PLANS AND DOCUMENTS
referred to in the PDA APPROVAL
17 JUN 2014
MEDQ

Cardno Bowler
Shaping the Future

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Our Ref 10937sk-2.14
Contact Sammy Kwok

9th April 2014

Mr Peter Martin
Hanson Construction Materials

E: Peter.Martin@hanson.com.au

Dear Peter,

REVETMENT WALL STABILITY ASSESSMENT
PROPOSED CONCRETE BATCH PLANT
ABBOTTSFORD ROAD, BOWEN HILLS

1. Introduction

As requested, a revetment wall stability assessment was undertaken for the proposed concrete batch plant at Abbottsford Road, Bowen Hills.

The purpose of the assessment was to determine if the additional truck parking load applied above the existing revetment wall will have any potential impact for destabilisation of the river bank. Recommendations are to be provided to protect the integrity of the revetment wall and the river bank.

Based on the supplied information, the original layout plan of the batch plant consisted of some truck car parking space in the north eastern area. Refer to Diagram 1 below for the original configuration of the area for our initial assessment.

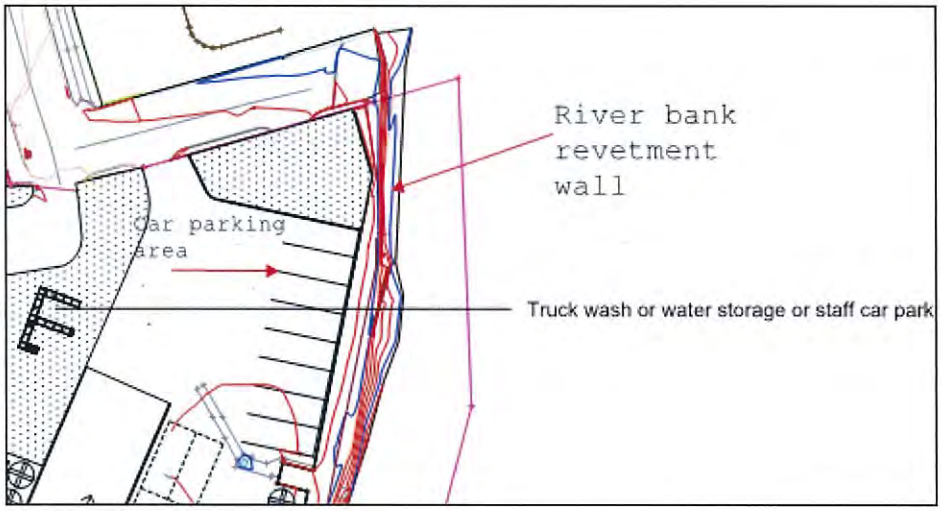

Diagram 1: Revetment wall plan view and proposed car parking area (preliminary plan)

2. Car Parking Load

From the information given by the client, car parking load will be from eight wheelers concrete trucks, most likely to be Mack Metro Liners. The tare weight of a single truck will weigh up to 11.45 tonne. Considering the truck load, a normally distributed load of 20kPa was presumed for the analysis.

A site mapping exercise of the existing river bank and site features were undertaken as the basis of the assessment work. Two critical cross-sections were identified for limit equilibrium stability analysis using the Rocscience Slide 6.0 software. The Morgenstern Price analysis method was used. Refer to Appendix A for the site mapping sketch.

3. Subsurface Profiles for Modelling

A geotechnical investigation was carried out by Cardno Bowler for the overall development site and the results of the investigation were used to determine the suitable subsurface profiles for analysis. The reference of the report is 10937sk.14 version 2, dated 9th April 2014.

Based on the results of the investigation work from boreholes S2 and P2 and DCP1 of the above mentioned report, the following subsurface profile for the analysis were adopted:

- 0.4m of silty gravel - Fill
- 1.1m of sandy silty clay - Fill
- 1.4m of firm to stiff clay over stiff clay –Alluvium

As discussed in the investigation report, due to obstructions at a depth of 0.2m below the existing surface level at borehole S1, we were unable to confirm the ground conditions at the northern section of the river bank with certainty.

