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Mr Jai O' Toole
Department for Water (DFW)
101 Grenfell Street
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14 September 2012

VE23686/Caloote Landing

Dear Jai

**RIVERBANK COLLAPSE HAZARD, LOWER REACHES RIVER MURRAY
STABILITY RISK MANAGEMENT, CALOOTE LANDING, MONITORING
REVIEW – AUGUST 2011 TO AUGUST 2012**

Introduction

Sinclair Knight Merz (SKM) are pleased to provide the South Australian Department for Water (DfW) a review of data from survey monitoring undertaken at the foreshore at Caloote Landing in the Lower Reaches of the River Murray (SKM letter dated 20 June 2012, reference VEP2176/Caloote Monitoring/RAS). The monitoring was carried out on behalf of DFW by Alexander Symonds Pty Ltd (Alexander Symonds), which consisted of collecting twelve data sets between 3 August 2011 and 31 August 2012. The aim of the monitoring was to measure surface deformation of fixed survey reference points within an area adjacent to the river bank and to relate the actual movement at these points over time. The review detailed herein is additional to an earlier review undertaken by Golder Associates Pty Ltd (Golder) for the period 3 August 2011 to 12 September 2011 as reported in a letter to DfW on 21 September 2011 (provided as Appendix A).

The reasons for initiation of the monitoring programme arose from the outcomes of detailed studies, investigations and recommendations carried out following a spate of river bank cracking and in some areas, collapse, brought about by unprecedently low water levels within the lower River Murray from 2008 to 2010.

Brief Background

River levels reached a recorded low of about -1.25m AHD at Murray Bridge in April 2009. This followed extreme drought over the preceding years (Reference 1). The lowering of water levels has been a major contributing factor in the occurrence of a large number of river bank cracking and collapse incidences since February 2008. A number of incidences were investigated in detail by the DFW in locations of particular severity, high risk to the public or a combination of both.

Caloote Landing and adjacent river front dwellings were inspected and subsequently a detailed ground investigation was carried out in October 2009 by SKM (Reference 2).

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Outcomes of the geotechnical investigation included characterisation of the Caloote area; derivation of geotechnical parameters for the various alluvial materials present within the river bank; and limiting equilibrium slope stability analysis carried out to establish margins of safety against bank failure. A recommendation made at this time was to fence off the river bank area and the southern residential area to deter vehicle and pedestrian access. The monitoring programme referred to within this report was undertaken as a result of the recommendations provided in the SKM 2010 Report (Reference 2).

Monitoring Programme

Monitoring of riverbank movement at Caloote Landing was carried out by Alexander Symonds between 3 August 2011 and 31 August 2012 (data presented in Appendix B).

The monitoring involved three dimensional (Easting (E), Northing (N), Elevation (y)) measurements using total station survey methods at seventy seven (77) reference targets. The targets consist of 'Y' section steel pins driven into the ground in the foreshore area to a depth of 0.5 m. The accuracy of the survey is reported to be within ± 3 mm horizontally (E and N) and ± 2 mm (y) vertically with a least squares survey adjustment used to close the survey. The first survey carried out on 3 August 2011 is the baseline survey. Subsequent surveys have been equated to the first survey; changes are measured in millimetres (mm).

Review of data

The data reviewed was from the first survey on 3 August 2011 through to the last survey on 31 August 2012. The review for each point followed a set pattern, referred to hereafter as the preliminary filter. The preliminary filter was conducted as follows:

1. Establish the cumulative difference between the first and last surveys (positive or negative) for each of the three components E, N, y, at each survey pin.
2. Highlight all points with a cumulative deformation greater than 5 mm in any direction over the full monitoring period.
3. Check that greater movement on a single axis on any individual survey did not exceed the value represented by the cumulative value.

From the preliminary filter (1 to 3) three sections of the monitored area were highlighted for further consideration. These sections (referred to as Sections 1, 2 and 3) are highlighted on Figure 1 (location plan from Reference 3) and detailed hereafter. These areas are centred on points D3 and D4 (Section 1), J3 (Section 2) and R4 and S4 (Section 3).

- **Section 1 (Car Park/Picnic Shelter):**

The focus of this section was the change in overall horizontal movements greater than 5 mm as defined at points C4, E2, C5 and D5. Vectors to demonstrate the magnitude and direction of movement are shown on a sketch plan, included as Figure 2. A maximum lateral movement of 7.0 mm at E2 is shown, with the direction for the points with



maximum lateral movement (C4, E2, C5, D5) being away from the river (inland). In general there is no overriding dominant direction of movement in this section. The lateral deformation at each point can be considered random. This suggests ground movement that is influenced to a greater or lesser extent by survey tolerance and very minor swelling and shrinkage governed by local (close to the monitoring pin) ground materials (clay content variability).

There was no vertical deformation exceeding 5mm within Section 1.

- **Section 2 (Boat Ramp):**

Section 2 exhibits a change in elevation inferred as a localised depression, with little discernable lateral movement within the area above survey accuracy.

The depression is centred at point J3 as shown on Figure 3. Contours of maximum vertical movement indicate the depression to be localised; adjacent points show slight heave. To test the validity of point J3 a plot of variation in elevation against time is presented as Figure 5. It is clear that settlement at this single point occurred between 25 October 2011 and 17 November 2011, at which time deformation of -12 mm occurred compared to the base value. Subsequent elevations at J3 suggested a small gradual rise in ground level with time, however this rise did not exceed the survey accuracy. Elevation is currently at -10 mm at point J3. This indicates a possible single event (e.g. influence of vehicle movement)

A maximum lateral movement of 6.0 mm occurred at K2 towards the river. The general direction of lateral movement near the riverbank is towards the river, however the magnitude of movement is within survey tolerance (apart from K2).

- **Section 3 (Southern Residential Area):**

This section of river bank demonstrates both lateral and vertical deformation exceeding a 5 mm threshold. Figure 4 shows a detailed appreciation of this area and demonstrated lateral movement of all measuring stations to the east (towards the river bank) with the maximum resultant movement at T2 of 10.4 mm.

Vertically the ground within this section is stable however a depression is suggested, based on a single point R2 settling by 14 mm between 17 February 2012 and 28 March 2012. To check on the validity of R2 a plot of vertical movement with time is presented on Figure 5. It can be seen that the variation in ground level in late February 2012 indicates heave (albeit within survey accuracy range) with a step change of 17 mm of settlement by the end of March 2012. Subsequently there was no further significant movement at R2. This anomaly may also represent human activities and is considered a single event rather than progressive settlement.

Discussion and Recommendations

The monitoring programme at Caloote Landing shows remarkable consistency and reproducibility of data over a full annual climatic cycle.

For all practical purposes relative movement of points between survey intervals (E, N, y), allowing for survey accuracy, are only 1 mm to 2 mm at most, with the exception of points T2,



R2 and J3. Points R2 and J3 both suggest subsidence hollows developing around the survey pin. Lateral movement at and surrounding the pin are negligible. Survey errors at R2 and J3, although possible, are discounted and are the more likely cause of localised settlement is from human interference (vehicle, pedestrian damage) particularly next to the boat ramp J3. Settlement due to consolidation of the upper soil strata is also a possibility.

The lateral movement at T2 is almost due east (towards the river), and amounts to 10.4 mm. This point has been examined in detail. Aligned points (S2, R2, Q2) also located immediately on the edge of the river bank all show lateral movement generally to the east (offshore) with S2 and R2 exceeding survey accuracy range. Figure 6 represents the change in lateral movement at point T2 with time. Gradual lateral movement is indicated at a rate of approximately 11 mm per year (less than 1mm per month).

Conclusions

The monitoring program has provided an accurate understanding of the active ground movements that occur across the Car Park, Landing and Cottage river front area at Caloote.

Based on the data provided actual movement recorded over the year from August 2011 to August 2012 is insignificant and most of the variations are within the survey accuracy range.

The data reviewed is extremely consistent with negligible movement that can be definitively attributed to ground deformation. This may be accounted for due to the almost static river water level conditions over the monitoring period although the actual water level at the time of each survey was not, as far as can be discerned, measured.

The influence of river water level on overall bank stability has been demonstrated by SKM (Reference 4), and it can be further stated that a similar effect controls bank deformation, particularly at Caloote where top of bank level and water level are not currently dissimilar in elevation.

Despite obvious additional risk items currently pertaining at the Caloote foreshore (e.g. the unfenced river edge itself and the rock cliff overhangs at the rear of properties) the monitoring shows a very stable alluvial shoreline within the monitored zone, provided that the river level is maintained at the current elevation.

Seasonal climatic cycle of swelling and shrinkage is not evident.

There are three areas (Sections 1 to 3 as described) where horizontal and vertical ground movement may be discernable. In the car park area (Section 1) random horizontal movement (in various directions) probably represents natural soil variability causing slight swelling and shrinkage. A single survey pin at E2 however suggests a few millimetres of ground movement away from the river from its position close to the bank.



In Section 2 at the boat ramp entrance, pin J3 has settled 10 mm. This has possibly resulted from vehicle activity following opening up of the boat ramp to the public, and the settlement seems to be a single event.

In Section 3, along the front of the residential area, horizontal movement is consistently towards the river but with magnitudes of only a few millimetres in real terms. However a single point at water's edge (T2) suggests a gradual easterly movement of about 1 mm per month. Vertical movement along the river edge in Section 3 is also only a few mm with the exception of point R2 which has settled by 14 mm.

Limitations

This review is based on the data provided being a true indication of the movement that has occurred within the monitoring programme.

No attempt has been made to equate ground movement to defects that may be attributed, by others, to dwellings or foreshore facilities.

Recommendations

1. Continued monthly survey monitoring of the grid at Caloote cannot be justified based on the ground deformation trends demonstrated over the past 12 months.
2. A gradual reduction in the frequency of monitoring is recommended in the following sequence.
 - a. Monitoring at quarterly intervals for 2 consecutive rounds (approximately to February 2013) – *Hold Point 1*.
 - b. A bi-annual survey for 1 round (approximately to August 2013) – *Hold Point 2*.
 - c. An annual survey of selected points (approximately to August 2014) – *Hold Point 3*.
3. River levels should be recorded in the vicinity of R2 during subsequent surveys and reported on the datasheet. It is recommended that the river level is monitored and tracked as long as the survey is continued and thereafter at reasonable intervals. The threshold river level of +0.2 m AHD suggested by Golder (Appendix A) as a red alert when consideration should be given to closing the foreshore and boat ramp is endorsed.
4. Monitoring frequency should be reviewed at each hold point and monitoring scope and frequency adjusted according to the findings at those times.



5. If the trends demonstrated by this review continue then it is suggested that monitoring along the river edge remains in place until deformation slows down to a negligible rate.
6. The southern residential area, currently fenced off, should remain restricted to vehicle access until the next review date, when the need for the restrictions can be re-assessed.

References:

- Reference 1: SKM Report, June 2012, 'Walker Flat, River Vessel Waste Disposal Station, Investigation of Actions Required to Return to Service'
- Reference 2: SKM Report, February 2010, 'Study into River Bank Collapsing for Lower River Murray, Geotechnical Investigation Report'
- Reference: SKM letter report dated 11 November 2011, 'River Bank Collapse Hazard – Lower River Murray Stability Risk Assessment for Caloote Landing'
- Reference 4: SKM letter report dated 9 July 2010 to DfW

We would be pleased to discuss the matters presented in this report. Please do not hesitate to contact Bob Scott should you require clarification.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Robert Scott'.

SINCLAIR KNIGHT MERZ

Robert Scott

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Attached:

Appendix A: Alexander Symonds Pty Ltd Monitoring Data

Appendix B: Golder Associates Pty Ltd Report

Figure 1: Location Plan

Figure 2: Section 1 Sketch Plan of Lateral and Vertical Movement

Figure 3: Section 2 Sketch Plan of Lateral and Vertical Movement

Figure 4: Section 3 Sketch Plan of Lateral and Vertical Movement

Figure 5: Analysis of Vertical Movement at Monitoring Points J3 and R2

Figure 6: Analysis of Lateral Movement at Monitoring Points T2



Appendix A Alexander Symonds Pty Ltd Monitoring Data



CALOOTE LANDING

RIVER BANK MOVEMENT MONITORING

17 AUGUST 2011 Observations

Date of survey	17-Aug-11
Equipment	Set 57
Surveyed by:	NRG

References:
 CALOOTE LANDING
 A&S: A078911.0001

Point	First Survey 3 August 2011					Current Survey					Current Survey Comparisons			Point Description		
	Easting	Northing	Elevation	Chainage	Offset	Easting	Northing	Elevation	Chainage	Offset	Upstream (mm)	Cross (mm)	Up (mm)	Upstream (mm)	Cross (mm)	Up (mm)
131	1508.115	9799.819	2.927	106.842	83.471	1508.115	9799.816	2.926	106.839	83.473	-3	2	-1	-3	2	-1
132	1500.637	9833.245	2.278	141.065	82.043	1500.635	9833.242	2.278	141.063	82.046	-2	3	0	-2	3	0
133	1504.001	9846.581	1.847	153.075	75.343	1504.001	9846.581	1.847	153.075	75.343	0	0	0	0	0	0
134	1489.782	9879.980	2.431	189.017	80.433	1489.781	9879.979	2.431	189.016	80.434	-1	1	0	-1	1	0
135	1498.839	9915.830	2.281	221.301	62.406	1498.836	9915.831	2.281	221.303	62.408	2	2	0	2	2	0
136	1554.785	9795.230	2.404	90.331	39.579	1554.786	9795.229	2.403	90.329	39.579	-2	0	-1	-2	0	-1
137	1569.940	9765.261	3.986	57.460	32.698	1569.941	9765.261	3.986	57.460	32.697	0	-1	0	0	-1	0
BG1	1542.590	9794.500	4.839	92.781	51.548	1542.590	9794.499	4.840	92.781	51.548	0	0	1	0	0	1
BG2	1551.302	9786.479	5.052	82.779	45.209	1551.304	9786.480	5.052	82.780	45.207	1	-2	0	1	-2	0
BG3	1555.157	9787.556	4.693	82.822	41.206	1555.160	9787.556	4.693	82.821	41.204	-1	-2	0	-1	-2	0
BG4	1558.738	9784.274	4.641	78.725	38.597	1558.740	9784.276	4.641	78.727	38.595	2	-2	0	2	-2	0
BG5	1559.997	9777.278	4.690	71.641	39.191	1559.997	9777.279	4.690	71.642	39.192	1	1	0	1	1	0
BG6	1573.381	9758.655	4.299	50.189	31.084	1573.380	9758.655	4.299	50.189	31.084	0	0	0	0	0	0
BG7	1578.193	9750.878	4.322	41.431	28.448	1578.193	9750.879	4.321	41.432	28.448	1	0	-1	1	0	-1
A3	1535.519	9890.493	0.809	187.334	33.533	1535.519	9890.494	0.808	187.335	33.533	1	0	-1	1	0	-1
A4	1528.942	9889.377	0.918	187.958	40.175	1528.943	9889.380	0.917	187.961	40.173	3	-2	-1	3	-2	-1
A5	1520.236	9887.828	1.037	188.715	48.986	1520.235	9887.829	1.037	188.716	48.986	1	0	0	1	0	0
B2	1548.889	9879.599	0.884	173.351	23.438	1548.889	9879.601	0.882	173.353	23.438	2	0	-2	2	0	-2
B3	1541.935	9878.666	0.855	174.250	30.397	1541.937	9878.670	0.854	174.253	30.394	3	-3	-1	3	-3	-1
B4	1534.095	9877.415	0.949	175.070	38.294	1534.095	9877.415	0.949	175.070	38.294	0	0	0	0	0	0
B5	1522.149	9875.439	1.138	176.253	50.344	1522.148	9875.440	1.138	176.255	50.345	2	1	0	2	1	0
C2	1550.228	9869.364	1.075	163.117	24.794	1550.232	9869.360	1.075	163.113	24.791	-4	-3	0	-4	-3	0
C3	1544.058	9867.349	1.051	162.768	31.276	1544.058	9867.350	1.052	162.769	31.275	1	-1	1	1	-1	1
C4	1536.208	9865.947	1.111	163.446	39.221	1536.204	9865.948	1.111	163.448	39.224	2	3	0	2	3	0
C5	1523.966	9863.735	1.218	164.478	51.619	1523.964	9863.730	1.218	164.474	51.621	-4	2	0	-4	2	0
D2	1553.812	9856.870	1.027	150.121	24.566	1553.814	9856.870	1.027	150.122	24.564	1	-2	0	1	-2	0
D3	1546.764	9855.580	1.134	150.701	31.708	1546.761	9855.582	1.134	150.703	31.710	2	2	0	2	2	0
D4	1538.877	9853.952	1.216	151.169	39.747	1538.876	9853.950	1.216	151.167	39.748	-2	1	0	-2	1	0
D5	1526.016	9851.295	1.345	151.931	52.857	1526.015	9851.291	1.345	151.927	52.859	-4	2	0	-4	2	0
E2	1552.840	9844.546	1.246	138.469	28.695	1552.834	9844.548	1.246	138.473	28.700	4	5	0	4	5	0
E3	1548.571	9843.740	1.289	138.796	33.027	1548.567	9843.742	1.289	138.799	33.030	3	3	0	3	3	0
E4	1540.756	9842.157	1.390	139.289	40.985	1540.756	9842.153	1.389	139.285	40.986	-4	1	-1	-4	1	-1
E5	1527.847	9839.583	1.384	140.145	54.120	1527.850	9839.581	1.383	140.142	54.117	-3	-3	-1	-3	-3	-1
F2	1555.038	9832.754	1.136	126.510	29.623	1555.037	9832.758	1.136	126.514	29.624	4	1	0	4	1	0
F3	1551.790	9832.093	1.371	126.712	32.931	1551.791	9832.092	1.370	126.711	32.932	-1	1	-1	-1	1	-1
F4	1543.948	9830.501	1.409	127.204	40.918	1543.944	9830.500	1.410	127.204	40.923	0	5	1	0	5	1
F5	1529.849	9827.702	1.451	128.150	55.262	1529.849	9827.702	1.451	128.150	55.262	0	0	0	0	0	0
G2	1557.617	9828.377	1.023	121.615	28.265	1557.618	9828.378	1.023	121.615	28.263	0	-2	0	0	-2	0
G3	1552.803	9827.380	1.289	121.898	33.173	1552.803	9827.380	1.288	121.898	33.174	0	1	-1	0	1	-1
G4	1545.016	9825.784	1.384	122.372	41.108	1545.014	9825.783	1.384	122.372	41.110	0	2	0	0	2	0
G5	1530.648	9822.879	1.470	123.285	55.738	1530.646	9822.877	1.470	123.283	55.741	-2	3	0	-2	3	0
H2	1558.902	9823.324	0.935	116.402	28.332	1558.903	9823.320	0.934	116.398	28.332	-4	0	-1	-4	0	-1
H3	1553.793	9822.356	1.121	116.788	33.517	1553.794	9822.353	1.121	116.785	33.517	-3	0	0	-3	0	0
H4	1545.855	9820.959	1.292	117.494	41.547	1545.853	9820.960	1.293	117.496	41.547	2	0	1	2	0	1
H5	1531.495	9817.952	1.470	118.306	56.195	1531.492	9817.947	1.470	118.302	56.199	-4	4	0	-4	4	0

J2	1559.568	9818.075	0.881	111.159	29.047	1559.571	9818.077	0.880	111.160	29.043	1	-4	-1	1	-4	-1	DROPPER
J3	1554.939	9817.309	1.079	111.617	33.716	1554.939	9817.311	1.080	111.619	33.716	2	0	1	2	0	1	DROPPER
J4	1547.055	9815.929	1.226	112.325	41.689	1547.054	9815.931	1.226	112.327	41.690	2	1	0	2	1	0	DROPPER
J5	1532.242	9813.153	1.353	113.477	56.715	1532.240	9813.151	1.353	113.476	56.718	-1	3	0	-1	3	0	DROPPER
K2	1560.810	9813.419	0.917	106.341	29.052	1560.809	9813.423	0.917	106.344	29.052	3	0	0	3	0	0	DROPPER
K3	1555.898	9812.483	1.024	106.708	34.039	1555.899	9812.483	1.025	106.708	34.038	0	-1	1	0	-1	1	DROPPER
K4	1548.045	9811.005	1.217	107.312	42.007	1548.045	9811.005	1.217	107.312	42.007	0	0	0	0	0	0	DROPPER
K5	1533.008	9808.326	1.499	108.617	57.225	1533.007	9808.325	1.499	108.616	57.227	-1	2	0	-1	2	0	DROPPER
L2	1562.235	9805.732	1.034	98.546	29.665	1562.235	9805.734	1.034	98.548	29.665	2	0	0	2	0	0	DROPPER
L3	1557.599	9804.225	1.533	98.291	34.534	1557.598	9804.229	1.533	98.295	34.533	4	-1	0	4	-1	0	DROPPER
L4	1549.266	9804.390	1.883	100.607	42.539	1549.265	9804.390	1.884	100.607	42.540	0	1	1	0	1	1	DROPPER
L5	1539.867	9796.580	2.372	95.496	53.640	1539.863	9796.575	2.372	95.492	53.645	-4	5	0	-4	5	0	DROPPER
M2	1567.229	9797.502	1.128	89.304	26.971	1567.232	9797.504	1.128	89.306	26.968	2	-3	0	2	-3	0	DROPPER
M3	1562.740	9795.048	1.310	88.095	31.943	1562.738	9795.050	1.310	88.098	31.944	3	1	0	3	1	0	DROPPER
N2	1574.660	9787.139	1.183	77.371	22.476	1574.660	9787.140	1.182	77.372	22.476	1	0	-1	1	0	-1	DROPPER
N3	1570.165	9784.176	1.522	75.672	27.584	1570.163	9784.178	1.523	75.675	27.586	3	2	1	3	2	1	DROPPER
N4	1565.798	9781.330	1.898	74.054	32.539	1565.796	9781.333	1.898	74.057	32.540	3	1	0	3	1	0	DROPPER
P2	1581.542	9777.475	1.455	66.255	18.330	1581.546	9777.475	1.455	66.254	18.326	-1	-4	0	-1	-4	0	DROPPER
P3	1576.989	9774.754	1.717	64.806	23.431	1576.991	9774.757	1.717	64.807	23.429	1	-2	0	1	-2	0	DROPPER
P4	1571.988	9771.816	2.000	63.262	29.022	1571.988	9771.814	1.997	63.260	29.024	-2	2	-3	-2	2	-3	DROPPER
Q2	1585.673	9766.239	1.577	54.333	17.248	1585.674	9766.239	1.577	54.333	17.246	0	-2	0	0	-2	0	DROPPER
Q4	1578.166	9762.768	2.034	52.923	25.398	1578.165	9762.768	2.034	52.923	25.398	0	0	0	0	0	0	DROPPER
Q5	1579.366	9754.390	2.649	44.520	26.406	1579.366	9754.390	2.649	44.520	26.406	0	0	0	0	0	0	DROPPER
R2	1589.576	9754.944	1.351	42.413	16.401	1589.577	9754.944	1.352	42.413	16.400	0	-1	1	0	-1	1	DROPPER
R4	1583.929	9752.637	1.857	41.645	22.452	1583.930	9752.645	1.856	41.653	22.450	8	-2	-1	8	-2	-1	DROPPER
R5	1579.688	9750.881	2.755	41.047	27.004	1579.688	9750.881	2.755	41.047	27.004	0	0	0	0	0	0	DROPPER
S2	1594.850	9744.151	1.375	30.622	14.100	1594.854	9744.147	1.375	30.617	14.098	-5	-2	0	-5	-2	0	DROPPER
S4	1589.588	9741.791	1.624	29.704	19.793	1589.588	9741.792	1.624	29.705	19.794	1	1	0	1	1	0	DROPPER
S5	1582.877	9738.801	3.040	28.553	27.050	1582.880	9738.802	3.040	28.553	27.047	0	-3	0	0	-3	0	DROPPER
T2	1600.735	9729.732	1.387	15.171	12.148	1600.738	9729.733	1.386	15.172	12.145	1	-3	-1	1	-3	-1	DROPPER
T4	1596.347	9727.482	1.647	14.134	16.968	1596.348	9727.483	1.647	14.134	16.967	0	-1	0	0	-1	0	DROPPER
T5	1587.615	9723.616	3.214	12.659	26.403	1587.614	9723.614	3.215	12.658	26.405	-1	2	1	-1	2	1	DROPPER

Max	8	5	1	8	5	1
Min	-5	-4	-3	-5	-4	-3
Average	0	0	-0	0	0	-0

Notes:

Max, Min & Average values are for settlement posts only
Coordinates are calculated from least squares adjustment.
Chainage & offset is relative to line approximately parallel to river bank
Origin of Chainage & Offset Alignment: E 1 616.395, N 9 718.221
End of Chainage & Offset Alignment: E 1 556.687, N 9 940.384
Cross movement is positive away from the river bank in a westerly direction
Upstream movement is positive in an upstream (Northerly) direction
Movement shown is relative to first survey 3 August 2011
Design co-ordinate accuracy is +/- 3mm
Design elevation accuracy is +/- 2mm
Droppers Q5 and R5 were placed and first surveyed on 17 August 2011



