDS: 4.645 g/L, DO: 209.3 %, DO: 17.83 ppm, pH: 7.98, ORP: 71.3 mV	
	151					
152			SANDSTONE medium grained , light to medium grey, quartzose,			
153						
154			SANDSTONE fine to medium grained, light creamy brown,			
155			SANDSTONE medium to coarse grained , light creamy brown,	Water Cut: 1.29 L/s, Temp: 23.71 °C, EC: 6948 µS/cm, TDS: 4.512 g/L, DO: 96.6 %, DO: 7.94 ppm, pH: 7.96, ORP: 57.7 mV		
156			SANDSTONE fine grained, light to medium grey,			
157			SILTSTONE dark grey,			
158			SANDSTONE coarse to very coarse grained , white, quartzose,			
159			SANDSTONE fine to medium grained, light creamy brown, quartzose,			
160						



Drawing No.: GLMB02 - Bore Construction

Revision: A Date drawn: 5/2/14

Drawn by: K. Maher Checked by: S. Daykin

Project No. 2114759B



**AGL Upstream Investments Pty Ltd**  
**GLMB02**

Glenlee VWP Conversion

BORE CONSTRUCTION	DEPTH (m)	STRATIGRAPHY	GRAPHIC LOG	LITHOLOGY	WATER QUALITY
<p>Bentonite seal</p> <p>VWP sensor (not to scale) Model No: 1200 Rating: 2000 kPa S/N: 20231</p> <p>Gravel pack (5mm wash)</p> <p>50mm slotted PN18 U-PVC casing (0.5mm aperture)</p> <p>Cement grout mix (Portland cemet (1) : Water (1:38))</p> <p>50mm blank PN18 U-PVC sump (threaded)</p> <p>Bentonite plug</p> <p>Blue metal gravel backfill</p>	160			SANDSTONE fine to medium grained, light creamy brown, quartzose,	
	161			SANDSTONE fine to medium grained, white, quartzose,	Water Cut: 1.16 L/s, Temp: 22.39 °C, EC: 7405 µS/cm, TDS: 4.813 g/L, DO: 58.6 %, DO: 4.97 ppm, pH: 8, ORP: 57.8 mV
	162			SANDSTONE fine to medium grained, white, quartzose,	
	163			SANDSTONE fine to medium grained, white, quartzose,	
	164			SANDSTONE fine to medium grained, white, quartzose,	
	165			SANDSTONE fine to medium grained, white, quartzose,	
	166			SANDSTONE fine grained, light grey, quartzose,	
	167			SANDSTONE fine grained, light grey, quartzose,	
	168			SANDSTONE fine to medium grained, light to medium grey,	Water Cut: 1.21 L/s, Temp: 23.02 °C, EC: 6989 µS/cm, TDS: 4.542 g/L, DO: 143.7 %, DO: 1.68 ppm, pH: 8.02, ORP: 26.9 mV
	169			SANDSTONE fine to medium grained, light to medium grey,	
	170			SANDSTONE fine to medium grained, light to medium grey,	
	171			SANDSTONE fine to medium grained, light to medium grey,	
172			SANDSTONE fine to medium grained, light to medium grey,		
173			SANDSTONE fine to medium grained, light to medium grey,		
174			SILTSTONE dark grey,		
175			SANDSTONE fine grained, light to medium grey,	Water Cut: 1.15 L/s, Temp: 22.11 °C, EC: 6707 µS/cm, TDS: 4.36 g/L, DO: 56 %, DO: 4.79 ppm, pH: 7.94, ORP: 42.7 mV	
176			SANDSTONE fine grained, light to medium grey,		
177			SANDSTONE fine grained, light greyish white,		
178			SANDSTONE fine grained, light greyish white,		
179			SANDSTONE coarse to very coarse grained , light grey,		
180			SANDSTONE coarse to very coarse grained , light grey,		
181			SANDSTONE fine grained, light grey,	Water Cut: 1.19 L/s, Temp: 22.35 °C, EC: 6903 µS/cm, TDS: 4.487 g/L, DO: 61.2 %, DO: 4.69 ppm, pH: 7.91, ORP: 37.8 mV	
182			SANDSTONE fine grained, light grey,		
183			SANDSTONE fine grained, light grey,		
184			SANDSTONE fine to medium grained, light creamy white,		
185			SANDSTONE fine to medium grained, light creamy white,		
186			SANDSTONE fine to medium grained, light creamy white,		
187			SANDSTONE medium to coarse grained , white, quartzose,	Water Cut: 1.31 L/s, Temp: 23.33 °C, EC: 6837 µS/cm, TDS: 4.443 g/L, DO: 61.2 %, DO: 5.1 ppm, pH: 8.01, ORP: 12.2 mV	
188			SANDSTONE medium to coarse grained , white, quartzose,		