The relevant borehole logs and DCP test results are attached in this report.

4. Cases Considered

It is expected that drained soil conditions will govern the stability of the river bank. Thus drained conditions were used for all cases of the stability analysis work. Five cases were considered for the analysis:

Case 1: Water level at one third of the revetment wall height.
Case 2: Water draw down condition, and materials subject to hydrostatic pressure.
Case 3: Water level at toe of lower revetment wall.
Case 4: Low tide condition. Water level retreated below toe of revetment wall.
Case 5: Slope fully submerged. Water table at an assumed height of 0.5m above the existing ground level.

Refer to the attached site mapping sketch for the two critical cross-sections (A-A and B-B) analysed for this assessment.

5. Cross-section A-A

Based on the stability analysis, the factor of safety (FoS) obtained for the above cases are shown in the table below.

Factor of Safety (FoS) for Cross-section A-A

Results of Stability Analysis for Cross-section A-A		
Case	**FoS from analysis**	**Required FoS**
Case 1	1.571	1.5
Case 2	1.353	1.3
Case 3	1.717	1.5
Case 4	1.644	1.5
Case 5	1.914	1.3

Based on the analysis results above, the stability of revetment wall and river bank should not be affected by the imposed traffic load of 20kPa as all cases demonstrated sufficient FoS against global stability. A majority of the proposed car parking area should not be affected by the additional traffic load provided that the following conditions are met:

- The proposed traffic load is at least 2.5m away from the front edge of the revetment wall at the river bank.
- Long term erosion control at the river bank is provided to maintain the 2.5m separation distance.

6. Cross-section B-B

Stability analysis for Cross-section B-B did not provide sufficient FoS against global stability in the current state under all cases, as the additional traffic will be too close to the edge of the river bank under the preliminary car park configuration. The mapping exercise also indicated that this section of the river bank has been eroded (due to the lack of scour and erosion protection), leaving a much reduced horizontal separation distance of only 0.5m from the crest of the river bank to the existing fence line. The existing concrete revetment wall did not extend to this area.

7. Stability Recommendations

In order to maintain the long term stability of the river bank, the following should be implemented and noted:

- In the areas where the existing revetment wall existed and that a horizontal separation distance of a minimum of 2.5m is available from the front face of the wall, no further work will be required to maintain stability.
- In the areas where the revetment wall was absent, and the required 2.5m of horizontal separation distance is not available, one of the following should be adopted:
    - Gabion basket to be provided at the river bank to prevent further erosion and to act as retaining wall support. If detailed design is required for this option, further investigation, stability and design work can be undertaken by Cardno Bowler. Preliminary data indicated a wall embedment depth of min 0.3m into the riverbank is likely to be required.

- Shot rocks/rip-rap maybe placed to protect the existing river bank. A horizontal separation distance of 2.5m from the crest of the river bank to the car parking load should be maintained. This will require wheel stops, line marking or the use of garden bed at the carpark to maintain these conditions.

8. Revised Carpark Layout Design

Further from our above recommendations and some correspondence with the client, drawings of the proposed truck car parking area were revised. The following key drawing was reviewed.

- *"Detailed Site Layout Plan"*, ref: 1713.007, Rev 2, dated 9th April 2014

Refer to diagram 2 below for the revised layout.