CALOOTE LANDING

RIVER BANK MOVEMENT MONITORING

30 AUGUST 2011 Observations

Date of survey	30-Aug-11
Equipment	Set 59
Surveyed by:	NRG

References:
 CALOOTE LANDING
 A&S: A078911.0001

Point	First Survey 3 August 2011					Current Survey					Upstream			Cross			Up			Upstream			Cross			Up			Point Description
	Easting	Northing	Elevation	Chainage	Offset	Easting	Northing	Elevation	Chainage	Offset	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	
131	1508.115	9799.819	2.927	106.842	83.471	1508.115	9799.816	2.926	106.839	83.473	-3	2	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	CROSS ON STOBIE
132	1500.637	9833.245	2.278	141.065	82.043	1500.637	9833.244	2.278	141.064	82.044	-1	1	0	1	0	1	0	1	0	1	0	1	0	0	0	0	0	CROSS ON STOBIE	
133	1504.001	9846.581	1.847	153.075	75.343	1503.999	9846.580	1.848	153.075	75.344	0	1	1	0	1	0	1	0	1	0	1	0	1	0	0	0	0	0	CROSS ON TANK
134	1489.782	9879.980	2.431	189.017	80.433	1489.782	9879.978	2.430	189.015	80.433	-2	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	CROSS ON STOBIE	
135	1498.839	9915.830	2.281	221.301	62.406	1498.837	9915.831	2.281	221.302	62.408	1	2	0	-1	0	2	-1	0	0	-1	0	0	0	0	0	0	0	CROSS ON STOBIE	
136	1554.785	9795.230	2.404	90.331	39.579	1554.787	9795.231	2.404	90.331	39.578	0	-1	0	0	2	0	2	-1	1	0	0	0	0	0	0	0	0	CROSS ON STOBIE	
137	1569.940	9765.261	3.986	57.460	32.698	1569.940	9765.261	3.987	57.460	32.697	0	-1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	CROSS ON STOBIE	
BG1	1542.590	9794.500	4.839	92.781	51.548	1542.592	9794.499	4.841	92.780	51.547	-1	-1	2	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	TARGET ON BUILDING	
BG2	1551.302	9786.479	5.052	82.779	45.209	1551.303	9786.478	5.052	82.778	45.208	-1	-1	0	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	TARGET ON BUILDING	
BG3	1555.157	9787.556	4.693	82.822	41.206	1555.159	9787.557	4.694	82.822	41.204	0	-2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	TARGET ON BUILDING	
BG4	1558.738	9784.274	4.641	78.725	38.597	1558.739	9784.276	4.641	78.726	38.596	1	-1	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	TARGET ON BUILDING	
BG5	1559.997	9777.278	4.690	71.641	39.191	1559.997	9777.279	4.691	71.642	39.191	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	TARGET ON BUILDING	
BG6	1573.381	9758.655	4.299	50.189	31.084	1573.380	9758.655	4.300	50.189	31.084	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	TARGET ON BUILDING	
BG7	1578.193	9750.878	4.322	41.431	28.448	1578.193	9750.878	4.322	41.431	28.448	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	TARGET ON BUILDING	
A3	1535.519	9890.493	0.809	187.334	33.533	1535.516	9890.495	0.807	187.336	33.535	2	2	-2	1	2	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	DROPPER	
A4	1528.942	9889.377	0.918	187.958	40.175	1528.941	9889.378	0.917	187.959	40.176	1	1	-1	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	DROPPER	
A5	1520.236	9887.828	1.037	188.715	48.986	1520.233	9887.828	1.035	188.716	48.988	1	2	-2	0	0	0	2	2	2	2	2	2	2	2	2	2	2	DROPPER	
B2	1548.889	9879.599	0.884	173.351	23.438	1548.892	9879.602	0.882	173.353	23.435	2	-3	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	DROPPER	
B3	1541.935	9878.666	0.855	174.250	30.397	1541.933	9878.669	0.854	174.253	30.398	3	1	-1	0	0	0	4	4	4	4	4	4	4	4	4	4	4	DROPPER	
B4	1534.095	9877.415	0.949	175.070	38.294	1534.092	9877.412	0.948	175.068	38.298	-2	4	-1	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	DROPPER	
B5	1522.149	9875.439	1.138	176.253	50.344	1522.148	9875.440	1.137	176.255	50.345	2	1	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	DROPPER	
C2	1550.228	9869.364	1.075	163.117	24.794	1550.230	9869.364	1.073	163.117	24.792	0	-2	-2	4	4	4	1	1	1	1	1	1	1	1	1	1	1	DROPPER	
C3	1544.058	9867.349	1.051	162.768	31.276	1544.056	9867.351	1.051	162.770	31.277	2	1	0	1	2	2	2	2	2	2	2	2	2	2	2	2	2	DROPPER	
C4	1536.208	9865.947	1.111	163.446	39.221	1536.202	9865.947	1.111	163.447	39.226	1	5	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	DROPPER	
C5	1523.966	9863.735	1.218	164.478	51.619	1523.959	9863.732	1.218	164.477	51.626	-1	7	0	0	3	3	5	0	0	0	0	0	0	0	0	0	0	DROPPER	
D2	1553.812	9856.870	1.027	150.121	24.566	1553.812	9856.872	1.026	150.124	24.566	3	0	-1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	DROPPER	
D3	1546.764	9855.580	1.134	150.701	31.708	1546.765	9855.586	1.134	150.705	31.705	4	-3	0	2	2	2	-5	0	0	0	0	0	0	0	0	0	0	DROPPER	
D4	1538.877	9853.952	1.216	151.169	39.747	1538.877	9853.952	1.215	151.168	39.747	-1	0	-1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	DROPPER	
D5	1526.016	9851.295	1.345	151.931	52.857	1526.016	9851.290	1.344	151.926	52.859	-5	2	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	DROPPER	
E2	1552.840	9844.546	1.246	138.469	28.695	1552.835	9844.551	1.246	138.475	28.698	6	3	0	2	2	2	-2	0	0	0	0	0	0	0	0	0	0	DROPPER	
E3	1548.571	9843.740	1.289	138.796	33.027	1548.570	9843.742	1.289	138.798	33.027	2	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	DROPPER	
E4	1540.756	9842.157	1.390	139.289	40.985	1540.755	9842.154	1.390	139.287	40.987	-2	2	0	2	2	2	1	1	1	1	1	1	1	1	1	1	1	DROPPER	
E5	1527.847	9839.583	1.384	140.145	54.120	1527.852	9839.582	1.383	140.142	54.116	-3	-4	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	DROPPER	
F2	1555.038	9832.754	1.136	126.510	29.623	1555.037	9832.756	1.136	126.513	29.623	3	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	DROPPER	
F3	1551.790	9832.093	1.371	126.712	32.931	1551.791	9832.092	1.370	126.711	32.931	-1	0	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	DROPPER	
F4	1543.948	9830.501	1.409	127.204	40.918	1543.945	9830.500	1.410	127.204	40.922	0	4	1	0	0	0	-1	0	0	0	0	0	0	0	0	0	0	DROPPER	
F5	1529.849	9827.702	1.451	128.150	55.262	1529.849	9827.703	1.451	128.150	55.261	0	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	DROPPER	
G2	1557.617	9828.377	1.023	121.615	28.265	1557.617	9828.379	1.022	121.617	28.265	2	0	-1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	DROPPER	
G3	1552.803	9827.380	1.289	121.898	33.173	1552.804	9827.380	1.288	121.898	33.172	0	-1	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	DROPPER	
G4	1545.016	9825.784	1.384	122.372	41.108	1545.017	9825.783	1.384	122.371	41.107	-1	-1	0	0	0	0	-1	-3	0	0	0	0	0	0	0	0	0	DROPPER	
G5	1530.648	9822.879	1.470	123.285	55.738	1530.647	9822.877	1.470	123.283	55.739	-2	1	0																

J2	1559.568	9818.075	0.881	111.159	29.047	1559.569	9818.074	0.881	111.158	29.046	-1	-1	0	-2	3	1	DROPPER
J3	1554.939	9817.309	1.079	111.617	33.716	1554.940	9817.311	1.080	111.619	33.715	2	-1	1	0	-1	0	DROPPER
J4	1547.055	9815.929	1.226	112.325	41.689	1547.056	9815.929	1.226	112.325	41.688	0	-1	0	-2	-2	0	DROPPER
J5	1532.242	9813.153	1.353	113.477	56.715	1532.242	9813.153	1.354	113.477	56.716	0	1	1	1	-2	1	DROPPER
K2	1560.810	9813.419	0.917	106.341	29.052	1560.812	9813.424	0.919	106.344	29.049	3	-3	2	0	-3	2	DROPPER
K3	1555.898	9812.483	1.024	106.708	34.039	1555.898	9812.481	1.026	106.706	34.039	-2	0	2	-2	1	1	DROPPER
K4	1548.045	9811.005	1.217	107.312	42.007	1548.047	9811.004	1.218	107.311	42.006	-1	-1	1	-1	-1	1	DROPPER
K5	1533.008	9808.326	1.499	108.617	57.225	1533.008	9808.324	1.500	108.614	57.225	-3	0	1	-2	-2	1	DROPPER
L2	1562.235	9805.732	1.034	98.546	29.665	1562.236	9805.733	1.035	98.547	29.664	1	-1	1	-1	-1	1	DROPPER
L3	1557.599	9804.225	1.533	98.291	34.534	1557.599	9804.226	1.534	98.292	34.533	1	-1	1	-3	0	1	DROPPER
L4	1549.266	9804.390	1.883	100.607	42.539	1549.268	9804.390	1.884	100.606	42.538	-1	-1	1	-1	-2	0	DROPPER
L5	1539.867	9796.580	2.372	95.496	53.640	1539.866	9796.578	2.373	95.494	53.641	-2	1	1	2	-4	1	DROPPER
M2	1567.229	9797.502	1.128	89.304	26.971	1567.232	9797.506	1.129	89.307	26.968	3	-3	1	1	0	1	DROPPER
M3	1562.740	9795.048	1.310	88.095	31.943	1562.740	9795.050	1.311	88.098	31.942	3	-1	1	0	-2	1	DROPPER
N2	1574.660	9787.139	1.183	77.371	22.476	1574.658	9787.140	1.183	77.373	22.478	2	2	0	1	2	1	DROPPER
N3	1570.165	9784.176	1.522	75.672	27.584	1570.164	9784.176	1.526	75.673	27.586	1	2	4	-2	0	3	DROPPER
N4	1565.798	9781.330	1.898	74.054	32.539	1565.797	9781.332	1.899	74.056	32.540	2	1	1	-1	0	1	DROPPER
P2	1581.542	9777.475	1.455	66.255	18.330	1581.544	9777.474	1.456	66.253	18.328	-2	-2	1	-1	2	1	DROPPER
P3	1576.989	9774.754	1.717	64.806	23.431	1576.990	9774.755	1.717	64.806	23.431	0	0	0	-1	2	0	DROPPER
P4	1571.988	9771.816	2.000	63.262	29.022	1571.986	9771.813	1.997	63.260	29.025	-2	3	-3	0	1	0	DROPPER
Q2	1585.673	9766.239	1.577	54.333	17.248	1585.675	9766.238	1.578	54.331	17.246	-2	-2	1	-2	0	1	DROPPER
Q4	1578.166	9762.768	2.034	52.923	25.398	1578.166	9762.766	2.035	52.921	25.398	-2	0	1	-2	0	1	DROPPER
Q5	1579.366	9754.390	2.649	44.520	26.406	1579.365	9754.388	2.651	44.519	26.408	-1	2	2	-1	2	2	DROPPER
R2	1589.576	9754.944	1.351	42.413	16.401	1589.578	9754.940	1.351	42.409	16.400	-4	-1	0	-4	0	-1	DROPPER
R4	1583.929	9752.637	1.857	41.645	22.452	1583.930	9752.638	1.857	41.647	22.451	2	-1	0	-6	1	1	DROPPER
R5	1579.688	9750.881	2.755	41.047	27.004	1579.689	9750.876	2.750	41.042	27.004	-5	0	-5	-5	0	-5	DROPPER
S2	1594.850	9744.151	1.375	30.622	14.100	1594.852	9744.148	1.374	30.619	14.099	-3	-1	-1	2	1	-1	DROPPER
S4	1589.588	9741.791	1.624	29.704	19.793	1589.588	9741.791	1.624	29.705	19.793	1	0	0	0	-1	0	DROPPER
S5	1582.877	9738.801	3.040	28.553	27.050	1582.878	9738.798	3.041	28.550	27.050	-3	0	1	-3	3	1	DROPPER
T2	1600.735	9729.732	1.387	15.171	12.148	1600.738	9729.732	1.388	15.170	12.144	-1	-4	1	-2	-1	2	DROPPER
T4	1596.347	9727.482	1.647	14.134	16.968	1596.350	9727.482	1.647	14.133	16.965	-1	-3	0	-1	-2	0	DROPPER
T5	1587.615	9723.616	3.214	12.659	26.403	1587.614	9723.613	3.215	12.657	26.405	-2	2	1	-1	0	0	DROPPER

Max	6	7	4	4	5	3
Min	-5	-4	-5	-6	-5	-5
Average	-0	0	-0	-0	-0	0

Notes:

Max, Min & Average values are for settlement posts only
Coordinates are calculated from least squares adjustment.
Chainage & offset is relative to line approximately parallel to river bank
Origin of Chainage & Offset Alignment: E 1 616.395, N 9 718.221
End of Chainage & Offset Alignment: E 1 556.687, N 9 940.384
Cross movement is positive away from the river bank in a westerly direction
Upstream movement is positive in an upstream (Northerly) direction
Movement shown is relative to first survey 3 August 2011
Design co-ordinate accuracy is +/- 3mm
Design elevation accuracy is +/- 2mm
Droppers Q5 and R5 were placed and first surveyed on 17 August 2011



CALOOTE LANDING

RIVER BANK MOVEMENT MONITORING

12 SEPTEMBER 2011 Observations

Date of survey	12-Sep-11
Equipment	Set 59
Surveyed by:	NRG

References:
 CALOOTE LANDING
 A&S: A078911.0001

Point	First Survey 3 August 2011					Current Survey					Current Survey Comparisons			Point Description		
	Easting	Northing	Elevation	Chainage	Offset	Easting	Northing	Elevation	Chainage	Offset	Upstream (mm)	Cross (mm)	Up (mm)	Upstream (mm)	Cross (mm)	Up (mm)
131	1508.115	9799.819	2.927	106.842	83.471	1508.115	9799.816	2.926	106.839	83.473	-3	2	-1	0	0	0
132	1500.637	9833.245	2.278	141.065	82.043	1500.636	9833.243	2.279	141.063	82.045	-2	2	1	-1	1	1
133	1504.001	9846.581	1.847	153.075	75.343	1503.999	9846.580	1.848	153.075	75.344	0	1	1	0	0	0
134	1489.782	9879.980	2.431	189.017	80.433	1489.783	9879.979	2.431	189.015	80.432	-2	-1	0	0	-1	1
135	1498.839	9915.830	2.281	221.301	62.406	1498.837	9915.829	2.282	221.301	62.408	0	2	1	-1	0	1
136	1554.785	9795.230	2.404	90.331	39.579	1554.787	9795.230	2.404	90.330	39.578	-1	-1	0	-1	0	0
137	1569.940	9765.261	3.986	57.460	32.698	1569.941	9765.261	3.987	57.460	32.697	0	-1	1	0	0	0
BG1	1542.590	9794.500	4.839	92.781	51.548	1542.590	9794.497	4.841	92.779	51.549	-2	1	2	-1	2	0
BG2	1551.302	9786.479	5.052	82.779	45.209	1551.303	9786.479	5.053	82.779	45.208	0	-1	1	1	0	1
BG3	1555.157	9787.556	4.693	82.822	41.206	1555.159	9787.556	4.694	82.822	41.204	0	-2	1	0	0	0
BG4	1558.738	9784.274	4.641	78.725	38.597	1558.738	9784.274	4.642	78.725	38.597	0	0	1	-1	1	1
BG5	1559.997	9777.278	4.690	71.641	39.191	1559.996	9777.278	4.691	71.642	39.192	1	1	1	0	1	0
BG6	1573.381	9758.655	4.299	50.189	31.084	1573.380	9758.655	4.300	50.189	31.084	0	0	1	0	0	0
BG7	1578.193	9750.878	4.322	41.431	28.448	1578.194	9750.878	4.322	41.431	28.448	0	0	0	0	0	0
A3	1535.519	9890.493	0.809	187.334	33.533	1535.519	9890.494	0.807	187.335	33.533	1	0	-2	-1	-2	0
A4	1528.942	9889.377	0.918	187.958	40.175	1528.942	9889.376	0.917	187.957	40.176	-1	1	-1	-2	0	0
A5	1520.236	9887.828	1.037	188.715	48.986	1520.234	9887.826	1.036	188.714	48.988	-1	2	-1	-2	0	1
B2	1548.889	9879.599	0.884	173.351	23.438	1548.888	9879.602	0.882	173.353	23.438	2	0	-2	0	3	0
B3	1541.935	9878.666	0.855	174.250	30.397	1541.933	9878.670	0.854	174.253	30.398	3	1	-1	0	0	0
B4	1534.095	9877.415	0.949	175.070	38.294	1534.092	9877.415	0.949	175.071	38.296	1	2	0	3	-2	1
B5	1522.149	9875.439	1.138	176.253	50.344	1522.146	9875.438	1.137	176.253	50.347	0	3	-1	-2	2	0
C2	1550.228	9869.364	1.075	163.117	24.794	1550.230	9869.364	1.074	163.117	24.792	0	-2	-1	0	0	1
C3	1544.058	9867.349	1.051	162.768	31.276	1544.056	9867.350	1.052	162.770	31.277	2	1	1	0	0	1
C4	1536.208	9865.947	1.111	163.446	39.221	1536.202	9865.947	1.111	163.447	39.226	1	5	0	0	0	0
C5	1523.966	9863.735	1.218	164.478	51.619	1523.961	9863.733	1.218	164.477	51.624	-1	5	0	0	-2	0
D2	1553.812	9856.870	1.027	150.121	24.566	1553.812	9856.872	1.026	150.124	24.566	3	0	-1	0	0	0
D3	1546.764	9855.580	1.134	150.701	31.708	1546.765	9855.584	1.134	150.704	31.705	3	-3	0	-1	0	0
D4	1538.877	9853.952	1.216	151.169	39.747	1538.874	9853.949	1.216	151.167	39.750	-2	3	0	-1	3	1
D5	1526.016	9851.295	1.345	151.931	52.857	1526.016	9851.289	1.344	151.925	52.859	-6	2	-1	-1	0	0
E2	1552.840	9844.546	1.246	138.469	28.695	1552.835	9844.550	1.246	138.474	28.698	5	3	0	-1	0	0
E3	1548.571	9843.740	1.289	138.796	33.027	1548.571	9843.739	1.289	138.795	33.027	-1	0	0	-3	0	0
E4	1540.756	9842.157	1.390	139.289	40.985	1540.756	9842.154	1.390	139.287	40.986	-2	1	0	0	-1	0
E5	1527.847	9839.583	1.384	140.145	54.120	1527.852	9839.581	1.383	140.141	54.116	-4	-4	-1	-1	0	0
F2	1555.038	9832.754	1.136	126.510	29.623	1555.034	9832.757	1.135	126.514	29.626	4	3	-1	1	3	-1
F3	1551.790	9832.093	1.371	126.712	32.931	1551.792	9832.090	1.370	126.710	32.931	-2	0	-1	-1	0	0
F4	1543.948	9830.501	1.409	127.204	40.918	1543.945	9830.500	1.409	127.204	40.922	0	4	0	0	0	-1
F5	1529.849	9827.702	1.451	128.150	55.262	1529.853	9827.700	1.451	128.147	55.259	-3	-3	0	-3	-2	0
G2	1557.617	9828.377	1.023	121.615	28.265	1557.618	9828.377	1.021	121.614	28.264	-1	-1	-2	-3	-1	-1
G3	1552.803	9827.380	1.289	121.898	33.173	1552.804	9827.378	1.287	121.896	33.173	-2	0	-2	-2	1	-1
G4	1545.016	9825.784	1.384	122.372	41.108	1545.015	9825.784	1.383	122.372	41.109	0	1	-1	1	2	-1
G5	1530.648	9822.879	1.470	123.285	55.738	1530.647	9822.875	1.469	123.280	55.740	-5	2	-1	-3	1	-1
H2	1558.902	9823.324	0.935	116.402	28.332	1558.903	9823.325	0.934	116.402	28.330	0	-2	-1	1	1	0
H3	1553.793	9822.356	1.121	116.788	33.517	1553.794	9822.355	1.120	116.788	33.516	0	-1	-1	0	1	0
H4	1545.855	9820.959	1.292	117.494	41.547	1545.855	9820.958	1.291	117.493	41.546	-1	-1	-1	-1	0	-1
H5	1531.495	9817.952	1.470	118.306	56.195	1531.495	9817.949	1.468	118.303	56.196	-3	1	-2	0	1	-1

J2	1559.568	9818.075	0.881	111.159	29.047	1559.567	9818.074	0.880	111.159	29.048	0	1	-1	1	2	-1	DROPPER
J3	1554.939	9817.309	1.079	111.617	33.716	1554.939	9817.310	1.080	111.619	33.716	2	0	1	0	1	0	DROPPER
J4	1547.055	9815.929	1.226	112.325	41.689	1547.056	9815.928	1.225	112.323	41.688	-2	-1	-1	-2	0	-1	DROPPER
J5	1532.242	9813.153	1.353	113.477	56.715	1532.242	9813.152	1.354	113.476	56.716	-1	1	1	-1	0	0	DROPPER
K2	1560.810	9813.419	0.917	106.341	29.052	1560.810	9813.423	0.917	106.344	29.051	3	-1	0	0	2	-2	DROPPER
K3	1555.898	9812.483	1.024	106.708	34.039	1555.897	9812.483	1.026	106.707	34.040	-1	1	2	1	1	0	DROPPER
K4	1548.045	9811.005	1.217	107.312	42.007	1548.048	9811.008	1.218	107.314	42.003	2	-4	1	3	-3	0	DROPPER
K5	1533.008	9808.326	1.499	108.617	57.225	1533.008	9808.324	1.498	108.615	57.225	-2	0	-1	1	0	-2	DROPPER
L2	1562.235	9805.732	1.034	98.546	29.665	1562.235	9805.732	1.035	98.546	29.665	0	0	1	-1	1	0	DROPPER
L3	1557.599	9804.225	1.533	98.291	34.534	1557.599	9804.228	1.534	98.294	34.532	3	-2	1	2	-1	0	DROPPER
L4	1549.266	9804.390	1.883	100.607	42.539	1549.268	9804.390	1.884	100.607	42.537	0	-2	1	1	-1	0	DROPPER
L5	1539.867	9796.580	2.372	95.496	53.640	1539.867	9796.577	2.372	95.493	53.640	-3	0	0	-1	-1	-1	DROPPER
M2	1567.229	9797.502	1.128	89.304	26.971	1567.230	9797.501	1.128	89.303	26.971	-1	0	0	-4	3	-1	DROPPER
M3	1562.740	9795.048	1.310	88.095	31.943	1562.742	9795.045	1.311	88.092	31.942	-3	-1	1	-6	0	0	DROPPER
N2	1574.660	9787.139	1.183	77.371	22.476	1574.658	9787.139	1.183	77.372	22.477	1	1	0	-1	-1	0	DROPPER
N3	1570.165	9784.176	1.522	75.672	27.584	1570.166	9784.177	1.523	75.673	27.584	1	0	1	0	-2	-3	DROPPER
N4	1565.798	9781.330	1.898	74.054	32.539	1565.798	9781.332	1.898	74.056	32.539	2	0	0	0	-1	-1	DROPPER
P2	1581.542	9777.475	1.455	66.255	18.330	1581.544	9777.473	1.456	66.253	18.328	-2	-2	1	0	0	0	DROPPER
P3	1576.989	9774.754	1.717	64.806	23.431	1576.991	9774.754	1.717	64.805	23.430	-1	-1	0	-1	-1	0	DROPPER
P4	1571.988	9771.816	2.000	63.262	29.022	1571.988	9771.812	1.996	63.258	29.024	-4	2	-4	-2	-1	-1	DROPPER
Q2	1585.673	9766.239	1.577	54.333	17.248	1585.675	9766.238	1.578	54.331	17.246	-2	-2	1	0	0	0	DROPPER
Q4	1578.166	9762.768	2.034	52.923	25.398	1578.166	9762.766	2.034	52.922	25.398	-1	0	0	1	0	-1	DROPPER
Q5	1579.366	9754.390	2.649	44.520	26.406	1579.366	9754.388	2.648	44.518	26.406	-2	0	-1	-1	-2	-3	DROPPER
R2	1589.576	9754.944	1.351	42.413	16.401	1589.579	9754.942	1.351	42.410	16.398	-3	-3	0	1	-2	0	DROPPER
R4	1583.929	9752.637	1.857	41.645	22.452	1583.931	9752.643	1.856	41.651	22.449	6	-3	-1	4	-2	-1	DROPPER
R5	1579.688	9750.881	2.755	41.047	27.004	1579.690	9750.878	2.750	41.044	27.002	-3	-2	-5	2	-2	0	DROPPER
S2	1594.850	9744.151	1.375	30.622	14.100	1594.853	9744.148	1.375	30.619	14.098	-3	-2	0	0	-1	1	DROPPER
S4	1589.588	9741.791	1.624	29.704	19.793	1589.589	9741.790	1.624	29.704	19.793	0	0	0	-1	0	0	DROPPER
S5	1582.877	9738.801	3.040	28.553	27.050	1582.880	9738.797	3.041	28.549	27.048	-4	-2	1	-1	-2	0	DROPPER
T2	1600.735	9729.732	1.387	15.171	12.148	1600.737	9729.733	1.388	15.172	12.145	1	-3	1	2	1	0	DROPPER
T4	1596.347	9727.482	1.647	14.134	16.968	1596.349	9727.481	1.648	14.133	16.967	-1	-1	1	0	2	1	DROPPER
T5	1587.615	9723.616	3.214	12.659	26.403	1587.618	9723.614	3.215	12.657	26.401	-2	-2	1	0	-4	0	DROPPER

Notes:

Max, Min & Average values are for monitoring droppers only
 Coordinates are calculated from least squares adjustment.
 Chainage & offset is relative to line approximately parallel to river bank
 Origin of Chainage & Offset Alignment: E 1 616.395, N 9 718.221
 End of Chainage & Offset Alignment: E 1 556.687, N 9 940.384
 Cross movement is positive away from the river bank in a westerly direction
 Upstream movement is positive in an upstream (Northerly) direction
 Movement shown is relative to first survey 3 August 2011
 Design co-ordinate accuracy is +/- 3mm
 Design elevation accuracy is +/- 2mm
Droppers Q5 and R5 were placed and first surveyed on 17 August 2011

Max	6	5	2	4	3	1
Min	-6	-4	-5	-6	-4	-3
Average	-0	-0	-0	-0	-0	-0

CALOOTE LANDING

RIVER BANK MOVEMENT MONITORING

23 SEPTEMBER 2011 Observations

Date of survey	23-Sep-11
Equipment	Set 59
Surveyed by:	NRG

References:
 CALOOTE LANDING
 A&S: A078911.0001

Point	First Survey 3 August 2011					Current Survey					Upstream (mm)			Cross (mm)			Up (mm)			Upstream (mm)			Cross (mm)			Up (mm)			Point Description
	Easting	Northing	Elevation	Chainage	Offset	Easting	Northing	Elevation	Chainage	Offset	difference from first survey	difference from last survey	difference from first survey	difference from last survey	difference from first survey	difference from last survey	difference from first survey	difference from last survey	difference from first survey	difference from last survey	difference from first survey	difference from last survey	difference from first survey	difference from last survey	difference from first survey	difference from last survey	difference from first survey	difference from last survey	
131	1508.115	9799.819	2.927	106.842	83.471	1508.115	9799.816	2.925	106.839	83.473	-3	2	-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1	CROSS ON STOBIE
132	1500.637	9833.245	2.278	141.065	82.043	1500.636	9833.243	2.278	141.063	82.045	-2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1	CROSS ON STOBIE
133	1504.001	9846.581	1.847	153.075	75.343	1503.999	9846.580	1.847	153.075	75.344	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1	CROSS ON TANK
134	1489.782	9879.980	2.431	189.017	80.433	1489.780	9879.979	2.430	189.016	80.435	-1	2	-1	1	3	-1	CROSS ON STOBIE												
135	1498.839	9915.830	2.281	221.301	62.406	1498.835	9915.829	2.281	221.301	62.410	0	4	0	0	2	-1	CROSS ON STOBIE												
136	1554.785	9795.230	2.404	90.331	39.579	1554.786	9795.230	2.404	90.331	39.578	0	-1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	CROSS ON STOBIE	
137	1569.940	9765.261	3.986	57.460	32.698	1569.941	9765.262	3.986	57.460	32.696	0	-2	0	0	-1	-1	-1	CROSS ON STOBIE											
BG1	1542.590	9794.500	4.839	92.781	51.548	1542.590	9794.496	4.840	92.778	51.549	-3	1	1	-1	0	0	0	-1	TARGET ON BUILDING										
BG2	1551.302	9786.479	5.052	82.779	45.209	1551.303	9786.479	5.052	82.779	45.208	0	-1	0	0	0	0	0	0	-1	TARGET ON BUILDING									
BG3	1555.157	9787.556	4.693	82.822	41.206	1555.159	9787.557	4.693	82.822	41.204	0	-2	0	0	0	0	0	0	-1	TARGET ON BUILDING									
BG4	1558.738	9784.274	4.641	78.725	38.597	1558.739	9784.276	4.641	78.726	38.596	1	-1	0	1	-1	-1	-1	-1	TARGET ON BUILDING										
BG5	1559.997	9777.278	4.690	71.641	39.191	1559.998	9777.279	4.690	71.642	39.190	1	-1	-0	0	-2	-2	-1	-1	TARGET ON BUILDING										
BG6	1573.381	9758.655	4.299	50.189	31.084	1573.381	9758.655	4.299	50.188	31.083	-1	-1	-0	-1	-1	-1	-1	-1	TARGET ON BUILDING										
BG7	1578.193	9750.878	4.322	41.431	28.448	1578.195	9750.878	4.321	41.431	28.447	0	-1	-1	0	-1	-1	-1	-1	TARGET ON BUILDING										
A3	1535.519	9890.493	0.809	187.334	33.533	1535.517	9890.494	0.808	187.335	33.535	1	2	-1	0	2	1	DROPPER												
A4	1528.942	9889.377	0.918	187.958	40.175	1528.941	9889.376	0.918	187.957	40.176	-1	1	0	0	0	1	DROPPER												
A5	1520.236	9887.828	1.037	188.715	48.986	1520.234	9887.827	1.037	188.714	48.988	-1	2	0	0	0	1	DROPPER												
B2	1548.889	9879.599	0.884	173.351	23.438	1548.888	9879.601	0.882	173.353	23.439	2	1	-2	0	1	0	DROPPER												
B3	1541.935	9878.666	0.855	174.250	30.397	1541.934	9878.668	0.854	174.251	30.398	1	1	-1	-2	0	0	DROPPER												
B4	1534.095	9877.415	0.949	175.070	38.294	1534.093	9877.414	0.948	175.069	38.296	-1	2	-1	-2	0	-1	DROPPER												
B5	1522.149	9875.439	1.138	176.253	50.344	1522.147	9875.439	1.137	176.254	50.346	1	2	-1	1	-1	0	DROPPER												
C2	1550.228	9869.364	1.075	163.117	24.794	1550.230	9869.363	1.074	163.116	24.792	-1	-2	-1	-1	-1	0	DROPPER												
C3	1544.058	9867.349	1.051	162.768	31.276	1544.056	9867.349	1.052	162.769	31.277	1	1	1	-1	0	0	DROPPER												
C4	1536.208	9865.947	1.111	163.446	39.221	1536.202	9865.947	1.111	163.448	39.227	2	6	0	1	1	0	DROPPER												
C5	1523.966	9863.735	1.218	164.478	51.619	1523.958	9863.732	1.218	164.477	51.626	-1	7	0	0	2	0	DROPPER												
D2	1553.812	9856.870	1.027	150.121	24.566	1553.812	9856.871	1.026	150.123	24.566	2	0	-1	-1	0	0	DROPPER												
D3	1546.764	9855.580	1.134	150.701	31.708	1546.764	9855.584	1.134	150.704	31.706	3	-2	0	0	1	0	DROPPER												
D4	1538.877	9853.952	1.216	151.169	39.747	1538.877	9853.951	1.216	151.168	39.748	-1	1	0	1	-2	0	DROPPER												
D5	1526.016	9851.295	1.345	151.931	52.857	1526.015	9851.289	1.344	151.925	52.860	-6	3	-1	0	1	0	DROPPER												
E2	1552.840	9844.546	1.246	138.469	28.695	1552.834	9844.550	1.246	138.475	28.699	6	4	0	1	1	0	DROPPER												
E3	1548.571	9843.740	1.289	138.796	33.027	1548.570	9843.741	1.289	138.797	33.028	1	1	0	2	1	0	DROPPER												
E4	1540.756	9842.157	1.390	139.289	40.985	1540.756	9842.155	1.389	139.287	40.986	-2	1	-1	0	0	-1	DROPPER												
E5	1527.847	9839.583	1.384	140.145	54.120	1527.851	9839.582	1.382	140.142	54.117	-3	-3	-2	1	1	-1	DROPPER												
F2	1555.038	9832.754	1.136	126.510	29.623	1555.038	9832.756	1.136	126.512	29.623	2	0	0	-2	-3	1	DROPPER												
F3	1551.790	9832.093	1.371	126.712	32.931	1551.791	9832.092	1.370	126.711	32.931	-1	0	-1	1	0	0	DROPPER												
F4	1543.948	9830.501	1.409	127.204	40.918	1543.944	9830.501	1.410	127.206	40.922	2	4	1	2	0	1	DROPPER												
F5	1529.849	9827.702	1.451	128.150	55.262	1529.851	9827.700	1.451	128.147	55.260	-3	-2	0	0	1	0	DROPPER												
G2	1557.617	9828.377	1.023	121.615	28.265	1557.617	9828.379	1.022	121.617	28.264	2	-1	-1	3	0	1	DROPPER												
G3	1552.803	9827.380	1.289	121.898	33.173	1552.804	9827.380	1.288	121.898	33.172	0	-1	-1	2	-1	1	DROPPER												
G4	1545.016	9825.784	1.384	122.372	41.108	1545.016	9825.784	1.384	122.371	41.108	-1	0	0	-1	-1	1	DROPPER												
G5	1530.648	9822.879	1.470	123.285	55.738	1530.646	9822.876	1.469	123.282	55.741	-3	3	-1	2	1	0	DROPPER												
H2	1558.902	9823.324	0.935	116.402	28.332	1558.903	9823.325	0.935	116.402	28.330	0	-2	0	0	0	1	DROPPER												
H3	1553.793	9822.356	1.121	116.788	33.517	1553.794	9822.355	1.121	116.788	33.517	0	0	0	0	1	1	DROPPER												
H4	1545.855	9820.959	1.292	117.494	41.547	1545.854	9820.959	1.292	117.494	41.548	0	1	0	1	2	1	DROPPER												
H5	1531.495	9817.952	1.470	118.306	56.195	1531.495	9817.948	1.469	118.302	56.196	-4	1	-1	-1	0	1	DROPPER												

