### Hyder Consulting (UK) Limited

2212959 Manning House 22 Carlisle Place London SW1 1JA United Kingdom

Tel: +44 (0)29 2092 6700 Fax: +44 (0)29 2079 9275 www.hyderconsulting.com





# Lock 12, Aylesbury Canal Review of Potential Causes of Failure

**Author** C. Frampton

Checker K Raven

**Approver** T Storr

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# 1 Introduction

## 1.1 Terms of Reference

The southern wall of Lock 12 along the Aylesbury Arm of the Grand Union Canal collapsed on the 28 March 2013 resulting in the closure of this section of the canal.

Under the terms and conditions of the Canal and River Trust (CRT) Professional Services Contract 2011 to 2014, Hyder Consulting (UK) Ltd were appointed to undertake a remedial design to replace the failed southern lock wall and provide additional stabilisation measures to the northern lock wall as part of the scope of work.

Temporary stabilisation measures were also assessed and designed to limit further movement of the failed wall and ensure stability of the remainder of the structure.

A Continuous Flight Auger (CFA) contiguous bored piled wall was designed to replace the failed section of wall, and a soil nail solution developed to provide long term additional support to the northern wall of Lock 12.

## 1.2 Site Location

The site is located approximately 1.3km north of the village of Buckland and approximately 5.2km east of Aylesbury. Both Buckland Road and College Road North cross the canal, with Lock 12 located between these two roads. The area surrounding the lock is predominantly flat farmland with the site at approximately 85m AOD.



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Figure 1 – Site Location Plan

The local topography includes a small embankment, approximately 1m in height, built up to accommodate the lock. A ditch, running parallel to the canal, was identified at the toe of the lock embankment on the southern side with a dairy site located adjacent to the lock to the south.

A new development incorporating a bund of 4.6m in height with a slope angle of approximately 18° is located immediately adjacent to the southern boundary of the CRT owned earthworks to the lock structure, which was constructed shortly before the failure occurred.

# 1.3 Report Objectives

As part of the scope of work associated with back analysis of the failure to inform the remedial works design, a review of the potential causes of the failure was to be undertaken.

This report provides a summary of the data obtained during the investigations and back analysis to identify the possible causes of failure of the southern wall of Lock 12.

# 2 Review of Available Information

# 2.1 Geology

With reference to the published Geological Map for the site location, 1:50,000 Sheet 238, the solid geology has been identified as the Gault Clay of Lower Cretaceous Age.

From the British Geological Survey Document Engineering Geology of British Soils and Rocks – Gault Clay, Technical Report WN/94/31, a number of serious geotechnical problems are generically associated with this deposit, including

- Landslips, or slope instability, with very low slope angles of between 1:3.5 and 1:5 recommended for the design of permanent earthworks
- The Gault Clay is in the high expansive potential category, highly susceptible to shrinkage and swelling due to moisture content changes

# 2.2 Background Site Investigation Data

A site investigation report was made available associated with the Arla North Development immediately to the south of the Grand Union Canal and opposite Lock 12, reference Project Blueprint, Arla North, Aylesbury. This report was produced by Jordan Prichard Gorman and issued in March 2011 (Document: RM/GI/AN/4290v1).

This confirmed the presence of the Gault Clay as the solid geology beneath the site, overlain by a mantle of between 1.8m and 2.5m thick of Head or Glacial Till Deposits, described typically as a firm to stiff grey brown silty clay with varying proportions of gravel, although identified as soft in local areas.

The underlying Gault Clay was described as a very stiff grey fissured silty Clay.

Maximum groundwater levels were monitored at between 1.1 and 1.3m below existing ground level.

# 2.3 CRT Investigation

A site investigation was undertaken to the instructions of CRT to provide geotechnical data on the ground and groundwater conditions immediately adjacent to Lock 12, to inform the back analysis and remedial design.

Six window sampled boreholes were undertaken together with associated laboratory testing, the results of which are reported in a Factual Report for CRT, Reference 0001-UA004512-30-UP32-01 dated June 2013.

The ground conditions identified from this investigation can be summarised as

- Made Ground described as a very soft gravelly clay/very loose clayey gravelly sand to a depth of nominally 1m
- Re-worked Gault Clay/Made Ground, typically soft to firm brown/grey Clay, but stiff in locations, proven to a maximum depth of 4.0m. This is almost certainly the backfill material to the open excavation within which the lock and the retaining walls were constructed. Reference should be made to Appendix A for a typical cross section of the form of temporary works employed at the date of construction, and cross sections through various lock arrangements
- Firm becoming very stiff fissured grey Clay, in-situ Gault Clay

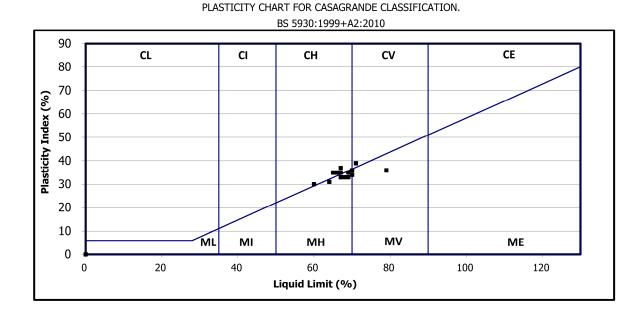


Figure 2 - Plasticity Chart for Gault Clay

The plasticity chart reproduced from the factual site investigation data confirms the High to Very High plasticity of Gault Clay, confirming the materials potential for shrinkage/swelling and also the potential for very low peak and residual drained shear strengths when assessing the stability of earthworks and earth retaining structures.

Ground water was monitored at a minimum depth of 3m bgl in Borehole WS05, constructed in the embankment behind the lock structure. Over the period of monitoring available, it is considered unlikely that the water level in the instrument has reached equilibrium with the surrounding soils.

# 2.4 Data on the Condition of the Lock Structure

The most recent Principal Inspection (PI) was undertaken in 2007 and this gave the lock a D2 rating. This Grading defines the asset as Poor, which implies a stable condition, but structural cracking and subsidence was evident. There are limited consequences of failure to 3<sup>rd</sup> Parties implied by this Grading.

The executive summary from this inspection is reproduced below:-

- Lock 12 is a narrow lock on the Grand Union Canal Aylesbury Arm approximately 2 kilometres North of Aston Clinton
- The lock head gate has a significant leak at the cill and its balance beam handrail needs securely fixing.
- There is a vertical crack in the south lock wall and the north west quadrant has significant cracking and is subsiding. Some brickwork repairs are required in the medium term.
- No major defects were observed on the south wall.
- The South (towpath side) chamber wall is inscribed "1911" and is well pointed except at the bedding of all the copings (where some vegetation is establishing) and within the tail gate recess, where brick faces are damaged. Almost all of the copings are badly spalled at the edge.
- There is a vertical crack in centre of the South wall, extending the full depth of the chamber. This is approx. 3mm wide. There is no discernible lateral displacement. The crack was not reported in the previous PI.
- The vertical crack was reported in a PM Notification Summary in 2004, when leaks down the embankments on both sides of the canal were observed as soon as the lock is filled. The Notification also reports, on 06.10.2006, "large offside leak and towpath leak" requiring urgent attention.
- From measurements taken post-failure, the lock walls, from top of wall to invert, are approximately 4.1m high.



Figure 3 - Lock 12 Post-Failure

In the early afternoon of Thursday 28th March 2013, the South East Waterway engineering team were advised by local bankstaff that the south wall of Lock 12 had failed. A photograph taken immediately after the failure is reproduced in Figure 3 above

### 2.5 Weather Conditions

Collation of information on the weather conditions, specifically rainfall, was undertaken for the preceding 12 months prior to failure, as shown in Figure 4 below.

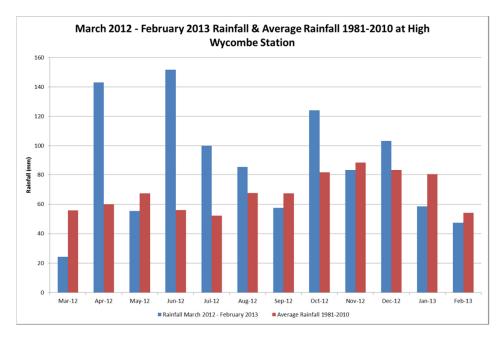


Figure 4 – Average Rainfall vs Rainfall Spring 2012 to Spring 2013

Information was obtained from the Met Office, which includes average monthly rainfall levels from 1981–2010, taken from a Meteorological Station located at High Wycombe, approximately 20 km from the site. This is the closest station containing historical data available on the website (Met Office, 2013). This has been compared to rainfall in the 12 months preceding the failure of the south wall of Lock 12 within Figure 4.

The data clearly indicates rainfall had been much greater than average, particularly over the period Spring to Autumn 2012, with several months receiving over twice the average rainfall.

# 3 Analysis of Potential Causes of Failure

# 3.1 Key Observations

From the background data, a number of observations can be made as follows

- It is potentially significant that the new earth bund to the Arla North development, immediately adjacent to the southern boundary of the CRT land, was constructed shortly before the south wall failed.
- The Gault Clay is a difficult engineering material, highly prone to landslips on relatively shallow slopes, particularly where Glacial or Periglacial effects are known to be present, and highly sensitive to volume change as a result of water content variations. These characteristics can have a significant impact on the performance of earth retaining structures within this geology
- During the last PI, The south wall was described as having a 3mm wide crack running the full depth of the wall, which had not been identified previous to 2004, with significant leaks reported in 2006. The overall lock structure had a condition grade as D (Poor). There is no information available on remedial works undertaken to repair the leaks reported.
- The date mark reported on the south wall of 1911 significantly post-dates construction of the canal. It is unclear as to whether the south wall was repaired or reconstructed at this date, but it may be an indication that there have been previous problems with the south wall to the canal.
- Almost double the average rainfall over the previous summer and autumn has been recorded. This can have a detrimental impact both by increasing water pressures in the retained soils behind the lock walls but can also increase loads by causing swelling of the highly expansive Gault Clay material.

Analyses were run as part of the process of understanding the potential mechanisms of failure, taking note of the data above, for development of the remedial work design, which are described in the following section.

# 3.2 Impact of the Arla North Development

### 3.2.1 Introduction

Initially, a slope stability back analysis was undertaken, looking at the potential for global failure of the lock structure. This was undertaken to investigate the potential impact of the new earthworks as part of the Arla North development on the overall stability of the lock/embankment system, but also to inform the remedial work design.

Following this, a PDisp analysis, using Elastic Theory, was undertaken to investigate the increase in stress and resultant strain as a result of the new earthworks construction associated with Arla North on the back of the existing wall.

# 3.2.2 Global Stability

An analyses was undertaken examining the long term stability of the new earth embankment constructed as part of the new Arla North development, which is located adjacent to the southern boundary of CRT's land. This was to establish if there was a potential for global instability associated with this new embankment to impact the lock structure.

If this was the case, then the new earthworks would be relying on the passive restraint provided by the lock embankment and structure, and significant additional loadings would be expected to be imposed on the CRT structure as a change from conditions predating the new development.

To provide an initial conservative approach, it was assumed that the near surface Gault Clay, Material 6 (blue shading,) shown on the longitudinal sections in Appendix B, contained relict shear surfaces with low residual strengths aligned in an unfavourable orientation, hence a very low angle of internal friction (phi) of 17 degrees was selected. Representative long term shear strengths were assigned to the other strata present based on published data and the classification testing undertaken.

For the long term condition in the analysis described as 'Pre-Failure' within Appendix B, the most critical shear surface was identified as daylighting in the ditch adjacent to the toe of the new embankment. The Factor of Safety of marginally less than 1.2 appears representative, and reflects the BGS recommendations of adopting shallow slope angles in earthworks within Gault Clay soils as summarised in Section 2.1.

As part of the temporary works assessment, 1m of material was removed from the CRT embankment south of the failed wall and the analysis was re-run, with a very similar geometry of the critical shear surface and Factor of Safety against failure obtained. This indicates that the most critical potential failure mechanism is independent of the CRT earthworks and structure at this location.

Although a very simplistic analyses was run, the analysis suggests that the stability of the new earth bund is independent of the earthworks and retaining walls to Lock 12 and is unlikely to have imposed any significant increase in loading on the back of the failed lock wall.

### This is supported by

- i. No evidence of failure or movement within the new embankment to the Arla North development as a result of the lock wall failure
- ii. Given the generally flat nature of the landscape, it is unlikely that continuous shear surfaces exist representing former landslips or glacially sheared material to the extent assumed in the analysis
- iii. The local stability of the lock walls will not be determined by these residual shear surfaces. Excavation for construction and the subsequent back filling behind the lock walls will have destroyed any such features immediately behind the walls.

# 3.2.3 Elastic Analysis

Analysis of the increase in loading and imposition of strain on the back of the wall generated by the construction of the earth bund to the Arla North development was undertaken specifically to identify whether any measurable change to the loading conditions behind the wall can be identified, which could impact the stability of the south wall to Lock 12

The software used for was the Oasys PDisp software, which is a geotechnical software package used to predict stress distribution and settlement/horizontal strain as a result of imposed loadings, from, for example, foundations and earthworks. The analysis is based on Elastic Theory.

The input and output data is provided within Appendix C of this report.

The simplistic ground model as identified within the slope stability model in Appendix B was constructed in the PDisp software, with soil stiffness parameters (Elastic Moduli) assigned on the basis of the soil descriptions from the site investigations and with reference to CIRIA C103 as a conservative approach to the analysis.

A vertical line was drawn on the model to represent the location of the back of the south retaining wall and the increase in stress and strain analyses at this location as a result of the loading conditions created by the new earthworks was calculated.

Two calculations were performed

- Boussinesq Analysis to investigate the change in stress at the back of the wall
- Mindlin analysis to determine the scale of horizontal strain imposed on the back of the wall

The results of the Boussinesq analysis highlighted identified an increase in the Principal Stress (likely to be predominantly horizontal) at the top of the wall of the order of 1 kPa increasing to 4.5 kPa at the base of the wall, as a result of the loadings from the new earthwork to the Arla North Development

The Mindlin Analysis identified a maximum strain (deformation) within the ground at the back of the wall of 0.2mm as a result of the ground movements generated by the new earthworks.

It should be noted that in the absence of direct stiffness data, which was obtained by correlation with soil descriptions, moderately conservative stiffness parameters were assumed. In addition, Elastic analysis is known to over–predict the distribution of stresses related to imposed loadings on the ground.

The increase in stress and strain imposed by the loadings is of a very low order. The increase in stress identified is of a similar order to placing 100mm of soil behind the wall or an increase in water pressures of 200mm behind the wall.

# 3.3 Wall Stability Analysis

As part of the back-analysis to understand the mechanism of failure and to verify the selection of parameters, a local stability analysis for the southern lock wall was undertaken, based on Earth Pressure Theory.

Details of the soil parameters adopted are included in the output data within Appendix D, selected on the basis of laboratory testing data and published data on the Gault Clay. The parameters adopted were un-factored for the purposes of understanding the failure mechanism. Note lower bound density parameters were adopted for the wall backfill to represent the level of compaction likely to be achieved at the time of construction of the canal.

Three trial pits were dug down the back of the south wall by CRT (Trial Holes 1 to 3). Simple sketches are included within Appendix D.