Drawing No.: GLMB02 - Bore Construction

Revision: A Date drawn: 5/2/14

Drawn by: K. Maher Checked by: S. Daykin




Project No. 2114759B



**AGL Upstream Investments Pty Ltd**  
**GLMB02**

Glenlee VWP Conversion

# BORE COMPLETION REPORT - GLMB02

BORE CONSTRUCTION	DEPTH (m)	STRATIGRAPHY	GRAPHIC LOG	LITHOLOGY	WATER QUALITY
	189 190 191			LITHOLOGY	WATER QUALITY



Drawing No.: GLMB02 - Bore Construction

Revision: A

Date drawn: 5/2/14

Drawn by: K. Maher

Checked by: S. Daykin

Project No. 2114759B



**AGL Upstream Investments Pty Ltd**  
**GLMB02**

Glenlee VWP Conversion



# CALIBRATION SHEET

CLIENT: **PARSONS BRINCKERHOFF**

JOB No. **GSA-31750**

<b>GSA Serial No.</b>	<b>20231</b>	<b>GOKON Serial No.</b>	<b>1338693</b>
DATE	<b>10/03/2015</b>	<b>TYPE</b>	<b>S S/S GLAND</b>

CAL SHEET No. **1**

RATING	2000 kPa		
RUN BY	MG	TEMP.(°C)	READING Hz <sup>2</sup> (10 <sup>-3</sup> )
	LOW		
	HIGH		

PRESSURE (KPa)	READING Hz <sup>2</sup> (10 <sup>-3</sup> )
0	8739
400	8102
800	7468
1200	6835
1600	6201
2000	5570

-3  
-3  
-3  
-3

TEMP CHANGE(°C)	
READING CHANGE Hz <sup>2</sup> (10 <sup>-3</sup> )	

AMBIENT TEMP (°C)	21
BAROMETRIC PRESSURE (hPa)	1018.7
GSA ZERO PRESSURE READING Hz <sup>2</sup> (10 <sup>-3</sup> )	8744
GSA THERMISTOR READING kΩ	3.35
GKN PRESSURE COEFFICIENT kPa /Hz <sup>2</sup> (10 <sup>-3</sup> )	0.63130
GKN THERMAL COEFFICIENT (KPa/°C)	0.32710