J2	1559.568	9818.075	0.881	111.159	29.047	1559.567	9818.075	0.881	111.159	29.048	0	1	0	0	0	1	DROPPER
J3	1554.939	9817.309	1.079	111.617	33.716	1554.940	9817.311	1.080	111.619	33.715	2	-1	1	0	-1	0	DROPPER
J4	1547.055	9815.929	1.226	112.325	41.689	1547.056	9815.930	1.225	112.325	41.688	0	-1	-1	2	0	0	DROPPER
J5	1532.242	9813.153	1.353	113.477	56.715	1532.242	9813.153	1.353	113.477	56.715	0	0	0	1	-1	-1	DROPPER
K2	1560.810	9813.419	0.917	106.341	29.052	1560.811	9813.423	0.917	106.344	29.050	3	-2	0	0	-1	0	DROPPER
K3	1555.898	9812.483	1.024	106.708	34.039	1555.899	9812.483	1.025	106.707	34.038	-1	-1	1	0	-2	-1	DROPPER
K4	1548.045	9811.005	1.217	107.312	42.007	1548.045	9811.004	1.217	107.311	42.007	-1	0	0	-3	4	-1	DROPPER
K5	1533.008	9808.326	1.499	108.617	57.225	1533.010	9808.323	1.499	108.613	57.224	-4	-1	0	-2	-1	1	DROPPER
L2	1562.235	9805.732	1.034	98.546	29.665	1562.236	9805.733	1.035	98.547	29.664	1	-1	1	1	-1	0	DROPPER
L3	1557.599	9804.225	1.533	98.291	34.534	1557.599	9804.228	1.534	98.294	34.533	3	-1	1	0	1	0	DROPPER
L4	1549.266	9804.390	1.883	100.607	42.539	1549.269	9804.390	1.884	100.606	42.537	-1	-2	1	-1	0	0	DROPPER
L5	1539.867	9796.580	2.372	95.496	53.640	1539.867	9796.578	2.372	95.493	53.641	-3	1	0	0	1	0	DROPPER
M2	1567.229	9797.502	1.128	89.304	26.971	1567.231	9797.503	1.129	89.305	26.970	1	-1	1	2	-1	1	DROPPER
M3	1562.740	9795.048	1.310	88.095	31.943	1562.739	9795.050	1.310	88.098	31.944	3	1	0	6	2	-1	DROPPER
N2	1574.660	9787.139	1.183	77.371	22.476	1574.659	9787.141	1.183	77.374	22.477	3	1	0	2	0	0	DROPPER
N3	1570.165	9784.176	1.522	75.672	27.584	1570.166	9784.178	1.523	75.674	27.583	2	-1	1	1	-1	0	DROPPER
N4	1565.798	9781.330	1.898	74.054	32.539	1565.799	9781.332	1.898	74.056	32.538	2	-1	0	0	-1	0	DROPPER
P2	1581.542	9777.475	1.455	66.255	18.330	1581.545	9777.474	1.456	66.253	18.328	-2	-2	1	0	0	0	DROPPER
P3	1576.989	9774.754	1.717	64.806	23.431	1576.992	9774.755	1.717	64.805	23.429	-1	-2	0	0	-1	0	DROPPER
P4	1571.988	9771.816	2.000	63.262	29.022	1571.988	9771.813	1.997	63.259	29.024	-3	2	-3	1	0	1	DROPPER
Q2	1585.673	9766.239	1.577	54.333	17.248	1585.675	9766.240	1.578	54.333	17.245	0	-3	1	2	-1	0	DROPPER
Q4	1578.166	9762.768	2.034	52.923	25.398	1578.167	9762.767	2.034	52.922	25.396	-1	-2	0	0	-2	0	DROPPER
Q5	1579.366	9754.390	2.649	44.520	26.406	1579.367	9754.392	2.649	44.522	26.405	2	-1	0	4	-1	1	DROPPER
R2	1589.576	9754.944	1.351	42.413	16.401	1589.580	9754.943	1.352	42.411	16.397	-2	-4	1	1	-1	1	DROPPER
R4	1583.929	9752.637	1.857	41.645	22.452	1583.932	9752.640	1.856	41.648	22.449	3	-3	-1	-3	0	0	DROPPER
R5	1579.688	9750.881	2.755	41.047	27.004	1579.691	9750.876	2.751	41.041	27.002	-6	-2	-4	-3	0	1	DROPPER
S2	1594.850	9744.151	1.375	30.622	14.100	1594.855	9744.149	1.374	30.619	14.096	-3	-4	-1	0	-2	-1	DROPPER
S4	1589.588	9741.791	1.624	29.704	19.793	1589.591	9741.791	1.624	29.704	19.791	0	-2	0	0	-2	0	DROPPER
S5	1582.877	9738.801	3.040	28.553	27.050	1582.881	9738.798	3.040	28.550	27.047	-3	-3	0	1	-1	-1	DROPPER
T2	1600.735	9729.732	1.387	15.171	12.148	1600.740	9729.734	1.388	15.172	12.142	1	-6	1	0	-3	0	DROPPER
T4	1596.347	9727.482	1.647	14.134	16.968	1596.351	9727.483	1.647	14.134	16.964	0	-4	0	1	-3	-1	DROPPER
T5	1587.615	9723.616	3.214	12.659	26.403	1587.619	9723.615	3.216	12.658	26.399	-1	-4	2	1	-2	1	DROPPER

Max	6
Min	-6
Average	-0

Notes:

Max, Min & Average values are for monitoring droppers only
Coordinates are calculated from least squares adjustment.
Chainage & offset is relative to line approximately parallel to river bank
Origin of Chainage & Offset Alignment: E 1 616.395, N 9 718.221
End of Chainage & Offset Alignment: E 1 556.687, N 9 940.384
Cross movement is positive away from the river bank in a westerly direction
Upstream movement is positive in an upstream (Northerly) direction
Movement shown is relative to first survey 3 August 2011
Design co-ordinate accuracy is +/- 3mm
Design elevation accuracy is +/- 2mm
Droppers Q5 and R5 were placed and first surveyed on 17 August 2011



CALOOTE LANDING

RIVER BANK MOVEMENT MONITORING

25-October-2011

Date of survey	25-Oct-11
Equipment	Set 59
Surveyed by:	NRG

References:
 CALOOTE LANDING
 A&S: A078911.0001

Point	First Survey 3 August 2011					Current Survey					Current Survey Comparisons			Point Description		
	Easting	Northing	Elevation	Chainage	Offset	Easting	Northing	Elevation	Chainage	Offset	Upstream (mm)	Cross (mm)	Up (mm)	Upstream (mm)	Cross (mm)	Up (mm)
131	1508.115	9799.819	2.927	106.842	83.471	1508.115	9799.816	2.925	106.839	83.473	-3	2	-2	0	0	0
132	1500.637	9833.245	2.278	141.065	82.043	1500.637	9833.244	2.279	141.063	82.043	-2	0	1	0	-2	1
133	1504.001	9846.581	1.847	153.075	75.343	1503.999	9846.580	1.847	153.075	75.344	0	1	0	0	0	0
134	1489.782	9879.980	2.431	189.017	80.433	1489.782	9879.979	2.431	189.016	80.433	-1	0	0	0	-2	1
135	1498.839	9915.830	2.281	221.301	62.406	1498.837	9915.829	2.281	221.300	62.408	-1	2	0	-1	-2	0
136	1554.785	9795.230	2.404	90.331	39.579	1554.787	9795.229	2.404	90.329	39.578	-2	-1	0	-2	0	0
137	1569.940	9765.261	3.986	57.460	32.698	1569.942	9765.261	3.986	57.460	32.696	0	-2	0	0	0	0
BG1	1542.590	9794.500	4.839	92.781	51.548	1542.591	9794.498	4.840	92.779	51.547	-2	-1	1	1	-2	0
BG2	1551.302	9786.479	5.052	82.779	45.209	1551.304	9786.479	5.052	82.779	45.207	0	-2	0	0	-1	0
BG3	1555.157	9787.556	4.693	82.822	41.206	1555.159	9787.557	4.693	82.822	41.204	0	-2	0	0	0	0
BG4	1558.738	9784.274	4.641	78.725	38.597	1558.739	9784.275	4.641	78.725	38.596	0	-1	0	-1	0	0
BG5	1559.997	9777.278	4.690	71.641	39.191	1559.999	9777.278	4.691	71.641	39.190	0	-1	1	-1	0	1
BG6	1573.381	9758.655	4.299	50.189	31.084	1573.382	9758.655	4.300	50.188	31.083	-1	-1	1	0	0	1
BG7	1578.193	9750.878	4.322	41.431	28.448	1578.194	9750.877	4.322	41.430	28.447	-1	-1	0	-1	0	1
A3	1535.519	9890.493	0.809	187.334	33.533	1535.519	9890.494	0.807	187.335	33.533	1	0	-2	0	-2	-1
A4	1528.942	9889.377	0.918	187.958	40.175	1528.944	9889.379	0.918	187.959	40.173	1	-2	0	2	-3	0
A5	1520.236	9887.828	1.037	188.715	48.986	1520.236	9887.828	1.037	188.715	48.985	0	-1	0	1	-3	-0
B2	1548.889	9879.599	0.884	173.351	23.438	1548.889	9879.600	0.882	173.351	23.438	0	0	-2	-2	-1	0
B3	1541.935	9878.666	0.855	174.250	30.397	1541.935	9878.667	0.855	174.250	30.396	0	-1	0	-1	-2	1
B4	1534.095	9877.415	0.949	175.070	38.294	1534.095	9877.413	0.949	175.068	38.294	-2	0	0	-1	-2	1
B5	1522.149	9875.439	1.138	176.253	50.344	1522.149	9875.438	1.138	176.253	50.345	0	1	0	-1	-1	1
C2	1550.228	9869.364	1.075	163.117	24.794	1550.231	9869.362	1.074	163.115	24.791	-2	-3	-1	-1	-1	0
C3	1544.058	9867.349	1.051	162.768	31.276	1544.058	9867.349	1.052	162.768	31.275	0	-1	1	-1	-2	0
C4	1536.208	9865.947	1.111	163.446	39.221	1536.205	9865.947	1.112	163.446	39.224	0	3	1	-2	-3	1
C5	1523.966	9863.735	1.218	164.478	51.619	1523.960	9863.732	1.218	164.477	51.625	-1	6	0	0	-1	-0
D2	1553.812	9856.870	1.027	150.121	24.566	1553.815	9856.870	1.027	150.121	24.563	0	-3	0	-2	-3	1
D3	1546.764	9855.580	1.134	150.701	31.708	1546.764	9855.583	1.135	150.703	31.707	2	-1	1	-1	1	1
D4	1538.877	9853.952	1.216	151.169	39.747	1538.877	9853.951	1.216	151.167	39.747	-2	0	0	-1	-1	-0
D5	1526.016	9851.295	1.345	151.931	52.857	1526.017	9851.289	1.345	151.925	52.858	-6	1	0	0	-2	1
E2	1552.840	9844.546	1.246	138.469	28.695	1552.837	9844.552	1.246	138.476	28.696	7	1	0	1	-3	-0
E3	1548.571	9843.740	1.289	138.796	33.027	1548.571	9843.741	1.289	138.796	33.026	0	-1	0	-1	-2	-0
E4	1540.756	9842.157	1.390	139.289	40.985	1540.757	9842.154	1.390	139.286	40.985	-3	0	0	-1	-1	1
E5	1527.847	9839.583	1.384	140.145	54.120	1527.852	9839.582	1.383	140.142	54.115	-3	-5	-1	0	-2	1
F2	1555.038	9832.754	1.136	126.510	29.623	1555.040	9832.756	1.136	126.512	29.621	2	-2	0	0	-2	-0
F3	1551.790	9832.093	1.371	126.712	32.931	1551.792	9832.091	1.370	126.710	32.931	-2	0	-1	-1	0	0
F4	1543.948	9830.501	1.409	127.204	40.918	1543.945	9830.501	1.410	127.205	40.922	1	4	1	-1	0	-0
F5	1529.849	9827.702	1.451	128.150	55.262	1529.850	9827.701	1.452	128.149	55.260	-1	-2	1	2	0	1
G2	1557.617	9828.377	1.023	121.615	28.265	1557.618	9828.379	1.023	121.617	28.263	2	-2	0	0	-1	1
G3	1552.803	9827.380	1.289	121.898	33.173	1552.803	9827.380	1.288	121.897	33.173	-1	0	-1	-1	1	0
G4	1545.016	9825.784	1.384	122.372	41.108	1545.015	9825.783	1.384	122.371	41.109	-1	1	0	0	1	-0
G5	1530.648	9822.879	1.470	123.285	55.738	1530.647	9822.876	1.470	123.282	55.740	-3	2	0	0	-1	1
H2	1558.902	9823.324	0.935	116.402	28.332	1558.901	9823.326	0.935	116.404	28.332	2	0	0	2	2	0
H3	1553.793	9822.356	1.121	116.788	33.517	1553.795	9822.355	1.121	116.787	33.516	-1	-1	0	-1	-1	-0
H4	1545.855	9820.959	1.292	117.494	41.547	1545.854	9820.958	1.293	117.493	41.548	-1	1	-1	0	1	DROPPER
H5	1531.495	9817.952	1.470	118.306	56.195	1531.495	9817.948	1.469	118.302	56.196	-4	1	-1	0	0	DROPPER

J2	1559.568	9818.075	0.881	111.159	29.047	1559.568	9818.073	0.881	111.158	29.048	-1	1	0	-1	0	0	DROPPER
J3	1554.939	9817.309	1.079	111.617	33.716	1554.941	9817.309	1.080	111.617	33.715	0	-1	1	-2	0	0	DROPPER
J4	1547.055	9815.929	1.226	112.325	41.689	1547.056	9815.928	1.226	112.324	41.688	-1	-1	0	-1	0	1	DROPPER
J5	1532.242	9813.153	1.353	113.477	56.715	1532.242	9813.151	1.355	113.475	56.716	-2	1	2	-2	1	2	DROPPER
K2	1560.810	9813.419	0.917	106.341	29.052	1560.811	9813.420	0.917	106.341	29.051	0	-1	0	-3	1	0	DROPPER
K3	1555.898	9812.483	1.024	106.708	34.039	1555.899	9812.482	1.026	106.706	34.039	-2	0	2	-1	1	1	DROPPER
K4	1548.045	9811.005	1.217	107.312	42.007	1548.045	9811.005	1.218	107.312	42.007	0	0	1	1	0	1	DROPPER
K5	1533.008	9808.326	1.499	108.617	57.225	1533.009	9808.323	1.499	108.614	57.225	-3	0	0	1	1	0	DROPPER
L2	1562.235	9805.732	1.034	98.546	29.665	1562.241	9805.729	1.035	98.542	29.660	-4	-5	1	-5	-4	-0	DROPPER
L3	1557.599	9804.225	1.533	98.291	34.534	1557.600	9804.226	1.534	98.291	34.532	0	-2	1	-3	-1	0	DROPPER
L4	1549.266	9804.390	1.883	100.607	42.539	1549.269	9804.390	1.885	100.606	42.537	-1	-2	2	0	0	1	DROPPER
L5	1539.867	9796.580	2.372	95.496	53.640	1539.866	9796.577	2.372	95.493	53.642	-3	2	0	0	1	-0	DROPPER
M2	1567.229	9797.502	1.128	89.304	26.971	1567.232	9797.501	1.129	89.303	26.969	-1	-2	1	-2	-1	0	DROPPER
M3	1562.740	9795.048	1.310	88.095	31.943	1562.737	9795.053	1.311	88.101	31.944	6	1	1	3	0	1	DROPPER
N2	1574.660	9787.139	1.183	77.371	22.476	1574.660	9787.142	1.183	77.374	22.475	3	-1	0	0	-2	0	DROPPER
N3	1570.165	9784.176	1.522	75.672	27.584	1570.165	9784.180	1.523	75.676	27.584	4	0	1	2	1	-0	DROPPER
N4	1565.798	9781.330	1.898	74.054	32.539	1565.797	9781.333	1.899	74.057	32.539	3	0	1	1	1	1	DROPPER
P2	1581.542	9777.475	1.455	66.255	18.330	1581.545	9777.474	1.456	66.254	18.327	-1	-3	1	1	-1	-0	DROPPER
P3	1576.989	9774.754	1.717	64.806	23.431	1576.992	9774.754	1.717	64.805	23.429	-1	-2	0	0	0	0	DROPPER
P4	1571.988	9771.816	2.000	63.262	29.022	1571.989	9771.814	1.997	63.260	29.023	-2	1	-3	1	-1	0	DROPPER
Q2	1585.673	9766.239	1.577	54.333	17.248	1585.675	9766.239	1.578	54.332	17.246	-1	-2	1	-1	1	0	DROPPER
Q4	1578.166	9762.768	2.034	52.923	25.398	1578.167	9762.766	2.035	52.921	25.396	-2	-2	1	-1	0	1	DROPPER
Q5	1579.366	9754.390	2.649	44.520	26.406	1579.367	9754.387	2.650	44.517	26.406	-3	0	1	-5	1	1	DROPPER
R2	1589.576	9754.944	1.351	42.413	16.401	1589.578	9754.943	1.352	42.411	16.399	-2	-2	1	0	2	0	DROPPER
R4	1583.929	9752.637	1.857	41.645	22.452	1583.932	9752.638	1.857	41.646	22.449	1	-3	0	-2	0	1	DROPPER
R5	1579.688	9750.881	2.755	41.047	27.004	1579.690	9750.881	2.751	41.047	27.002	0	-2	-4	6	0	0	DROPPER
S2	1594.850	9744.151	1.375	30.622	14.100	1594.853	9744.147	1.375	30.617	14.098	-5	-2	0	-2	2	1	DROPPER
S4	1589.588	9741.791	1.624	29.704	19.793	1589.590	9741.790	1.625	29.703	19.791	-1	-2	1	-1	0	1	DROPPER
S5	1582.877	9738.801	3.040	28.553	27.050	1582.880	9738.798	3.041	28.550	27.048	-3	-2	1	0	1	1	DROPPER
T2	1600.735	9729.732	1.387	15.171	12.148	1600.739	9729.733	1.389	15.171	12.143	0	-5	2	-1	1	1	DROPPER
T4	1596.347	9727.482	1.647	14.134	16.968	1596.349	9727.481	1.648	14.133	16.966	-1	-2	1	-1	2	1	DROPPER
T5	1587.615	9723.616	3.214	12.659	26.403	1587.617	9723.615	3.216	12.658	26.402	-1	-1	2	0	3	0	DROPPER

Notes:

Max, Min & Average values are for monitoring droppers only
 Coordinates are calculated from least squares adjustment.
 Chainage & offset is relative to line approximately parallel to river bank
 Origin of Chainage & Offset Alignment: E 1 616.395, N 9 718.221
 End of Chainage & Offset Alignment: E 1 556.687, N 9 940.384
 Cross movement is positive away from the river bank in a westerly direction
 Upstream movement is positive in an upstream (Northerly) direction
 Movement shown is relative to first survey 3 August 2011
 Design co-ordinate accuracy is +/- 3mm
 Design elevation accuracy is +/- 2mm
Droppers Q5 and R5 were placed and first surveyed on 17 August 2011

Max	7	6	2	6	3	2
Min	-6	-5	-4	-5	-4	-1
Average	-1	-1	0	-0	-0	0



CALOOTE LANDING

RIVER BANK MOVEMENT MONITORING

17-November-2011

Date of survey	17-Nov-11
Equipment	Set 59
Surveyed by:	NRG

References:
 CALOOTE LANDING
 A&S: A078911.0001

Point	First Survey 3 August 2011					Current Survey					Current Survey Comparisons			Point Description		
	Easting	Northing	Elevation	Chainage	Offset	Easting	Northing	Elevation	Chainage	Offset	Upstream (mm)	Cross (mm)	Up (mm)	Upstream (mm)	Cross (mm)	Up (mm)
131	1508.115	9799.819	2.927	106.842	83.471	1508.115	9799.816	2.925	106.839	83.473	-3	2	-2	0	0	0
132	1500.637	9833.245	2.278	141.065	82.043	1500.637	9833.245	2.279	141.064	82.044	-1	1	1	1	1	0
133	1504.001	9846.581	1.847	153.075	75.343	1504.000	9846.580	1.848	153.075	75.344	0	1	1	0	0	1
134	1489.782	9879.980	2.431	189.017	80.433	1489.782	9879.979	2.431	189.016	80.433	-1	0	0	0	0	0
135	1498.839	9915.830	2.281	221.301	62.406	1498.837	9915.829	2.282	221.300	62.408	-1	2	1	0	0	1
136	1554.785	9795.230	2.404	90.331	39.579	1554.787	9795.230	2.403	90.330	39.578	-1	-1	-1	1	0	-1
137	1569.940	9765.261	3.986	57.460	32.698	1569.941	9765.261	3.986	57.460	32.696	0	-2	0	0	0	0
BG1	1542.590	9794.500	4.839	92.781	51.548	1542.591	9794.498	4.841	92.780	51.548	-1	0	2	1	1	1
BG2	1551.302	9786.479	5.052	82.779	45.209	1551.303	9786.479	5.052	82.779	45.208	0	-1	0	0	1	0
BG3	1555.157	9787.556	4.693	82.822	41.206	1555.159	9787.558	4.693	82.823	41.204	1	-2	0	1	0	0
BG4	1558.738	9784.274	4.641	78.725	38.597	1558.740	9784.275	4.641	78.725	38.594	0	-3	0	0	-2	0
BG5	1559.997	9777.278	4.690	71.641	39.191	1559.998	9777.278	4.690	71.641	39.191	0	0	0	0	1	-1
BG6	1573.381	9758.655	4.299	50.189	31.084	1573.381	9758.655	4.299	50.188	31.084	-1	0	0	0	1	-1
BG7	1578.193	9750.878	4.322	41.431	28.448	1578.193	9750.878	4.321	41.431	28.448	0	0	-1	1	1	-1
A3	1535.519	9890.493	0.809	187.334	33.533	1535.518	9890.493	0.809	187.334	33.534	0	1	0	-1	1	2
A4	1528.942	9889.377	0.918	187.958	40.175	1528.942	9889.376	0.919	187.957	40.175	-1	0	1	-2	2	1
A5	1520.236	9887.828	1.037	188.715	48.986	1520.235	9887.827	1.038	188.715	48.987	0	1	1	0	2	1
B2	1548.889	9879.599	0.884	173.351	23.438	1548.889	9879.601	0.883	173.352	23.438	1	0	-1	1	0	1
B3	1541.935	9878.666	0.855	174.250	30.397	1541.935	9878.668	0.856	174.251	30.397	1	0	1	1	1	1
B4	1534.095	9877.415	0.949	175.070	38.294	1534.094	9877.414	0.950	175.069	38.295	-1	1	1	1	1	1
B5	1522.149	9875.439	1.138	176.253	50.344	1522.148	9875.439	1.139	176.253	50.345	0	1	0	0	0	1
C2	1550.228	9869.364	1.075	163.117	24.794	1550.231	9869.362	1.074	163.115	24.791	-2	-3	-1	0	0	0
C3	1544.058	9867.349	1.051	162.768	31.276	1544.057	9867.349	1.053	162.769	31.276	1	0	2	1	1	1
C4	1536.208	9865.947	1.111	163.446	39.221	1536.203	9865.947	1.113	163.447	39.225	1	4	2	1	1	1
C5	1523.966	9863.735	1.218	164.478	51.619	1523.959	9863.732	1.219	164.477	51.625	-1	6	1	0	0	1
D2	1553.812	9856.870	1.027	150.121	24.566	1553.813	9856.871	1.028	150.123	24.565	2	-1	1	2	2	1
D3	1546.764	9855.580	1.134	150.701	31.708	1546.766	9855.584	1.135	150.703	31.705	2	-3	1	0	-2	0
D4	1538.877	9853.952	1.216	151.169	39.747	1538.877	9853.951	1.217	151.168	39.747	-1	0	1	1	0	1
D5	1526.016	9851.295	1.345	151.931	52.857	1526.016	9851.289	1.346	151.925	52.860	-6	3	1	0	2	1
E2	1552.840	9844.546	1.246	138.469	28.695	1552.835	9844.551	1.247	138.476	28.698	7	3	1	0	2	1
E3	1548.571	9843.740	1.289	138.796	33.027	1548.571	9843.740	1.290	138.796	33.027	0	0	1	0	1	1
E4	1540.756	9842.157	1.390	139.289	40.985	1540.757	9842.154	1.391	139.286	40.985	-3	0	1	0	0	1
E5	1527.847	9839.583	1.384	140.145	54.120	1527.852	9839.582	1.384	140.142	54.116	-3	-4	0	0	1	1
F2	1555.038	9832.754	1.136	126.510	29.623	1555.038	9832.757	1.137	126.513	29.622	3	-1	1	1	1	1
F3	1551.790	9832.093	1.371	126.712	32.931	1551.792	9832.091	1.371	126.710	32.930	-2	-1	0	0	-1	1
F4	1543.948	9830.501	1.409	127.204	40.918	1543.945	9830.500	1.411	127.204	40.921	0	3	2	-1	-1	1
F5	1529.849	9827.702	1.451	128.150	55.262	1529.851	9827.700	1.452	128.147	55.260	-3	-2	1	-2	0	0
G2	1557.617	9828.377	1.023	121.615	28.265	1557.617	9828.380	1.023	121.618	28.264	3	-1	0	1	1	0
G3	1552.803	9827.380	1.289	121.898	33.173	1552.804	9827.380	1.289	121.898	33.172	0	-1	0	1	-1	1
G4	1545.016	9825.784	1.384	122.372	41.108	1545.016	9825.783	1.385	122.371	41.108	-1	0	1	0	-1	1
G5	1530.648	9822.879	1.470	123.285	55.738	1530.647	9822.875	1.471	123.281	55.740	-4	2	1	-1	0	1
H2	1558.902	9823.324	0.935	116.402	28.332	1558.903	9823.325	0.937	116.403	28.330	1	-2	2	-1	-2	2
H3	1553.793	9822.356	1.121	116.788	33.517	1553.794	9822.355	1.123	116.788	33.516	0	-1	2	1	0	2
H4	1545.855	9820.959	1.292	117.494	41.547	1545.854	9820.957	1.294	117.493	41.548	-1	1	2	0	0	1
H5	1531.495	9817.952	1.470	118.306	56.195	1531.495	9817.948	1.470	118.302	56.196	-4	1	0	0	0	1