Different geometries of the wall were identified at each trial hole, and two different cases of wall geometry and water pressures were analysed as follows

- Analysis 1a Wall geometry shown by Trial Pit 3, with a top of wall thickness of 0.6m, with two step-outs down the wall to a base thickness of 1.95m. Water pressure behind the wall has been assumed at 2.9m above the base of the lock, representing a case where the lock is equalised with the lower level of the canal for a significant period of time. This represents the greatest wall thickness and most onerous water pressures
- Analysis 1b Wall geometry shown by Trial Pit 1, with a top of wall width of 0.6m, and foundation width of 1.5m, with a step out at 3.2m from the top of the wall. Water pressure was ignored as it is assumed in this analysis that the lock is full and there is equalisation with the top canal level, hence there is no differential head between the canal and groundwater behind the wall. This represents the intermediate wall thickness indicated and the least onerous water pressures

The base slab to the lock was assumed to act as a prop to the wall, and a force within this 'prop' was increased to provide a Factor of Sliding above 1.0, on the basis that the base is intact and was able to support loads associated with sliding of the wall.

For both analysis, the Factor of Safety against overturning for the water pressures selected is of the order of 1.0, which indicates that the wall is in a condition of marginal stability, and well below minimum Safety Factors that would be adopted for a design based on un-factored Parameters.

Because of the operation of the lock and constantly varying water levels and hence changing differential pressures between the front and rear of the wall, and the different geometries of the wall along its length, which includes buttressing at intervals along the wall, it is difficult to predict the exact composite behaviour of the wall.

On the assumption that the soil parameters selected for the assessment are appropriate, the analysis does however suggest that the lock wall is potentially vulnerable to changes in loading conditions behind the wall, particularly ground water pressures, where a measurable increase in pore pressures in the backfill behind the wall would reduce the calculated Factor of Safety below unity.

It is of note that Trial Pit 4 identified a far more robust gravity structure to the north wall, with a 1 in 3 batter described to the rear of this wall.

# 4 Potential Cause of Failure of the South Lock Wall

### 4.1 Introduction

As part of the back analysis to determine the mode of failure of the south wall to Lock 12 and select parameters for design, together with records of inspection and data gathered during the investigation work, the following conclusions can be made

# 4.2 Geological Influences

From the analyses undertaken, it is unlikely that the presence of residual shear surfaces frequently associated with former or active landslips within the Gault Clay has impacted on the Lock structure.

Potentially of more significance is the fact that the Gault Clay is highly susceptible to shrinkage/swelling effects as a result of water content changes, likely to be mainly seasonally related, but reported leakages in the past may have contributed to wetting up and drying of the Gault Clay derived backfill material immediately behind the wall.

Although there was no evidence of instability in 2006, the description of the defects and overall condition rating suggests deterioration of the south wall in particular, which could be related to ground movements and pressures exerted by cyclic soil volume changes over time. This may have weakened the structural integrity of the south wall, and reduced the walls ability to resist earth pressures behind the wall. The leakages reported in 2006 may also have weakened the wall further by internal erosion of the masonry structure.

The north wall, due to its more massive construction, is unlikely to be as susceptible to these seasonal related movements.

# 4.3 Impact of the Arla North Embankment

The stability of the new earth embankment to the Arla North development does not appear to be dependent on the presence of the CRT lock and shallow embankments to the lock, with critical shear surfaces daylighting outside the existing CRT earthworks. There is currently no evidence of any instability associated with the Arla North earthworks following failure of the south lock wall.

On the basis of a simple elastic analysis, there is however a nominal increase in loading indicated on the back of the wall associated with construction of the Arla North earthwork. This loading in itself is unlikely to have a destabilising impact on the wall, but in combination with other impacts may have had a minor disturbing influence on the wall.

# 4.4 Back Analysis of the Wall Failure

The back analysis undertaken for two water pressure and wall geometry conditions suggests that the wall stability in overturning is highly susceptible to changes in loading on the back of the wall, particularly soil pore water pressures which will vary according to the prevailing weather conditions.

# 4.5 Climatic Impacts

The prevailing summer of 2012 was the second wettest since records began in 1910. This is likely to have resulted in much higher than average water pressures in the clays soils behind the wall at the end of Summer 2012.

Although rainfall in the winter of 2012 was at or slightly below average, the lack of evaporation of rainfall and surface run-off in the winter months, particularly given the prevailing cold weather during this period, will have increased water pressures still further.

Typically, water pressures in the ground reach a maximum in March/April and they would have been much higher than normal in the Spring of 2013, which coincides with the timing of the wall failure.

An article in Ground Engineering in October 2013 indicating a UK wide problem with earthwork stability over the period June 2012 to June 2013 is included in Appendix E, for information

## 4.6 Conclusions

The back analysis undertaken of the local stability of the south lock wall has identified a potential vulnerability to changes in loadings associated with an increase in pore pressures in the overturning mode of failure.

The failure of the south wall to Lock 12 followed shortly after construction of the new embankment to the Arla North development. The global stability analysis suggested no link between the stability of the wall and the new earthworks.

However, the simple elastic analysis undertaken has identified a nominal increase in loading (between 1 and 5kPa from top to base) on the back of the wall as a result of the new earthwork construction, but with negligible strain (<0.2mm). Although the use of an elastic analysis approach may have slightly over-predicted the magnitude of this increase, this level of increase in loading is unlikely to have initiated the collapse in isolation, but may in combination with other factors have had a slight detrimental impact on the wall stability.

It is considered that the deterioration of the south lock wall, possibly in part due to progressive damage caused by the shrinkage and swelling of the Gault Clay materials, and the exceptionally high porewater pressures likely to be in operation in the soils behind the retaining wall in Spring 2013, due to the very wet proceeding Summer and Autumn 2012, has been the primary cause of the overturning and structural failure of the wall.

There may have been a nominal contribution to this failure associated with imposed loadings from the new earthworks to the Arla North development, but it is considered that the timing of the failure during the period where there is likely to have been one of the highest seasonal porewater pressures in the ground since records began is no coincidence, although it should be noted that this failure also occurred shortly after construction of the new embankment for Arla North.

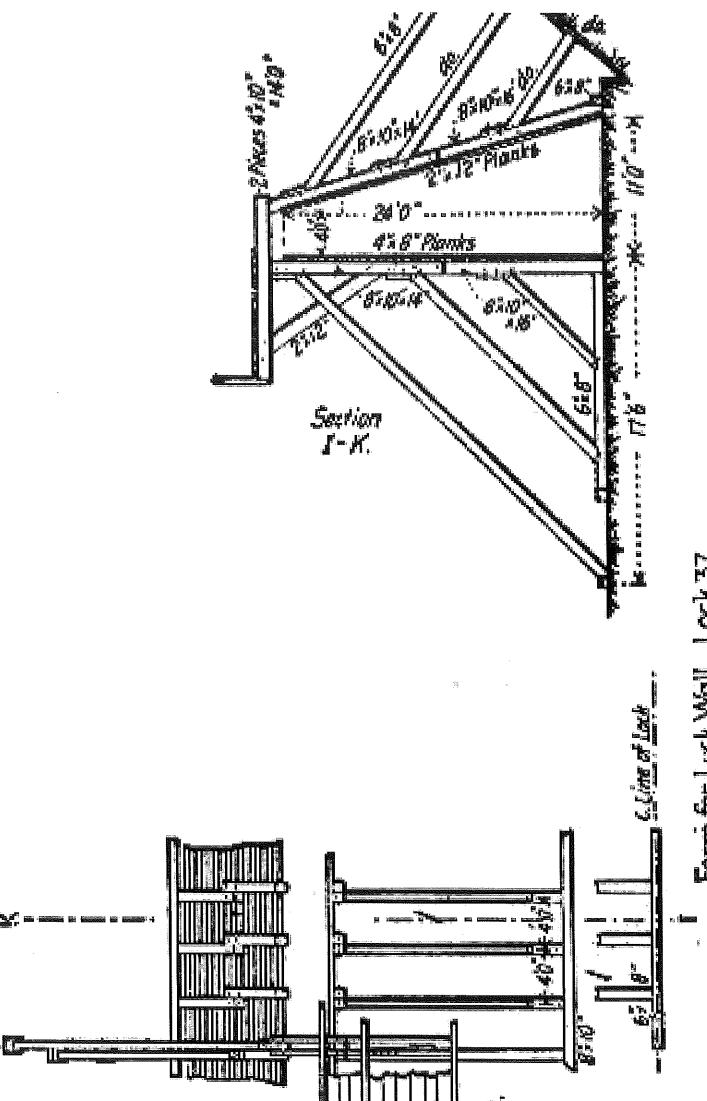
Given the date stamp on the south wall of 1911 and the varying wall cross sections identified along the wall, it is possible that there have historically been problems with the condition or instability of this wall.

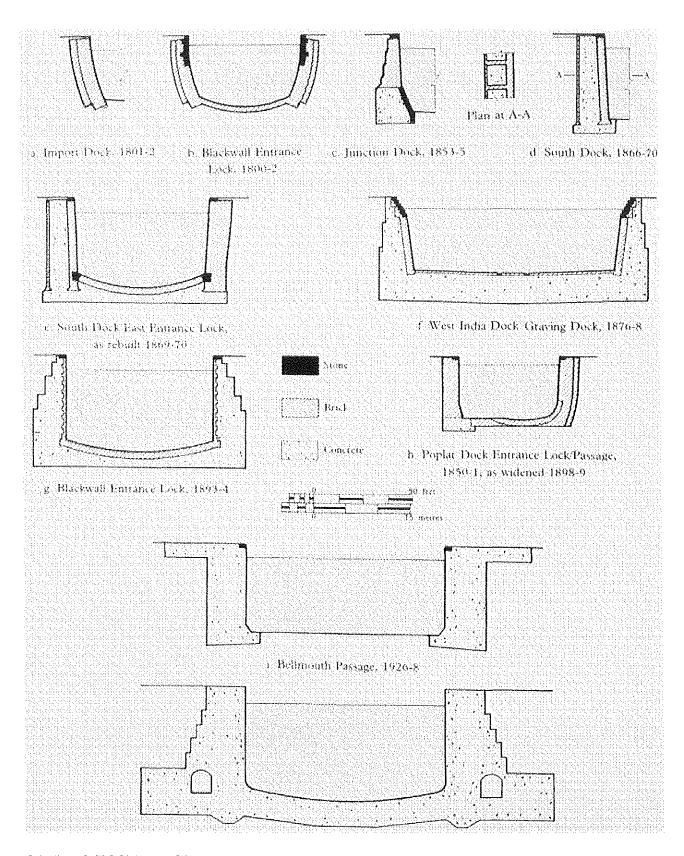
The north wall, from the evidence obtained from the trail pitting, is of a far more massive construction than the south wall, and is therefore potentially less vulnerable to structural damage caused by seasonal volume changes in the soils behind the wall, and is capable of resisting significantly higher earth pressures than the failed north wall.

Appendices		
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# Appendix A

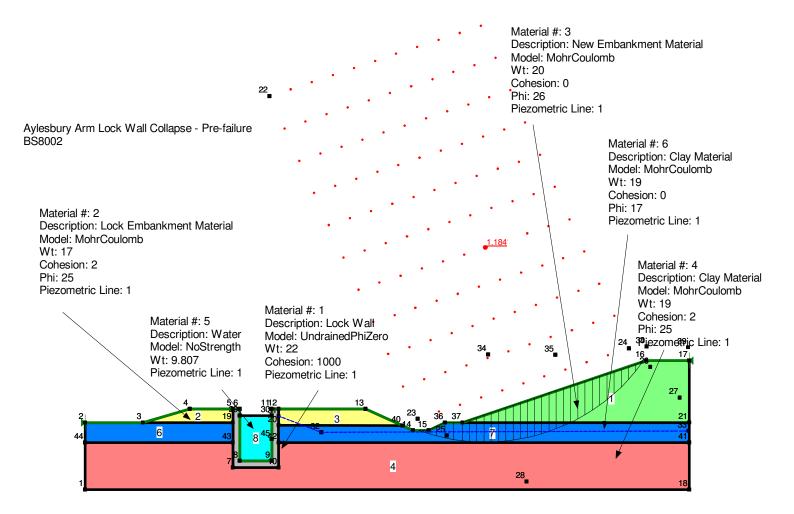
Typical Arrangements of Temporary Works and General Arrangements of Lock Structures

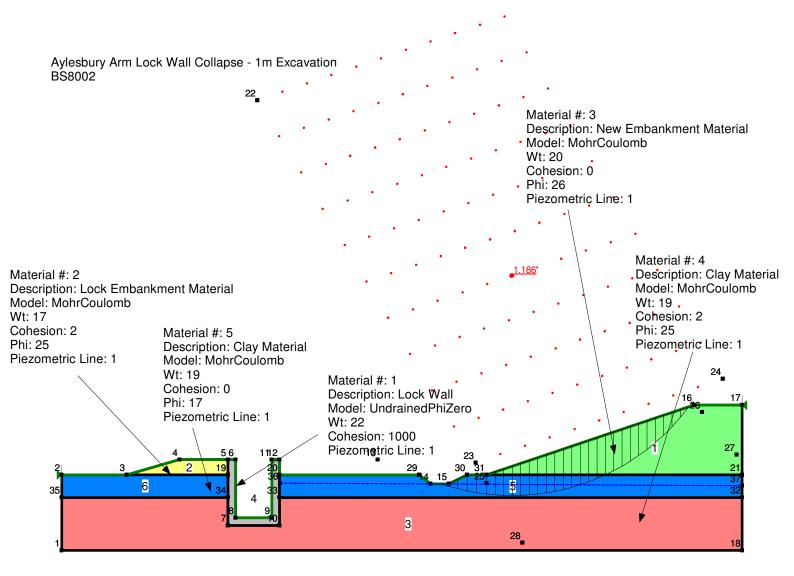




http://www.british-history.ac.uk/

Appendix B Global Stability Analysis – Arla North Development



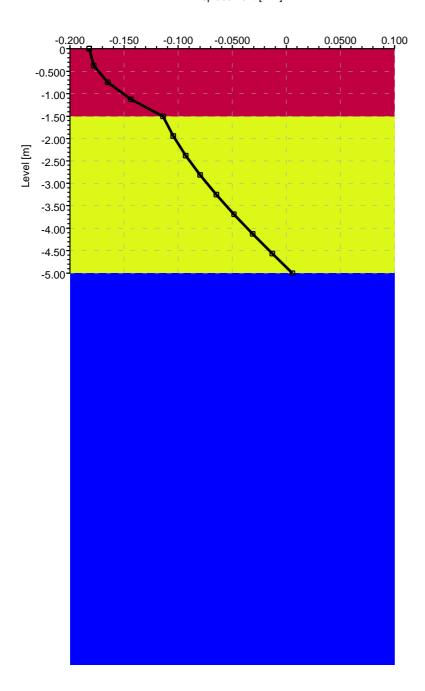


Appendix C Elastic Analysis – Arla North Development

# Layer 1 Layer 2 Layer 3 Layer 4

# Boussinesq Analysis

### Z-Displacement [mm]





### Notes

Analysis Options
Analysis: Boussinesq
Global Poisson's ratio: 0.20
Maximum allowable ratio between values of B: 1.5
Morizontal rigid boundary level: -5.00 [m oD]
Displacements at area centroids calculated.