# VIBRATING WIRE PIEZOMETER CALIBRATION

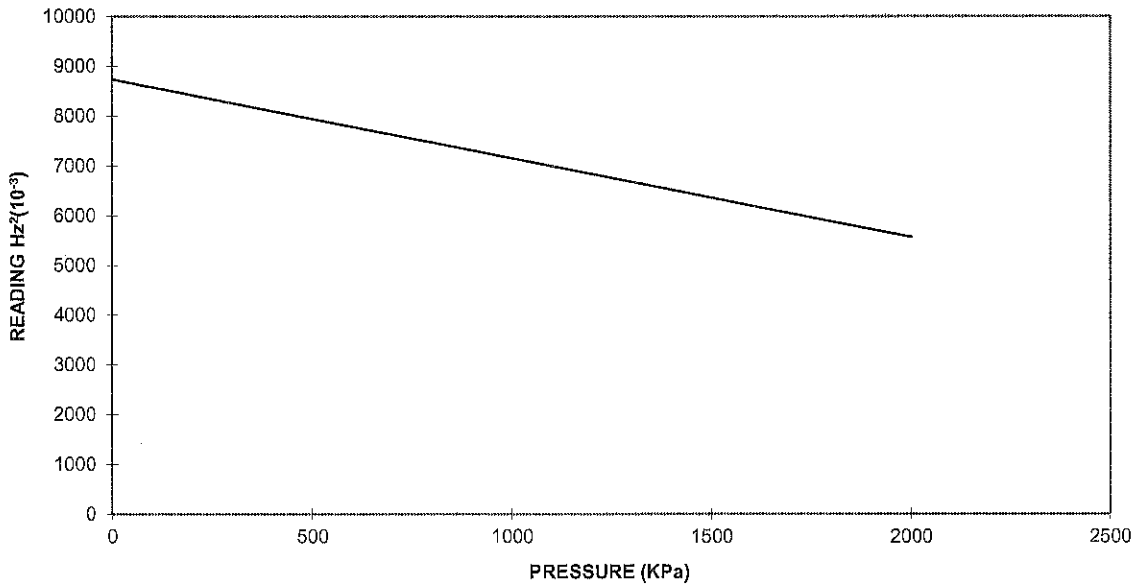
CLIENT : PARSONS BRINCKERHOFF

JOB No GSA-31750

SERIAL No. : 20231

RATING : 2000 KPa

PIEZOMETER CALIBRATION GRAPH



FACTORY ZERO READING : 8744  $\text{Hz}^2(10^{-3})$

PRESSURE COEFFICIENT : 0.63130  $\text{KPa}/\text{Hz}^2(10^{-3})$  ----- ( $C_P$ )

AMBIENT TEMPERATURE : 21  $^{\circ}\text{C}$

THERMAL COEFFICIENT : 0.32710  $\text{KPa}/^{\circ}\text{C}$  ----- ( $C_T$ )

SEE INSTRUCTION MANUAL FOR STANDARD THERMISTOR/TEMPERATURE DATA

MAXIMUM PRESSURE : 3000 kPa

BAROMETRIC PRESSURE : 1018.7 hPa

OPERATING TEMPERATURE RANGE :  $-30^{\circ}\text{C}$  to  $+65^{\circ}\text{C}$

ZERO READING: ( $F_0$ ) & ( $T_0$ ) TO BE ESTABLISHED DURING INSTALLATION

$\text{PORE PRESSURE} = (F_0 - F_1)C_P + (T_1 - T_0)C_T$
--



# CALIBRATION SHEET

CLIENT: **PARSONS BRINCKERHOFF**

JOB No. **GSA-31750**

<b>GSA Serial No.</b>	<b>21013</b>	<b>GOKON Serial No.</b>	<b>1438661</b>
<b>DATE</b>	<b>10/03/2015</b>	<b>TYPE</b>	<b>S S/S GLAND</b>

CAL SHEET No. **1**

RATING	1000 kPa	TEMP.(°C)	READING Hz <sup>2</sup> (10 <sup>-3</sup> )
RUN BY	MG		
	LOW		
	HIGH		

PRESSURE (KPa)	READING Hz <sup>2</sup> (10 <sup>-3</sup> )
0	8853
200	8136
400	7420
600	6698
800	5974
1000	5245

5  
10  
10  
7

TEMP CHANGE(°C)	
READING CHANGE Hz <sup>2</sup> (10 <sup>-3</sup> )	