J2	1559.568	9818.075	0.881	111.159	29.047	1559.568	9818.076	0.882	111.160	29.047	1	0	1	2	-1	1	DROPPER
J3	1554.939	9817.309	1.079	111.617	33.716	1554.941	9817.310	1.067	111.617	33.714	0	-2	-12	0	-1	-13	DROPPER
J4	1547.055	9815.929	1.226	112.325	41.689	1547.056	9815.928	1.227	112.324	41.689	-1	0	1	0	1	1	DROPPER
J5	1532.242	9813.153	1.353	113.477	56.715	1532.242	9813.152	1.356	113.476	56.716	-1	1	3	1	0	1	DROPPER
K2	1560.810	9813.419	0.917	106.341	29.052	1560.811	9813.423	0.919	106.344	29.050	3	-2	2	3	-1	2	DROPPER
K3	1555.898	9812.483	1.024	106.708	34.039	1555.899	9812.482	1.027	106.706	34.038	-2	-1	3	0	-1	1	DROPPER
K4	1548.045	9811.005	1.217	107.312	42.007	1548.046	9811.003	1.218	107.310	42.007	-2	0	1	-2	0	0	DROPPER
K5	1533.008	9808.326	1.499	108.617	57.225	1533.009	9808.324	1.500	108.614	57.224	-3	-1	1	0	-1	1	DROPPER
L2	1562.235	9805.732	1.034	98.546	29.665	1562.237	9805.731	1.036	98.545	29.663	-1	-2	2	3	3	1	DROPPER
L3	1557.599	9804.225	1.533	98.291	34.534	1557.598	9804.227	1.534	98.293	34.533	2	-1	1	2	1	0	DROPPER
L4	1549.266	9804.390	1.883	100.607	42.539	1549.268	9804.390	1.885	100.606	42.537	-1	-2	2	0	0	0	DROPPER
L5	1539.867	9796.580	2.372	95.496	53.640	1539.867	9796.578	2.373	95.494	53.641	-2	1	1	1	-1	1	DROPPER
M2	1567.229	9797.502	1.128	89.304	26.971	1567.230	9797.503	1.129	89.305	26.970	1	-1	1	2	1	0	DROPPER
M3	1562.740	9795.048	1.310	88.095	31.943	1562.738	9795.049	1.311	88.097	31.944	2	1	1	-4	0	0	DROPPER
N2	1574.660	9787.139	1.183	77.371	22.476	1574.658	9787.139	1.183	77.372	22.477	1	1	0	-2	2	0	DROPPER
N3	1570.165	9784.176	1.522	75.672	27.584	1570.165	9784.179	1.523	75.676	27.584	4	0	1	0	0	0	DROPPER
N4	1565.798	9781.330	1.898	74.054	32.539	1565.797	9781.332	1.899	74.056	32.540	2	1	1	-1	1	0	DROPPER
P2	1581.542	9777.475	1.455	66.255	18.330	1581.544	9777.474	1.456	66.254	18.328	-1	-2	1	0	1	0	DROPPER
P3	1576.989	9774.754	1.717	64.806	23.431	1576.990	9774.755	1.717	64.806	23.431	0	0	0	1	2	0	DROPPER
P4	1571.988	9771.816	2.000	63.262	29.022	1571.988	9771.815	1.997	63.261	29.024	-1	2	-3	1	1	0	DROPPER
Q2	1585.673	9766.239	1.577	54.333	17.248	1585.673	9766.240	1.577	54.334	17.247	1	-1	0	2	1	-1	DROPPER
Q4	1578.166	9762.768	2.034	52.923	25.398	1578.166	9762.766	2.035	52.922	25.397	-1	-1	1	1	1	0	DROPPER
Q5	1579.366	9754.390	2.649	44.520	26.406	1579.366	9754.388	2.648	44.518	26.406	-2	0	-1	1	0	-2	DROPPER
R2	1589.576	9754.944	1.351	42.413	16.401	1589.579	9754.944	1.354	42.412	16.398	-1	-3	3	1	-1	2	DROPPER
R4	1583.929	9752.637	1.857	41.645	22.452	1583.931	9752.640	1.857	41.649	22.450	4	-2	0	3	1	0	DROPPER
R5	1579.688	9750.881	2.755	41.047	27.004	1579.688	9750.882	2.751	41.048	27.003	1	-1	-4	1	1	0	DROPPER
S2	1594.850	9744.151	1.375	30.622	14.100	1594.853	9744.148	1.374	30.618	14.098	-4	-2	-1	1	0	-1	DROPPER
S4	1589.588	9741.791	1.624	29.704	19.793	1589.589	9741.791	1.625	29.704	19.792	0	-1	1	1	1	0	DROPPER
S5	1582.877	9738.801	3.040	28.553	27.050	1582.878	9738.798	3.041	28.551	27.049	-2	-1	1	1	1	0	DROPPER
T2	1600.735	9729.732	1.387	15.171	12.148	1600.740	9729.734	1.390	15.172	12.142	1	-6	3	1	-1	1	DROPPER
T4	1596.347	9727.482	1.647	14.134	16.968	1596.349	9727.483	1.648	14.135	16.966	1	-2	1	2	0	0	DROPPER
T5	1587.615	9723.616	3.214	12.659	26.403	1587.617	9723.616	3.216	12.659	26.402	0	-1	2	1	0	0	DROPPER

Notes:

Max, Min & Average values are for monitoring droppers only
 Coordinates are calculated from least squares adjustment.
 Chainage & offset is relative to line approximately parallel to river bank
 Origin of Chainage & Offset Alignment: E 1 616.395, N 9 718.221
 End of Chainage & Offset Alignment: E 1 556.687, N 9 940.384
 Cross movement is positive away from the river bank in a westerly direction
 Upstream movement is positive in an upstream (Northerly) direction
 Movement shown is relative to first survey 3 August 2011
 Design co-ordinate accuracy is +/- 3mm
 Design elevation accuracy is +/- 2mm
Droppers Q5 and R5 were placed and first surveyed on 17 August 2011

	Max	6	3	3	3	2
	Min	-6	-12	-4	-2	-13
	Average	-0	-0	1	0	0



CALOOTE LANDING

RIVER BANK MOVEMENT MONITORING

09-December-2011

Date of survey	9-Dec-11
Equipment	Set 59
Surveyed by:	NRG

References:
 CALOOTE LANDING
 A&S: A078911.0001

Point	First Survey 3 August 2011					Current Survey					Current Survey Comparisons			Point Description		
	Easting	Northing	Elevation	Chainage	Offset	Easting	Northing	Elevation	Chainage	Offset	Upstream (mm)	Cross (mm)	Up (mm)	Upstream (mm)	Cross (mm)	Up (mm)
131	1508.115	9799.819	2.927	106.842	83.471	1508.115	9799.816	2.925	106.839	83.473	-3	2	-2	0	0	0
132	1500.637	9833.245	2.278	141.065	82.043	1500.636	9833.244	2.279	141.064	82.045	-1	2	1	0	1	0
133	1504.001	9846.581	1.847	153.075	75.343	1504.000	9846.580	1.848	153.075	75.344	0	1	1	0	0	0
134	1489.782	9879.980	2.431	189.017	80.433	1489.782	9879.978	2.430	189.015	80.433	-2	0	-1	-1	0	-1
135	1498.839	9915.830	2.281	221.301	62.406	1498.835	9915.830	2.283	221.302	62.410	1	4	2	2	2	1
136	1554.785	9795.230	2.404	90.331	39.579	1554.787	9795.230	2.403	90.330	39.578	-1	-1	-1	0	0	0
137	1569.940	9765.261	3.986	57.460	32.698	1569.941	9765.262	3.987	57.461	32.696	1	-2	1	1	0	1
BG1	1542.590	9794.500	4.839	92.781	51.548	1542.591	9794.498	4.841	92.779	51.548	-2	0	2	-1	0	0
BG2	1551.302	9786.479	5.052	82.779	45.209	1551.303	9786.479	5.052	82.779	45.208	0	-1	0	0	0	0
BG3	1555.157	9787.556	4.693	82.822	41.206	1555.160	9787.556	4.694	82.821	41.204	-1	-2	1	-2	0	1
BG4	1558.738	9784.274	4.641	78.725	38.597	1558.740	9784.273	4.642	78.723	38.595	-2	-2	1	-2	1	1
BG5	1559.997	9777.278	4.690	71.641	39.191	1559.998	9777.279	4.690	71.642	39.191	1	0	0	1	0	0
BG6	1573.381	9758.655	4.299	50.189	31.084	1573.380	9758.654	4.300	50.188	31.085	-1	1	1	0	1	1
BG7	1578.193	9750.878	4.322	41.431	28.448	1578.193	9750.878	4.322	41.431	28.448	0	0	0	0	0	1
A3	1535.519	9890.493	0.809	187.334	33.533	1535.518	9890.494	0.808	187.335	33.534	1	1	-1	1	0	-1
A4	1528.942	9889.377	0.918	187.958	40.175	1528.941	9889.377	0.918	187.958	40.176	0	1	0	1	1	-1
A5	1520.236	9887.828	1.037	188.715	48.986	1520.234	9887.828	1.037	188.716	48.987	1	1	0	1	0	-1
B2	1548.889	9879.599	0.884	173.351	23.438	1548.888	9879.601	0.883	173.353	23.439	2	1	-1	1	1	0
B3	1541.935	9878.666	0.855	174.250	30.397	1541.934	9878.668	0.855	174.252	30.398	2	1	0	1	1	-1
B4	1534.095	9877.415	0.949	175.070	38.294	1534.093	9877.414	0.949	175.070	38.296	0	2	0	1	1	-1
B5	1522.149	9875.439	1.138	176.253	50.344	1522.147	9875.440	1.138	176.254	50.346	1	2	0	1	1	-1
C2	1550.228	9869.364	1.075	163.117	24.794	1550.229	9869.362	1.073	163.115	24.793	-2	-1	-2	0	2	-1
C3	1544.058	9867.349	1.051	162.768	31.276	1544.056	9867.350	1.052	162.769	31.277	1	1	0	0	1	-1
C4	1536.208	9865.947	1.111	163.446	39.221	1536.204	9865.948	1.112	163.448	39.225	2	4	1	1	0	-1
C5	1523.966	9863.735	1.218	164.478	51.619	1523.958	9863.733	1.219	164.478	51.626	0	7	1	1	1	0
D2	1553.812	9856.870	1.027	150.121	24.566	1553.812	9856.872	1.027	150.124	24.566	3	0	0	1	1	-1
D3	1546.764	9855.580	1.134	150.701	31.708	1546.765	9855.584	1.135	150.704	31.706	3	-2	1	1	1	0
D4	1538.877	9853.952	1.216	151.169	39.747	1538.876	9853.952	1.216	151.169	39.748	0	1	0	1	1	-1
D5	1526.016	9851.295	1.345	151.931	52.857	1526.015	9851.290	1.345	151.926	52.860	-5	3	0	1	0	-1
E2	1552.840	9844.546	1.246	138.469	28.695	1552.834	9844.552	1.246	138.477	28.698	8	3	0	1	0	-1
E3	1548.571	9843.740	1.289	138.796	33.027	1548.569	9843.742	1.290	138.798	33.028	2	1	1	2	1	0
E4	1540.756	9842.157	1.390	139.289	40.985	1540.756	9842.155	1.390	139.288	40.986	-1	1	0	2	1	-1
E5	1527.847	9839.583	1.384	140.145	54.120	1527.851	9839.582	1.384	140.142	54.117	-3	-3	0	0	1	0
F2	1555.038	9832.754	1.136	126.510	29.623	1555.038	9832.758	1.137	126.514	29.623	4	0	1	1	1	0
F3	1551.790	9832.093	1.371	126.712	32.931	1551.790	9832.093	1.371	126.712	32.932	0	1	0	2	2	0
F4	1543.948	9830.501	1.409	127.204	40.918	1543.944	9830.501	1.410	127.206	40.922	2	4	1	2	1	-1
F5	1529.849	9827.702	1.451	128.150	55.262	1529.850	9827.701	1.452	128.149	55.261	-1	-1	1	2	1	0
G2	1557.617	9828.377	1.023	121.615	28.265	1557.617	9828.380	1.023	121.618	28.264	3	-1	0	0	0	0
G3	1552.803	9827.380	1.289	121.898	33.173	1552.804	9827.381	1.289	121.898	33.172	0	-1	0	0	0	0
G4	1545.016	9825.784	1.384	122.372	41.108	1545.016	9825.784	1.384	122.371	41.108	-1	0	0	0	0	-1
G5	1530.648	9822.879	1.470	123.285	55.738	1530.646	9822.875	1.470	123.281	55.740	-4	2	0	0	0	-1
H2	1558.902	9823.324	0.935	116.402	28.332	1558.902	9823.326	0.936	116.404	28.331	2	-1	1	1	1	-1
H3	1553.793	9822.356	1.121	116.788	33.517	1553.793	9822.356	1.122	116.789	33.517	1	0	1	1	1	-1
H4	1545.855	9820.959	1.292	117.494	41.547	1545.854	9820.959	1.293	117.494	41.548	0	1	1	1	0	-1
H5	1531.495	9817.952	1.470	118.306	56.195	1531.495	9817.947	1.470	118.301	56.197	-5	2	0	-1	1	0

J2	1559.568	9818.075	0.881	111.159	29.047	1559.568	9818.076	0.881	111.160	29.046	1	-1	0	0	-1	-1
J3	1554.939	9817.309	1.079	111.617	33.716	1554.941	9817.312	1.067	111.619	33.714	2	-2	-12	2	0	0
J4	1547.055	9815.929	1.226	112.325	41.689	1547.054	9815.930	1.227	112.326	41.690	1	1	1	2	1	0
J5	1532.242	9813.153	1.353	113.477	56.715	1532.243	9813.151	1.357	113.476	56.715	-1	0	4	0	-1	1
K2	1560.810	9813.419	0.917	106.341	29.052	1560.811	9813.424	0.919	106.345	29.050	4	-2	2	1	0	0
K3	1555.898	9812.483	1.024	106.708	34.039	1555.897	9812.484	1.026	106.709	34.040	1	1	2	3	2	-1
K4	1548.045	9811.005	1.217	107.312	42.007	1548.044	9811.006	1.218	107.313	42.008	1	1	1	3	1	0
K5	1533.008	9808.326	1.499	108.617	57.225	1533.008	9808.324	1.500	108.614	57.225	-3	0	1	0	1	0
L2	1562.235	9805.732	1.034	98.546	29.665	1562.237	9805.732	1.036	98.546	29.663	0	-2	2	1	0	0
L3	1557.599	9804.225	1.533	98.291	34.534	1557.599	9804.228	1.534	98.294	34.533	3	-1	1	1	0	0
L4	1549.266	9804.390	1.883	100.607	42.539	1549.270	9804.388	1.885	100.604	42.536	-3	-3	2	-2	-1	0
L5	1539.867	9796.580	2.372	95.496	53.640	1539.866	9796.578	2.373	95.493	53.642	-3	2	1	-1	1	0
M2	1567.229	9797.502	1.128	89.304	26.971	1567.231	9797.503	1.129	89.305	26.969	1	-2	1	0	-1	0
M3	1562.740	9795.048	1.310	88.095	31.943	1562.738	9795.050	1.311	88.098	31.944	3	1	1	1	0	0
N2	1574.660	9787.139	1.183	77.371	22.476	1574.658	9787.141	1.183	77.374	22.477	3	1	0	2	0	0
N3	1570.165	9784.176	1.522	75.672	27.584	1570.165	9784.180	1.523	75.677	27.584	5	0	1	1	0	0
N4	1565.798	9781.330	1.898	74.054	32.539	1565.798	9781.330	1.899	74.054	32.539	0	0	1	-2	-1	0
P2	1581.542	9777.475	1.455	66.255	18.330	1581.543	9777.474	1.456	66.254	18.329	-1	-1	1	0	1	0
P3	1576.989	9774.754	1.717	64.806	23.431	1576.990	9774.756	1.718	64.807	23.430	1	-1	1	1	-1	1
P4	1571.988	9771.816	2.000	63.262	29.022	1571.990	9771.815	1.998	63.260	29.021	-2	-1	-2	-1	-3	1
Q2	1585.673	9766.239	1.577	54.333	17.248	1585.674	9766.239	1.578	54.333	17.246	0	-2	1	-1	-1	1
Q4	1578.166	9762.768	2.034	52.923	25.398	1578.168	9762.766	2.035	52.920	25.396	-3	-2	1	-2	-1	0
Q5	1579.366	9754.390	2.649	44.520	26.406	1579.367	9754.388	2.650	44.517	26.406	-3	0	1	-1	0	2
R2	1589.576	9754.944	1.351	42.413	16.401	1589.580	9754.942	1.353	42.410	16.398	-3	-3	2	-2	0	-1
R4	1583.929	9752.637	1.857	41.645	22.452	1583.932	9752.638	1.857	41.646	22.449	1	-3	0	-3	-1	0
R5	1579.688	9750.881	2.755	41.047	27.004	1579.690	9750.878	2.752	41.044	27.002	-3	-2	-3	-4	-1	1
S2	1594.850	9744.151	1.375	30.622	14.100	1594.853	9744.147	1.374	30.618	14.099	-4	-1	-1	0	1	0
S4	1589.588	9741.791	1.624	29.704	19.793	1589.589	9741.790	1.625	29.703	19.792	-1	-1	1	-1	0	0
S5	1582.877	9738.801	3.040	28.553	27.050	1582.879	9738.798	3.042	28.550	27.049	-3	-1	2	-1	0	1
T2	1600.735	9729.732	1.387	15.171	12.148	1600.741	9729.734	1.390	15.172	12.141	1	-7	3	0	-1	0
T4	1596.347	9727.482	1.647	14.134	16.968	1596.349	9727.482	1.648	14.133	16.966	-1	-2	1	-2	0	0
T5	1587.615	9723.616	3.214	12.659	26.403	1587.617	9723.613	3.216	12.656	26.402	-3	-1	2	-3	0	0

Max	8
Min	-5
Average	0

Notes:

Max, Min & Average values are for monitoring droppers only
Coordinates are calculated from least squares adjustment.
Chainage & offset is relative to line approximately parallel to river bank
Origin of Chainage & Offset Alignment: E 1 616.395, N 9 718.221
End of Chainage & Offset Alignment: E 1 556.687, N 9 940.384
Cross movement is positive away from the river bank in a westerly direction
Upstream movement is positive in an upstream (Northerly) direction
Movement shown is relative to first survey 3 August 2011
Design co-ordinate accuracy is +/- 3mm
Design elevation accuracy is +/- 2mm
Droppers Q5 and R5 were placed and first surveyed on 17 August 2011

CALOOTE LANDING
RIVER BANK MOVEMENT MONITORING

19-January-2012

Date of survey	19-Jan-12
Equipment	Set 59
Surveyed by:	NRG

References:
CALOOTE LANDING
A&S: A078911.0001

Point	Current Survey Comparisons										Point Description						
	difference from first survey					difference from last survey											
	Upstream (mm)	Cross (mm)	Up (mm)	Upstream (mm)	Cross (mm)	Up (mm)											
131	1508.115	9799.819	2.927	106.842	83.471	1508.115	9799.816	2.925	106.839	83.473	-3	2	-2	0	0	0	CROSS ON STOBIE
132	1500.637	9833.245	2.278	141.065	82.043	1500.636	9833.243	2.277	141.063	82.045	-2	2	-1	-1	0	-2	CROSS ON STOBIE
133	1504.001	9846.581	1.847	153.075	75.343	1504.000	9846.580	1.848	153.075	75.344	0	1	1	0	0	0	CROSS ON TANK
134	1489.782	9879.980	2.431	189.017	80.433	1489.780	9879.979	2.430	189.016	80.435	-1	2	-1	1	2	0	CROSS ON STOBIE
135	1498.839	9915.830	2.281	221.301	62.406	1498.837	9915.829	2.282	221.300	62.408	-1	2	1	-2	-2	-1	CROSS ON STOBIE
136	1554.785	9795.230	2.404	90.331	39.579	1554.786	9795.230	2.403	90.330	39.578	-1	-1	-1	0	0	0	CROSS ON STOBIE
137	1569.940	9765.261	3.986	57.460	32.698	1569.941	9765.262	3.986	57.461	32.697	1	-1	0	0	1	-1	CROSS ON STOBIE
BG1	1542.590	9794.500	4.839	92.781	51.548	1542.590	9794.498	4.840	92.779	51.548	-2	0	1	0	0	-1	TARGET ON BUILDING
BG2	1551.302	9786.479	5.052	82.779	45.209	1551.303	9786.480	5.052	82.780	45.208	1	-1	0	1	0	0	TARGET ON BUILDING
BG3	1555.157	9787.556	4.693	82.822	41.206	1555.159	9787.556	4.693	82.822	41.205	0	-1	0	1	1	-1	TARGET ON BUILDING
BG4	1558.738	9784.274	4.641	78.725	38.597	1558.737	9784.275	4.641	78.726	38.597	1	0	0	3	2	-1	TARGET ON BUILDING
BG5	1559.997	9777.278	4.690	71.641	39.191	1559.997	9777.279	4.690	71.642	39.191	1	0	0	0	0	0	TARGET ON BUILDING
BG6	1573.381	9758.655	4.299	50.189	31.084	1573.380	9758.653	4.299	50.187	31.085	-2	1	0	-1	0	-1	TARGET ON BUILDING
BG7	1578.193	9750.878	4.322	41.431	28.448	1578.192	9750.879	4.321	41.432	28.449	1	1	-1	1	1	-1	TARGET ON BUILDING
A3	1535.519	9890.493	0.809	187.334	33.533	1535.517	9890.494	0.808	187.335	33.535	1	2	-1	0	1	0	DROPPER
A4	1528.942	9889.377	0.918	187.958	40.175	1528.940	9889.377	0.918	187.959	40.177	1	2	0	1	1	0	DROPPER
A5	1520.236	9887.828	1.037	188.715	48.986	1520.233	9887.828	1.038	188.716	48.988	1	2	1	0	1	1	DROPPER
B2	1548.889	9879.599	0.884	173.351	23.438	1548.890	9879.602	0.883	173.353	23.437	2	-1	-1	0	-2	0	DROPPER
B3	1541.935	9878.666	0.855	174.250	30.397	1541.933	9878.667	0.855	174.251	30.399	1	2	0	-1	1	0	DROPPER
B4	1534.095	9877.415	0.949	175.070	38.294	1534.092	9877.412	0.950	175.068	38.298	-2	4	1	-2	2	1	DROPPER
B5	1522.149	9875.439	1.138	176.253	50.344	1522.146	9875.439	1.138	176.254	50.347	1	3	0	0	1	0	DROPPER
C2	1550.228	9869.364	1.075	163.117	24.794	1550.230	9869.362	1.073	163.115	24.793	-2	-1	-2	0	0	0	DROPPER
C3	1544.058	9867.349	1.051	162.768	31.276	1544.054	9867.348	1.053	162.768	31.279	0	3	2	-1	2	1	DROPPER
C4	1536.208	9865.947	1.111	163.446	39.221	1536.202	9865.948	1.113	163.448	39.226	2	5	2	0	1	1	DROPPER
C5	1523.966	9863.735	1.218	164.478	51.619	1523.957	9863.731	1.219	164.476	51.628	-2	9	1	-2	2	0	DROPPER
D2	1553.812	9856.870	1.027	150.121	24.566	1553.812	9856.871	1.027	150.123	24.565	2	-1	0	-1	-1	0	DROPPER
D3	1546.764	9855.580	1.134	150.701	31.708	1546.761	9855.584	1.135	150.705	31.709	4	1	1	1	3	0	DROPPER
D4	1538.877	9853.952	1.216	151.169	39.747	1538.875	9853.951	1.216	151.168	39.750	-1	3	0	-1	2	0	DROPPER
D5	1526.016	9851.295	1.345	151.931	52.857	1526.016	9851.290	1.345	151.926	52.859	-5	2	0	0	-1	0	DROPPER
E2	1552.840	9844.546	1.246	138.469	28.695	1552.835	9844.550	1.247	138.475	28.698	6	3	1	-2	0	1	DROPPER
E3	1548.571	9843.740	1.289	138.796	33.027	1548.570	9843.744	1.290	138.800	33.027	4	0	1	2	-1	0	DROPPER
E4	1540.756	9842.157	1.390	139.289	40.985	1540.756	9842.156	1.390	139.288	40.985	-1	0	0	0	-1	0	DROPPER
E5	1527.847	9839.583	1.384	140.145	54.120	1527.851	9839.580	1.384	140.140	54.117	-5	-3	0	-2	0	0	DROPPER
F2	1555.038	9832.754	1.136	126.510	29.623	1555.038	9832.757	1.137	126.513	29.623	3	0	1	-1	0	0	DROPPER
F3	1551.790	9832.093	1.371	126.712	32.931	1551.790	9832.092	1.372	126.712	32.932	0	1	1	0	0	1	DROPPER
F4	1543.948	9830.501	1.409	127.204	40.918	1543.944	9830.500	1.410	127.205	40.923	1	5	1	-1	1	0	DROPPER
F5	1529.849	9827.702	1.451	128.150	55.262	1529.849	9827.700	1.452	128.148	55.262	-2	0	1	-1	1	0	DROPPER
G2	1557.617	9828.377	1.023	121.615	28.265	1557.616	9828.378	1.023	121.616	28.266	1	1	0	-2	2	0	DROPPER
G3	1552.803	9827.380	1.289	121.898	33.173	1552.804	9827.379	1.289	121.896	33.173	-2	0					