### Soil ProfilesSoil Profile 1

Layer	yer Level at top		Number of intermediate displacement levels	Youngs	Modulus	Poissons ratio	Non-linear curve
				Top	Btm		
		[mOD]		[kN/m <sup>2</sup> ]	[kN/m <sup>2</sup> ]		
	1	0.0	3	8000.0	0.0008	0.50000	None
	2	-1.5000	7	15000.	15000.	0.20000	None
	3	-5.0000	10	30000.	. 100000.	0.20000	None
	4	-20.000	20	100000.	. 100000.	0.20000	None

### Soil ProfilesSoil Profile 2

Layer	Level at top	Number of intermediate displacement levels	Youngs	Modulus	Poissons ratio	Non-linear curve
	[mOD]		Top [kN/m²]	Btm [kN/m²]		

### Soil Zones

Zone	Name	X coordi	X coordinates		nates	Profile		
		min	max	min	max			
		[m]	[ m ]	[ m ]	[m]			
1	1	-5.0000	40.000	0.0	50.000	Soil	Profile	1

### Load Data

Load	Name	Loaded plane				ne	Loads						
ref.		Orientation	Cen	Centre of load		Angle of local	x Shape	Dimen	sion	1	Load valu	e	Number
				(Global)		w.r.t. global X		Width x/	Depth y	Normal z	Tange	ntial	of
			x	Y	Z(level)			Radius			x	y	rectangles
			[ m ]	[m]	[m]	[Degrees]		[m]	[m]	[kN/m <sup>2</sup> ]	[kN/m <sup>2</sup> ]	[kN/m²]	
1		1 Horizontal	24.000	25.000	0.0	0.	0 Rectangular	2.0000	50.000	6.7153	0.0	0.0	N/A
2		2 Horizontal	26.000	25.000	0.0	0.	0 Rectangular	2.0000	50.000	20.146	0.0	0.0	N/A
3		3 Horizontal	28.000	25.000	0.0	0.	0 Rectangular	2.0000	50.000	33.577	0.0	0.0	N/A
4		4 Horizontal	30.000	25.000	0.0	0.	0 Rectangular	2.0000	50.000	47.007	0.0	0.0	N/A
5		5 Horizontal	32.000	25.000	0.0	0.	0 Rectangular	2.0000	50.000	60.438	0.0	0.0	N/A
6		6 Horizontal	34.000	25.000	0.0	0.	0 Rectangular	2.0000	50.000	73.869	0.0	0.0	N/A
7		7 Horizontal	36.000	25.000	0.0	0.	0 Rectangular	2.0000	50.000	87.299	0.0	0.0	N/A
8		8 Horizontal	38.000	25.000	0.0	0.	0 Rectangular	2.0000	50.000	87.300	0.0	0.0	N/A
9		9 Horizontal	40.000	25.000	0.0	0.	0 Rectangular	2.0000	50.000	87.300	0.0	0.0	N/A

### **Displacement Data**

			Direction		Li	ne/Line fo	r extrus	ion		No. of intrvls		No. of intrvls		Show
Ref.	Type	Name	of	Fi	irst point	t	S	econd poi	nt	across	Extrusion	along	Calculate	Detailed
			Extrusion	x	Y	Z(level)	x	Y	Z(level)	extrusion/line	Depth	extrusion		results
				[ m ]	[ m ]	[ m ]	[m]	[ m ]	[m]		[m]			
1	Line	Line 1	N/A	9.40000	.00000	.00000	9.40000	50.00000	.00000	10	N/A	N/A	Yes	Yes
2	Grid	Grid 1	Global Y	-8.20133	-1.99090	.00000	43.79988	N/A	.00000	10	54.319	10	Yes	No
3	Line	Line 2	N/A	9.80000	24.00000	.00000	9.80000	24.00000	-5.00000	15	N/A	N/A	Yes	Yes

### Warnings

Not all displacement points lie within soil zones. Results calculated for points outside soil zones will assume a soil zone with properties of the first soil profile.

### **RESULTS FOR GRIDS**

Analysis: Boussinesq Global Poisson's ratio: 0.20 Horizontal rigid boundary level: -5.00 [m OD]

The maximum displacement difference between Boussineag method = 21.758mm and Mindlin method = 17.385mm occurs at point X = 36.000m Y = 25.000mLevel = 0.0mcD and is: 4.3726mm

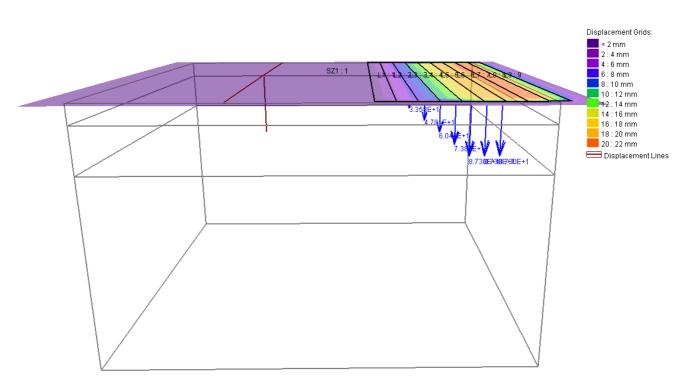
Name		Location				Stre	esses	
	x	Y	Z[Level]	Z	Calc	Vert	Sum Princ	Vert
					Level	Stress		Strain
	[m]	[m]	[mOD]	[ mm ]	[mOD]	[kN/m <sup>2</sup> ]	[kN/m <sup>2</sup> ]	[%]
	24.00000	25.00000	.00000	1.3839	-0.18750	6.7253	17.920	0.014100
	26.00000	25.00000	.00000	4.6000	-0.18750	20.147	48.605	0.073963
	28.00000	25.00000	.00000	8.0748	-0.18750	33.577	79.981	0.12968
	30.00000	25.00000	.00000	11.612	-0.18750	47.007	111.43	0.18493
	32.00000	25.00000	.00000	15.175	-0.18750	60.438	142.78	0.24081
	34.00000	25.00000	.00000	18.695	-0.18750	73.867	173.78	0.29886
	36.00000	25.00000	.00000	21.758	-0.18750	87.279	203.24	0.36623
	38.00000	25.00000	.00000	21.831	-0.18750	87.295	203.34	0.36587
	40.00000	25.00000	.00000	19.220	-0.18750	87.183	195.67	0.41175
Line 1	9.40000	.00000	.00000	-0.11473		7.6050E-6		-709.97E-6
	9.40000	5.00000	.00000	-0.13806		11.107E-6		-865.02E-6
	9.40000	10.00000	.00000	-0.15756		11.408E-6		-992.22E-6
	9.40000	15.00000	.00000	-0.17151		12.909E-6		-0.0010811
	9.40000	20.00000	.00000	-0.17967		13.109E-6		-0.0011322
	9.40000	25.00000	.00000	-0.18234		12.608E-6		-0.0011487
	9.40000	30.00000	.00000	-0.17967		13.109E-6		-0.0011322
	9.40000	35.00000	.00000	-0.17151		12.909E-6		-0.0010811
	9.40000	40.00000	.00000	-0.15756		11.408E-6		-992.22E-6
	9.40000		.00000	-0.13806		11.107E-6		-865.02E-6
- 114		50.00000	.00000	-0.11473		7.6050E-6		
Grid 1	-8.20133	-1.99090	.00000	-0.032566		1.1007E-6		-185.65E-6 !
	-8.20133	3.44099	.00000	-0.036743		1.5010E-6		-209.98E-6 !
	-8.20133	8.87289	.00000	-0.040406	-0.18750	0.0		-231.34E-6 !
	-8.20133	14.30479	.00000	-0.043241		1.8012E-6		-247.87E-6 !
	-8.20133	19.73669	.00000	-0.045014	-0.18750	0.0	0.041318	-258.24E-6 !
	-8.20133	25.16859	.00000	-0.045594	-0.18750	1.8012E-6	0.041858	-261.58E-6 !
	-8.20133	30.60048	.00000	-0.044938	-0.18750	0.0	0.041248	-257.80E-6 !
	-8.20133	36.03238	.00000	-0.043094	-0.18750	1.7011E-6	0.039526	-247.00E-6 !
	-8.20133	41.46428	.00000	-0.040200	-0.18750	1.6011E-6	0.036827	-230.14E-6 !
	-8.20133	46.89618	.00000	-0.036495	-0.18750	1.9013E-6		-208.51E-6 !
	-8.20133	52.32808	.00000	-0.032298	-0.18750	0.0		-184.08E-6 !
	-3.00121	-1.99090	.00000	-0.044008	-0.18750	0.0		-253.59E-6 !
	-3.00121	3.44099	.00000	-0.050692	-0.18750	2.3015E-6		-293.23E-6
	-3.00121	8.87289	.00000	-0.056590		1.9013E-6		-328.18E-6
	-3.00121	14.30479	.00000	-0.061139	-0.18750	3.5023E-6	0.056835	-355.15E-6
	-3.00121	19.73669	.00000	-0.063968	-0.18750	2.5017E-6	0.059513	-371.91E-6
	-3.00121	25.16859	.00000	-0.064888	-0.18750	2.0013E-6	0.060377	-377.32E-6
	-3.00121	30.60048	.00000	-0.063847	-0.18750	2.2015E-6	0.059391	-371.15E-6
	-3.00121	36.03238	.00000	-0.060904	-0.18750	1.5010E-6		-353.78E-6
	-3.00121	41.46428	.00000	-0.056258	-0.18750	0.0		-326.24E-6
	-3.00121	46.89618	.00000	-0.050293		2.3015E-6	0.046538	-290.82E-6
	-3.00121	52.32808	.00000	-0.043582	-0.18750	0.0	0.040167	-251.06E-6 !
	2.19891	-1.99090	.00000	-0.061485	-0.18750	0.0	0.057655	-360.33E-6 !
	2.19891	3.44099	.00000	-0.072739		3.1021E-6		-429.00E-6
	2.19891	8.87289	.00000	-0.082680		3.0020E-6		-489.55E-6
	2.19891	14.30479	.00000	-0.090250		4.2028E-6		-535.45E-6
	2.19891	19.73669	.00000	-0.094881		3.1021E-6		-563.37E-6
	2.19891	25.16859	.00000	-0.096372		4.0027E-6		-572.32E-6
	2.19891	30.60048	.00000	-0.094684		3.9026E-6		-562.18E-6
	2.19891	36.03238	.00000	-0.089862		4.1027E-6		-533.13E-6
	2.19891	41.46428	.00000	-0.082123		2.4016E-6		-486.21E-6
	2.19891	46.89618	.00000	-0.072066		1.6010E-6		-424.87E-6
	2.19891	52.32808	.00000	-0.060774	-0.18750	0.0		-355.98E-6 !
	7.39903	-1.99090	.00000	-0.089647		4.6031E-6		-541.10E-6 !
	7.39903	3.44099	.00000	-0.10991		7.1047E-6		-671.49E-6
	7.39903	8.87289	.00000	-0.12765		9.5063E-6		-784.71E-6
	7.39903	14.30479	.00000	-0.14073		9.4062E-6		-866.87E-6
	7.39903	19.73669 25.16859	.00000	-0.14847 -0.15092		8.2054E-6		-914.76E-6
	7.39903	30.60048	.00000	-0.15092		10.607E-6 8.2054E-6		-929.76E-6 -912.78E-6
	7.39903	36.03238		-0.14815		9.9066E-6		-862.74E-6
	7.39903	30.03230	.00000	-0.14007	-0.10/50	J.JUUGE-0	0.13607	-002.745-0