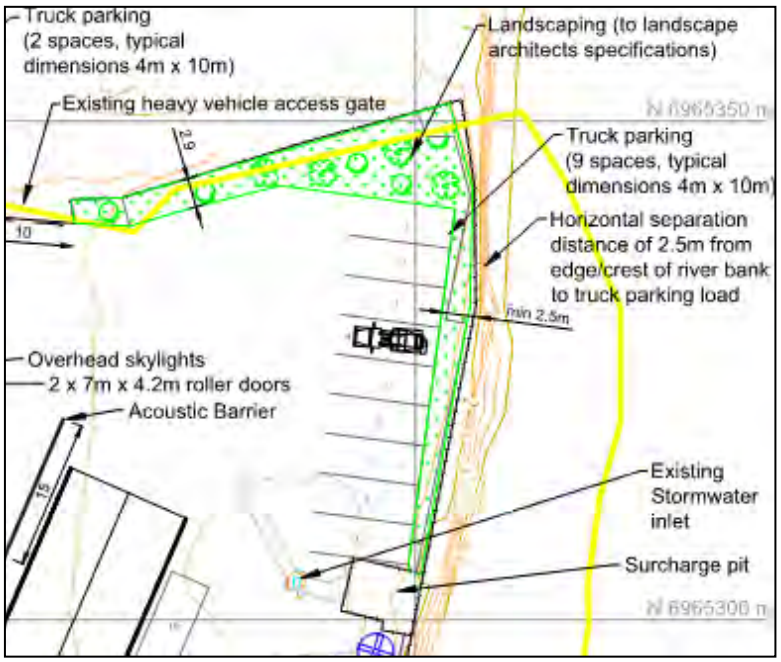

Diagram 2: Revised car parking area

We noted that the revised drawing have included an extension of the garden bed in order to maintain the 2.5m horizontal separation distance, as such, the revetment wall stability should not be affected by the truck parking load. However, a significant part of the existing river bank did not have erosion and scour protection and it is recommended that rip rap or shot rock be used to protect the river bank from further deterioration.

I trust this meets your requirements, please do not hesitate to contact me if you have any questions.

Yours faithfully

Sammy Kwok
Geotechnical Engineer
For **Cardno Bowler**

David Stirling
Senior Geotechnical Engineer
RPEQ No: 8820

Brisbane City Council - Printed Map

Print Out

Printed Date: Mon Mar 3 2014

DATA INFORMATION
© Brisbane City Council (unless stated below)

Cadastre © 2006 Department of Natural Resources and Mines
2009 NAVTEQ Street Data © 2008 NAVTEQ
2007 Aerial Imagery © 2007 Fugro Spatial Solutions
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BOREHOLE LOG SHEET

Client: HANSON CONSTRUCTION MATERIALS **Project:** PROPOSED BATCH PLANT **Location:** ABBOTSFORD ROAD, BOWEN HILLS			**Hole No: BHS2**
	Job No: 10937		**Sheet: 1 of 1**
Position: E504248.000 N6965283.000 56 MGA94	**Angle from Horizontal: 90°**		**Surface Elevation: 2.400 m**
Rig Type: Quickdrill 3000	**Bit: 'TC'**		**Driller: DL**
Casing Diameter:	**Contractor: CARDNO BOWLER PTY LTD**		
Date Started : 3/3/14	**Date Completed: 5/3/14**	**Logged By: DL**	**Date Logged: 5/3/14**

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
0										2.0			ASPHALT 170mm
												GM	SILTY GRAVEL, fine to coarse grained, grey, ROADBASE
0.5									1 2 1			CI-CH	SANDY SILTY CLAY, medium to high plasticity, red/orange, fine to coarse grained sand, with gravel and organic matter, moist, FILL
							D 0.90 - 1.00 m		2	1.5			
1.0									5 4 7 4			CI-CH	SANDY SILTY CLAY, medium to high plasticity, grey/pale brown, fine to coarse grained sand, with gravel and organic matter, moist, FILL
							D 1.40 - 1.50 m		4	1.0			
1.5									2 3 3			CI-CH	CLAY, medium to high plasticity, grey, with some organic matter, moist, firm to stiff, NATURAL
							D 1.80 - 1.90 m		2	0.5			
2.0									4 6 5 6 3 4			CI-CH	
2.5							D 2.50 - 2.60 m		3	0.0			
									3 2 3			CI-CH	CLAY, medium to high plasticity, grey, with fine grained gravel, with some organic matter, wet, firm to stiff, NATURAL
3.0									4 4 4 4 3	-0.5			CLAY, medium to high plasticity, grey, with some organic matter, wet, firm, NATURAL
							D 3.40 - 3.50 m		3	-1.0		CI-CH	
3.5									4 3 4 3				
4.0										-1.5			BOREHOLE TERMINATED AT 4.00 m
										-2.0			