H2	1558.902	9823.324	0.935	116.402	28.332	1558.902	9823.323	0.936	116.400	28.332	-2	0	1	-4	1	0	DROPPER
H3	1553.793	9822.356	1.121	116.788	33.517	1553.792	9822.356	1.123	116.789	33.518	1	1	2	0	1	1	DROPPER
H4	1545.855	9820.959	1.292	117.494	41.547	1545.853	9820.957	1.294	117.493	41.549	-1	2	2	-1	1	1	DROPPER
H5	1531.495	9817.952	1.470	118.306	56.195	1531.494	9817.947	1.470	118.301	56.197	-5	2	0	0	0	0	DROPPER
J2	1559.568	9818.075	0.881	111.159	29.047	1559.567	9818.075	0.881	111.160	29.048	1	1	0	0	2	0	DROPPER
J3	1554.939	9817.309	1.079	111.617	33.716	1554.940	9817.308	1.068	111.616	33.715	-1	-1	-11	-3	1	1	DROPPER
J4	1547.055	9815.929	1.226	112.325	41.689	1547.055	9815.927	1.227	112.323	41.689	-2	0	1	-3	-1	0	DROPPER
J5	1532.242	9813.153	1.353	113.477	56.715	1532.241	9813.153	1.358	113.477	56.717	0	2	5	1	2	1	DROPPER
K2	1560.810	9813.419	0.917	106.341	29.052	1560.808	9813.423	0.920	106.345	29.053	4	1	3	0	3	1	DROPPER
K3	1555.898	9812.483	1.024	106.708	34.039	1555.898	9812.484	1.027	106.708	34.039	0	0	3	-1	-1	1	DROPPER
K4	1548.045	9811.005	1.217	107.312	42.007	1548.043	9811.005	1.218	107.313	42.009	1	2	1	0	1	0	DROPPER
K5	1533.008	9808.326	1.499	108.617	57.225	1533.011	9808.324	1.500	108.613	57.223	-4	-2	1	-1	-2	0	DROPPER
L2	1562.235	9805.732	1.034	98.546	29.665	1562.236	9805.732	1.036	98.546	29.664	0	-1	2	0	1	0	DROPPER
L3	1557.599	9804.225	1.533	98.291	34.534	1557.598	9804.229	1.533	98.295	34.534	4	0	0	1	1	-1	DROPPER
L4	1549.266	9804.390	1.883	100.607	42.539	1549.268	9804.389	1.885	100.606	42.538	-1	-1	2	2	2	0	DROPPER
L5	1539.867	9796.580	2.372	95.496	53.640	1539.866	9796.577	2.373	95.493	53.642	-3	2	1	0	0	0	DROPPER
M2	1567.229	9797.502	1.128	89.304	26.971	1567.231	9797.503	1.129	89.305	26.970	1	-1	1	0	1	0	DROPPER
M3	1562.740	9795.048	1.310	88.095	31.943	1562.738	9795.051	1.310	88.100	31.944	5	1	0	2	0	-1	DROPPER
N2	1574.660	9787.139	1.183	77.371	22.476	1574.658	9787.140	1.183	77.373	22.477	2	1	0	-1	0	0	DROPPER
N3	1570.165	9784.176	1.522	75.672	27.584	1570.165	9784.178	1.524	75.675	27.584	3	0	2	-2	0	1	DROPPER
N4	1565.798	9781.330	1.898	74.054	32.539	1565.797	9781.332	1.899	74.056	32.540	2	1	1	2	1	0	DROPPER
P2	1581.542	9777.475	1.455	66.255	18.330	1581.544	9777.473	1.456	66.253	18.328	-2	-2	1	-1	-1	0	DROPPER
P3	1576.989	9774.754	1.717	64.806	23.431	1576.990	9774.754	1.717	64.805	23.431	-1	0	0	-2	1	-1	DROPPER
P4	1571.988	9771.816	2.000	63.262	29.022	1571.988	9771.813	1.998	63.258	29.024	-4	2	-2	-2	3	0	DROPPER
Q2	1585.673	9766.239	1.577	54.333	17.248	1585.672	9766.239	1.577	54.333	17.248	0	0	0	0	2	-1	DROPPER
Q4	1578.166	9762.768	2.034	52.923	25.398	1578.166	9762.765	2.035	52.920	25.398	-3	0	1	0	2	0	DROPPER
Q5	1579.366	9754.390	2.649	44.520	26.406	1579.367	9754.389	2.651	44.519	26.406	-1	0	2	2	0	1	DROPPER
R2	1589.576	9754.944	1.351	42.413	16.401	1589.578	9754.944	1.353	42.412	16.399	-1	-2	2	2	1	0	DROPPER
R4	1583.929	9752.637	1.857	41.645	22.452	1583.930	9752.640	1.857	41.648	22.450	3	-2	0	2	1	0	DROPPER
R5	1579.688	9750.881	2.755	41.047	27.004	1579.691	9750.876	2.751	41.041	27.002	-6	-2	-4	-3	0	-1	DROPPER
S2	1594.850	9744.151	1.375	30.622	14.100	1594.852	9744.146	1.374	30.617	14.100	-5	0	-1	-1	1	0	DROPPER
S4	1589.588	9741.791	1.624	29.704	19.793	1589.590	9741.790	1.625	29.703	19.792	-1	-1	1	0	0	0	DROPPER
S5	1582.877	9738.801	3.040	28.553	27.050	1582.879	9738.799	3.041	28.551	27.048	-2	-2	1	1	-1	-1	DROPPER
T2	1600.735	9729.732	1.387	15.171	12.148	1600.739	9729.735	1.389	15.174	12.142	3	-6	2	2	1	-1	DROPPER
T4	1596.347	9727.482	1.647	14.134	16.968	1596.348	9727.483	1.648	14.135	16.967	1	-1	1	2	1	0	DROPPER
T5	1587.615	9723.616	3.214	12.659	26.403	1587.617	9723.613	3.216	12.656	26.402	-3	-1	2	0	0	0	DROPPER

Max 6
 Min -6
 Average -0

Notes:

Max, Min & Average values are for monitoring droppers only

Coordinates are calculated from least squares adjustment.

Chainage & offset is relative to line approximately parallel to river bank

Origin of Chainage & Offset Alignment: E 1 616.395, N 9 718.221

End of Chainage & Offset Alignment: E 1 556.687, N 9 940.384

Cross movement is positive away from the river bank in a westerly direction

Upstream movement is positive in an upstream (Northerly) direction

Movement shown is relative to first survey 3 August 2011

Design co-ordinate accuracy is +/- 3mm

Design elevation accuracy is +/- 2mm

Droppers Q5 and R5 were placed and first surveyed on 17 August 2011

CALOOTE LANDING
RIVER BANK MOVEMENT MONITORING

17-February-2012

Date of survey	17-Feb-12
Equipment	Set 59
Surveyed by:	NRG

References:
CALOOTE LANDING
A&S: A078911.0001

Point	Current Survey Comparisons										Point Description	
	difference from first survey				difference from last survey							
	Upstream (mm)	Cross (mm)	Up (mm)	Upstream (mm)	Cross (mm)	Up (mm)						
Point	Easting	Northing	Elevation	Chainage	Offset	Easting	Northing	Elevation	Chainage	Offset	Point Description	
131	1508.115	9799.819	2.927	106.842	83.471	1508.115	9799.816	2.925	106.839	83.473	CROSS ON STOBIE	
132	1500.637	9833.245	2.278	141.065	82.043	1500.635	9833.242	2.279	141.062	82.046	CROSS ON STOBIE	
133	1504.001	9846.581	1.847	153.075	75.343	1504.000	9846.580	1.848	153.075	75.344	CROSS ON TANK	
134	1489.782	9879.980	2.431	189.017	80.433	1489.781	9879.977	2.430	189.014	80.435	CROSS ON STOBIE	
135	1498.839	9915.830	2.281	221.301	62.406	1498.836	9915.827	2.281	221.299	62.409	CROSS ON STOBIE	
136	1554.785	9795.230	2.404	90.331	39.579	1554.787	9795.230	2.403	90.330	39.578	CROSS ON STOBIE	
137	1569.940	9765.261	3.986	57.460	32.698	1569.941	9765.262	3.986	57.461	32.696	CROSS ON STOBIE	
BG1	1542.590	9794.500	4.839	92.781	51.548	1542.591	9794.498	4.841	92.780	51.548	TARGET ON BUILDING	
BG2	1551.302	9786.479	5.052	82.779	45.209	1551.303	9786.480	5.053	82.780	45.208	TARGET ON BUILDING	
BG3	1555.157	9787.556	4.693	82.822	41.206	1555.159	9787.556	4.694	82.821	41.204	TARGET ON BUILDING	
BG4	1558.738	9784.274	4.641	78.725	38.597	1558.739	9784.272	4.642	78.723	38.596	TARGET ON BUILDING	
BG5	1559.997	9777.278	4.690	71.641	39.191	1559.998	9777.279	4.690	71.642	39.191	TARGET ON BUILDING	
BG6	1573.381	9758.655	4.299	50.189	31.084	1573.380	9758.654	4.298	50.188	31.084	TARGET ON BUILDING	
BG7	1578.193	9750.878	4.322	41.431	28.448	1578.193	9750.877	4.321	41.431	28.448	TARGET ON BUILDING	
A3	1535.519	9890.493	0.809	187.334	33.533	1535.519	9890.494	0.808	187.334	33.533	DROPPER	
A4	1528.942	9889.377	0.918	187.958	40.175	1528.941	9889.376	0.918	187.957	40.176	DROPPER	
A5	1520.236	9887.828	1.037	188.715	48.986	1520.234	9887.827	1.037	188.715	48.987	DROPPER	
B2	1548.889	9879.599	0.884	173.351	23.438	1548.890	9879.601	0.883	173.352	23.437	DROPPER	
B3	1541.935	9878.666	0.855	174.250	30.397	1541.934	9878.668	0.855	174.251	30.397	DROPPER	
B4	1534.095	9877.415	0.949	175.070	38.294	1534.094	9877.414	0.949	175.069	38.295	DROPPER	
B5	1522.149	9875.439	1.138	176.253	50.344	1522.148	9875.439	1.138	176.253	50.345	DROPPER	
C2	1550.228	9869.364	1.075	163.117	24.794	1550.231	9869.361	1.073	163.115	24.792	DROPPER	
C3	1544.058	9867.349	1.051	162.768	31.276	1544.057	9867.349	1.052	162.768	31.276	DROPPER	
C4	1536.208	9865.947	1.111	163.446	39.221	1536.203	9865.947	1.111	163.447	39.226	DROPPER	
C5	1523.966	9863.735	1.218	164.478	51.619	1523.959	9863.732	1.218	164.477	51.626	DROPPER	
D2	1553.812	9856.870	1.027	150.121	24.566	1553.813	9856.870	1.027	150.122	24.565	DROPPER	
D3	1546.764	9855.580	1.134	150.701	31.708	1546.765	9855.584	1.135	150.703	31.706	DROPPER	
D4	1538.877	9853.952	1.216	151.169	39.747	1538.877	9853.951	1.216	151.168	39.748	DROPPER	
D5	1526.016	9851.295	1.345	151.931	52.857	1526.017	9851.290	1.345	151.926	52.858	DROPPER	
E2	1552.840	9844.546	1.246	138.469	28.695	1552.834	9844.551	1.247	138.476	28.699	DROPPER	
E3	1548.571	9843.740	1.289	138.796	33.027	1548.570	9843.741	1.289	138.797	33.028	DROPPER	
E4	1540.756	9842.157	1.390	139.289	40.985	1540.756	9842.155	1.390	139.287	40.986	DROPPER	
E5	1527.847	9839.583	1.384	140.145	54.120	1527.851	9839.582	1.383	140.142	54.117	DROPPER	
F2	1555.038	9832.754	1.136	126.510	29.623	1555.039	9832.758	1.137	126.514	29.622	DROPPER	
F3	1551.790	9832.093	1.371	126.712	32.931	1551.790	9832.092	1.372	126.711	32.933	DROPPER	
F4	1543.948	9830.501	1.409	127.204	40.918	1543.943	9830.501	1.410	127.206	40.923	DROPPER	
F5	1529.849	9827.702	1.451	128.150	55.262	1529.849	9827.700	1.451	128.148	55.262	DROPPER	
G2	1557.617	9828.377	1.023	121.615	28.265	1557.615	9828.380	1.023	121.618	28.266	DROPPER	
G3	1552.803	9827.380	1.289	121.898	33.173	1552.803	9827.378	1.289	121.896	33.173	DROPPER	
G4	1545.016	9825.784	1.384	122.372	41.108	1545.015	9825.783	1.385	122.371	41.109	DROPPER	
G5	1530.648	9822.879	1.470	123.285	55.738	1530.647	9822.875	1.470	123.281	55.741	DROPPER	

H2	1558.902	9823.324	0.935	116.402	28.332	1558.901	9823.324	0.936	116.402	28.332	0	0	1	2	0	0	DROPPER
H3	1553.793	9822.356	1.121	116.788	33.517	1553.793	9822.356	1.123	116.789	33.517	1	0	2	0	-1	0	DROPPER
H4	1545.855	9820.959	1.292	117.494	41.547	1545.854	9820.959	1.293	117.494	41.548	0	1	1	1	-1	-1	DROPPER
H5	1531.495	9817.952	1.470	118.306	56.195	1531.494	9817.947	1.470	118.301	56.197	-5	2	0	0	0	0	DROPPER
J2	1559.568	9818.075	0.881	111.159	29.047	1559.567	9818.075	0.881	111.160	29.048	1	1	0	0	0	0	DROPPER
J3	1554.939	9817.309	1.079	111.617	33.716	1554.942	9817.310	1.068	111.617	33.714	0	-2	-11	1	-1	0	DROPPER
J4	1547.055	9815.929	1.226	112.325	41.689	1547.055	9815.928	1.227	112.324	41.689	-1	0	1	1	0	0	DROPPER
J5	1532.242	9813.153	1.353	113.477	56.715	1532.241	9813.153	1.358	113.478	56.717	1	2	5	1	0	0	DROPPER
K2	1560.810	9813.419	0.917	106.341	29.052	1560.814	9813.421	0.920	106.341	29.048	0	-4	3	-4	-5	0	DROPPER
K3	1555.898	9812.483	1.024	106.708	34.039	1555.898	9812.482	1.027	106.707	34.039	-1	0	3	-1	0	0	DROPPER
K4	1548.045	9811.005	1.217	107.312	42.007	1548.045	9811.004	1.218	107.312	42.008	0	1	1	-1	-1	0	DROPPER
K5	1533.008	9808.326	1.499	108.617	57.225	1533.008	9808.324	1.500	108.615	57.225	-2	0	1	2	2	0	DROPPER
L2	1562.235	9805.732	1.034	98.546	29.665	1562.238	9805.733	1.034	98.546	29.662	0	-3	0	0	-2	-2	DROPPER
L3	1557.599	9804.225	1.533	98.291	34.534	1557.598	9804.228	1.533	98.294	34.534	3	0	0	-1	0	0	DROPPER
L4	1549.266	9804.390	1.883	100.607	42.539	1549.269	9804.389	1.885	100.605	42.537	-2	-2	2	-1	-1	0	DROPPER
L5	1539.867	9796.580	2.372	95.496	53.640	1539.866	9796.577	2.373	95.493	53.642	-3	2	1	0	0	0	DROPPER
M2	1567.229	9797.502	1.128	89.304	26.971	1567.232	9797.502	1.129	89.304	26.969	0	-2	1	-1	-1	0	DROPPER
M3	1562.740	9795.048	1.310	88.095	31.943	1562.739	9795.048	1.310	88.096	31.944	1	1	0	-4	0	0	DROPPER
N2	1574.660	9787.139	1.183	77.371	22.476	1574.659	9787.140	1.183	77.372	22.477	1	1	0	-1	0	0	DROPPER
N3	1570.165	9784.176	1.522	75.672	27.584	1570.167	9784.178	1.523	75.674	27.582	2	-2	1	-1	-2	-1	DROPPER
N4	1565.798	9781.330	1.898	74.054	32.539	1565.797	9781.333	1.899	74.057	32.539	3	0	1	1	-1	0	DROPPER
P2	1581.542	9777.475	1.455	66.255	18.330	1581.544	9777.474	1.456	66.253	18.328	-2	-2	1	0	0	0	DROPPER
P3	1576.989	9774.754	1.717	64.806	23.431	1576.989	9774.756	1.718	64.807	23.431	1	0	1	2	0	1	DROPPER
P4	1571.988	9771.816	2.000	63.262	29.022	1571.988	9771.814	1.997	63.260	29.023	-2	1	-3	2	-1	-1	DROPPER
Q2	1585.673	9766.239	1.577	54.333	17.248	1585.673	9766.237	1.577	54.331	17.248	-2	0	0	-2	0	0	DROPPER
Q4	1578.166	9762.768	2.034	52.923	25.398	1578.167	9762.766	2.035	52.921	25.397	-2	-1	1	1	-1	0	DROPPER
Q5	1579.366	9754.390	2.649	44.520	26.406	1579.366	9754.390	2.650	44.520	26.407	0	1	1	1	1	-1	DROPPER
R2	1589.576	9754.944	1.351	42.413	16.401	1589.579	9754.944	1.354	42.411	16.398	-2	-3	3	-1	-1	1	DROPPER
R4	1583.929	9752.637	1.857	41.645	22.452	1583.931	9752.640	1.857	41.648	22.450	3	-2	0	0	0	0	DROPPER
R5	1579.688	9750.881	2.755	41.047	27.004	1579.689	9750.876	2.751	41.042	27.004	-5	0	-4	1	2	0	DROPPER
S2	1594.850	9744.151	1.375	30.622	14.100	1594.852	9744.146	1.374	30.617	14.099	-5	-1	-1	0	-1	0	DROPPER
S4	1589.588	9741.791	1.624	29.704	19.793	1589.589	9741.791	1.625	29.704	19.792	0	-1	1	1	0	0	DROPPER
S5	1582.877	9738.801	3.040	28.553	27.050	1582.878	9738.798	3.041	28.551	27.049	-2	-1	1	0	1	0	DROPPER
T2	1600.735	9729.732	1.387	15.171	12.148	1600.740	9729.735	1.390	15.173	12.142	2	-6	3	-1	0	1	DROPPER
T4	1596.347	9727.482	1.647	14.134	16.968	1596.348	9727.482	1.648	14.134	16.967	0	-1	1	-1	0	0	DROPPER
T5	1587.615	9723.616	3.214	12.659	26.403	1587.616	9723.615	3.216	12.659	26.402	0	-1	2	3	0	0	DROPPER

Max 7 7 5 3 2 1
 Min -5 -6 -11 -4 -5 -2
 Average -0 0 0 -0 -1 -0

Notes:

Max, Min & Average values are for monitoring droppers only

Coordinates are calculated from least squares adjustment.

Chainage & offset is relative to line approximately parallel to river bank

Origin of Chainage & Offset Alignment: E 1 616.395, N 9 718.221

End of Chainage & Offset Alignment: E 1 556.687, N 9 940.384

Cross movement is positive away from the river bank in a westerly direction

Upstream movement is positive in an upstream (Northerly) direction

Movement shown is relative to first survey 3 August 2011

Design co-ordinate accuracy is +/- 3mm

Design elevation accuracy is +/- 2mm

Droppers Q5 and R5 were placed and first surveyed on 17 August 2011

CALOOTE LANDING
RIVER BANK MOVEMENT MONITORING

28-March-2012

Date of survey	28-Mar-12
Equipment	Set 59
Surveyed by:	NRG

References:
CALOOTE LANDING
A&S: A078911.0001

Point	First Survey 3 August 2011					Current Survey					Upstream			Cross			Up			Current Survey Comparisons		
	Easting	Northing	Elevation	Chainage	Offset	Easting	Northing	Elevation	Chainage	Offset	(mm)	(mm)	(mm)	Upstream	Cross	Up	Upstream	Cross	Up	difference from first survey	difference from last survey	
131	1508.115	9799.819	2.927	106.842	83.471	1508.115	9799.816	2.925	106.839	83.473	-3	2	-2	0	0	0	0	0	0	CROSS ON STOBIE		
132	1500.637	9833.245	2.278	141.065	82.043	1500.637	9833.241	2.279	141.061	82.045	-4	2	1	-1	-1	-1	0	0	0	CROSS ON STOBIE		
133	1504.001	9846.581	1.847	153.075	75.343	1504.000	9846.580	1.847	153.074	75.344	-1	1	0	-1	0	-1	0	0	-1	CROSS ON TANK		
134	1489.782	9879.980	2.431	189.017	80.433	1489.782	9879.977	2.431	189.014	80.434	-3	1	0	0	0	-1	1	0	-1	CROSS ON STOBIE		
135	1498.839	9915.830	2.281	221.301	62.406	1498.835	9915.828	2.282	221.300	62.410	-1	4	1	1	1	1	1	1	1	CROSS ON STOBIE		
136	1554.785	9795.230	2.404	90.331	39.579	1554.787	9795.231	2.404	90.331	39.577	0	-2	0	1	1	-1	1	1	1	CROSS ON STOBIE		
137	1569.940	9765.261	3.986	57.460	32.698	1569.942	9765.262	3.987	57.461	32.696	1	-2	1	0	0	0	0	0	1	CROSS ON STOBIE		
BG1	1542.590	9794.500	4.839	92.781	51.548	1542.592	9794.498	4.841	92.779	51.547	-2	-1	2	-1	-1	-1	0	0	0	TARGET ON BUILDING		
BG2	1551.302	9786.479	5.052	82.779	45.209	1551.304	9786.480	5.053	82.779	45.207	0	-2	1	-1	-1	-1	0	0	0	TARGET ON BUILDING		
BG3	1555.157	9787.556	4.693	82.822	41.206	1555.160	9787.556	4.694	82.821	41.204	-1	-2	1	0	0	0	0	0	0	TARGET ON BUILDING		
BG4	1558.738	9784.274	4.641	78.725	38.597	1558.740	9784.275	4.642	78.725	38.595	0	-2	1	2	-1	0	0	0	0	TARGET ON BUILDING		
BG5	1559.997	9777.278	4.690	71.641	39.191	1559.997	9777.278	4.691	71.641	39.191	0	0	1	-1	0	0	1	0	1	TARGET ON BUILDING		
BG6	1573.381	9758.655	4.299	50.189	31.084	1573.381	9758.654	4.299	50.188	31.084	-1	0	0	0	0	0	0	0	1	TARGET ON BUILDING		
BG7	1578.193	9750.878	4.322	41.431	28.448	1578.194	9750.877	4.321	41.430	28.448	-1	0	-1	-1	0	0	0	0	0	TARGET ON BUILDING		
A3	1535.519	9890.493	0.809	187.334	33.533	1535.519	9890.494	0.808	187.334	33.533	0	0	-1	0	0	0	0	0	0	DROPPER		
A4	1528.942	9889.377	0.918	187.958	40.175	1528.940	9889.378	0.918	187.960	40.177	2	2	0	3	1	0	0	1	0	DROPPER		
A5	1520.236	9887.828	1.037	188.715	48.986	1520.234	9887.832	1.038	188.719	48.986	4	0	1	4	-1	1	0	1	1	DROPPER		
B2	1548.889	9879.599	0.884	173.351	23.438	1548.893	9879.602	0.883	173.353	23.434	2	-4	-1	1	-3	0	1	0	0	DROPPER		
B3	1541.935	9878.666	0.855	174.250	30.397	1541.934	9878.669	0.855	174.252	30.397	2	0	0	1	0	0	0	0	0	DROPPER		
B4	1534.095	9877.415	0.949	175.070	38.294	1534.093	9877.415	0.949	175.070	38.296	0	2	0	1	1	1	0	0	0	DROPPER		
B5	1522.149	9875.439	1.138	176.253	50.344	1522.145	9875.439	1.138	176.254	50.347	1	3	0	1	2	0	2	0	0	DROPPER		
C2	1550.228	9869.364	1.075	163.117	24.794	1550.230	9869.360	1.074	163.114	24.793	-3	-1	-1	-1	1	1	1	1	1	DROPPER		
C3	1544.058	9867.349	1.051	162.768	31.276	1544.057	9867.348	1.053	162.768	31.276	0	0	2	0	0	0	0	1	1	DROPPER		
C4	1536.208	9865.947	1.111	163.446	39.221	1536.203	9865.947	1.112	163.447	39.226	1	5	1	0	0	0	0	1	1	DROPPER		
C5	1523.966	9863.735	1.218	164.478	51.619	1523.960	9863.733	1.218	164.477	51.625	-1	6	0	0	-1	0	0	0	0	DROPPER		
D2	1553.812	9856.870	1.027	150.121	24.566	1553.812	9856.871	1.028	150.123	24.565	2	-1	1	1	0	1	0	1	1	DROPPER		
D3	1546.764	9855.580	1.134	150.701	31.708	1546.765	9855.582	1.135	150.702	31.706	1	-2	1	-1	0	0	0	0	0	DROPPER		
D4	1538.877	9853.952	1.216	151.169	39.747	1538.877	9853.950	1.216	151.167	39.748	-2	1	0	-1	0	0	0	0	0	DROPPER		
D5	1526.016	9851.295	1.345	151.931	52.857	1526.015	9851.288	1.345	151.925	52.861	-6	4	0	-1	3	0	0	0	0	DROPPER		
E2	1552.840	9844.546	1.246	138.469	28.695	1552.834	9844.550	1.247	138.475	28.700	6	5	1	-1	1	0	-1	0	0	DROPPER		
E3	1548.571	9843.740	1.289	138.796	33.027	1548.570	9843.739	1.290	138.795	33.028	-1	1	1	-2	0	0	1	1	0	DROPPER		
E4	1540.756	9842.157	1.390	139.289	40.985	1540.756	9842.153	1.390	139.286	40.986	-3	1	0	-1	0	0	-1	0	0	DROPPER		
E5	1527.847	9839.583	1.384	140.145	54.120	1527.850	9839.580	1.383	140.141	54.118	-4	-2	-1	-1	1	0	1	0	0	DROPPER		
F2	1555.038	9832.754	1.136	126.510	29.623	1555.040	9832.756	1.138	126.512	29.621	2	-2	2	-2	-1	1	-1	1	0	DROPPER		
F3	1551.790	9832.09																				

H5	1531.495	9817.952	1.470	118.306	56.195	1531.494	9817.947	1.470	118.302	56.198	-4	3	0	1	1	0	DROPPER	
J2	1559.568	9818.075	0.881	111.159	29.047	1559.567	9818.074	0.882	111.159	29.048	0	1	1	-1	0	1	DROPPER	
J3	1554.939	9817.309	1.079	111.617	33.716	1554.940	9817.308	1.068	111.616	33.715	-1	-1	-11	-1	1	0	DROPPER	
J4	1547.055	9815.929	1.226	112.325	41.689	1547.055	9815.927	1.227	112.323	41.689	-2	0	1	-1	0	0	DROPPER	
J5	1532.242	9813.153	1.353	113.477	56.715	1532.238	9813.150	1.359	113.475	56.720	-2	5	6	-3	3	1	DROPPER	
K2	1560.810	9813.419	0.917	106.341	29.052	1560.810	9813.422	0.920	106.343	29.051	2	-1	3	2	3	0	DROPPER	
K3	1555.898	9812.483	1.024	106.708	34.039	1555.899	9812.481	1.027	106.706	34.039	-2	0	3	-1	0	0	DROPPER	
K4	1548.045	9811.005	1.217	107.312	42.007	1548.045	9811.003	1.219	107.310	42.008	-2	1	2	-2	0	1	DROPPER	
K5	1533.008	9808.326	1.499	108.617	57.225	1533.008	9808.324	1.501	108.615	57.226	-2	1	2	0	1	1	DROPPER	
L2	1562.235	9805.732	1.034	98.546	29.665	1562.236	9805.732	1.036	98.546	29.664	0	-1	2	0	2	2	DROPPER	
L3	1557.599	9804.225	1.533	98.291	34.534	1557.598	9804.227	1.534	98.293	34.534	2	0	1	-1	0	1	DROPPER	
L4	1549.266	9804.390	1.883	100.607	42.539	1549.269	9804.392	1.885	100.608	42.536	1	-3	2	3	-1	0	DROPPER	
L5	1539.867	9796.580	2.372	95.496	53.640	1539.864	9796.576	2.374	95.492	53.644	-4	4	2	-1	2	1	DROPPER	
M2	1567.229	9797.502	1.128	89.304	26.971	1567.231	9797.502	1.129	89.303	26.970	-1	-1	1	-1	1	0	DROPPER	
M3	1562.740	9795.048	1.310	88.095	31.943	1562.741	9795.046	1.311	88.094	31.942	-1	-1	1	-2	-2	1	DROPPER	
N2	1574.660	9787.139	1.183	77.371	22.476	1574.660	9787.139	1.183	77.372	22.476	1	0	0	0	-1	0	DROPPER	
N3	1570.165	9784.176	1.522	75.672	27.584	1570.168	9784.178	1.524	75.674	27.582	2	-2	2	0	0	1	DROPPER	
N4	1565.798	9781.330	1.898	74.054	32.539	1565.798	9781.332	1.899	74.056	32.539	2	0	1	-1	0	0	DROPPER	
P2	1581.542	9777.475	1.455	66.255	18.330	1581.544	9777.473	1.455	66.253	18.329	-2	-1	0	0	1	-1	DROPPER	
P3	1576.989	9774.754	1.717	64.806	23.431	1576.991	9774.753	1.718	64.804	23.430	-2	-1	1	-3	-1	0	DROPPER	
P4	1571.988	9771.816	2.000	63.262	29.022	1571.988	9771.814	1.997	63.260	29.024	-2	2	-3	0	1	0	DROPPER	
Q2	1585.673	9766.239	1.577	54.333	17.248	1585.675	9766.236	1.577	54.330	17.246	-3	-2	0	-1	-2	0	DROPPER	
Q4	1578.166	9762.768	2.034	52.923	25.398	1578.167	9762.767	2.035	52.922	25.397	-1	-1	1	1	0	0	DROPPER	
Q5	1579.366	9754.390	2.649	44.520	26.406	1579.366	9754.391	2.650	44.521	26.406	1	0	1	1	-1	0	DROPPER	
R2	1589.576	9754.944	1.351	42.413	16.401	1589.578	9754.943	1.337	42.412	16.399	-1	-2	-14	1	1	-17	DROPPER	
R4	1583.929	9752.637	1.857	41.645	22.452	1583.933	9752.637	1.857	41.645	22.449	0	-3	0	-3	-1	0	DROPPER	
R5	1579.688	9750.881	2.755	41.047	27.004	1579.687	9750.879	2.752	41.045	27.005	-2	1	-3	3	1	1	DROPPER	
S2	1594.850	9744.151	1.375	30.622	14.100	1594.853	9744.145	1.373	30.616	14.098	-6	-2	-2	-1	-1	-1	DROPPER	
S4	1589.588	9741.791	1.624	29.704	19.793	1589.589	9741.791	1.625	29.704	19.793	0	0	1	0	1	0	DROPPER	
S5	1582.877	9738.801	3.040	28.553	27.050	1582.879	9738.800	3.041	28.552	27.048	-1	-2	1	1	-1	0	DROPPER	
T2	1600.735	9729.732	1.387	15.171	12.148	1600.744	9729.736	1.391	15.173	12.137	2	-11	4	0	-5	1	DROPPER	
T4	1596.347	9727.482	1.647	14.134	16.968	1596.349	9727.483	1.648	14.134	16.967	0	-1	1	0	0	0	DROPPER	
T5	1587.615	9723.616	3.214	12.659	26.403	1587.616	9723.616	3.216	12.659	26.403	0	0	2	0	1	0	DROPPER	
												Max	6	6	6	4	3	2
												Min	-6	-11	-14	-3	-5	-17
												Average	-1	0	0	-0	0	0

Notes:

Max, Min & Average values are for monitoring droppers only
Coordinates are calculated from least squares adjustment.
Chainage & offset is relative to line approximately parrellel to river bank
Origin of Chainage & Offset Alignment: E 1 616.395, N 9 718.221
End of Chainage & Offset Alignment: E 1 556.687, N 9 940.384
Cross movement is positive away from the river bank in a westerly direction
Upstream movement is positive in an upstream (Northerly) direction
Movement shown is relative to first survey 3 August 2011
Design co-ordinate accuracy is +/- 3mm
Design elevation accuracy is +/- 2mm

Droppers Q5 and R5 were placed and first surveyed on 17 August 2011

28/03/2012 Dropper R2 appears to have been driven over by a vehicle possibly causing the difference in elevation.