Name		Location					esses		
1	x	Y	Z[Level]	z	Calc Level	Vert Stress	Sum Princ	Vert Strain	
	[m]	[m]	[mOD]	[mm]	[mOD]	[kN/m²]	[kN/m²]	strain [%]	
	7.39903	41.46428	.00000	-0.12667	-0.18750	7.6050E-6	0.12458	-778.51E-6	
	7.39903	46.89618	.00000	-0.10870	-0.18750	6.8045E-6	0.10622	-663.72E-6	
	7.39903	52.32808	.00000	-0.088376		6.3042E-6	0.085285	-532.91E-6	1
	12.59915	-1.99090 3.44099	.00000	-0.13791 -0.17762	-0.18750	12.408E-6 21.414E-6	0.14167	-885.23E-6	
	12.59915	8.87289				24.116E-6	0.22593	-0.0011743	
	12.59915	14.30479	.00000	-0.23479	-0.18750	26.918E-6	0.25083	-0.0015672	
	12.59915	19.73669 25.16859	.00000	-0.24783 -0.25181	-0.18750	29.620E-6 28.819E-6	0.26421	-0.0016508	
	12.59915	30.60048				28.719E-6	0.26367	-0.0016474	
	12.59915	36.03238	.00000	-0.23365	-0.18750	27.118E-6	0.24965	-0.0015598	
	12.59915 12.59915	41.46428 46.89618	.00000	-0.20959 -0.17525	-0.18750 -0.18750	25.417E-6 18.612E-6	0.22395 0.18521	-0.0013992 -0.0011572	
	12.59915	52.32808				12.909E-6		-867.31E-6	1
	17.79927	-1.99090	.00000	-0.22107	-0.18750	54.136E-6	0.27140	-0.0016953	1
	17.79927	3.44099	.00000	-0.29744	-0.18750	121.88E-6	0.41579	-0.0025964	
	17.79927 17.79927	8.87289 14.30479	.00000	-0.36376 -0.40599	-0.18750	148.50E-6 156.10E-6	0.51182	-0.0031961 -0.0035061	
	17.79927	19.73669	.00000	-0.42753	-0.18750	158.71E-6	0.58459	-0.0035001	
	17.79927	25.16859	.00000	-0.43382	-0.18750	161.61E-6	0.59112	-0.0036915	
	17.79927 17.79927	30.60048	.00000	-0.42668	-0.18750	157.70E-6 156.20E-6	0.58370 0.55928	-0.0036452	
	17.79927	36.03238 41.46428	.00000	-0.40404 -0.36032	-0.18750	150.10E-6	0.55928	-0.0034926 -0.0031689	
	17.79927	46.89618	.00000	-0.29277	-0.18750	150.10E-6 119.58E-6	0.40781	-0.0025466	
	17.79927	52.32808	.00000	-0.21630	-0.18750	51.934E-6	0.26267	-0.0016407	!
	22.99939	-1.99090	.00000	-0.25579	-0.18750	981.33E-6	0.76575	-0.0047676	.!
	22.99939	3.44099 8.87289	.00000	0.63435	-0.18750 -0.18750	3.3463	9.1417	0.0056072	
	22.99939	14.30479	.00000	0.46898	-0.18750	3.3466 3.3466	9.4555 9.5536	0.0036513 0.0030380	
	22.99939	19.73669	.00000	0.43557	-0.18750	3.3466	9.5914	0.0028018	
	22.99939 22.99939	25.16859 30.60048	.00000	0.42634 0.43684	-0.18750 -0.18750	3.3466 3.3466	9.6013 9.5901	0.0027400 0.0028105	
	22.99939	36.03238	.00000	0.47213	-0.18750	3.3466	9.5901	0.0028105	
	22.99939	41.46428	.00000	0.47213 0.54749	-0.18750	3.3465	9.4455	0.0037136	
	22.99939	46.89618	.00000	0.63348	-0.18750	3.3462	9.1002	0.0058656	
	22.99939 28.19951	52.32808 -1.99090	.00000	-0.26885		687.58E-6	0.69468	-0.0043289	Ŗ
	28.19951	3.44099	.00000	0.059532 8.4959	-0.18750	0.0061311 33.600	2.2107 79.767	-0.013702 0.13145	
	28.19951	8.87289	.00000	8.4643	-0.18750	33.601	80.616	0.12616	
	28.19951	14.30479	.00000	8.3562	-0.18750		80.785	0.12511	
	28.19951 28.19951	19.73669 25.16859	.00000	8.3102 8.2980	-0.18750 -0.18750	33.601 33.601	80.839 80.853	0.12477 0.12469	
	28.19951	30.60048		8.3119	-0.18750	33.601	80.837	0.12478	
	28.19951	36.03238	.00000	8.3607	-0.18750	33.601	80.779	0.12515	
	28.19951	41.46428	.00000	8.4737	-0.18750	33.601	80.596	0.12629	
	28.19951 28.19951	46.89618 52.32808	.00000	8.4543 -0.067014	-0.18750	33.599 0.0038484	79.612 1.8510	0.13241	,
	33.39964	-1.99090	.00000	0.51439	-0.18750	0.012004	3.7499	-0.023212	i
	33.39964	3.44099	.00000	18.082	-0.18750	73.637	168.66	0.32660	
	33.39964	8.87289	.00000	18.162	-0.18750	73.640	170.06	0.31787	
	33.39964 33.39964	14.30479 19.73669	.00000	18.030 17.977	-0.18750 -0.18750	73.640 73.640	170.28 170.35	0.31647 0.31607	
	33.39964	25.16859	.00000	17.963 17.979	-0.18750	73.640	170 36	0.31597	
	33.39964	30.60048	.00000	17.979	-0.18750	73.640 73.640	170.35 170.28	0.31608 0.31652	
	33.39964 33.39964	36.03238 41.46428	.00000	18.036 18.173	-0.18750 -0.18750	73.640	170.28	0.31652	
	33.39964	46.89618	.00000	17.989	-0.18750	73.637	168.37	0.32835	
	33.39964	52.32808	.00000	0.25262	-0.18750	0.0074580	3.0636	-0.019008	1
	38.59975	-1.99090	00000	0 65365	-0.18750	0.013829	3.8750	-0.023959	!
	38.59975 38.59975	3.44099 8.87289	.00000	21.573 21.687	-0.18750 -0.18750	87.288 87.291	200.84	0.38138 0.37281	
	38.59975	14.30479	.00000	21.563	-0.18750	87.291	202.22	0.37149	
	38.59975	19.73669	.00000	21.511	-0.18750	87.291	202.50	0.37111	
	38.59975	25.16859	.00000	21.498	-0.18750	87.291	202.51	0.37101	
	38.59975	30.60048 36.03238	.00000	21.513 21.568	-0.18750 -0.18750	87.291 87.291	202.49 202.43	0.37112 0.37153	
	38.59975	41.46428	.00000	21.698	-0.18750	87.291	202.20	0.37297	
	38.59975	46.89618			-0.18750		200.55	0.38320	
	38.59975	52.32808	.00000	0.35516	-0.18750	0.0083906	3.1094	-0.019276	
	43.79988	-1.99090 3.44099	.00000	-0.30705 0.021599	-0.18750	978.65E-6 0.0050298	1.0736 2.7386	-0.0066915 -0.017022	1
	43.79988	8.87289	.00000	-0.093336	-0.18750	0.0050298	3.2237	-0.017022	ń
	43.79988	14.30479	.00000	-0.18487	-0.18750	0.0054563	3.3572	-0.020880	
	43.79988	19.73669	.00000	-0.22505	-0.18750	0.0054643	3.4039	-0.021172	
	43.79988	25.16859	.00000	-0.23586	-0.18750	0.0054659	3.4156	-0.021245	
	43.79988	30.60048	.00000	-0.22355		0.0054626	3.4023	-0.021162	
	43.79988 43.79988	36.03238 41.46428	.00000	-0.18100 -0.085367	-0.18750	0.0054567 0.0054138	3.3524 3.2093	-0.020850 -0.019957	i
	43.79988	46.89618	.00000	0.019856	-0.18750	0.0034138	2.6761	-0.019937	Ť
	43.79988	52.32808	.00000	-0.31993	-0.18750	806.64E-6	0.98608	-0.0061478	!
Line 2	9.80000	24.00000	.00000	-0.18948	-0.18750	15.310E-6	0.19205	-0.0012000	
	9.80000	24.00000 24.00000	-0.33333	-0.18593 -0.17529		336.12E-6 0.0015253	0.54024	-0.0033702 -0.0055620	
	9.80000	24.00000	-1.00000	-0.17529	-1.1250	0.0015253	1.1485	-0.0055620	
	9.80000	24.00000	-1.33333	-0.13302	-1.4167	0.0064320	1.4434	-0.0089008	
	9.80000	24.00000	-1.66667	-0.11474	-1.9048	0.015495	1.9324	-0.0024526	
	9.80000	24.00000	-2.00000 -2.33333	-0.10682 -0.097682	-2.2143 -2.5556	0.024176	2.2389	-0.0027917 -0.0031357	
	9.80000	24.00000	-2.66667	-0.087412	-2.9000	0.053291	2.9053	-0.0034473	
	9.80000	24.00000	-3.00000	-0.076089	-3.2000	0.070904	3.1905	-0.0036868	
	9.80000	24.00000	-3.33333 -3.66667	-0.063884 -0.050905	-3.5417 -3.8889	0.094958	3.5101 3.8287	-0.0039205 -0.0041127	
	9.80000	24.00000	-4.00000	-0.050905	-3.8889	0.12402 0.15078	4.0787	-0.0041127	
	9.80000	24.00000	-4.33333	-0.023161	-4.5000	0.18713	4.3727	-0.0043333	
	9.80000	24.00000 24.00000	-4.66667 -5.00000	-0.0087171	-4.8333 -5.5316	0.22822	4.6599	-0.0043874 -0.0020102	
! Doint lies outside soi				-0.084312				-0.0020102	

9.80000 24.00000 -5.00000 -0.084312 -5.5316 0.32991
! Point lies outside soil zones. Results calculated for this point assume a soil zone with properties of the first soil profile.

# Oasys

Graphic Display: SoilProfiles - Lines - Grids - Loads

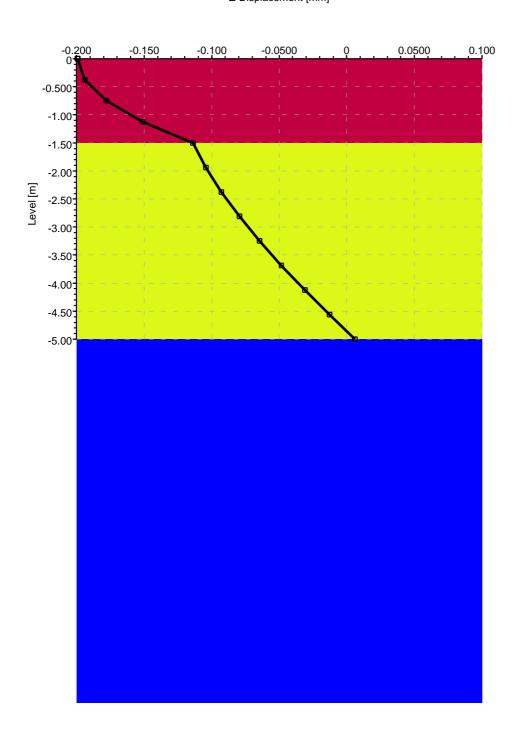


y \_\_\_\_\_\_

# Layer 1 Layer 2 Layer 3 Layer 4

# Mindlin Analysis

### Z-Displacement [mm]





### Notes

Analysis Options
Analysis: Mindlin - Horizontal dispacements are calculated
Soil above horizontal load on horizontal plane dampens displacements below load: Yes
Soil above vertical load on horizontal plane dampens displacements below load: No
Maximum allowable ratio between values of E: 1.5
Horizontal rigid boundary level: -5.00 [m OD]
Displacements at area centroids calculated.

So		Profiles: Level at top	Soil Profile Number of intermediate displacement levels	1 Youngs	Modulus	Poissons ratio	Non-linear curve	
				Top	Btm			
		[mOD]		[kN/m <sup>2</sup> ]	[kN/m <sup>2</sup> ]			
	1	0.0	3	8000.0	8000.0	0.50000	None	
	2	-1.5000	7	15000.	15000.	0.20000	None	
	3	-5.0000	10	30000.	100000.	0.20000	None	
	4	-20.000	20	100000.	100000.	0.20000	None	

### Soil ProfilesSoil Profile 2

Layer	Level top	intermediate displacement	Youngs	Modulus	Poissons ratio	Non-linear curve
		levels				
			man	Dam		

Top Btm [kN/m2] [mOD]

### Soil Zones

2	Zone	Name		X coord	inates	Y coord:	inates		Profile	
				min	max	min	max			
				[m]	[m]	[m]	[m]			
	1		1	-5.0000	40.000	0.0	50.000	Soil	Profile	1

### Load Data

Load	Name			Lo	aded pla	ne				L	oads		
ref.		Orientation	Cen	tre of lo	ad	Angle of local	x Shape	Dime	nsion	1	Load valu	e	Number
				(Global)		w.r.t. global	X	Width x/	Depth y	Normal z	Tange	ntial	of
			x	Y	Z(level)			Radius			x	y	rectangles
			[m]	[m]	[m]	[Degrees]		[m]	[m]	[kN/m <sup>2</sup> ]	[kN/m <sup>2</sup> ]	[kN/m²]	
1		1 Horizontal	24.000	25.000	0.0	0	.0 Rectangula			6.7153	0.0	0.0	N/A
2		2 Horizontal	26.000	25.000	0.0		.0 Rectangula				0.0		
3		3 Horizontal	28.000	25.000	0.0	0	.0 Rectangula	ar 2.0000	50.000	33.577	0.0	0.0	N/A
4		4 Horizontal	30.000	25.000	0.0	0	.0 Rectangula			47.007	0.0	0.0	N/A
5		5 Horizontal	32.000	25.000	0.0	0	.0 Rectangula	ar 2.0000	50.000	60.438	0.0	0.0	N/A
6		6 Horizontal	34.000	25.000	0.0	0	.0 Rectangula			73.869	0.0	0.0	N/A
7		7 Horizontal	36.000	25.000	0.0	0	.0 Rectangula	ar 2.0000	50.000	87.299	0.0	0.0	N/A
8		8 Horizontal	38.000	25.000	0.0	0	.0 Rectangula	ar 2.0000	50.000	87.300	0.0	0.0	N/A
0		9 Horizontal	40 000	25 000	0.0	0	O Postangul	2 0000	50 000	97 200	0.0	0.0	NT / 7s

### **Displacement Data**

			iciit Dat	Direction			ne/Line fo				No. of intrvls		No. of intrvls		Show
R	ef.	Type	Name	of .	Fi	rst point		S	econd poi		across	Extrusion	along	Calculate	
				Extrusion	x	Y	Z(level)	x	Y		extrusion/line	Depth	extrusion		results
					[ m ]	[m]	[m]	[m]	[m]	[m]		[m]			
	1 I	ine	Line 1	N/A	9.40000	.00000	.00000	9.40000	50.00000	.00000	10	N/A	N/A	Yes	Yes
	2 G	rid	Grid 1	Global Y	-8.20133	-1.99090	.00000	43.79988	N/A	.00000	10	54.319	10	Yes	No
	3 T	.ine	Line 2	NI / Z	9 80000	24 00000	00000	9 80000	24 00000	-5 00000	15	N/A	N/A	Yes	Vec

### RESULTS FOR GRIDS

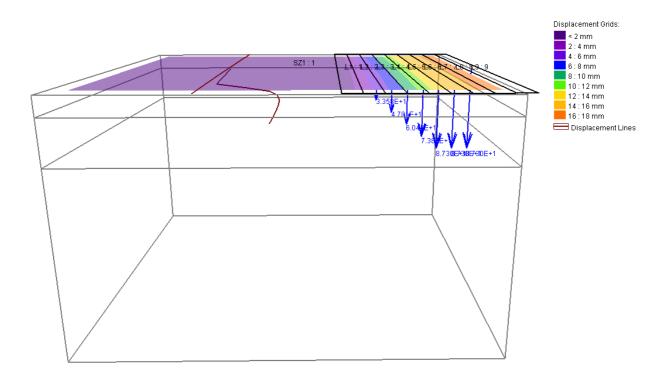
Analysis: Mindlin Maximum allowable ratio between values of E: 1.5 Horizontal rigid boundary level: -5.00 [m OD]