See Standard Sheets for details of abbreviations & basis of descriptions

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BG LIB 05.GLB Log BG SOIL LOG 10937A.GPJ <<DrawingFile>> 07/04/2014 14:08

BOREHOLE LOG SHEET

Client: HANSON CONSTRUCTION MATERIALS **Project:** PROPOSED BATCH PLANT **Location:** ABBOTSFORD ROAD, BOWEN HILLS		**Hole No: P2**
	Job No: 10937	**Sheet: 1 of 1**
Position: E504229.000 N6965308.000 56 MGA94	**Angle from Horizontal: 90°**	**Surface Elevation: 2.300 m**
Rig Type: Quickdrill 3000	**Bit: 'TC'**	**Driller: DL**
Casing Diameter:	**Contractor: CARDNO BOWLER PTY LTD**	
Date Started : 6/3/14 **Date Completed: 6/3/14**	**Logged By: DL**	**Date Logged: 6/3/14**

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
													ASPHALT 35mm
													CEMENT TREATED BASE 130mm
									20				ROADBASE
										2.0		GC-GM	CLAYEY SILTY GRAVEL, fine to coarse grained, grey, dry to moist, FILL
0.5							D 0.50 - 0.60 m		5				
									3				SANDY SILTY CLAY, medium to high plasticity, pale brown/yellow/cream, fine to coarse grained sand, with fine to medium grained gravel, dry to moist, FILL
									2			CI-CH	
									1	1.5			
							D 0.90 - 1.00 m		1				SANDY SILTY CLAY, medium to high plasticity, pale brown/yellow/cream, fine to coarse grained sand, dry to moist, FILL
1.0									1			CI-CH	
									4				
									7				SILTY GRAVELLY CLAY, medium to high plasticity, pale grey, with fine grained gravel, moist to wet, firm to stiff, NATURAL
							D 1.30 - 1.40 m		3	1.0		CI-CH	
									2				
1.5									3				BOREHOLE TERMINATED AT 1.50 m
										0.5			

See Standard Sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG - DCP ONLY SHEET

Client:	**HANSON CONSTRUCTION MATERIALS**	**Hole No:** ~~S1~~ DCP1	
Project:	**PROPOSED BATCH PLANT**		
Location:	**ABBOTSFORD ROAD, BOWEN HILLS**	**Job No: 10937**	**Sheet: 1 of 1**
Position:		**Angle from Horizontal: 90°**	**Surface Elevation:**
Rig Type:		**Bit:**	**Driller:**
Casing Diameter:		**Contractor: CARDNO BOWLER PTY LTD**	
Date Started : 7/3/14	**Date Completed: 7/3/14**	**Logged By: SS**	**Date Logged: 7/3/14**

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
0.5									3 3 2 1 2 1 2 2 4 3 3 4 5 5 5 4 4 4 3				
1.0													
1.5													