CALOOTE LANDING
RIVER BANK MOVEMENT MONITORING

30-April-2012

Date of survey	30-Apr-12
Equipment	Set 59
Surveyed by:	NRG

References:
CALOOTE LANDING
A&S: A078911.0001

Point	First Survey 3 August 2011					Current Survey					Current Survey Comparisons			Point Description		
	Easting	Northing	Elevation	Chainage	Offset	Easting	Northing	Elevation	Chainage	Offset	Upstream (mm)	Cross (mm)	Up (mm)	Upstream (mm)	Cross (mm)	Up (mm)
131	1508.115	9799.819	2.927	106.842	83.471	1508.115	9799.816	2.925	106.839	83.473	-3	2	-2	0	0	0
132	1500.637	9833.245	2.278	141.065	82.043	1500.638	9833.243	2.279	141.063	82.043	-2	0	1	2	-2	0
133	1504.001	9846.581	1.847	153.075	75.343	1504.000	9846.580	1.847	153.074	75.344	-1	1	0	0	0	0
134	1489.782	9879.980	2.431	189.017	80.433	1489.781	9879.978	2.433	189.015	80.434	-2	1	2	1	0	2
135	1498.839	9915.830	2.281	221.301	62.406	1498.834	9915.829	2.283	221.301	62.410	0	4	2	1	0	1
136	1554.785	9795.230	2.404	90.331	39.579	1554.787	9795.230	2.404	90.330	39.578	-1	-1	0	-1	1	0
137	1569.940	9765.261	3.986	57.460	32.698	1569.941	9765.262	3.986	57.461	32.696	1	-2	0	0	0	-1
BG1	1542.590	9794.500	4.839	92.781	51.548	1542.591	9794.498	4.841	92.780	51.548	-1	0	2	1	1	0
BG2	1551.302	9786.479	5.052	82.779	45.209	1551.303	9786.480	5.053	82.780	45.208	1	-1	1	1	1	0
BG3	1555.157	9787.556	4.693	82.822	41.206	1555.159	9787.557	4.694	82.822	41.204	0	-2	1	1	0	0
BG4	1558.738	9784.274	4.641	78.725	38.597	1558.740	9784.274	4.642	78.724	38.595	-1	-2	1	-1	0	0
BG5	1559.997	9777.278	4.690	71.641	39.191	1559.997	9777.279	4.691	71.643	39.192	2	1	1	2	1	0
BG6	1573.381	9758.655	4.299	50.189	31.084	1573.381	9758.654	4.299	50.188	31.084	-1	0	0	0	0	0
BG7	1578.193	9750.878	4.322	41.431	28.448	1578.194	9750.879	4.320	41.432	28.448	1	0	-2	2	0	-1
A3	1535.519	9890.493	0.809	187.334	33.533	1535.519	9890.494	0.808	187.334	33.533	0	0	-1	0	0	0
A4	1528.942	9889.377	0.918	187.958	40.175	1528.942	9889.377	0.920	187.958	40.175	0	0	2	-2	-2	2
A5	1520.236	9887.828	1.037	188.715	48.986	1520.234	9887.828	1.038	188.716	48.987	1	1	1	-3	1	0
B2	1548.889	9879.599	0.884	173.351	23.438	1548.892	9879.602	0.884	173.353	23.435	2	-3	0	0	1	1
B3	1541.935	9878.666	0.855	174.250	30.397	1541.935	9878.668	0.857	174.251	30.397	1	0	2	-1	0	2
B4	1534.095	9877.415	0.949	175.070	38.294	1534.094	9877.414	0.950	175.070	38.295	0	1	1	0	-1	1
B5	1522.149	9875.439	1.138	176.253	50.344	1522.147	9875.439	1.139	176.254	50.345	1	1	1	0	-2	1
C2	1550.228	9869.364	1.075	163.117	24.794	1550.232	9869.361	1.074	163.114	24.791	-3	-3	-1	0	-2	0
C3	1544.058	9867.349	1.051	162.768	31.276	1544.057	9867.349	1.054	162.769	31.277	1	1	3	1	1	1
C4	1536.208	9865.947	1.111	163.446	39.221	1536.205	9865.947	1.113	163.446	39.224	0	3	2	-1	-2	1
C5	1523.966	9863.735	1.218	164.478	51.619	1523.959	9863.733	1.219	164.478	51.625	0	6	1	1	0	1
D2	1553.812	9856.870	1.027	150.121	24.566	1553.813	9856.871	1.028	150.123	24.565	2	-1	1	0	0	0
D3	1546.764	9855.580	1.134	150.701	31.708	1546.762	9855.582	1.136	150.703	31.709	2	1	2	1	3	1
D4	1538.877	9853.952	1.216	151.169	39.747	1538.877	9853.951	1.217	151.168	39.748	-1	1	1	1	0	1
D5	1526.016	9851.295	1.345	151.931	52.857	1526.014	9851.290	1.345	151.926	52.861	-5	4	0	1	0	0
E2	1552.840	9844.546	1.246	138.469	28.695	1552.836	9844.552	1.248	138.476	28.696	7	1	2	1	-4	1
E3	1548.571	9843.740	1.289	138.796	33.027	1548.571	9843.741	1.291	138.796	33.027	0	0	2	1	-1	1
E4	1540.756	9842.157	1.390	139.289	40.985	1540.755	9842.154	1.391	139.287	40.986	-2	1	1	1	0	1
E5	1527.847	9839.583	1.384	140.145	54.120	1527.851	9839.581	1.383	140.142	54.117	-3	-3	-1	1	-1	0
F2	1555.038	9832.754	1.136	126.510	29.623	1555.041	9832.756	1.139	126.512	29.620	2	-3	3	0	-1	1
F3	1551.790	9832.093	1.371	126.712	32.931	1551.790	9832.093	1.373	126.712	32.932	0	1	2	3	0	1
F4	1543.948	9830.501	1.409	127.204	40.918	1543.944	9830.500	1.411	127.205	40.923	1	5	2	0	-1	1
F5	1529.849	9827.702	1.451	128.150	55.262	1529.850	9827.701	1.451	128.149	55.261	-1	-1	0	1	0	0
G2	1557.617	9828.377	1.023	121.615	28.265	1557.620	9828.381	1.024	121.618	28.262	3	-3	1	-1	-2	1
G3	1552.803	9827.380	1.289	121.898	33.173	1552.804	9827.379	1.291	121.897	33.172	-1	-1	2	0	-1	2
G4	1545.016	9825.784	1.384	122.372	41.108	1545.015	9825.783	1.385	122.371	41.109	-1	1	1	1	-1	0
G5	1530.648	9822.879	1.470	123.285	55											

H5	1531.495	9817.952	1.470	118.306	56.195	1531.495	9817.948	1.470	118.303	56.197	-3	2	0	1	-1	0	DROPPER	
J2	1559.568	9818.075	0.881	111.159	29.047	1559.568	9818.075	0.882	111.159	29.047	0	0	1	0	-1	0	DROPPER	
J3	1554.939	9817.309	1.079	111.617	33.716	1554.941	9817.310	1.069	111.618	33.714	1	-2	-10	2	-1	1	DROPPER	
J4	1547.055	9815.929	1.226	112.325	41.689	1547.055	9815.928	1.227	112.324	41.689	-1	0	1	1	0	0	DROPPER	
J5	1532.242	9813.153	1.353	113.477	56.715	1532.241	9813.152	1.358	113.477	56.716	0	1	5	2	-4	-1	DROPPER	
K2	1560.810	9813.419	0.917	106.341	29.052	1560.812	9813.424	0.921	106.345	29.049	4	-3	4	2	-2	1	DROPPER	
K3	1555.898	9812.483	1.024	106.708	34.039	1555.899	9812.483	1.028	106.707	34.038	-1	-1	4	1	-1	1	DROPPER	
K4	1548.045	9811.005	1.217	107.312	42.007	1548.045	9811.004	1.219	107.312	42.008	0	1	2	2	0	0	DROPPER	
K5	1533.008	9808.326	1.499	108.617	57.225	1533.008	9808.325	1.501	108.615	57.225	-2	0	2	0	-1	0	DROPPER	
L2	1562.235	9805.732	1.034	98.546	29.665	1562.237	9805.731	1.037	98.545	29.663	-1	-2	3	-1	-1	1	DROPPER	
L3	1557.599	9804.225	1.533	98.291	34.534	1557.598	9804.227	1.534	98.293	34.533	2	-1	1	0	-1	0	DROPPER	
L4	1549.266	9804.390	1.883	100.607	42.539	1549.268	9804.391	1.885	100.607	42.537	0	-2	2	-1	1	0	DROPPER	
L5	1539.867	9796.580	2.372	95.496	53.640	1539.866	9796.578	2.373	95.494	53.641	-2	1	1	2	-3	-1	DROPPER	
M2	1567.229	9797.502	1.128	89.304	26.971	1567.230	9797.506	1.130	89.308	26.970	4	-1	2	5	0	1	DROPPER	
M3	1562.740	9795.048	1.310	88.095	31.943	1562.739	9795.049	1.311	88.097	31.943	2	0	1	3	1	0	DROPPER	
N2	1574.660	9787.139	1.183	77.371	22.476	1574.659	9787.141	1.184	77.373	22.476	2	0	1	1	0	1	DROPPER	
N3	1570.165	9784.176	1.522	75.672	27.584	1570.167	9784.178	1.524	75.674	27.583	2	-1	2	0	1	0	DROPPER	
N4	1565.798	9781.330	1.898	74.054	32.539	1565.798	9781.328	1.899	74.052	32.540	-2	1	1	-4	1	0	DROPPER	
P2	1581.542	9777.475	1.455	66.255	18.330	1581.544	9777.474	1.456	66.254	18.328	-1	-2	1	1	-1	1	DROPPER	
P3	1576.989	9774.754	1.717	64.806	23.431	1576.991	9774.755	1.718	64.805	23.430	-1	-1	1	1	0	0	DROPPER	
P4	1571.988	9771.816	2.000	63.262	29.022	1571.989	9771.815	1.997	63.261	29.022	-1	0	-3	1	-2	0	DROPPER	
Q2	1585.673	9766.239	1.577	54.333	17.248	1585.676	9766.237	1.577	54.330	17.246	-3	-2	0	0	0	0	DROPPER	
Q4	1578.166	9762.768	2.034	52.923	25.398	1578.167	9762.766	2.035	52.921	25.396	-2	-2	1	-1	-1	0	DROPPER	
Q5	1579.366	9754.390	2.649	44.520	26.406	1579.367	9754.388	2.650	44.518	26.406	-2	0	1	-3	0	0	DROPPER	
R2	1589.576	9754.944	1.351	42.413	16.401	1589.577	9754.945	1.338	42.414	16.400	1	-1	-13	2	1	1	DROPPER	
R4	1583.929	9752.637	1.857	41.645	22.452	1583.930	9752.639	1.858	41.647	22.451	2	-1	1	2	2	1	DROPPER	
R5	1579.688	9750.881	2.755	41.047	27.004	1579.690	9750.876	2.752	41.042	27.003	-5	-1	-3	-3	-2	0	DROPPER	
S2	1594.850	9744.151	1.375	30.622	14.100	1594.852	9744.147	1.374	30.617	14.099	-5	-1	-1	1	1	1	DROPPER	
S4	1589.588	9741.791	1.624	29.704	19.793	1589.589	9741.790	1.625	29.704	19.793	0	0	1	0	0	0	DROPPER	
S5	1582.877	9738.801	3.040	28.553	27.050	1582.879	9738.798	3.041	28.550	27.049	-3	-1	1	-2	1	0	DROPPER	
T2	1600.735	9729.732	1.387	15.171	12.148	1600.742	9729.736	1.391	15.174	12.140	3	-8	4	1	3	0	DROPPER	
T4	1596.347	9727.482	1.647	14.134	16.968	1596.349	9727.483	1.648	14.134	16.966	0	-2	1	0	-1	0	DROPPER	
T5	1587.615	9723.616	3.214	12.659	26.403	1587.615	9723.616	3.215	12.660	26.403	1	0	1	1	0	-1	DROPPER	
											Max	7	6	5	5	3	2	
											Min	-5	-8	-13	-4	-4	-1	
											Average	-0	-0	1	0	-0	0	

Notes:

Max, Min & Average values are for monitoring droppers only
Coordinates are calculated from least squares adjustment.
Chainage & offset is relative to line approximately parallel to river bank
Origin of Chainage & Offset Alignment: E 1 616.395, N 9 718.221
End of Chainage & Offset Alignment: E 1 556.687, N 9 940.384
Cross movement is positive away from the river bank in a westerly direction
Upstream movement is positive in an upstream (Northerly) direction
Movement shown is relative to first survey 3 August 2011
Design co-ordinate accuracy is +,- 3mm
Design elevation accuracy is +,- 2mm

Droppers Q5 and R5 were placed and first surveyed on 17 August 2011

28/03/2012 Dropper R2 appears to have been driven over by a vehicle possibly causing the difference in elevation.

CALOOTE LANDING
RIVER BANK MOVEMENT MONITORING

01-June-2012

Date of survey	1-Jun-12
Equipment	Set 59
Surveyed by:	NRG

References:
CALOOTE LANDING
A&S: A078911.0001

Point	First Survey 3 August 2011					Current Survey				Upstream			Cross			Up			Current Survey Comparisons		
	Easting	Northing	Elevation	Chainage	Offset	Easting	Northing	Elevation	Chainage	Offset	(mm)	(mm)	(mm)	Upstream	Cross	Up	Upstream	Cross	Up		
131	1508.115	9799.819	2.927	106.842	83.471	1508.115	9799.816	2.925	106.839	83.473	-3	2	-2	0	0	0	0	0	0		
132	1500.637	9833.245	2.278	141.065	82.043	1500.637	9833.244	2.280	141.064	82.044	-1	1	2	1	1	1	1	1	1		
133	1504.001	9846.581	1.847	153.075	75.343	1504.000	9846.580	1.847	153.074	75.344	-1	1	0	0	0	0	0	0	0		
134	1489.782	9879.980	2.431	189.017	80.433	1489.781	9879.981	2.431	189.018	80.434	1	1	0	3	0	-2	0	0	-2		
135	1498.839	9915.830	2.281	221.301	62.406	1498.837	9915.830	2.282	221.302	62.408	1	2	1	1	1	-2	-1	-1	-1		
136	1554.785	9795.230	2.404	90.331	39.579	1554.787	9795.230	2.404	90.330	39.578	-1	-1	0	0	0	0	0	0	0		
137	1569.940	9765.261	3.986	57.460	32.698	1569.941	9765.262	3.987	57.461	32.696	1	-2	1	0	0	0	0	0	1		
BG1	1542.590	9794.500	4.839	92.781	51.548	1542.590	9794.499	4.841	92.780	51.548	-1	0	2	0	0	0	0	0	0		
BG2	1551.302	9786.479	5.052	82.779	45.209	1551.303	9786.480	5.054	82.780	45.207	1	-2	2	0	-1	1	0	-1	1		
BG3	1555.157	9787.556	4.693	82.822	41.206	1555.159	9787.556	4.695	82.821	41.204	-1	-2	2	-1	0	0	1	0	1		
BG4	1558.738	9784.274	4.641	78.725	38.597	1558.739	9784.274	4.642	78.724	38.596	-1	-1	1	0	1	0	1	0	0		
BG5	1559.997	9777.278	4.690	71.641	39.191	1559.997	9777.279	4.692	71.642	39.192	1	1	2	-1	0	0	1	0	1		
BG6	1573.381	9758.655	4.299	50.189	31.084	1573.381	9758.655	4.300	50.189	31.083	0	-1	1	1	-1	1	0	1	1		
BG7	1578.193	9750.878	4.322	41.431	28.448	1578.195	9750.879	4.322	41.431	28.447	0	-1	0	-1	-1	-1	2	0	0		
A3	1535.519	9890.493	0.809	187.334	33.533	1535.519	9890.494	0.808	187.334	33.533	0	0	-1	0	0	0	0	0	0		
A4	1528.942	9889.377	0.918	187.958	40.175	1528.942	9889.376	0.920	187.958	40.175	0	0	2	0	0	0	0	0	0		
A5	1520.236	9887.828	1.037	188.715	48.986	1520.235	9887.827	1.039	188.715	48.987	0	1	2	-1	0	0	1	0	1		
B2	1548.889	9879.599	0.884	173.351	23.438	1548.892	9879.602	0.885	173.352	23.434	1	-4	1	-1	-1	-1	1	0	1		
B3	1541.935	9878.666	0.855	174.250	30.397	1541.935	9878.667	0.858	174.251	30.396	1	-1	3	0	-1	1	0	-1	1		
B4	1534.095	9877.415	0.949	175.070	38.294	1534.094	9877.414	0.951	175.070	38.295	0	1	2	0	0	0	1	0	1		
B5	1522.149	9875.439	1.138	176.253	50.344	1522.147	9875.439	1.139	176.254	50.346	1	2	1	0	1	0	1	0	0		
C2	1550.228	9869.364	1.075	163.117	24.794	1550.231	9869.361	1.075	163.115	24.792	-2	-2	0	1	1	1	1	1	1		
C3	1544.058	9867.349	1.051	162.768	31.276	1544.057	9867.349	1.054	162.768	31.276	0	0	3	-1	-1	0	0	0	0		
C4	1536.208	9865.947	1.111	163.446	39.221	1536.203	9865.947	1.113	163.447	39.226	1	5	2	1	2	0	0	2	0		
C5	1523.966	9863.735	1.218	164.478	51.619	1523.959	9863.733	1.219	164.477	51.625	-1	6	1	-1	0	0	0	0	0		
D2	1553.812	9856.870	1.027	150.121	24.566	1553.814	9856.871	1.029	150.122	24.564	1	-2	2	-1	-1	1	0	0	1		
D3	1546.764	9855.580	1.134	150.701	31.708	1546.762	9855.582	1.137	150.702	31.709	1	1	3	-1	0	0	1	0	1		
D4	1538.877	9853.952	1.216	151.169	39.747	1538.876	9853.950	1.217	151.167	39.748	-2	1	1	-1	0	0	0	0	0		
D5	1526.016	9851.295	1.345	151.931	52.857	1526.015	9851.289	1.346	151.926	52.861	-5	4	1	0	0	0	1	0	1		
E2	1552.840	9844.546	1.246	138.469	28.695	1552.835	9844.551	1.249	138.475	28.698	6	3	3	-1	2	1	0	0	1		
E3	1548.571	9843.740	1.289	138.796	33.027	1548.569	9843.741	1.291	138.797	33.028	1	1	2	1	1	0	0	1	0		
E4	1540.756	9842.157	1.390	139.289	40.985	1540.756	9842.154	1.391	139.287	40.986	-2	1	1	0	0	0	0	0	0		
E5	1527.847	9839.583	1.384	140.145	54.120	1527.851	9839.582	1.384	140.142	54.116	-3	-4	0	0	0	-1	1	0	1		
F2	1555.038	9832.754	1.136	126.510	29.623	1555.040	9832.756	1.140	126.512	29.620	2	-3	4	0	0	0	1	0	1		
F3	1551.790	9832.093	1.371	126.712	32.931	1551.790	9832.091	1.374	126.711	32.932	-1	1	3	-1	0	0	1	0	1		
F4	1543.948	9830.501	1.409	127.204	40.918	1543.944	9830.501	1.412	127.205	40.922	1	4	3	0	0	-1	1</				

H4	1545.855	9820.959	1.292	117.494	41.547	1545.854	9820.958	1.295	117.493	41.548	-1	1	3	-1	1	1	DROPPER
H5	1531.495	9817.952	1.470	118.306	56.195	1531.494	9817.948	1.471	118.302	56.197	-4	2	1	-1	0	1	DROPPER
J2	1559.568	9818.075	0.881	111.159	29.047	1559.568	9818.075	0.883	111.159	29.047	0	0	2	0	0	1	DROPPER
J3	1554.939	9817.309	1.079	111.617	33.716	1554.940	9817.309	1.070	111.617	33.715	0	-1	-9	-1	1	1	DROPPER
J4	1547.055	9815.929	1.226	112.325	41.689	1547.055	9815.929	1.228	112.324	41.689	-1	0	2	0	0	1	DROPPER
J5	1532.242	9813.153	1.353	113.477	56.715	1532.241	9813.153	1.360	113.477	56.716	0	1	7	0	0	2	DROPPER
K2	1560.810	9813.419	0.917	106.341	29.052	1560.812	9813.424	0.922	106.345	29.049	4	-3	5	0	0	1	DROPPER
K3	1555.898	9812.483	1.024	106.708	34.039	1555.897	9812.481	1.029	106.706	34.041	-2	2	5	-1	3	1	DROPPER
K4	1548.045	9811.005	1.217	107.312	42.007	1548.045	9811.004	1.220	107.311	42.007	-1	0	3	-1	-1	1	DROPPER
K5	1533.008	9808.326	1.499	108.617	57.225	1533.008	9808.324	1.503	108.615	57.225	-2	0	4	0	0	2	DROPPER
L2	1562.235	9805.732	1.034	98.546	29.665	1562.238	9805.729	1.038	98.542	29.663	-4	-2	4	-3	0	1	DROPPER
L3	1557.599	9804.225	1.533	98.291	34.534	1557.598	9804.228	1.535	98.294	34.534	3	0	2	1	1	1	DROPPER
L4	1549.266	9804.390	1.883	100.607	42.539	1549.269	9804.391	1.886	100.607	42.537	0	-2	3	0	0	1	DROPPER
L5	1539.867	9796.580	2.372	95.496	53.640	1539.866	9796.578	2.373	95.494	53.641	-2	1	1	0	0	0	DROPPER
M2	1567.229	9797.502	1.128	89.304	26.971	1567.231	9797.502	1.130	89.304	26.969	0	-2	2	-4	-1	0	DROPPER
M3	1562.740	9795.048	1.310	88.095	31.943	1562.739	9795.049	1.312	88.098	31.944	3	1	2	1	1	1	DROPPER
N2	1574.660	9787.139	1.183	77.371	22.476	1574.659	9787.141	1.184	77.373	22.476	2	0	1	0	0	0	DROPPER
N3	1570.165	9784.176	1.522	75.672	27.584	1570.166	9784.179	1.525	75.675	27.583	3	-1	3	1	0	1	DROPPER
N4	1565.798	9781.330	1.898	74.054	32.539	1565.797	9781.333	1.900	74.057	32.540	3	1	2	5	0	1	DROPPER
P2	1581.542	9777.475	1.455	66.255	18.330	1581.544	9777.474	1.456	66.254	18.327	-1	-3	1	0	-1	0	DROPPER
P3	1576.989	9774.754	1.717	64.806	23.431	1576.990	9774.755	1.718	64.806	23.431	0	0	1	1	1	0	DROPPER
P4	1571.988	9771.816	2.000	63.262	29.022	1571.988	9771.814	1.998	63.260	29.023	-2	1	-2	-1	1	1	DROPPER
Q2	1585.673	9766.239	1.577	54.333	17.248	1585.675	9766.238	1.578	54.331	17.245	-2	-3	1	1	-1	1	DROPPER
Q4	1578.166	9762.768	2.034	52.923	25.398	1578.167	9762.768	2.035	52.923	25.396	0	-2	1	2	0	0	DROPPER
Q5	1579.366	9754.390	2.649	44.520	26.406	1579.368	9754.390	2.650	44.520	26.405	0	-1	1	2	-1	0	DROPPER
R2	1589.576	9754.944	1.351	42.413	16.401	1589.578	9754.945	1.337	42.413	16.398	0	-3	-14	-1	-2	-1	DROPPER
R4	1583.929	9752.637	1.857	41.645	22.452	1583.932	9752.640	1.858	41.648	22.449	3	-3	1	1	-2	0	DROPPER
R5	1579.688	9750.881	2.755	41.047	27.004	1579.689	9750.876	2.751	41.042	27.004	-5	0	-4	0	1	-1	DROPPER
S2	1594.850	9744.151	1.375	30.622	14.100	1594.854	9744.147	1.374	30.617	14.098	-5	-2	-1	0	-1	0	DROPPER
S4	1589.588	9741.791	1.624	29.704	19.793	1589.590	9741.791	1.626	29.704	19.791	0	-2	2	0	-2	1	DROPPER
S5	1582.877	9738.801	3.040	28.553	27.050	1582.879	9738.799	3.041	28.551	27.048	-2	-2	1	1	-1	0	DROPPER
T2	1600.735	9729.732	1.387	15.171	12.148	1600.743	9729.737	1.391	15.174	12.138	3	-10	4	0	-2	0	DROPPER
T4	1596.347	9727.482	1.647	14.134	16.968	1596.350	9727.484	1.649	14.135	16.965	1	-3	2	1	-1	1	DROPPER
T5	1587.615	9723.616	3.214	12.659	26.403	1587.617	9723.616	3.216	12.659	26.402	0	-1	2	-1	-1	1	DROPPER

Max 6 6 7 5 3 2
 Min -5 -10 -14 -4 -2 -1
 Average -0 -0 2 -0 -0 1

Notes:

Max, Min & Average values are for monitoring droppers only

Coordinates are calculated from least squares adjustment.