Name		Location			isplacement	
	x	Y	Z[Level]	X	Y	Z
	[m]	[m]	[mOD]	[mm]	[ mm ]	[ mm ]
	24.00000	25.00000	.00000	0.0	0.0	0.86051
	26.00000	25.00000	.00000	0.0	0.0	3.4443
		25.00000	.00000			
	30.00000	25.00000	.00000	0.0	0.0	9.0952
	32.00000	25.00000	.00000			11.984
	34.00000	25.00000	.00000		0.0	11.904
	34.00000	25.00000		-1.9073E-6	0.0	14.860
	36.00000	25.00000	.00000	-1.9073E-6	0.0	17.385
	38.00000	25.00000	.00000	-1.9073E-6	0.0	17.475
	40.00000	25.00000	.00000	-1.9073E-6	0.0	
Line 1	9.40000	.00000	.00000	0.0	1.9073E-6	-0.12506
	9.40000	5.00000	.00000	0.0	0.0	-0.15069
	9.40000	10.00000	.00000	-1.9073E-6	0.0	-0.17215
	9.40000	15.00000		3.8147E-6	0.0	
	9.40000	20.00000	.00000	3.8147E-6	0.0	-0.19623
	9.40000	25.00000	.00000			
	9.40000	30.00000	.00000	3.8147E-6	0.0	-0.19626
	9.40000	35.00000	.00000			-0.18743
	9.40000	40.00000	.00000	-1.9073E-6	0.0	-0.17212
	9.40000	45.00000				
	9.40000	50.00000	.00000	0.0	-1.9073E-6	-0.12520
Grid 1	-8.20133	-1.99090	.00000	-1.#IND	-1.#IND	-0.035386 !
	-8.20133	3.44099	.00000	-1.#IND	-1.#IND	-0.040079 !
	-8.20133	8.87289		-1.#IND	-1.#IND	-0.043745 !
	-8.20133	14.30479		-1.#IND	-1.#IND	-0.045745 !
	-8.20133	19.73669	.00000	-1.#IND	-1.#IND	-0.048800 !
	-8.20133	25.16859		-1.#IND	-1.#IND	-0.049488 !
	-8.20133	30.60048	.00000	-1.#IND	-1.#IND	-0.048703 !
	-8.20133	36.03238	.00000	-1.#IND	-1.#IND	-0.046850 !
	-8.20133	41.46428		-1.#IND	-1.#IND	-0.043563 !
	-8.20133	46.89618		-1.#IND	-1.#IND	-0.039703 !
		52.32808				
				-1.#IND	-1.#IND	-0.035163 !
	-3.00121	-1.99090	.00000	-1.#IND	-1.#IND	-0.047923 !
	-3.00121	3.44099	.00000	0.0	0.0	-0.054888
	-3.00121	8.87289	.00000	0.0	0.0	-0.061421
	-3.00121	14.30479	.00000	0.0	0.0	-0.066250
	-3.00121	19.73669	.00000	0.0	0.0	-0.069404
	-3.00121	25.16859				
	-3.00121	30.60048	.00000	0.0	0.0	-0.069231
	-3.00121	36.03238	.00000		0.0	
	-3.00121	41.46428	.00000	1.9073E-6	0.0	-0.060980
	-3.00121	46.89618			0.0	
	-3.00121	52.32808		-1.#IND	-1.#IND	-0.047142 !
	2.19891	-1.99090		-1.#IND	-1.#IND	-0.066617 !
	2.19891	3.44099	.00000	0.0	0.0	-0.079064
	2.19891	8.87289	.00000	0.0	0.0	-0.089911
	2.19891	14.30479	.00000	0.0	0.0	-0.098078
	2.19891	19.73669	.00000	0.0	0.0	-0.10321
	2.19891	25.16859	.00000	0.0	0.0	-0.10467
	2.19891	30.60048		3.8147E-6		
	2.19891	36.03238	.00000	0.0	0.0	-0.097658
	2.19891	41.46428	.00000		0.0	-0.097638
	2.19891	46.89618	.00000	0.0	0.0	-0.078155
	2.19891	52.32808		-1.#IND	-1.#IND	-0.066236 !
	7.39903	-1.99090		-1.#IND	-1.#IND	-0.097620 !
	7.39903	3.44099	.00000		1.9073E-6	-0.11971
	7.39903	8.87289	.00000	0.0	0.0	-0.13923
	7.39903	14.30479	.00000	0.0	0.0	-0.15336
	7.39903	19.73669	.00000	0.0	0.0	-0.16185
	7.39903	25.16859	.00000		0.0	
	7.39903	30.60048	.00000	0.0	0.0	-0.16150
	7.39903	36.03238	.00000		0.0	
	7.39903	41.46428	.00000	5.7220E-6	0.0	-0.13207
	7.39903	46.89618			-1.9073E-6	-0.11848
	7.39903	52.32808		-1.#IND	-1.#IND	-0.095994 !
	12.59915	-1.99090		-1.#IND	-1.#IND	-0.15084 !
	12.59915	3.44099	.00000	0.0	1.9073E-6	-0.19488
	12.59915	8.87289	.00000	0.0		-0.23234
	12.59915	14.30479	.00000	3.8147E-6	0.0	-0.25790
	12.59915	19.73669	.00000			-0.27209
	12.59915	25.16859	.00000	0.0	0.0	-0.27650
	12.59915	30.60048	.00000		0.0	-0.27158
	12.59915	36.03238	.00000	5.7220E-6	0.0	-0.27156
	12.59915	41.46428	.00000		-1.9073E-6	
	12.39913	11.70720	.00000	J.014/E-0	1.90/35-0	0.23022