See Standard Sheets for details of abbreviations & basis of descriptions

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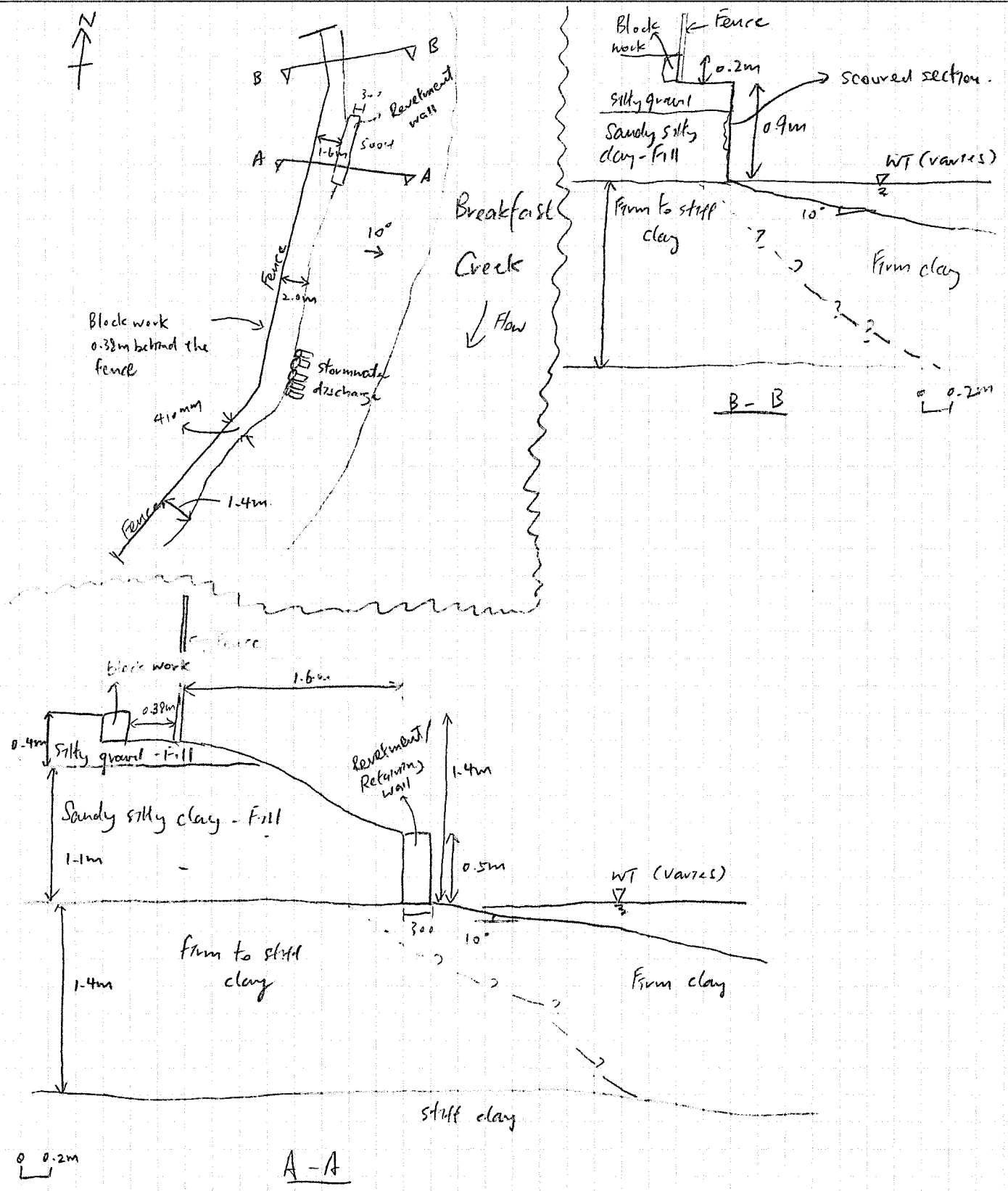
BG LIB 05.GLB Log BG SOIL LOG 10937A.GPJ <<DrawingFile>> 07/04/2014 14:09

PROJECT Proposed Hanson Batch Plant Abbotsford Rd, Bowen Hills	**PROJECT NO.** 10937 **Designed** SK **Date** 31/3/14 **Sheet** 1 of 1



* Strata thickness based on borehole (S2, P2) and DCP test results.