Chainage & offset is relative to line approximately parallel to river bank

Origin of Chainage & Offset Alignment: E 1 616.395, N 9 718.221

End of Chainage & Offset Alignment: E 1 556.687, N 9 940.384

Cross movement is positive away from the river bank in a westerly direction

Upstream movement is positive in an upstream (Northerly) direction

Movement shown is relative to first survey 3 August 2011

Design co-ordinate accuracy is +, - 3mm

Design elevation accuracy is +, - 2mm

Droppers Q5 and R5 were placed and first surveyed on 17 August 2011

28/03/2012 Dropper R2 appears to have been driven over by a vehicle possibly causing the difference in elevation.

1/06/2012 A3 under water - not surveyed

CALOOTE LANDING

RIVER BANK MOVEMENT MONITORING

27-July-2012

Date of survey	27-Jul-12
Equipment	Set 59
Surveyed by:	NRG

References:
 CALOOTE LANDING
 A&S: A078911.0001

Point	First Survey 3 August 2011					Current Survey					Current Survey Comparisons			Point Description		
	Easting	Northing	Elevation	Chainage	Offset	Easting	Northing	Elevation	Chainage	Offset	Upstream (mm)	Cross (mm)	Up (mm)	Upstream (mm)	Cross (mm)	Up (mm)
131																
132	1500.637	9833.245	2.278	141.065	82.043	1500.637	9833.244	2.279	141.063	82.044	-2	1	1	-1	-0	-1
133	1504.001	9846.581	1.847	153.075	75.343	1504.000	9846.580	1.848	153.075	75.344	-0	1	1	1	0	1
134	1489.782	9879.980	2.431	189.017	80.433	1489.782	9879.977	2.432	189.014	80.433	-3	0	1	-4	-1	1
135	1498.839	9915.830	2.281	221.301	62.406	1498.837	9915.829	2.282	221.300	62.409	-1	2	1	-2	0	0
136	1554.785	9795.230	2.404	90.331	39.579	1554.787	9795.230	2.404	90.330	39.578	-1	-1	0	0	-0	0
137	1569.940	9765.261	3.986	57.460	32.698	1569.942	9765.262	3.987	57.461	32.696	1	-2	0	-0	-0	-1
BG1	1542.590	9794.500	4.839	92.781	51.548	1542.591	9794.498	4.841	92.780	51.548	-1	-0	2	-0	-0	-0
BG2	1551.302	9786.479	5.052	82.779	45.209	1551.304	9786.480	5.053	82.780	45.207	1	-2	1	-0	0	-1
BG3	1555.157	9787.556	4.693	82.822	41.206	1555.160	9787.556	4.694	82.821	41.204	-1	-2	1	-0	0	-1
BG4	1558.738	9784.274	4.641	78.725	38.597	1558.740	9784.273	4.642	78.724	38.596	-1	-2	1	-0	-0	0
BG5	1559.997	9777.278	4.690	71.641	39.191	1559.998	9777.279	4.691	71.642	39.190	0	-1	1	-1	-2	-1
BG6	1573.381	9758.655	4.299	50.189	31.084	1573.382	9758.655	4.300	50.188	31.083	-1	-1	1	-1	-0	-0
BG7	1578.193	9750.878	4.322	41.431	28.448	1578.195	9750.877	4.322	41.430	28.446	-1	-2	0	-1	-1	0
A3	1535.519	9890.493	0.809	187.334	33.533	1535.519	9890.494	0.808	187.334	33.533	0	0	-1	0	0	0
A4	1528.942	9889.377	0.918	187.958	40.175	1528.941	9889.376	0.920	187.957	40.176	-1	1	2	-1	1	-0
A5	1520.236	9887.828	1.037	188.715	48.986	1520.234	9887.827	1.038	188.715	48.988	-0	2	1	-0	1	-1
B2	1548.889	9879.599	0.884	173.351	23.438	1548.892	9879.602	0.885	173.352	23.434	1	-4	1	0	0	0
B3	1541.935	9878.666	0.855	174.250	30.397	1541.935	9878.667	0.858	174.251	30.396	1	-1	3	0	0	0
B4	1534.095	9877.415	0.949	175.070	38.294	1534.093	9877.414	0.950	175.069	38.296	-1	2	1	-1	0	-1
B5	1522.149	9875.439	1.138	176.253	50.344	1522.147	9875.439	1.138	176.254	50.346	1	2	0	-0	-0	-1
C2	1550.228	9869.364	1.075	163.117	24.794	1550.233	9869.362	1.075	163.114	24.790	-3	-4	-0	-1	-2	-0
C3	1544.058	9867.349	1.051	162.768	31.276	1544.057	9867.348	1.054	162.768	31.277	0	1	3	0	1	-0
C4	1536.208	9865.947	1.111	163.446	39.221	1536.202	9865.947	1.112	163.447	39.226	1	5	1	0	0	-1
C5	1523.966	9863.735	1.218	164.478	51.619	1523.959	9863.732	1.218	164.477	51.625	-1	6	0	-0	0	-1
D2	1553.812	9856.870	1.027	150.121	24.566	1553.812	9856.870	1.029	150.122	24.566	1	0	2	0	2	-0
D3	1546.764	9855.580	1.134	150.701	31.708	1546.765	9855.583	1.136	150.703	31.706	2	-2	2	1	-3	-1
D4	1538.877	9853.952	1.216	151.169	39.747	1538.876	9853.950	1.216	151.167	39.749	-2	2	0	0	1	-1
D5	1526.016	9851.295	1.345	151.931	52.857	1526.016	9851.289	1.344	151.925	52.859	-6	2	-1	-1	-2	-2
E2	1552.840	9844.546	1.246	138.469	28.695	1552.833	9844.551	1.248	138.476	28.700	7	5	2	1	2	-1
E3	1548.571	9843.740	1.289	138.796	33.027	1548.570	9843.740	1.291	138.796	33.028	0	1	2	-1	-0	-0
E4	1540.756	9842.157	1.390	139.289	40.985	1540.755	9842.154	1.390	139.286	40.987	-3	2	0	-1	1	-1
E5	1527.847	9839.583	1.384	140.145	54.120	1527.852	9839.582	1.383	140.142	54.116	-3	-4	-1	-0	0	-1
F2	1555.038	9832.754	1.136	126.510	29.623	1555.039	9832.757	1.139	126.513	29.621	3	-2	3	1	1	-1
F3	1551.790	9832.093	1.371	126.712	32.931	1551.791	9832.091	1.373	126.711	32.932	-2	1	2	-1	-1	-1
F4	1543.948	9830.501	1.409	127.204	40.918	1543.945	9830.501	1.411	127.205	40.922	1	4	2	0	0	-1
F5	1529.849	9827.702	1.451	128.150	55.262	1529.851	9827.701	1.452	128.149	55.260	-1	-2	0	-0	-1	-2
G2	1557.617	9828.377	1.023	121.615	28.265	1557.617	9828.380	1.024	121.618	28.264	3	-1	1	1	1	-1
G3	1552.803	9827.380	1.289	121.898	33.173	1552.804	9827.379	1.290	121.897	33.173	-1	-1	1	-1	-1	-2
G4	1545.016	9825.784	1.384	122.372	41.108	1545.016	9825.783	1.385	122.371	41.108	-1	0	1	-1	-1	-1
G5	1530.648	9822.879	1.470	123.285	55.738	1530.647	9822.876	1.470	123.282	55.740	-3	2	0	-0	-1	-1
H2	1558.902	9823.324	0.935	116.402	28.332	1558.905	9823.325	0.938	116.402	28.329	-0	-3	3	-0	0	-0
H3	1553.793	9822.356	1.121	116.788	33.517	1553.793	9822.354	1.124	116.787	33.518	-1	1	3	-1	-0	-1
H4	1545.855	9820.959	1.292	117.494	41.547	1545.854	9820.959	1.294	117.494	41.547	-0	0	2	1	-1	-1
H5	1531.495	9817.952	1.470	118.306	56.195	1531.495	9817.949	1.470	118.303	56.197	-3	2	0	1	-1	-1

J2	1559.568	9818.075	0.881	111.159	29.047	1559.568	9818.075	0.882	111.159	29.047	-0	-0	1	-0	-0	-1
J3	1554.939	9817.309	1.079	111.617	33.716	1554.942	9817.303	1.069	111.611	33.715	-6	-1	-10	-6	0	-1
J4	1547.055	9815.929	1.226	112.325	41.689	1547.056	9815.929	1.228	112.324	41.689	-1	-0	2	0	-0	-0
J5	1532.242	9813.153	1.353	113.477	56.715	1532.242	9813.152	1.360	113.476	56.716	-1	1	7	-1	-0	-0
K2	1560.810	9813.419	0.917	106.341	29.052	1560.813	9813.424	0.922	106.344	29.048	3	-4	5	-1	-1	-0
K3	1555.898	9812.483	1.024	106.708	34.039	1555.899	9812.482	1.028	106.706	34.039	-2	-0	4	-0	-2	-1
K4	1548.045	9811.005	1.217	107.312	42.007	1548.046	9811.003	1.219	107.311	42.007	-1	-0	2	-0	-0	-1
K5	1533.008	9808.326	1.499	108.617	57.225	1533.008	9808.325	1.501	108.616	57.225	-2	0	2	1	0	-2
L2	1562.235	9805.732	1.034	98.546	29.665	1562.238	9805.731	1.037	98.545	29.663	-1	-2	3	3	-0	-1
L3	1557.599	9804.225	1.533	98.291	34.534	1557.599	9804.227	1.534	98.293	34.533	2	-1	1	-1	-1	-1
L4	1549.266	9804.390	1.883	100.607	42.539	1549.269	9804.390	1.885	100.606	42.537	-1	-3	2	-1	-1	-1
L5	1539.867	9796.580	2.372	95.496	53.640	1539.867	9796.578	2.373	95.494	53.641	-2	1	1	0	-0	0
M2	1567.229	9797.502	1.128	89.304	26.971	1567.232	9797.501	1.129	89.303	26.969	-1	-2	1	-1	0	-1
M3	1562.740	9795.048	1.310	88.095	31.943	1562.739	9795.049	1.311	88.097	31.944	2	1	1	-1	-0	-1
N2	1574.660	9787.139	1.183	77.371	22.476	1574.659	9787.140	1.184	77.372	22.477	1	1	1	-1	1	-0
N3	1570.165	9784.176	1.522	75.672	27.584	1570.167	9784.177	1.524	75.673	27.582	1	-2	2	-2	-1	-1
N4	1565.798	9781.330	1.898	74.054	32.539	1565.796	9781.334	1.899	74.058	32.540	4	1	1	1	0	-1
P2	1581.542	9777.475	1.455	66.255	18.330	1581.544	9777.474	1.456	66.253	18.328	-2	-2	1	-1	1	-0
P3	1576.989	9774.754	1.717	64.806	23.431	1576.988	9774.755	1.718	64.807	23.432	1	1	1	1	1	0
P4	1571.988	9771.816	2.000	63.262	29.022	1571.988	9771.812	1.997	63.258	29.024	-4	2	-3	-2	1	-1
Q2	1585.673	9766.239	1.577	54.333	17.248	1585.675	9766.238	1.577	54.332	17.246	-1	-2	-0	1	1	-1
Q4	1578.166	9762.768	2.034	52.923	25.398	1578.168	9762.766	2.035	52.921	25.396	-2	-2	1	-2	0	0
Q5	1579.366	9754.390	2.649	44.520	26.406	1579.367	9754.390	2.649	44.520	26.406	0	-0	0	0	0	-1
R2	1589.576	9754.944	1.351	42.413	16.401	1589.578	9754.947	1.337	42.415	16.399	2	-2	-14	2	1	0
R4	1583.929	9752.637	1.857	41.645	22.452	1583.933	9752.640	1.858	41.647	22.448	2	-4	0	-1	-1	-1
R5	1579.688	9750.881	2.755	41.047	27.004	1579.689	9750.878	2.751	41.044	27.003	-3	-1	-4	2	-1	0
S2	1594.850	9744.151	1.375	30.622	14.100	1594.854	9744.146	1.373	30.616	14.097	-6	-3	-2	-1	-1	-1
S4	1589.588	9741.791	1.624	29.704	19.793	1589.591	9741.791	1.625	29.704	19.791	0	-2	1	0	-0	-1
S5	1582.877	9738.801	3.040	28.553	27.050	1582.879	9738.799	3.041	28.551	27.048	-2	-2	1	-0	0	0
T2	1600.735	9729.732	1.387	15.171	12.148	1600.744	9729.736	1.391	15.173	12.138	2	-11	4	-1	-1	-0
T4	1596.347	9727.482	1.647	14.134	16.968	1596.350	9727.483	1.648	14.134	16.965	-0	-3	1	-1	0	-1
T5	1587.615	9723.616	3.214	12.659	26.403	1587.617	9723.615	3.216	12.659	26.401	-1	-2	2	-1	-1	0

Max	7	6	7	3	2	1
Min	-6	-11	-14	-6	-3	-2
Average	-1	-0	1	-0	-0	-1

Notes:

Max, Min & Average values are for monitoring droppers only
Coordinates are calculated from least squares adjustment.
Chainage & offset is relative to line approximately parallel to river bank
Origin of Chainage & Offset Alignment: E 1 616.395, N 9 718.221
End of Chainage & Offset Alignment: E 1 556.687, N 9 940.384
Cross movement is positive away from the river bank in a westerly direction
Upstream movement is positive in an upstream (Northerly) direction
Movement shown is relative to first survey 3 August 2011
Design co-ordinate accuracy is +/- 3mm
Design elevation accuracy is +/- 2mm
Droppers Q5 and R5 were placed and first surveyed on 17 August 2011
28/03/2012 Dropper R2 appears to have been driven over by a vehicle possibly causing the difference in elevation.
1/06/2012 A3 under water - not surveyed
2/07/2012 Substantial drop in pool level since 1/6/12
27/07/2012 131 - not surveyed obscured
A3,B2,B3 under water - not surveyed

CALOOTE LANDING

RIVER BANK MOVEMENT MONITORING

31-August-2012

Date of survey	31-Aug-12
Equipment	Set 59
Surveyed by:	NRG

References:
 CALOOTE LANDING
 A&S: A078911.0001

Point	First Survey 3 August 2011					Current Survey					Current Survey Comparisons			Point Description		
	Easting	Northing	Elevation	Chainage	Offset	Easting	Northing	Elevation	Chainage	Offset	Upstream (mm)	Cross (mm)	Up (mm)	Upstream (mm)	Cross (mm)	Up (mm)
131																
132	1500.637	9833.245	2.278	141.065	82.043	1500.637	9833.245	2.279	141.065	82.043	-0	0	1	1	-0	-0
133	1504.001	9846.581	1.847	153.075	75.343	1504.000	9846.580	1.847	153.075	75.344	0	1	-0	0	-0	-1
134	1489.782	9879.980	2.431	189.017	80.433	1489.781	9879.980	2.432	189.017	80.434	-0	1	1	3	1	1
135	1498.839	9915.830	2.281	221.301	62.406	1498.837	9915.830	2.283	221.301	62.408	0	2	2	1	-0	1
136	1554.785	9795.230	2.404	90.331	39.579	1554.787	9795.231	2.404	90.331	39.578	-0	-1	0	0	0	0
137	1569.940	9765.261	3.986	57.460	32.698	1569.942	9765.263	3.987	57.462	32.696	2	-2	0	1	-0	0
BG1	1542.590	9794.500	4.839	92.781	51.548	1542.591	9794.499	4.841	92.780	51.548	-1	-0	1	1	-0	-0
BG2	1551.302	9786.479	5.052	82.779	45.209	1551.303	9786.480	5.053	82.780	45.207	1	-2	1	0	0	-0
BG3	1555.157	9787.556	4.693	82.822	41.206	1555.159	9787.556	4.694	82.822	41.205	-1	-2	1	1	1	-0
BG4	1558.738	9784.274	4.641	78.725	38.597	1558.738	9784.276	4.642	78.726	38.596	1	-1	1	3	1	-0
BG5	1559.997	9777.278	4.690	71.641	39.191	1559.997	9777.279	4.691	71.643	39.191	1	0	1	1	1	0
BG6	1573.381	9758.655	4.299	50.189	31.084	1573.382	9758.656	4.300	50.190	31.083	1	-2	1	1	-0	0
BG7	1578.193	9750.878	4.322	41.431	28.448	1578.194	9750.879	4.322	41.432	28.447	1	-1	0	1	1	0
A3	1535.519	9890.493	0.809	187.334	33.533	1535.519	9890.494	0.808	187.334	33.533	0	0	-1	0	0	0
A4	1528.942	9889.377	0.918	187.958	40.175	1528.944	9889.376	0.919	187.957	40.174	-1	-1	1	-1	-2	-1
A5	1520.236	9887.828	1.037	188.715	48.986	1520.235	9887.828	1.038	188.715	48.987	0	1	1	0	-1	-0
B2	1548.889	9879.599	0.884	173.351	23.438	1548.892	9879.602	0.885	173.352	23.434	1	-4	1	0	0	0
B3	1541.935	9878.666	0.855	174.250	30.397	1541.935	9878.667	0.858	174.251	30.396	1	-1	3	0	0	0
B4	1534.095	9877.415	0.949	175.070	38.294	1534.094	9877.414	0.950	175.069	38.295	-1	1	1	0	-1	-0
B5	1522.149	9875.439	1.138	176.253	50.344	1522.148	9875.440	1.138	176.254	50.344	1	0	-0	0	-2	-0
C2	1550.228	9869.364	1.075	163.117	24.794	1550.231	9869.362	1.075	163.115	24.791	-2	-3	-0	1	1	-0
C3	1544.058	9867.349	1.051	162.768	31.276	1544.057	9867.350	1.054	162.769	31.276	1	0	3	1	-1	-0
C4	1536.208	9865.947	1.111	163.446	39.221	1536.203	9865.947	1.112	163.447	39.226	1	5	1	0	-1	-0
C5	1523.966	9863.735	1.218	164.478	51.619	1523.960	9863.733	1.218	164.478	51.624	-1	5	-0	1	-1	-0
D2	1553.812	9856.870	1.027	150.121	24.566	1553.813	9856.871	1.029	150.123	24.565	2	-1	2	1	-1	0
D3	1546.764	9855.580	1.134	150.701	31.708	1546.764	9855.584	1.136	150.703	31.706	2	-2	2	0	0	-0
D4	1538.877	9853.952	1.216	151.169	39.747	1538.876	9853.951	1.216	151.168	39.748	-1	1	0	0	-1	0
D5	1526.016	9851.295	1.345	151.931	52.857	1526.015	9851.289	1.344	151.926	52.860	-5	3	-1	1	1	-0
E2	1552.840	9844.546	1.246	138.469	28.695	1552.835	9844.551	1.248	138.475	28.698	6	3	2	-0	-1	-0
E3	1548.571	9843.740	1.289	138.796	33.027	1548.570	9843.741	1.291	138.797	33.028	1	1	2	0	-0	-0
E4	1540.756	9842.157	1.390	139.289	40.985	1540.755	9842.154	1.390	139.287	40.986	-2	1	-0	0	-0	-0
E5	1527.847	9839.583	1.384	140.145	54.120	1527.851	9839.582	1.382	140.142	54.117	-3	-3	-2	1	0	-0
F2	1555.038	9832.754	1.136	126.510	29.623	1555.040	9832.757	1.139	126.513	29.621	3	-3	3	0	-1	0
F3	1551.790	9832.093	1.371	126.712	32.931	1551.790	9832.092	1.372	126.712	32.932	-0	1	1	1	0	-0
F4	1543.948	9830.501	1.409	127.204	40.918	1543.944	9830.501	1.411	127.206	40.922	2	4	2	0	0	-0
F5	1529.849	9827.702	1.451	128.150	55.262	1529.850	9827.701	1.451	128.149	55.260	-1	-2	0	0	0	-0
G2	1557.617	9828.377	1.023	121.615	28.265	1557.617	9828.381	1.023	121.619	28.264	4	-1	0	1	-0	-0
G3	1552.803	9827.380	1.289	121.898	33.173	1552.803	9827.380	1.290	121.898	33.173	0	-0	1	1	0	-0
G4	1545.016	9825.784	1.384	122.372	41.108	1545.015	9825.784	1.385	122.372	41.109	-0	1	1	1	0	0
G5	1530.648	9822.879	1.470	123.285	55.738	1530.647	9822.876	1.470	123.282	55.740	-3	2	-0	1	0	-0
H2	1558.902	9823.324	0.935	116.402	28.332	1558.904	9823.326	0.937	116.403	28.329	1	-3	2	1	0	-0
H3	1553.793	9822.356	1.121	116.788	33.517	1553.793	9822.356	1.125	116.789	33.517	1	0	4	2	-1	0
H4	1545.855	9820.959	1.292	117.494	41.547	1545.853	9820.959	1.294	117.494	41.548	0	1	2	0	1	0
H5	1531.495	9817.952	1.470	118.306	56.195	1531.495	9817.949	1.470	118.303	56.196	-3	1	-0	0	-0	-0

J2	1559.568	9818.075	0.881	111.159	29.047	1559.568	9818.075	0.882	111.159	29.047	-0	-0	1	0	0	0	DROPPER
J3	1554.939	9817.309	1.079	111.617	33.716	1554.941	9817.310	1.069	111.618	33.714	1	-2	-10	7	-1	-0	DROPPER
J4	1547.055	9815.929	1.226	112.325	41.689	1547.055	9815.930	1.228	112.326	41.689	1	0	2	1	1	0	DROPPER
J5	1532.242	9813.153	1.353	113.477	56.715	1532.242	9813.153	1.360	113.477	56.716	0	1	7	1	0	0	DROPPER
K2	1560.810	9813.419	0.917	106.341	29.052	1560.812	9813.425	0.921	106.345	29.049	4	-3	4	1	0	-0	DROPPER
K3	1555.898	9812.483	1.024	106.708	34.039	1555.899	9812.483	1.028	106.707	34.038	-1	-1	4	1	-0	0	DROPPER
K4	1548.045	9811.005	1.217	107.312	42.007	1548.045	9811.005	1.219	107.312	42.007	0	0	2	1	0	-0	DROPPER
K5	1533.008	9808.326	1.499	108.617	57.225	1533.009	9808.325	1.501	108.615	57.225	-2	-0	2	-0	-0	-0	DROPPER
L2	1562.235	9805.732	1.034	98.546	29.665	1562.237	9805.732	1.037	98.546	29.663	-0	-2	3	1	0	0	DROPPER
L3	1557.599	9804.225	1.533	98.291	34.534	1557.598	9804.228	1.534	98.293	34.533	2	-1	1	1	0	-0	DROPPER
L4	1549.266	9804.390	1.883	100.607	42.539	1549.269	9804.392	1.885	100.608	42.536	1	-3	2	2	-0	-0	DROPPER
L5	1539.867	9796.580	2.372	95.496	53.640	1539.867	9796.579	2.373	95.495	53.641	-1	1	1	1	-0	-0	DROPPER
M2	1567.229	9797.502	1.128	89.304	26.971	1567.231	9797.502	1.130	89.304	26.969	0	-2	2	1	0	1	DROPPER
M3	1562.740	9795.048	1.310	88.095	31.943	1562.739	9795.050	1.311	88.098	31.943	3	0	1	1	-0	-0	DROPPER
N2	1574.660	9787.139	1.183	77.371	22.476	1574.659	9787.141	1.184	77.374	22.477	3	1	0	2	0	-0	DROPPER
N3	1570.165	9784.176	1.522	75.672	27.584	1570.166	9784.179	1.524	75.675	27.583	3	-1	2	2	0	0	DROPPER
N4	1565.798	9781.330	1.898	74.054	32.539	1565.798	9781.333	1.899	74.057	32.539	3	0	1	-1	-1	-0	DROPPER
P2	1581.542	9777.475	1.455	66.255	18.330	1581.545	9777.475	1.456	66.255	18.327	-1	-3	1	1	-0	0	DROPPER
P3	1576.989	9774.754	1.717	64.806	23.431	1576.989	9774.756	1.718	64.808	23.431	2	-0	1	1	-1	0	DROPPER
P4	1571.988	9771.816	2.000	63.262	29.022	1571.988	9771.816	1.997	63.261	29.023	-1	1	-3	3	-1	-0	DROPPER
Q2	1585.673	9766.239	1.577	54.333	17.248	1585.675	9766.238	1.577	54.332	17.246	-2	-2	-0	-0	-0	0	DROPPER
Q4	1578.166	9762.768	2.034	52.923	25.398	1578.167	9762.768	2.035	52.923	25.397	0	-2	1	2	0	0	DROPPER
Q5	1579.366	9754.390	2.649	44.520	26.406	1579.366	9754.393	2.650	44.523	26.406	3	-0	1	3	0	1	DROPPER
R2	1589.576	9754.944	1.351	42.413	16.401	1589.578	9754.946	1.337	42.414	16.398	1	-3	-14	-1	-1	-0	DROPPER
R4	1583.929	9752.637	1.857	41.645	22.452	1583.932	9752.641	1.858	41.649	22.449	4	-3	1	2	0	0	DROPPER
R5	1579.688	9750.881	2.755	41.047	27.004	1579.688	9750.880	2.752	41.046	27.004	-1	-1	-3	2	0	0	DROPPER
S2	1594.850	9744.151	1.375	30.622	14.100	1594.853	9744.148	1.374	30.619	14.098	-3	-2	-1	2	0	0	DROPPER
S4	1589.588	9741.791	1.624	29.704	19.793	1589.590	9741.792	1.625	29.706	19.792	2	-2	1	2	1	0	DROPPER
S5	1582.877	9738.801	3.040	28.553	27.050	1582.879	9738.800	3.042	28.552	27.048	-1	-2	2	1	-1	1	DROPPER
T2	1600.735	9729.732	1.387	15.171	12.148	1600.744	9729.738	1.391	15.175	12.138	4	-11	4	2	0	0	DROPPER
T4	1596.347	9727.482	1.647	14.134	16.968	1596.349	9727.484	1.649	14.135	16.966	1	-2	2	2	0	0	DROPPER
T5	1587.615	9723.616	3.214	12.659	26.403	1587.616	9723.618	3.216	12.661	26.402	2	-1	2	2	0	0	DROPPER

Max	6	5	7	7	1	1
Min	-5	-11	-14	-1	-2	-1
Average	0	-1	1	1	-0	-0

Notes:

Max, Min & Average values are for monitoring droppers only

Coordinates are calculated from least squares adjustment.

Chainage & offset is relative to line approximately parallel to river bank

Origin of Chainage & Offset Alignment: E 1 616.395, N 9 718.221

End of Chainage & Offset Alignment: E 1 556.687, N 9 940.384

Cross movement is positive away from the river bank in a westerly direction

Upstream movement is positive in an upstream (Northerly) direction

Movement shown is relative to first survey 3 August 2011

Design co-ordinate accuracy is +/- 3mm

Design elevation accuracy is +/- 2mm

Droppers Q5 and R5 were placed and first surveyed on 17 August 2011**28/03/2012 Dropper R2 appears to have been driven over by a vehicle possibly causing the difference in elevation.****1/06/2012 A3 under water - not surveyed****2/07/2012 Substantial drop in pool level since 1/6/12****27/07/2012 131 - not surveyed obscured****A3,B2,B3 under water - not surveyed****31/08/2012 131 - not surveyed obscured****A3,B2,B3 under water - not surveyed**



Appendix B Golder Associates Pty Ltd Report

21 September 2011

Document No. 107662007-020-L-Rev0

Mr Richard Brown
Department for Water
25 Grenfell Street
ADELAIDE SA 5000

RIVERBANK COLLAPSE HAZARD, LOWER REACHES RIVER MURRAY STABILITY RISK MANAGEMENT, CALOOTE LANDING

Dear Richard

Introduction

The South Australian Department for Water (DfW) has requested that Golder Associates Pty Ltd (Golder Associates) review data from survey monitoring at the foreshore of Caloote Landing in the Lower Reaches of the River Murray. The aim of the monitoring is to detect movement of the ground that might indicate instability of the River Murray bank at this location. Our review was requested to assess whether riverbank instability is indicated by the measurements available to date. We understand that consideration is being given to temporary reopening of the Caloote Landing foreshore area in early October 2011.