X	Name	Location Displacement					
12.59915	1				x	Y	
12.59915   52.32808   .00000					[ mm ]	[ mm ]	[ mm ]
117.79927	· /-	12.59915	46.89618	.00000	0.0	-3.8147E-6	
17.79927   3.44099   .00000   3.8147E-6   1.9073E-6   -0.31586   17.79927   14.30479   .00000   3.8147E-6   0.0   -0.45781   17.79927   14.30479   .00000   3.8147E-6   0.0   -0.45781   17.79927   19.73669   .00000   3.8147E-6   0.0   -0.48156   17.79927   36.03238   .00000   11.444E-6   0.0   -0.45565   17.79927   36.03238   .00000   11.444E-6   0.0   -0.45565   17.79927   41.46428   .00000   -1.9073E-6   1.9073E-6   -0.33038   17.79927   52.32808   .00000   -1.9073E-6   -0.9073E-6   -0.340938   22.99939   3.4.30479   .00000   0.0   -0.9073E-6   -0.340938   22.99939   3.4.30479   .00000   0.0   -0.9073E-6   -0.340938   22.99939   37.5669   .00000   0.0   -0.9073E-6   -0.00973E-22.99939   36.03238   .00000   0.0   -0.0   -0.0   .0.16068   22.99939   36.03238   .00000   0.0   -0.0   -0.0   .0.16068   22.99939   36.03238   .00000   0.0   -0.0   -0.0   .0.16068   22.99939   36.03238   .00000   0.0   -0.0   -0.0   .0.16068   22.99939   36.03238   .00000   0.0   -0.0   -0.0   .0.16046   22.99939   36.03238   .00000   0.0   -0.0   -0.0   .0.16046   22.99939   36.03238   .00000   0.0   -0.0   -0.0   .0.16046   22.99939   36.03238   .00000   0.0   -0.0   -0.0   .0.16046   22.99939   36.03238   .00000   -0.0   .0.0				.00000	-1.#IND		-0.14818
17.79927		17.79927	3.44099	.00000	3.8147E-6	1.9073E-6	
17.79927   19.73669   .00000   0.0		17.79927	8.87289	00000			-0.41111
17.79927   36.03238   .00000   11.444E-6   0.0   -0.45565   17.79927   41.46428   .00000   -1.9073E-6   1.9073E-6   -0.33038   17.79927   52.32808   .00000   -1.9073E-6   1.9073E-6   -0.33038   17.79927   52.32808   .00000   -1.9073E-6   1.9073E-6   -0.33038   17.79927   52.32808   .00000   -1.9073E-6   1.9073E-6   -0.33038   22.99939   1.90000   .00000   -1.9073E-6   -0.24053   22.99939   1.90000   .00000   .00000   .00000   .00000   .00000   .00000   .00000   .00000   .00000   .00000   .00000   .00000   .00000   .000000   .000000   .000000   .000000   .000000   .000000   .000000   .000000   .000000   .000000   .000000   .000000   .000000   .000000   .000000   .000000   .000000   .0000000   .0000000   .0000000   .0000000   .0000000   .0000000   .0000000   .0000000   .0000000   .0000000   .00000000		17.79927	14.30479	.00000	3.8147E-6	0.0	-0.45781
117.79927   36.03238   .00000   11.4448-6   0.0   -0.0718   17.79927   46.869618   .00000   -1.90738-6   .1.90738-6   -0.33038   17.79927   52.32808   .00000   -1.181ND   -1.181ND   -0.24055   .000000   .000000   .000000   .000000   .000000   .000000   .000000   .000000   .000000   .000000   .0000000   .0000000   .0000000   .0000000   .0000000   .0000000   .00000000				.00000	0.0	0.0	-0.48837
17,79927   41,46428   .00000   -1,9073E-6   1,9073E-6   -0,33038   17,79927   52,32808   .00000   -1,87ND   -1,87ND   -0,24055   22,99939   -1,99090   .00000   -1,87ND   -1,87ND   -0,32403   22,99939   8,87299   .00000   0.0   -1,9073E-6   0.14988   22,99939   18,73669   .00000   0.0   1,9073E-6   0.14683   22,99939   19,73669   .00000   0.0   1,9073E-6   0.14683   22,99939   19,73669   .00000   7,6294E-6   0.0   0.0   0.11006   22,99939   36,60238   .00000   7,6294E-6   0.0   0.0   0.19073E-6   22,99939   36,60238   .00000   5,723E-6   0.0   0		17.79927	30.60048	.00000			
17,79927   46,89618   .00000			41.46428	.00000	0.0	0.0	
22.99939   -1.99090   .00000   -1.#IND		17.79927	46.89618	.00000	-1.9073E-6	1.9073E-6	
22,99339   8.87289   0.0000   0.0   0.0   0.0   0.2283					-1.#IND	-1.#IND	
22,99939   14,30479   0.0000   0.0   1,9073E-6   0.14683   22,99939   25,16859   0.0000   7.6394E-6   0.0		22.99939	3.44099	.00000	0.0	-1.9073E-6	0.34988
22,99939   19,73669   .00000   0.0   0.0   0.11006   22,99939   25,16859   .00000   5,7220E-6   0.0   0.099739   22,99939   36,03238   .00000   1,9073E-6   0.0   0.11041   22,99939   36,03238   .00000   1,9073E-6   -1,9073E-6   0.0   35524   22,99939   46,89618   0.0000   1,9073E-6   -1,9073E-6   0.0   35524   22,99939   52,32808   0.00000   -1,81ND   -1,81ND   -1,81ND   -0,12633   28,19951   -1,9909   0.00000   -1,81ND   -1,81ND   -0,12633   28,19951   3,44099   0.00000   -1,81ND   -1,81ND   -0,12633   28,19951   14,30479   0.00000   -5,7220E-6   -1,9073E-6   6,6085   28,19951   19,73669   0.00000   -5,7220E-6   -1,9073E-6   0.0   6,4353   28,19951   36,60848   0.00000   1,9073E-6   0.0   6,4353   28,19951   36,60848   0.00000   1,9073E-6   0.0   6,4353   28,19951   36,60848   0.00000   1,9073E-6   0.0   6,4353   28,19951   41,46428   0.00000   9,5367E-6   5,7220E-6   6,60867   28,19951   52,32808   0.00000   -1,81ND   -1,81ND   -1,81ND   -0,2658   33,3964   1,90909   0.00000   -1,81ND   -1,81ND   -1,81ND   -0,2658   33,3964   1,9009   0.00000   -1,81ND   -1,81ND   -1,81ND   -0,2658   33,39964   1,9009   0.00000   -1,81ND   -1,81ND   -0,2658   33,39964   1,9009   0.00000   -1,81ND   -1,81ND   -1,81ND   -0,2658   33,39964   1,9009   0.0000   -1,81ND   -1			8.87289	.00000		0.0	
22.99939   30.10048   .00000   5.72208-6   .0.0   .0.13143   .0.			19.73669	.00000	0.0	1.9073E-6	0.14683
22,99339   41,46428   0,0000   1,90738-6   -1,90738-6   0,23342		22.99939	25.16859	.00000			0.055/35
22,99939   41,46428   0.0000   1,90738-6   -1,90738-6   0.0   33524   22,99939   52,32808   0.0000   -1,81ND   -1,81ND   -0,12633   28,19951   3,44099   0.0000   -1,81ND   -1,81ND   -0,12633   28,19951   14,30479   0.0000   -5,72208-6   -1,90738-6   6.6085   6.6085   28,19951   19,73669   0.0000   -5,72208-6   -1,90738-6   6.6085   6.8488   28,19951   36,60848   0.0000   1,90738-6   0.0   6.4337   6.4283   28,19951   36,60848   0.0000   1,90738-6   0.0   6.4357   6.6858   28,19951   36,60848   0.0000   1,90738-6   0.0   6.4357   6.6858   28,19951   36,60848   0.0000   1,90738-6   0.0   6.4357   6.6858   28,19951   34,46428   0.0000   1,90738-6   0.0   6.4353   6.6858   28,19951   41,46428   0.0000   9,53678-6   5,72208-6   6.6198   28,19951   41,46428   0.0000   -1,81ND   -1,81ND   -0,22658   33,39864   -1,99080   0.0000   -1,81ND   -1,81ND   -0,22658   33,39864   -1,99080   0.0000   -1,81ND   -1,81ND   -0,22658   33,39964   41,46428   0.0000   -1,81ND   -1,81ND   -0,22658   33,39964   41,46428   0.0000   -1,90738-6   3,81478-6   14,430   33,39964   14,30479   0.0000   -1,90738-6   0.0   14,272   33,39964   14,30479   0.0000   -1,90738-6   0.0   14,275   33,39964   14,46428   0.0000   -1,90738-6   0.0   14,275   33,39964   41,46428   0.0000   -1,90738-6   0.0   14,275   33,39964   41,46428   0.0000   -1,90738-6   0.0   14,275   33,39964   41,46428   0.0000   -1,90738-6   0.0   14,275   33,39964   46,89618   0.0000   -1,90738-6   0.0   14,275   33,39964   46,89618   0.0000   -1,90738-6   0.0   14,275   33,39964   46,89618   0.0000   -1,90738-6   0.0   14,275   33,39964   46,89618   0.0000   -1,90738-6   0.0   14,275   33,39964   46,89618   0.0000   -1,90738-6   0.0   14,275   33,39964   46,89618   0.0000   -1,90738-6   0.0   0.0   14,275   33,39964   46,89618   0.0000   -1,90738-6   0.0   0.0   14,275   33,39964   46,89618   0.0000   -1,90738-6   0.0   0.0   14,275   33,39964   46,89618   0.0000   -1,90738-6   0.0   0.0   14,275   33,39964   46,89618   0.00000   -1,81ND   -1,81ND   -1,81ND   -0,00008   38,8997		22.99939		.00000	5.7220E-6	0.0	
22,99939   46,89618   .00000   1,9773E-6   .0   0.35254   .22,99939   52,32808   .00000   -1,#IND		22.99939	41.46428	.00000	1.9073E-6		
28.19951   -1,99090   0.0000   -1,#IND			46.89618	.00000	1.9073E-6	0.0	0.35254
28.19951 3.44099 .00000 9.53672-6 3.81472-6 6.6085 28.19951 14.30479 .00000 9.53672-6 3.81472-6 6.6085 28.19951 19.73669 .00000 1.90738-6 0.0 6.4337 28.19951 30.60048 .00000 1.90738-6 0.0 6.4337 28.19951 30.60048 .00000 1.90738-6 0.0 6.4353 28.19951 41.46428 .00000 9.53672-6 5.70248-6 6.6085 28.19951 41.46428 .00000 9.53672-6 5.70248-6 6.6193 28.19951 52.32808 .00000 1.8180 -1.8180 -1.8180 -0.22658 38.39964 1.84099 .00000 -1.8180 -1.8180 -1.8180 -0.22658 38.39964 1.84099 .00000 -1.8180 -1.8180 -1.8180 -0.22658 38.39964 1.84099 .00000 -1.8180 -1.8180 -1.8180 -0.22658 38.339964 1.87499 .00000 -1.8180 -1.8180 -1.8180 -0.22658 38.339964 18.7369 .00000 -3.81472-6 1.90732-6 14.422 38.339964 19.73669 .00000 -3.81472-6 -1.90732-6 14.425 38.339964 19.73669 .00000 -3.81472-6 -0.0 14.272 38.339964 30.60048 .00000 -3.81472-6 -1.90732-6 14.425 38.339964 41.46428 .00000 3.81472-6 -1.90732-6 14.425 38.339964 41.46428 .00000 3.81472-6 -1.90732-6 14.425 38.339964 41.46428 .00000 3.81472-6 0.0 14.272 38.339964 50.6048 .00000 -1.90733-6 -1.90732-6 14.436 38.339964 41.46428 .00000 3.81472-6 0.0 14.272 38.39957 51.90000 -1.90733-6 -1.90732-6 17.279 38.59975 1.90900 .00000 -1.9733-6 -1.90732-6 17.279 38.59975 1.90900 .00000 -1.9733-6 0.0 14.720 38.59975 1.90900 .00000 -1.9733-6 0.0 14.720 38.59975 1.90900 .00000 -1.9733-6 0.0 14.720 38.59975 1.90900 .00000 -1.9733-6 0.0 14.720 38.59975 1.40099 .00000 -1.9733-6 0.0 0.0 14.720 38.59975 1.40099 .00000 -1.9733-6 0.0 0.0 17.228 38.59975 1.40099 .00000 -1.9733-6 0.0 0.0 17.228 38.59975 1.40099 .00000 -1.9733-6 0.0 0.0 17.238 38.59975 1.40090 .00000 -1.9733-6 0.0 0.0 17.238 38.59975 1.40090 .00000 -1.9733-6 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.					-1.#IND		
28.19951		28.19951	3.44099	.00000	0.0	0.0	
28.19951 19.73669 .00000 1.90738-6 0.0 6.4203 28.19951 30.000328 .00000 1.90738-6 0.0 6.4203 28.19951 30.000328 .00000 1.90738-6 0.0 6.4203 28.19951 36.03238 .00000 1.90738-6 0.0 6.4203 28.19951 46.89618 .00000 9.53678-6 5.720.0 6.4893 28.19951 46.89618 .00000 9.53678-6 5.720.0 6.4893 28.19951 52.32808 .00000 1.80000 1.1800 0.0 7.62948-6 6.8867 28.19951 52.32808 .00000 1.8000 0.0 1.800 1.800 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0		28.19951	8.87289	.00000	9.5367E-6	3.8147E-6	6.6085
28.19951   25.16859   .00000   1.90738-6   0.0   6.4203		28.19951	14.30479	.00000	-5.7220E-6	-1.9073E-6	6.4848
28.19951 41.46428 0.0000 9.5367E-6 -5.7220E-6 6.6198 28.19951 52.32808 0.0000 -1.#IND -1.#IND -0.22658 33.39964 3.46999 0.0000 -1.#IND -1.#IND 0.20558 33.39964 3.4699 0.0000 -5.7220E-6 13.51E-6 14.482 33.39964 1.49090 0.0000 -1.973E-6 1.9073E-6 14.482 33.39964 3.60429 0.0000 -1.973E-6 3.6147E-6 14.333 33.3964 3.50469 0.0000 -1.973E-6 3.6147E-6 14.333 33.3964 35.60048 0.0000 -1.973E-6 3.6147E-6 14.333 33.39964 35.60048 0.0000 -3.8147E-6 0.0 14.272 33.39964 36.0238 0.0000 -3.8147E-6 0.0 14.272 33.39964 41.46428 0.0000 3.8147E-6 0.0 14.496 33.39964 41.46428 0.0000 1.9073E-6 -1.9073E-6 14.386 33.39964 52.32808 0.0000 -1.9173E-6 -1.9073E-6 14.386 33.39965 52.3808 0.0000 -1.#IND -1.#IND -0.0077288 38.59975 3.46999 0.0000 -1.#IND -1.#IND 0.33692 38.59975 1.43699 0.0000 -1.95367E-6 11.4446-6 17.430 38.59975 1.973669 0.0000 -1.973E-6 -0.0 14.426 38.59975 1.973669 0.0000 -1.973E-6 -0.0 17.222 38.59975 1.973669 0.0000 -1.973E-6 0.0 17.222 38.59975 1.973669 0.0000 -1.973E-6 0.0 17.223 38.59975 1.973669 0.0000 -1.973E-6 0.0 17.222 38.59975 1.973669 0.0000 -1.973E-6 0.0 0.0 17.223 38.59975 1.973669 0.0000 -1.973E-6 0.0 0.0 0.0 17.223 38.59975 1.973669 0.0000 -1.#IND 0.0000 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0		28.19951	25.16859	.00000	1.9073E-6		
28.19951 41.46428 0.0000 9.5367E-6 -5.7220E-6 6.6198 28.19951 52.32808 0.0000 -1.#IND -1.#IND -0.22658 33.39964 3.46999 0.0000 -1.#IND -1.#IND 0.20558 33.39964 3.4699 0.0000 -5.7220E-6 13.51E-6 14.482 33.39964 1.49090 0.0000 -1.973E-6 1.9073E-6 14.482 33.39964 3.60429 0.0000 -1.973E-6 3.6147E-6 14.333 33.3964 3.50469 0.0000 -1.973E-6 3.6147E-6 14.333 33.3964 35.60048 0.0000 -1.973E-6 3.6147E-6 14.333 33.39964 35.60048 0.0000 -3.8147E-6 0.0 14.272 33.39964 36.0238 0.0000 -3.8147E-6 0.0 14.272 33.39964 41.46428 0.0000 3.8147E-6 0.0 14.496 33.39964 41.46428 0.0000 1.9073E-6 -1.9073E-6 14.386 33.39964 52.32808 0.0000 -1.9173E-6 -1.9073E-6 14.386 33.39965 52.3808 0.0000 -1.#IND -1.#IND -0.0077288 38.59975 3.46999 0.0000 -1.#IND -1.#IND 0.33692 38.59975 1.43699 0.0000 -1.95367E-6 11.4446-6 17.430 38.59975 1.973669 0.0000 -1.973E-6 -0.0 14.426 38.59975 1.973669 0.0000 -1.973E-6 -0.0 17.222 38.59975 1.973669 0.0000 -1.973E-6 0.0 17.222 38.59975 1.973669 0.0000 -1.973E-6 0.0 17.223 38.59975 1.973669 0.0000 -1.973E-6 0.0 17.222 38.59975 1.973669 0.0000 -1.973E-6 0.0 0.0 17.223 38.59975 1.973669 0.0000 -1.973E-6 0.0 0.0 0.0 17.223 38.59975 1.973669 0.0000 -1.#IND 0.0000 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0		28.19951		.00000	1.9073E-6	0.0	6.4355
28.19951   46.89618   0.0000				.00000	9.5367E-6	-5.7220E-6	6.6198
33,39964   -1,99090   0.0000   -1,#IND		28.19951	46.89618	.00000	0.0	-7.6294E-6	6.6867
33.39964 8.87289 .00000 -5.72208-6 13.3518-6 14.825 33.39964 18.73669 .00000 -1.91738-6 3.81478-6 1.0014.370 33.39964 19.73669 .00000 -1.91738-6 3.81478-6 1.0014.370 33.39964 19.73669 .00000 -3.81478-6 0.0014.370 33.39964 30.0000 -3.81478-6 0.0014.370 33.39964 30.00000 -3.81478-6 0.0014.370 33.39964 30.00000 -3.81478-6 0.0014.370 33.39964 30.00000 -3.81478-6 0.0014.370 33.39964 46.89618 .00000 3.81478-6 0.0 14.272 33.39964 46.89618 .00000 1.90738-6 -1.90738-6 14.456 33.39964 52.32808 .00000 -1.81ND -1.81ND -0.0077288 38.59975 3.40090 .00000 -1.81ND -1.81ND -0.0077288 38.59975 19.73669 .00000 -1.953678-6 11.4448-6 17.430 38.59975 19.73669 .00000 -1.90738-6 0.0 17.423 38.59975 19.73669 .00000 -1.90738-6 0.0 17.223 38.59975 30.60048 .00000 -3.81478-6 0.0 17.223 38.59975 36.60288 .00000 -1.90738-6 0.0 17.223 38.59975 46.89618 .00000 -1.90738-6 0.0 17.223 38.59975 46.89618 .00000 -3.81478-6 1.00738-6 17.385 38.59975 52.518895 .00000 -1.90738-6 0.0 17.228 38.59975 88.7289 .00000 -1.90738-6 0.0 17.228 38.59975 88.7289 .00000 -1.90738-6 0.0 17.228 38.59975 88.7289 .00000 -1.90738-6 0.0 17.229 38.59975 88.7289 .00000 -1.90738-6 0.0 17.226 38.59975 88.7289 .00000 -1.90738-6 0.0 17.226 38.59975 88.7289 .00000 -1.90738-6 0.0 17.226 38.59975 88.7289 .00000 -1.90738-6 0.0 0.0 17.226 38.59975 88.7289 .00000 -1.81ND -0.00000 -1.000000 -1.00000000000000000			52.32808	.00000			
33,39964   14,30479   0,0000   -3,81478-6   1,90738-6   14,482   33,39964   14,30479   0,0000   -3,81478-6   0,0   14,270   33,39964   25,16859   0,0000   -3,81478-6   0,0   14,275   33,39964   36,00288   0,0000   -3,81478-6   0,0   14,275   33,39964   36,00288   0,0000   -3,81478-6   0,0   14,275   33,39964   36,00288   0,0000   -3,81478-6   0,0   14,275   33,39964   36,00288   0,0000   -3,81478-6   0,0   14,275   33,39964   46,89618   0,0000   3,81478-6   0,0   14,496   33,39964   46,89618   0,0000   -1,90738-6   -1,90738-6   14,456   33,39964   52,32808   0,0000   -1,8170   -1,8170   -1,8170   -0,007288   38,59975   -1,90900   0,0000   -1,8170   -1,8170   -1,8170   -0,007288   38,59975   14,30499   0,0000   -1,90738-6   11,4486-6   17,439   38,59975   14,30499   0,0000   -1,90738-6   10,90738-6   17,273   38,59975   14,30499   0,0000   -1,90738-6   10,90738-6   17,273   38,59975   14,30499   0,0000   -1,90738-6   0,0		33.39964	3.44099	.00000	-1.#IND -5.7220E-6	13.351E-6	
33.39964   19.73669   .00000   -3.8147E-6   .0   14.270   33.39964   25.16859   .00000   -1.9073E-6   .0   14.275   33.39964   36.00238   .00000   -3.8147E-6   .0   0   14.275   33.39964   36.00238   .00000   1.9073E-6   -1.9073E-6   14.376   33.39964   41.46428   .00000   3.8147E-6   .0   0   14.275   33.39964   41.46428   .00000   3.8147E-6   .1   .0002E-6   14.356   33.39964   46.89618   .00000   1.9073E-6   -1.9073E-6   14.456   33.39964   52.32808   .00000   -1.81ND   -1.81ND   -1.81ND   .0.007288   38.59975   -1.99090   .00000   -1.81ND   -1.81ND   .0.007288   38.59975   34.4099   .00000   -9.5367E-6   11.445E-6   17.430   38.59975   34.8729   .00000   -1.9073E-6   11.445E-6   17.430   38.59975   25.16859   .00000   -1.9073E-6   .0   .0   .0   .0   .1   .7.22   38.59975   36.00288   .00000   -3.8147E-6   .1.9073E-6   .1   .4256   .00000   38.59975   36.00288   .00000   -3.8147E-6   -1.9073E-6   .1   .4256   .00000   .0   .0   .0   .0   .0   .0		33.39964	8.87289	.00000	-3.8147E-6	1.9073E-6	
33,39964   25,16859   0.0000		33.39964	14.30479	.00000	-1.9073E-6	3.8147E-6	