AMBIENT TEMP (°C)	21
BAROMETRIC PRESSURE (hPa)	1018.7
GSA ZERO PRESSURE READING Hz <sup>2</sup> (10 <sup>-3</sup> )	8862
GSA THERMISTOR READING kΩ	3.39
GKN PRESSURE COEFFICIENT kPa /Hz <sup>2</sup> (10 <sup>-3</sup> )	0.27730
GKN THERMAL COEFFICIENT (KPa/°C)	0.15270



# VIBRATING WIRE PIEZOMETER CALIBRATION

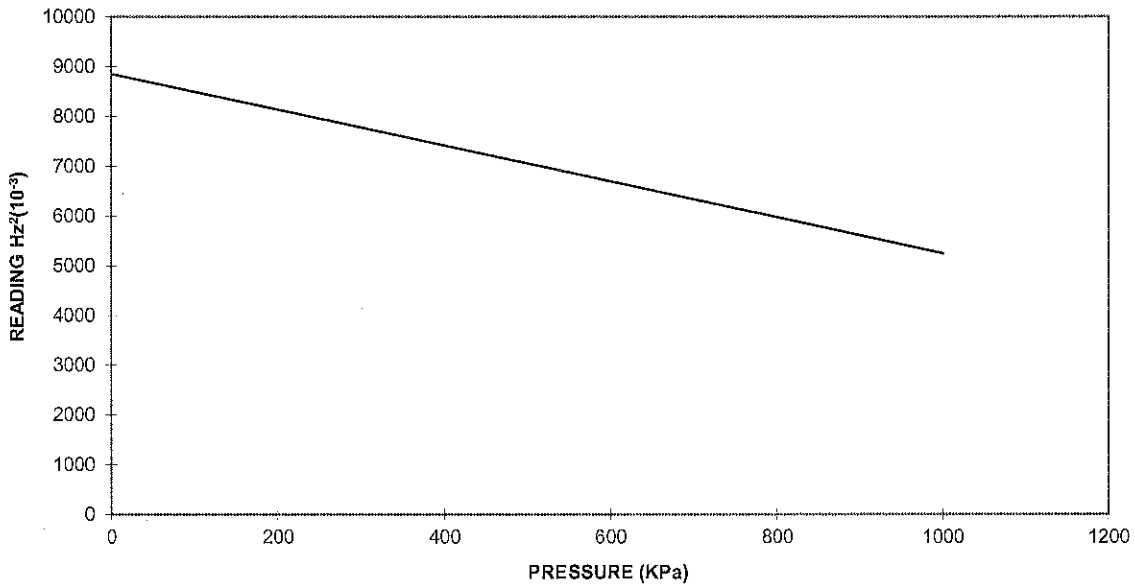
CLIENT : PARSONS BRINCKERHOFF

JOB No GSA-31750

SERIAL No. : 21013

RATING : 1000 KPa

PIEZOMETER CALIBRATION GRAPH



FACTORY ZERO READING : 8862  $\text{Hz}^2(10^{-3})$

PRESSURE COEFFICIENT : 0.27730  $\text{KPa}/\text{Hz}^2(10^{-3})$  ----- ( $C_P$ )

AMBIENT TEMPERATURE : 21  $^{\circ}\text{C}$

THERMAL COEFFICIENT : 0.15270  $\text{KPa}/^{\circ}\text{C}$  ----- ( $C_T$ )

SEE INSTRUCTION MANUAL FOR STANDARD THERMISTOR/TEMPERATURE DATA

MAXIMUM PRESSURE : 1500 kPa

BAROMETRIC PRESSURE : 1018.7 hPa

OPERATING TEMPERATURE RANGE :  $-30^{\circ}\text{C}$  to  $+65^{\circ}\text{C}$

ZERO READING: ( $F_0$ ) & ( $T_0$ ) TO BE ESTABLISHED DURING INSTALLATION

$\text{PORE PRESSURE} = (F_0 - F_1)C_P + (T_1 - T_0)C_T$
--