Background information

The stability of the river banks at Caloote Landing has been addressed by Sinclair Knight Merz (SKM) in its report *Stability Risk Assessment for Caloote Landing* dated 11 November 2010. This report includes calculations of the Factor of Safety for various zones within Caloote Landing foreshore at various assumed river water levels. The report indicates a calculated Factor of Safety of 1.42 for the boat ramp area with the water at or above pool level (approximately +0.7 m AHD). A Factor of Safety of 1.5 or more would have been acceptable compared to commonly adopted criteria. On the basis of its studies SKM concluded that the risk of slope failure at the boat ramp was '*nearly tolerable*' with the river water at or above normal pool level.

At the time that report was in preparation, the river water level was rising from the depressed level it had experienced for several years. Subsequently the water level has generally been above or close to the nominal pool level. We understand from recent discussions at a meeting with DfW (O'Toole/Brown/Sanders, 27 July 2011) that the level in the Lower Reaches is predicted to remain at or above normal pool level for the next year.

Golder Associates' report (Reference 107662007-018-L-Rev0, dated 29 July 2011) suggested that a decision to reopen the foreshore area and boat ramp in Caloote Landing while water levels remained close to pool level could be made on the basis of survey monitoring. We recommended monitoring of the whole of the Caloote Landing foreshore with survey measurements of all points being taken at fortnightly or closer intervals.



Our report stated:

If the measurements are indicating negligible movement over 4 or more measurement cycles it may be possible for Mid-Murray Council to reopen the boat ramp. The criteria for assessing what is negligible will depend on the repeatability and accuracy of the measurements, but might (for instance) include no detectable trend of movement and successive measurements at a point or group of points not differing by more than (say) 5 mm.

Monitoring data.

The monitoring at Caloote Landing involves measurement by survey of the position and level of 77 targets placed securely into the ground in the foreshore area. The points were installed and their positions and levels were measured on 3 August 2011 by Alexander Symonds Pty Ltd (AS). DfW has provided Golder Associates with the results of position and level surveys of those points conducted by AS on 17 August 2011, 30 August 2011 and 12 September 2011. These include vector plots of the monitoring data produced by AS. AS documents indicate that the design coordinate accuracy is ± 3 mm and the design level accuracy is ± 2 mm.

Review of data

The measurement data indicates measured changes in level and position up to about 8 mm:-

- between all successive surveys (17 August, 30 August and 12 September)
- between the baseline survey on 3 August and the survey on 17 August
- between the baseline survey on 3 August and the survey on 30 August and
- between the baseline survey on 3 August and the survey on 12 September.

The average change in position and level across all points surveyed between the baseline survey and each of the other surveys was zero.

The vector plots indicate that the measured movements are not generally consistent between nearby points: in some places in some surveys vectors on adjoining points are in opposite directions. Commonly the vectors from successive surveys differ in size and direction although the differences in size are within about 8 mm. The monitoring data and the vectors suggest that there may be a small trend to southerly and/or easterly movements (ie towards the water) in the southern part of the survey area, although the inferred movements are all less than 8 mm.

Discussion and Recommendations

In each survey the average change in position and level between the baseline and the particular survey across all points surveyed was zero. Similarly the average change in position and level across all points between successive surveys was zero. From that, we infer that the individual differences measured between baseline and survey and between successive surveys (with a maximum of 8 mm) represent the ordinary 'noise' present in all sets of measured data. On the basis of the data available to date we judge that the repeatability and reliability of the survey measurements is probably around ± 8 mm.

That judgement suggests that 'negligible' movement might be defined (consistently with our previous report) as:

- no detectable trend of movement, and
- successive measurements at a point or group of points not differing by more than 8 mm.

Under that definition the measured movements to date would be considered negligible.

We understand that a further survey round of all measuring points is scheduled for 23 September 2011. The definition of 'negligible' movement will require review based on the measurements to be taken on that date. If those measurements are consistent with the monitoring measurements made between 3 August 2011 and 12 September we see no impediment to Caloote Landing (except the southern area) being temporarily reopened while the river level remains at pool level subject to continued monitoring demonstrating that ground movements remain negligible.

While we do not consider that the data presently available reliably demonstrates a trend to movement of the southern area, we suggest that it might be prudent to manage access to this area until the data allows more reliable conclusions to be drawn. We understand that controls are in place to prevent public access to the southern area of Caloote Landing.

Any decision to reopen the Caloote Landing foreshore and boat ramp can only be taken by the landowner which we understand to be the Mid-Murray Council.

If Mid-Murray Council reopens the boat ramp, we recommend that it implement the recommendations regarding access restrictions to the boat ramp that are included in SKM's report – single lane access to the ramp etc.

If the foreshore and boat ramp are reopened we recommend ongoing survey monitoring. Review of the data may allow measurements to be taken at longer intervals, although we would expect that substantially more data than is currently available would be necessary to confirm that. We recommend a review of the monitoring in June 2012 so that the scope of future monitoring can be assessed.

If the river water level is predicted at any time to fall below +0.2 m AHD we recommend that consideration be given to closing the foreshore and boat ramp. That decision is likely to be illuminated by the data gained from survey monitoring.

Limitations

Your attention is drawn to the document – "Limitations", which is attached to this report. The statements presented in this document are intended to advise you of what your realistic expectations of this report should be. The document is not intended to reduce the level of responsibility accepted by Golder Associates, but rather to ensure that all parties who may rely on this report are aware of the responsibilities each assumes in so doing.

Closure

We would be pleased to discuss the matters presented in this report. Should you require clarification please call Lyndon Sanders on 8213 2100.

GOLDER ASSOCIATES PTY LTD

Lyndon Sanders

Lyndon Sanders
Principal Geotechnical Engineer

LJS/THH/ljs:rr

Attachments: Limitations (LEG04 RL1).

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Figure 1 Location Plan

LEGEND

- Pool Level at -0.8m (Oct 2009)
- Pool Level at +0.7m (Oct 2010 - not shown)
- Tolerable Risk Boundaries For Probability = 10^{-4} for Failure With WL = -0.0m AHD
- Tolerable Risk Boundaries For Probability = 10^{-4} for Failure With WL = -0.8m AHD

N

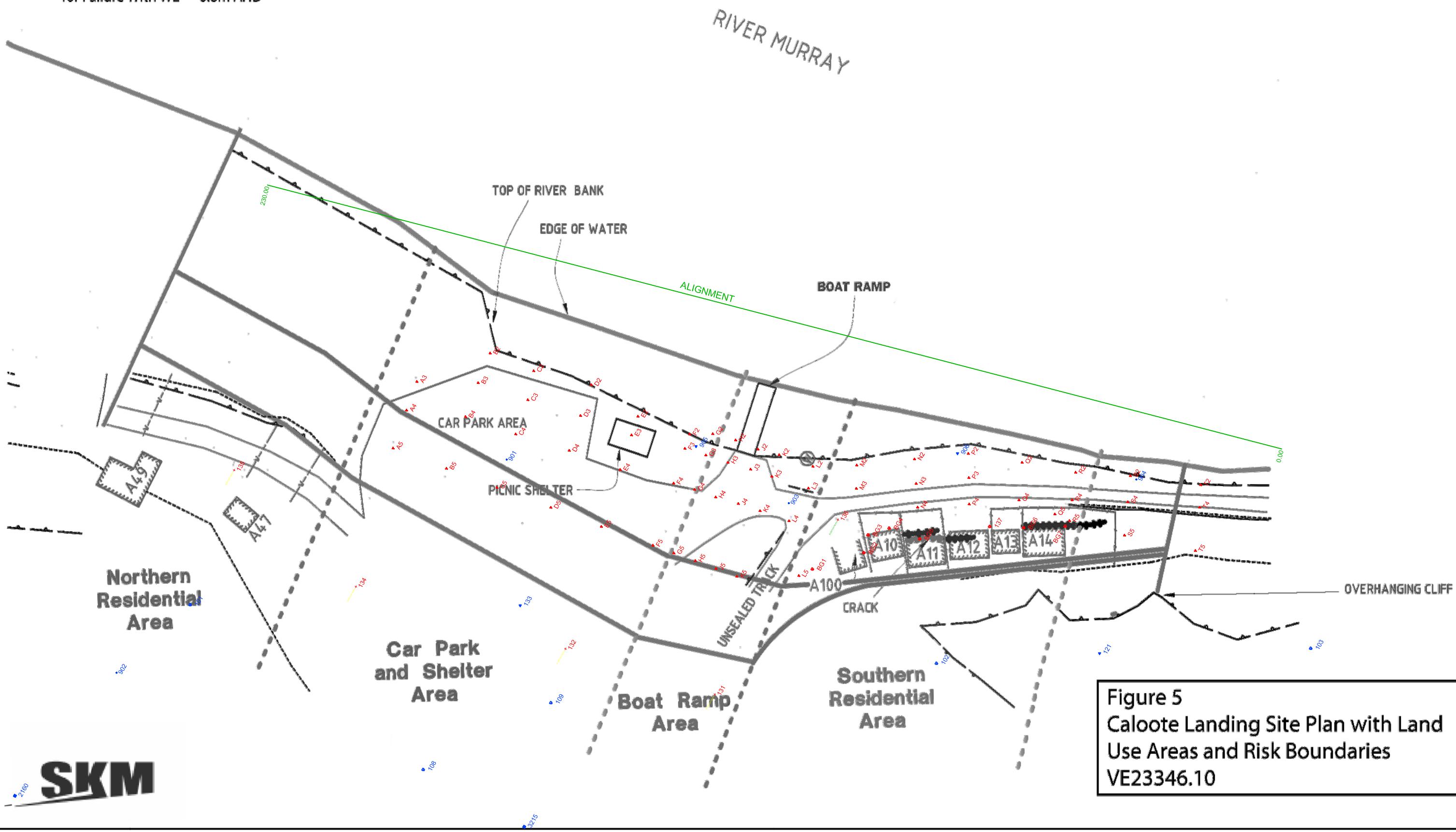
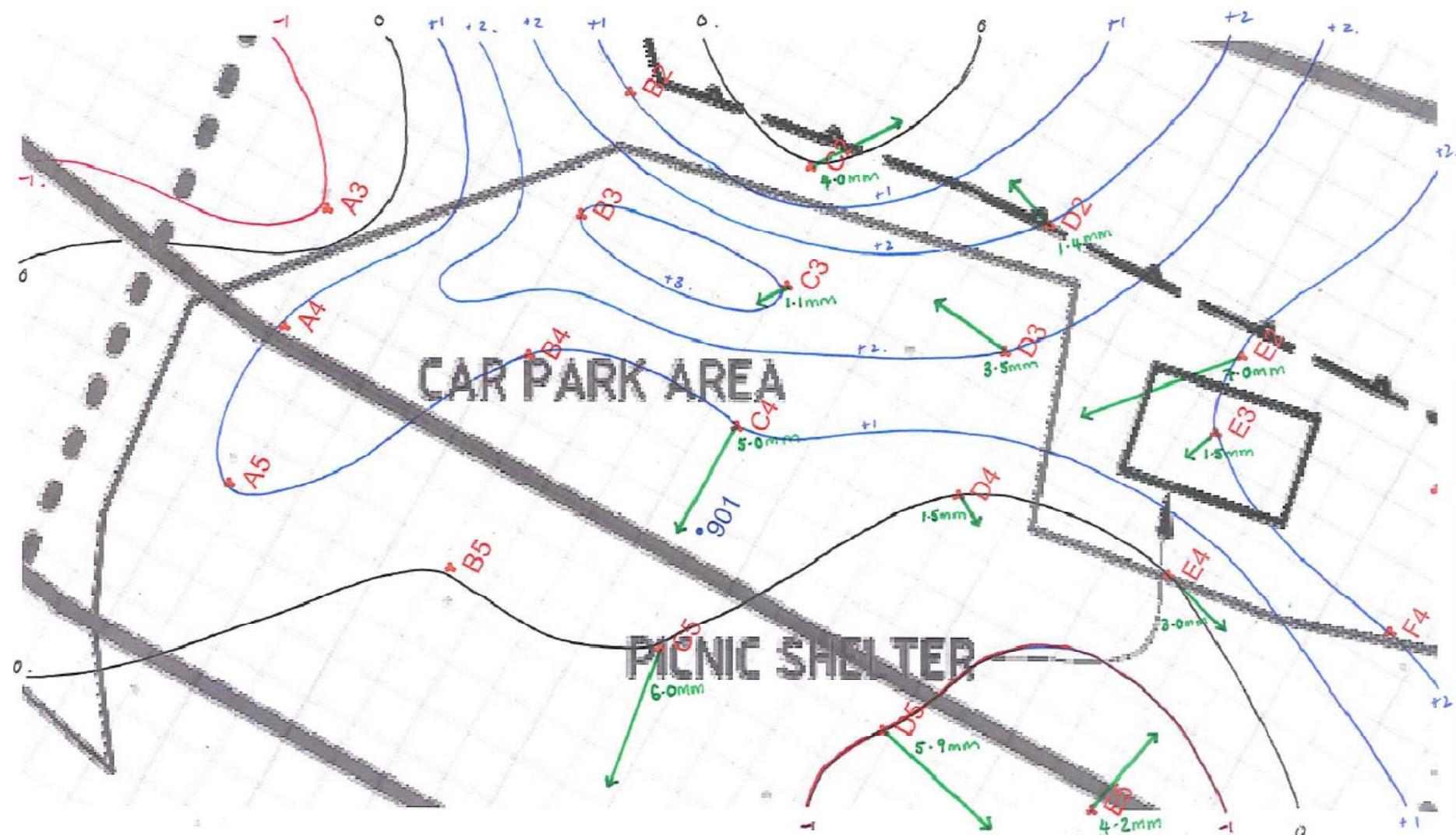




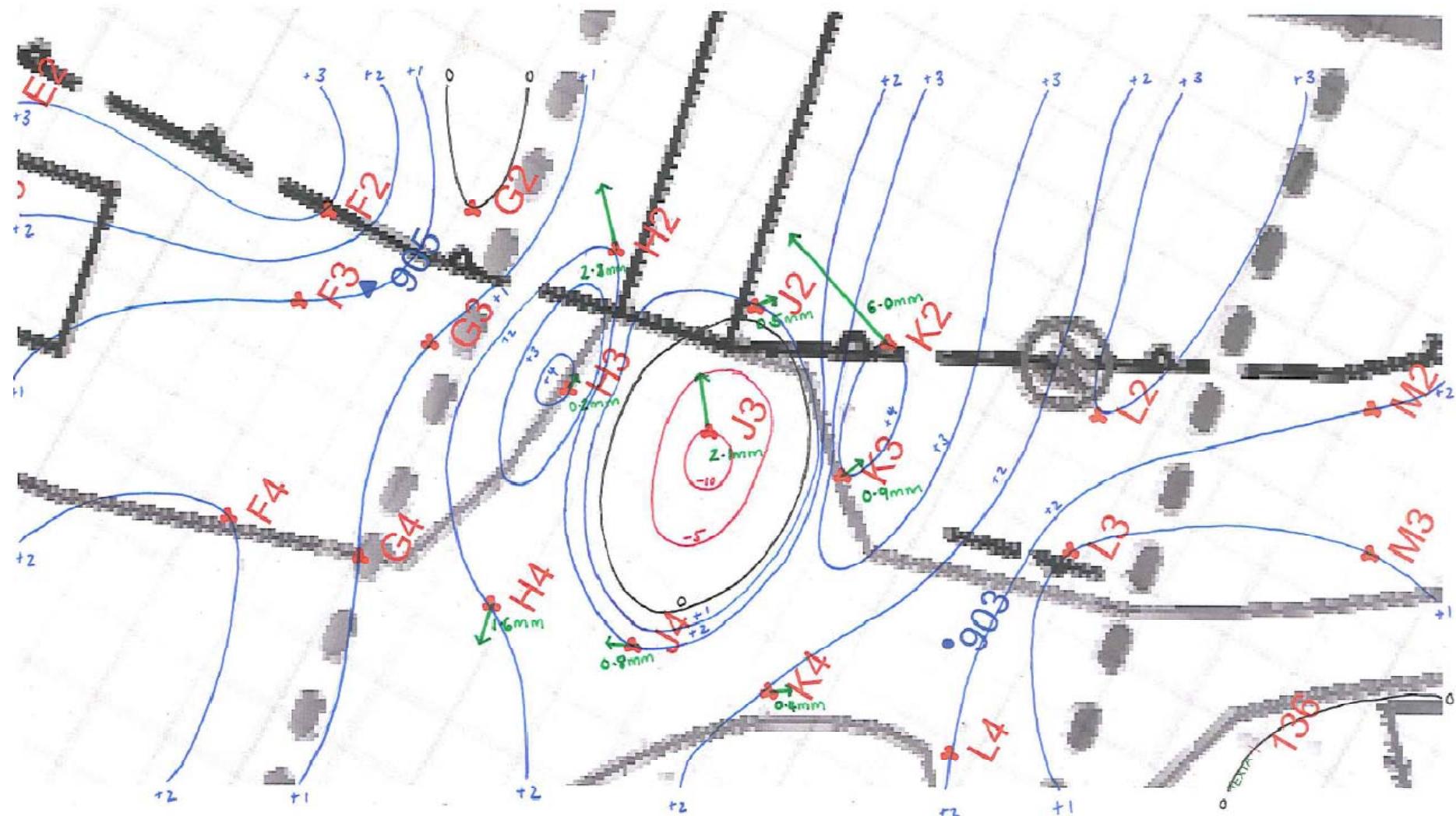
Figure 2 Section 1 Sketch Plan of Lateral and Vertical Movement

**Section 1****Legend:**

- Vector Resultant of Lateral Movement (in mm)
- ↖ Positive Vertical Movement
- ↔ Zero Level
- ↙ Negative Vertical Movement



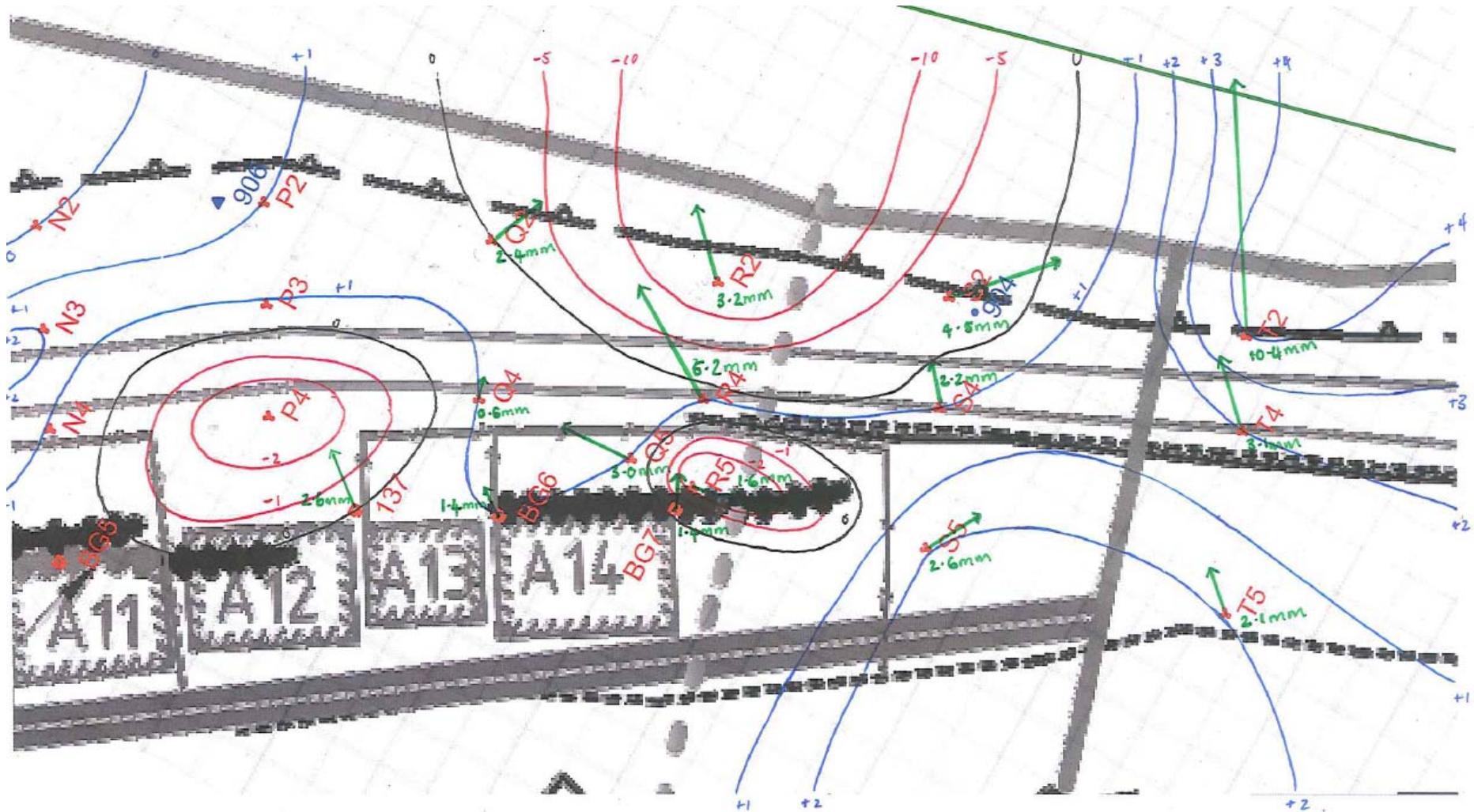
Figure 3 Section 2 Sketch Plan of Lateral and Vertical Movement

**Section 2****Legend:**

- Vector Resultant of Lateral Movement (in mm)
- ↗ Positive Vertical Movement
- ↖ Zero Level
- ↙ Negative Vertical Movement



Figure 4 Section 3 Sketch Plan of Lateral and Vertical Movement



Section 3

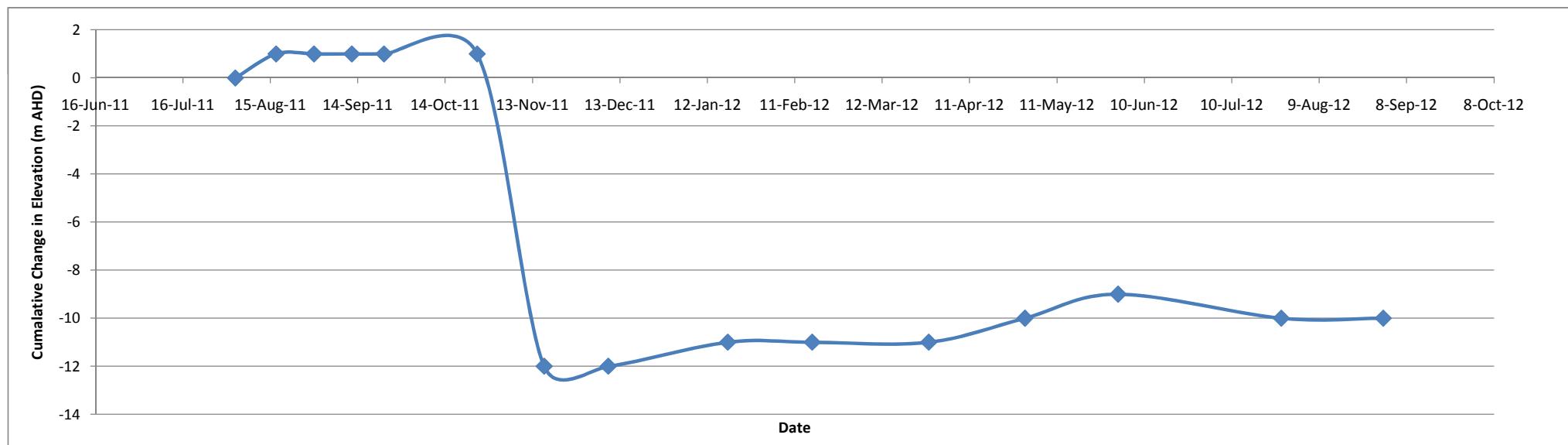
Legend:

- Vector Resultant of Lateral Movement (in mm)
 - ↖ Positive Vertical Movement
 - ↔ Zero Level
 - ↙ Negative Vertical Movement



Figure 5 Analysis of Vertical Movement at Monitoring Points J3 and R2

J3	Date	Cumulative Change in Elevation (m AHD)	Change in Elevation (m AHD)
	3-Aug-11	0	0
	17-Aug-11	1	1
	30-Aug-11	1	0
	12-Sep-11	1	0
	23-Sep-11	1	0
	25-Oct-11	1	0
	17-Nov-11	-12	-13
	9-Dec-11	-12	0
	19-Jan-12	-11	1
	17-Feb-12	-11	0
	28-Mar-12	-11	0
	30-Apr-12	-10	1
	1-Jun-12	-9	1
	27-Jul-12	-10	-1
	31-Aug-12	-10	0



R2	Cumulative Change in Elevation (m AHD)	Change in Elevation (m AHD)
Date		
3-Aug-11	0	0
17-Aug-11	1	1
30-Aug-11	0	-1
12-Sep-11	0	0
23-Sep-11	1	1
25-Oct-11	1	0
17-Nov-11	3	2
9-Dec-11	2	-1
19-Jan-12	2	0
17-Feb-12	3	1
28-Mar-12	-14	-17
30-Apr-12	-13	1
1-Jun-12	-14	-1
27-Jul-12	-14	0
31-Aug-12	-14	0

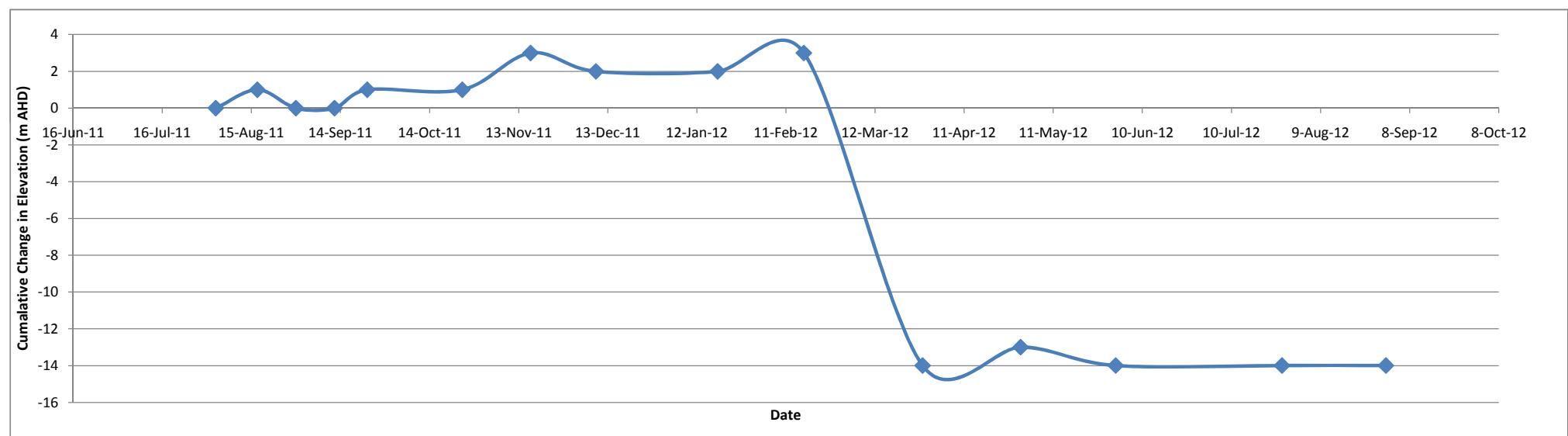




Figure 6 Analysis of Lateral Movement at Monitoring Points T2

T2	Cumulative Change in Easting (mm)	Change in Easting (mm)
Date		
3-Aug-11	0	0
17-Aug-11	-3	-3
30-Aug-11	-4	-1
12-Sep-11	-3	1
23-Sep-11	-6	-3
25-Oct-11	-5	1
17-Nov-11	-6	-1
9-Dec-11	-7	-1
19-Jan-12	-6	1
17-Feb-12	-6	0
28-Mar-12	-11	-5
30-Apr-12	-8	3
1-Jun-12	-10	-2
27-Jul-12	-11	-1
31-Aug-12	-11	0

T2	Cumulative Change in Northing (mm)	Change in Northing (mm)
Date		
3-Aug-11	0	0
17-Aug-11	1	1
30-Aug-11	-1	-2
12-Sep-11	1	2
23-Sep-11	1	0
25-Oct-11	0	-1
17-Nov-11	1	1
9-Dec-11	1	0
19-Jan-12	3	2
17-Feb-12	2	-1
28-Mar-12	2	0
30-Apr-12	3	1
1-Jun-12	3	0
27-Jul-12	2	-1
31-Aug-12	4	2