33,39964   36,03238   0.0000   1,90738-6   -1,9073E-6   14,336   33,39964   46,89618   0.0000   1,90738-6   -1,9073E-6   14,456   33,39964   46,89618   0.0000   1,90738-6   -1,9073E-6   14,456   33,39964   52,32808   0.0000   -1,81ND   -1,81ND   -1,81ND   0.33692   38,59975   3,44099   0.0000   -1,81ND   -1,81ND   -1,81ND   0.33692   38,59975   8,80729   0.0000   -1,9073E-6   0.0   17,423   38,59975   14,30479   0.0000   -1,9073E-6   0.0   0.7,423   38,59975   14,30479   0.0000   -1,9073E-6   0.0   0.7,228   38,59975   25,16859   0.0000   -1,9073E-6   0.0   0.7,228   38,59975   25,16859   0.0000   -3,8147E-6   -1,9073E-6   17,279   38,59975   36,03238   0.0000   -3,8147E-6   -7,6294E-6   17,433   38,59975   36,03238   0.0000   -3,8147E-6   -7,6294E-6   17,351   38,59975   46,89618   0.0000   -3,8147E-6   -7,6294E-6   17,351   38,59975   46,89618   0.0000   -3,8147E-6   -7,6294E-6   17,351   38,59975   46,89618   0.0000   -1,81ND   -1,81ND   0.033576   43,79988   3,44099   0.0000   -1,81ND   -1,81ND   -0,37513   43,79988   8,87289   0.0000   -1,81ND   -1,81ND   -0,37513   43,79988   8,87289   0.0000   -1,81ND   -1,81ND   -0,37513   43,79988   14,30479   0.0000   -1,81ND   -1,81ND   -0,37513   43,79988   14,30479   0.0000   -1,81ND   -1,81ND   -0,52538   43,79988   36,60048   0.0000   -1,81ND   -1,81ND   -0,52538   43,79988   44,6428   0.0000   -1,81ND   -1,81ND   -0,52538   43,79988   44,6428   0.0000   -1,81ND   -1,81ND   -0,52538   43,79988   44,6428   0.0000   -1,81ND   -1,81ND   -0,52534   43,79988   44,6428   0.0000   -1,81ND   -1,81ND   -1,81ND   -0,52534   43,79988   44,6428   0.0000   -1,81ND   -1,81ND   -1,81ND   -0,52534   43,79988   44,6428		33.39964	25.16859	.00000	-1.9073E-6	0.0	14.255
33,39964   41,46428   .00000   3,8147E-6   0,0   14,496   33,39964   46,89618   .00000   1,9073E-6   -1,9073E-6   14,456   33,39964   52,32808   .00000   -1,#IND		33.39964	30.60048	.00000	-3.8147E-6	0.0	14.272
33,39964   46,89618   .00000   1,9773E-6   -1,9773E-6   14,456   38,59975   -1,99090   .00000   -1,81ND   -1,81ND   -1,81ND   .033692   38,59975   34,4099   .00000   -1,973E-6   11,445E-6   17,430   38,59975   14,30479   .00000   -1,973E-6   .0.0   17,228   38,59975   14,30479   .00000   -1,973E-6   .0.0   17,228   38,59975   25,16859   .00000   -1,973E-6   .0.0   .17,228   38,59975   25,16859   .00000   -1,973E-6   .0.0   .17,228   38,59975   36,03238   .00000   -3,8147E-6   -1,9073E-6   .17,227   .38,59975   36,03238   .00000   -3,8147E-6   -1,9073E-6   .17,228   .38,59975   36,03238   .00000   -3,8147E-6   -7,6294E-6   .17,356   .38,59975   36,03238   .00000   -3,8147E-6   -7,6294E-6   .17,356   .38,59975   36,63238   .00000   -3,8147E-6   -7,6294E-6   .17,356   .38,59975   36,63238   .00000   -1,9073E-6   -7,6294E-6   .17,356   .38,59975   36,3238   .00000   -1,9073E-6   -7,6294E-6   .17,356   .38,59975   36,3238   .00000   -1,81ND   -1,81ND   -0,40376   .43,79988   38,87299   .00000   -1,81ND   -1,81ND   -0,40376   .43,79988   38,87299   .00000   -1,81ND   -1,81ND   -0,40376   .43,79988   38,87299   .00000   -1,81ND   -1,81ND   -0,37513   .43,79988   38,87299   .00000   -1,81ND   -1,81ND   -0,52358   .43,79988   39,73669   .00000   -1,81ND   -1,81ND   -0,52358   .43,79988   36,60048   .00000   -1,81ND   -1,81ND   -0,52354   .43,79988   36,60048   .00000   -1,81ND   -1,81ND   -0,52354   .43,79988   41,46428   .00000   -1,81ND   -1,81ND   -1,81ND   -0,52354   .43,79988   .43,80000		33.39964		.00000	3.8147E-6	0.0	14.496
38.59975   -1.99090   0.0000		33.39964		.00000	1.9073E-6	-1.9073E-6	14.456
38.59975 3.44099 .00000 -9.5367E-6 11.444E-6 17.430 38.59975 14.30479 .00000 -1.9073E-6 0.0 17.423 38.59975 19.73669 .00000 -1.9073E-6 0.0 17.223 38.59975 25.16859 .00000 -1.9073E-6 0.0 17.222 38.59975 36.60048 .00000 -3.8147E-6 -1.9073E-6 17.236 38.59975 36.603238 .00000 -3.8147E-6 -1.9073E-6 17.436 38.59975 41.46428 .00000 -3.8147E-6 -7.6294E-6 17.436 38.59975 41.46428 .00000 -3.8147E-6 -7.6294E-6 17.436 38.59975 52.32808 .00000 -1.81ND -1.81ND .0.93597 43.79988 81.4099 .00000 -1.81ND -1.81ND .0.93597 43.79988 83.44099 .00000 -1.81ND -1.81ND .0.21604 43.79988 84.4099 .00000 -1.81ND -1.81ND .0.21604 43.79988 14.30479 .00000 -1.81ND -1.81ND .0.37513 43.79988 14.30479 .00000 -1.81ND -1.81ND .0.47991 43.79988 14.30479 .00000 -1.81ND -1.81ND .0.47991 43.79988 14.30479 .00000 -1.81ND .1.81ND .0.47991 43.79988 30.60048 .00000 -1.81ND .1.81ND .0.53528 43.79988 30.60048 .00000 -1.81ND .1.81ND .0.53528 43.79988 36.003238 .00000 -1.81ND .1.81ND .0.535258 43.79988 36.003238 .00000 -1.81ND .1.81ND .0.63562 43.79988 36.003238 .00000 -1.81ND .1.81ND .0.63562 43.79988 36.003238 .00000 -1.81ND .1.81ND .0.63562 43.79988 36.00008 .00000 -1.81ND .1.81ND .0.63562 3.80000 24.00000 .0.66667 .1.2004 .0.036640 .0.18333 5.80000 24.00000 .0.33333 .0.60419 .0.036640 .0.18333 5.80000 24.00000 .0.33333 .2.4069 .0.036640 .0.18333 5.80000 24.00000 .0.33333 .2.4069 .0.07577 .0.036642 .0.07079 9.80000 24.00000 .0.33333 .2.4069 .0.07577 .0.036640 .0.18262 .0.036667 .0.075771 .9.80000 .2.30000 .2.33333 .2.4069 .0.075777 .0.075771 .9.80000 .2.400000 .0.33333 .2.4069 .0.075777 .0.075771 .9.80000 .2.400000 .0.33333 .7.36667 .0.17577 .0.075771 .9.80000 .2.400000 .0.33333 .7.36667 .0.075771 .0.075771 .9.80000 .2.400000 .0.33333 .7.36667 .0.075771 .0.075771 .9.80000 .2.400000 .0.33333 .7.36667 .0.075771 .0.075771 .9.80000 .2.400000 .0.33333 .7.36667 .0.075771 .0.075771 .9.80000 .2.400000 .0.466667 .0.56667 .0.26567 .0.26567 .0.075771 .0.075771 .9.80000 .2.400000 .0.466667 .0.56667 .0.26567 .0.075771 .0.075771 .9.80000 .2.400000 .0.466667 .0.56667 .0.		33.39964	52.32808 -1 99090	.00000	-1.#IND	-1.#IND	0.0077288
38.59975 14.30479 .00000 -1.9073E-6 17.279 38.59975 25.16859 .00000 -1.9073E-6 .0 17.222 38.59975 25.16859 .00000 -1.9073E-6 .0 17.222 38.59975 36.60048 .00000 -3.8147E-6 .0 .0 .17.228 38.59975 36.603238 .00000 -3.8147E-6 -1.9073E-6 17.285 38.59975 41.46428 .00000 -3.8147E-6 -7.6294E-6 17.436 38.59975 46.89618 .00000 -1.81710 -1.#1710 -0.093597 43.79988 -1.99909 .00000 -1.#1710 -1.#1710 -0.40376 43.79988 3.44099 .00000 -1.#1710 -1.#1710 -0.40376 43.79988 8.87289 .00000 -1.#1710 -1.#1710 -0.37513 43.79988 14.30479 .00000 -1.#1710 -1.#1710 -0.37513 43.79988 14.30479 .00000 -1.#1710 -1.#1710 -0.37513 43.79988 14.30479 .00000 -1.#1710 -1.#1710 -0.37513 43.79988 3.40090 .00000 -1.#1710 -1.#1710 -0.47921 43.79988 30.60048 .00000 -1.#1710 -1.#1710 -0.5258 43.79988 41.46428 .00000 -1.#1710 -1.#1710 -0.52528 43.79988 41.46428 .00000 -1.#1710 -1.#1710 -0.52528 43.79988 52.3288 .00000 -1.#1710 -1.#1710 -0.52131 43.79988 52.3288 .00000 -1.#1710 -1.#1710 -0.36573 43.79988 52.3288 .00000 -1.#1710 -1.#1710 -0.36573 43.79988 52.3288 .00000 -1.#1710 -1.#1710 -0.36573 43.79988 62.366667 .00000 -1.#1710 -1.#1710 -0.36573 43.79988 62.366667 .00000 -1.#1710 -1.#1710 -0.36573 43.79988 62.366667 .00000 -1.#1710 -1.#1710 -0.36573 43.79988 62.3686 .00000 -1.#1710 -1.#1710 -0.36573 43.79988 72.3688 .00000 -1.#1710 -1.#1710 -0.36573 43.79988 72.3688 .00000 -1.#1710 -1.#1710 -0.36573 43.79988 72.3688 .00000 -1.#1710 -1.#1710 -0.36573 43.79988 72.3688 .00000 -1.#1710 -1.#1710 -0.36573 43.79988 72.3688 .00000 -1.#1710 -1.#1710 -0.36573 43.79988 72.3688 .00000 -1.#1710 -1.#1710 -0.36573 43.79988 72.3688 .00000 -1.#1710 -1.#1710 -0.36573 43.79988 72.3688 .00000 -1.#1710 -1.#1710 -0.36573 43.79988 72.3688 .00000 -1.#1710 -1.#1710 -0.77478 43.79988 72.3688 .00000 -1.#1710 -1.#1710 -0.77478 43.79988 72.3688 .00000 -1.#1710 -1.#1710 -0.77478 43.79988 72.3688 .00000 -1.#1710 -1.#1710 -0.77478 43.79988 72.3688 .00000 -1.#1710 -1.#1710 -0.77478 43.79988 72.3688 .000000 -1.#1710 -1.#1710 -0.77478 43.79988 72.3688 .00000 -1.#1710 -1.#1710 -0.77771 -0.		38.59975	3.44099	.00000	-9.5367E-6	11.444E-6	17.430
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43.79988   -1.99090   0.0000 -1.#IND							
43.79988   3.44099   0.0000 -1.#IND   -1.#IND   -0.21604     43.79988   8.87299   0.0000 -1.#IND   -1.#IND   -0.37513     43.79988   14.30479   0.0000 -1.#IND   -1.#IND   -0.47891     43.79988   14.30479   0.0000 -1.#IND   -1.#IND   -0.52528     43.79988   19.73669   0.0000 -1.#IND   -1.#IND   -0.55238     43.79988   36.60048   0.0000 -1.#IND   -1.#IND   -0.55234     43.79988   36.60048   0.0000 -1.#IND   -1.#IND   -0.55234     43.79988   46.46428   0.0000 -1.#IND   -1.#IND   -0.5214     43.79988   44.46428   0.0000 -1.#IND   -1.#IND   -0.36572     43.79988   44.6428   0.0000 -1.#IND   -1.#IND   -0.2624     43.79988   46.89618   0.0000 -1.#IND   -1.#IND   -0.2624     43.79988   52.32808   0.0000 -1.#IND   -1.#IND   -0.2023     43.79988   52.32808   0.0000 -1.#IND   -1.#IND   -0.2023     43.79988   52.32808   0.0000 -1.#IND   -1.#IND   -0.40919     5.80000   24.00000   -0.33333   -0.60419   -0.011826   -0.20266     9.80000   24.00000   -1.33333   -2.60419   -0.01286   -0.20266     9.80000   24.00000   -1.36333   -2.60419   -0.035437   -0.16733     9.80000   24.00000   -1.66667   -2.2555   0.075747   -0.13651     9.80000   24.00000   -2.66667   2.2555   0.075747   -0.11452     9.80000   24.00000   -2.33333   7.1894   0.20720   -0.07564     9.80000   24.00000   -2.33333   7.1894   0.20720   -0.07564     9.80000   24.00000   -3.33333   7.1894   0.20720   -0.07564     9.80000   24.00000   -3.33333   7.1894   0.20720   -0.07564     9.80000   24.00000   -3.33333   7.1894   0.20720   -0.07564     9.80000   24.00000   -3.33333   7.3364   0.21748   -0.085031     9.80000   24.00000   -3.33333   7.3364   0.21748   -0.085031     9.80000   24.00000   -3.33333   7.336667   0.22255   -0.055622     9.80000   24.00000   -3.33333   7.36667   0.22255   -0.056622     9.80000   24.00000   -3.33333   0.56667   0.20564   0.20564   0.20574   0.0222873     9.80000   24.00000   -3.66667   0.70731   0.22225   -0.056622     9.80000   24.00000   -3.66667   0.5551   0.056622   0.000074   0.000074   0.000074     9.80000   24.000000   -3.666					-1.#IND		
43.79988		43.79988	3.44099	.00000	-1.#IND		
1,3986   25.16859   0.0000 -1.#IND   -1.#IND   -1.#IND   -0.53343     43.79988   25.16859   0.0000 -1.#IND   -1.#IND   -0.53343     43.79988   36.03238   0.0000 -1.#IND   -1.#IND   -0.532194     43.79988   36.03238   0.0000 -1.#IND   -1.#IND   -0.47478     43.79988   46.89618   0.0000 -1.#IND   -1.#IND   -0.47478     43.79988   46.89618   0.0000 -1.#IND   -1.#IND   -0.21231     43.79988   52.32808   0.0000 -1.#IND   -1.#IND   -0.21231     59.80000   24.00000   -0.33333   -0.60419   -0.011826   -0.02266     9.80000   24.00000   -1.66667   -1.2074   -0.023640   -0.18934     9.80000   24.00000   -1.33333   -2.4069   -0.047201   -0.13651     9.80000   24.00000   -1.033333   -2.4069   -0.047201   -0.13651     9.80000   24.00000   -2.33333   -2.4069   -0.047201   -0.13651     9.80000   24.00000   -2.33333   7.3264   0.210702   -0.97364     9.80000   24.00000   -3.33333   7.3264   0.210702   -0.97364     9.80000   24.00000   -3.33333   7.3264   0.21678   -0.067502     9.80000   24.00000   -3.33333   7.3264   0.21678   -0.0650622     9.80000   24.00000   -3.33333   7.3264   0.21678   -0.0650622     9.80000   24.00000   -3.33333   7.3264   0.21678   -0.0650622     9.80000   24.00000   -3.33333   7.3264   0.21678   -0.0650622     9.80000   24.00000   -3.33333   7.3264   0.21678   -0.0650622     9.80000   24.00000   -3.33333   6.4569   0.20017   -0.022873     9.80000   24.00000   -4.33333   6.4569   0.20017   -0.022873     9.80000   24.00000   -4.66667   6.1251   0.19343   -0.085038		43.79988			4 0	-1.#IND	
1,3986   25.16859   0.0000 -1.#IND   -1.#IND   -1.#IND   -0.53343     43.79988   25.16859   0.0000 -1.#IND   -1.#IND   -0.53343     43.79988   36.03238   0.0000 -1.#IND   -1.#IND   -0.532194     43.79988   36.03238   0.0000 -1.#IND   -1.#IND   -0.47478     43.79988   46.89618   0.0000 -1.#IND   -1.#IND   -0.47478     43.79988   46.89618   0.0000 -1.#IND   -1.#IND   -0.21231     43.79988   52.32808   0.0000 -1.#IND   -1.#IND   -0.21231     59.80000   24.00000   -0.33333   -0.60419   -0.011826   -0.02266     9.80000   24.00000   -1.66667   -1.2074   -0.023640   -0.18934     9.80000   24.00000   -1.33333   -2.4069   -0.047201   -0.13651     9.80000   24.00000   -1.033333   -2.4069   -0.047201   -0.13651     9.80000   24.00000   -2.33333   -2.4069   -0.047201   -0.13651     9.80000   24.00000   -2.33333   7.3264   0.210702   -0.97364     9.80000   24.00000   -3.33333   7.3264   0.210702   -0.97364     9.80000   24.00000   -3.33333   7.3264   0.21678   -0.067502     9.80000   24.00000   -3.33333   7.3264   0.21678   -0.0650622     9.80000   24.00000   -3.33333   7.3264   0.21678   -0.0650622     9.80000   24.00000   -3.33333   7.3264   0.21678   -0.0650622     9.80000   24.00000   -3.33333   7.3264   0.21678   -0.0650622     9.80000   24.00000   -3.33333   7.3264   0.21678   -0.0650622     9.80000   24.00000   -3.33333   6.4569   0.20017   -0.022873     9.80000   24.00000   -4.33333   6.4569   0.20017   -0.022873     9.80000   24.00000   -4.66667   6.1251   0.19343   -0.085038		43.79988	14.30479	.00000	-1.#IND	-1.#IND	
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9,80000 24,00000 -0.66667 -1.2074 -0.023640 -0.18934   9,80000 24,00000 -1.00000 -1.80866 -0.035437 -0.16733   9,80000 24,00000 -1.33333 -2.4069 -0.047201 -0.13651   9,80000 24,00000 -1.66667 2.2555 -0.075747 -0.11442   9,80000 24,00000 -2.00000 -6.0287 0.17500 -0.10650   9,80000 24,00000 -2.33333 7,1894 0.20702 -0.097364   9,80000 24,00000 -2.33333 7,1894 0.20702 -0.097364   9,80000 24,00000 -3.33333 7,3264 0.20702 -0.097364   9,80000 24,00000 -3.33333 7,3264 0.21679 -0.06502   9,80000 24,00000 -3.66667 7,731 0.21225 -0.056622   9,80000 24,00000 -4.33333 6,3566 0.20674 -0.207371   9,80000 24,00000 -4.3086667 6.1251 0.20017 -0.022873   9,80000 24,00000 -4.3086667 6.1251 0.20017 -0.022873   9,80000 24,00000 -4.66667 6.1251 0.19343 -0.0085038	Line 2			.00000			
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9.80000 24.00000 -1.66667 2.2555 0.075747 -0.11452 9.80000 24.00000 -2.00000 6.027 0.17500 -0.10650 9.80000 24.00000 -2.33333 7.1894 0.20702 -0.97364 9.80000 24.00000 -2.66667 7.5138 0.21748 -0.087127 9.80000 24.00000 -3.00000 7.4992 0.21917 -0.075771 9.80000 24.00000 -3.03333 7.3264 0.21678 -0.063622 9.80000 24.00000 -3.66667 7.0731 0.21225 -0.050622 9.80000 24.00000 -4.00000 6.7666 0.20554 -0.37010 9.80000 24.00000 -4.33333 6.356 0.2056 0.20564 -0.37010 9.80000 24.00000 -4.66667 6.1251 0.19343 -0.085038 9.80000 24.00000 -4.66667 6.1251 0.19343 -0.085038		9.80000	24.00000	-1.00000	-1.8086	-0.035437	
9,80000 24,00000 -2,00000 6,0287 0,17500 -0,10650 9,80000 24,00000 -2,33333 7,1894 0,20702 -0,97364 9,80000 24,00000 -2,66667 7,5138 0,21748 -0,087127 9,80000 24,00000 -3,00000 7,4992 0,21917 -0,075771 9,80000 24,00000 -3,33333 7,3264 0,21678 -0,063622 9,80000 24,00000 -4,00000 6,7766 0,22654 -0,037010 9,80000 24,00000 -4,00000 6,7766 0,20554 -0,037010 9,80000 24,00000 -4,33333 6,4569 0,20017 -0,022873 9,80000 24,00000 -4,66667 6,1251 0,19343 -0,0085038			24.00000	-1.33333	-2.4069	-0.047201	
9.80000 24.00000 -2.33333 7.1894 0.20702 -0.997324 9.80000 24.00000 -2.66667 7.5138 0.21748 -0.087127 9.80000 24.00000 -3.00000 7.4992 0.21917 -0.075771 9.80000 24.00000 -3.33333 7.3264 0.21678 -0.063622 9.80000 24.00000 -3.66667 7.0731 0.21225 -0.050622 9.80000 24.00000 -4.00000 6.7666 0.20554 -0.397010 9.80000 24.00000 -4.33333 6.4569 0.20017 -0.022873 9.80000 24.00000 -4.66667 6.1251 0.19343 -0.085038 9.80000 24.00000 -4.66667 6.1251 0.19343 -0.085038		9.80000	24.00000	-2.00000	6.0287	0.075747	-0.11442
9.80000 24.00000 -3.00000 7.4992 0.21917 -0.075771 9.80000 24.00000 -3.33333 7.3264 0.21678 -0.065622 9.80000 24.00000 -3.66667 7.0731 0.21225 -0.050622 9.80000 24.00000 -4.00000 6.7666 0.20554 -0.37010 9.80000 24.00000 -4.66667 6.1251 0.20017 -0.022873 9.90000 24.00000 -4.66667 6.1251 0.19343 -0.085038		9.80000	24.00000	-2.33333	7.1894	0.20702	-0.097364
9.80000 24.00000 -3.33333 7.3264 0.21678 -0.063622 9.80000 24.00000 -3.66667 7.0731 0.21225 -0.050622 9.80000 24.00000 -4.00000 6.7766 0.20554 -0.037010 9.80000 24.00000 -4.33333 6.4569 0.20017 -0.022873 9.80000 24.00000 -4.66667 6.1251 0.19343 -0.0085038							
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9.80000 24.00000 -4.33333 6.4569 0.20017 -0.022873 9.80000 24.00000 -4.66667 6.1251 0.19343 -0.0085038		9.80000	24.00000	-3.66667	7.0731	0.21225	-0.050622
9.80000 24.00000 -4.66667 6.1251 0.19343 -0.0085038						0.20654	-0.037010
9.80000 24.00000 -5.00000 5.7880 0.18642 0.0		9.80000	24.00000	-4.66667	6.1251	0.19343	-0.0085038
	! Point lies outside s-:1 -						
Point lies outside soil zones. Results calculated for this point assume a soil zone with properties of the first soil profile.	: romt nes outside son z	ones. Results	carculated Io	uns point assu	me a son zone with	properties of the	mst som profile

# Oasys

Graphic Display: SoilProfiles - Lines - Grids - Loads



<u>y</u>\_\_\_\_\_

# Appendix D

Wall Stability Analysis



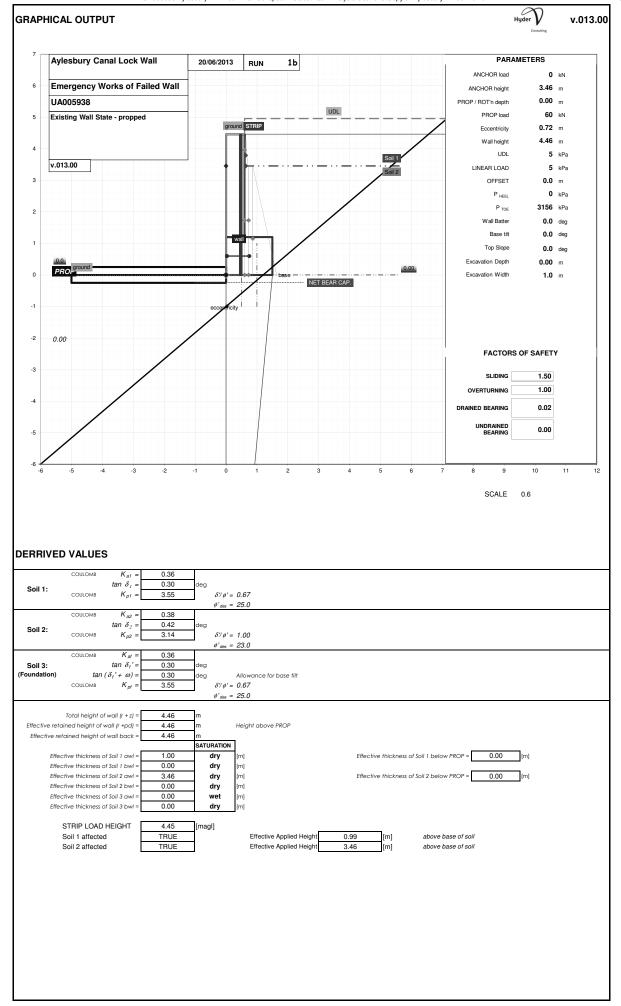
Z 600M47 < 1.5" > BRICK WALL PIER 9007 1.200 < 600 > 7-5 2.0 600 mm 26007 APPROX 1 IN 3 SCOP. REAR. 70 900mm 450mm

TRIAL HOLE

TRIAL HOLE

Aylesbury Canal Lock Wall  WA005938 Run No 1b  Existing Wall State - propped  Author CF Checker Approved By:  Wall dimensions as obtained from Trial Hole I as an intermediate case. Top of wall thickness 600mm, base of wall thickness 1.5m. Minumum water level	
Wall dimensions as obtained from Trial Hole 1 as an intermediate case. Top of wall thickness 600mm, base of wall	yder /
Existing Wall State - propped  Author: CF Checked By: Approved By: Date:  Wall dimensions as obtained from Trial Hole 1 as an intermediate case. Top of wall thickness 600mm, base of wall	Consulting
Checked By: Date:  Approved By:  Wall dimensions as obtained from Trial Hole 1 as an intermediate case. Top of wall thickness 600mm, base of wall	
Wall dimensions as obtained from Trial Hole 1 as an intermediate case. Top of wall thickness 600mm, base of wall	20/06/201
Wall dimensions as obtained from Trial Hole 1 as an intermediate case. Top of wall thickness 600mm, base of wall	

	USE PARTIA		S OF SAFETY ?	N	]					
	ALLOW FO	(Y / N)	L SOIL FORCE					1		
Soil 1:	Above water	(Y / N)	Unit wt fill	N 17.0	n x 17 - 35	Partial Factors of			Factored	T
3011 1.	Below water	γ <sub>s1</sub> γ′ <sub>s1</sub>	Submerged wt	7.2	[kN/m³] [kN/m³]	$S\gamma_{1 \; fill}$	1.00	γ <sub>s1</sub> γ' <sub>s1 (sub)</sub>	7.2	[kN/m³]
Soil 2:	Above water	<b>Y</b> s2	Unit wt fill	17.0	[kN/m³]	Sγ <sub>2 fill</sub>	1.00	<b>Y</b> s2	17.0	[kN/m³]
Soil 3 <sub>f</sub> :	Below water Above water	γ' <sub>s2</sub> γ <sub>s2</sub>	Submerged wt Unit wt fill	7.2 19.0	[kN/m <sup>3</sup> ] [kN/m <sup>3</sup> ]	+	1.00	γ's2 (sub) γs3f	7.2 19.0	
	Below water	γ′ <sub>s2</sub>	Submerged wt	9.2	[kN/m³]	Sγ <sub>3f fill</sub>		γ's3f (sub)	9.2	[kN/m³]
Wall:	WALL PARAPET	γw γ <sub>P</sub>	Unit wt Unit wt	22.0	[kN/m <sup>3</sup> ] [kN/m <sup>3</sup> ]	Sγ <sub>masonry</sub>	1.00	j		
	BASE	γ,	Unit wt	22.0	[kN/m³]	Sγ concrete	1.00	]		
Water: Soil 1:		γ	Unit wt water Fill	9.81 25.0	[kN/m³] [deg]	C+ IMI	1.50	1 A'	25.0	
3011 1.		Φι' <sub>peak</sub> C <sub>1</sub>	riii	0.0	[kN/m³]	Sφ fill [M]	1.50	<b>∳¹</b> des	25.0	
Soil 2:		Φ2 peak	Fill	23.0	[deg]			<b>∳2</b> des	23.0	[deg]
Soil 3 <sub>f</sub> :		¢ f peak		0.0 25.0	[kN/m <sup>3</sup> ] [deg]	So formation	1.50	∳ f des	25.0	_
		Ca'	Formation	2.0	[kN/m³]	1 lollidatori		1 1 000		1
Loads:		C <sub>u</sub>	UDL	0.0 5	[kN/m <sup>3</sup> ] [kN/m <sup>2</sup> ]	S <sub>surcharge</sub>	1.00	1		
Louds.		S <sub>L</sub>	Linear Load	5	[kN/m²]	MUST BE GREATE		<u>.</u> -		
	APPLY LOA (Y/N		N	0.0	[kN/m <sup>2</sup> ]					
	(1/10		s <sub>L</sub> offset	0.0	[m from back of wall]			7		
		1.	s <sub>L</sub> width oad shed angle	0.0 35	[m] [deg]	s <sub>L</sub> ' effective width	0.02	[m]		
	APPLY BASE	SHEAR	N	0.0	[kN/m run]	Qs - Shear component	t of reultant loa	ıd (per m run) - Re	earing capacity co	ulculation
	(Y/N	)	1		200 0 000 and				J .== 30.1, 00	
			ninst overturning	1.0	Global min.				ALL FRICTION RA	TIOS
ı	неquired Facto	or of Safet	y against sliding	1.0	Global min.			გ's₁/ф: გ's₂/ф:		-
Require	d Factor of Saf	ety agains	st bearing failure	1.0	Global min			δ's <sub>3f</sub> /φ		1
	Г		Soil thickness	DIMENSIONS	Thickness of Soil 1 [m]			İ		
		_	Soil thickness S <sub>1</sub>	1.00	(from top of wall)		ELEVATIONS	=		AFFECTED BY WATER?
		s o		1.00		Top elevation	4.46	[m]		No
/!	O NEO ATIVE	l L	Soil thickness		Thickness of Soil 2	Bottom elevation Top elevation	3.46 3.46			V
arning! S <sub>2</sub> I	S NEGATIVE	S	S <sub>2</sub>	3.46	[m]	Bottom elevation	0.00	[m]		Yes
			Soil thickness S <sub>3 foundation</sub>	0.00	Thickness of Soil 3 <sub>f</sub> below gl / overdig [m]	Top elevation Bottom elevation	0.00	[m]		Yes
	-			0.00	Water height behind [m]	o.ovanon	0.00	1		I
		W A	BEHIND WALL		(above ground level)					
		T E		0.00	Water height in front [m]					
		R	IN FRONT	-1.15	(above ground level)					
TOO	HIGH ATER INFRONT C	F WAII		-1.15	Effective height of water in	front of wall				
	(Y / N)		Υ	0.00	(above ground level)					
			P <sub>h</sub> P <sub>w</sub>	0.00	Parapet height [m] Parapet width [m]	APPLY PARAPI (Y/N)	ET LOAD	N		
			z	0.00	Toe depth [m]					
			z GLC	0.00	(below ground level)					
				4.46	Retained height [m]	EAC	TORED PROPE	DTIEC	1	
		D	r		(top of wall to gl)					
		I M	r GLC W <sub>1</sub>	4.46 0.00	Equiv. face width [m]	γ <sub>des</sub> Wall	22.0	[kN/m <sup>3</sup> ]		
		E		0.00		γ <sub>des</sub> Base	22.0	[kN/m³]		
		N S	W <sub>2</sub>	0.60 1.50	Top of wall width [m] Base width [m]	Batter 6º	0.0	[deg]		
		I	L	1.0	Wall length [m]	1				/
		O N	h t	0.90	Heel projection [m] Toe projection [m]	1				/
		s	t GLC	0.00	.oc projection [m]	Surcharge (Sr <sub>des</sub> )	5.0	[kN/m <sup>2</sup> ]		/
			d	1.20	Min base thickness [m]	$\delta_{l' \text{des}}$ fill-wall	16.50	[deg]	EXISTIN	IG GL
			d' β <sub>back</sub>	1.20 0.0	Max base thickness [m]  Back slope angle [deg]	$\delta_{2}'_{des}$ fill-wall $\delta_{i}'_{des}$ formation	23.00 16.50	[deg] [deg]	▼	GLC
			$\beta_{front}$	0.0	Front slope angle [deg]				NEW G	
			αω	90	Back wall angle [deg] Base Tilt [deg]	Max base depth	0.00	[m bgl]	\	~ /
GROUND LEV	/EL CHANGE (IN	FRONT)	EXISTING GL	-0.60	[m]	bass dopill	0.00	I' ∽Aı1	_	
	(Y/N)		EXISTING GE	0.00	LOWERED					7
ALLOW FOR	OVERDIG?	N	O <sub>d</sub>	0.0	Overdig = 0.5m or 10% or r which ever is less.					
			DEDT!	0.00	[m] - (below EXISTING grou	nd level)				
		P	DEPTH pd	0.00	[m] - (below proposed NEV	V ground level)			FoS - SLIDE	1.50
		R O	FORCE Pf	60	[kN/m run]				oS - OVERTURNING	3 1.00
		P	effective pd	0.00	[m]	PROP Depth (Rotal	tion around l	PROP)	FoS - BEARING FAILURE	
			effective Pf	60	[kN/m run]	No Passive Resista	nce utilised		(Drained	
		A N	UPIAI -	3.46	[m] - (above EXISTING grou	und level)			FoS - BEARING	
	ŀ		HEIGHT ah	3.46	[m] - (above proposed NE	W ground level)			FAILURE (Undrained	
		C H			i e		ANCHORIA	vel / m run		
			FORCE Af	0	[kN/m run]	Horizontal thrust at	ANCHORIE	17017 1111011		
lea Coule	h mathod	H O R	•	0	[kN/m run]	Horizontal thrust at	ANCHORIE		<b>K</b> r	
put own Ea	b method or irth Pressure	H O R	FORCE Af	0	[kN/m run]	Horizontal thrust at	Soil 1	<b>Ka</b> 0.44	<b>Kp</b> 2.60	
	rth Pressure	H O R	•	0	[kN/m run]	Horizontal thrust at		Ka	-	

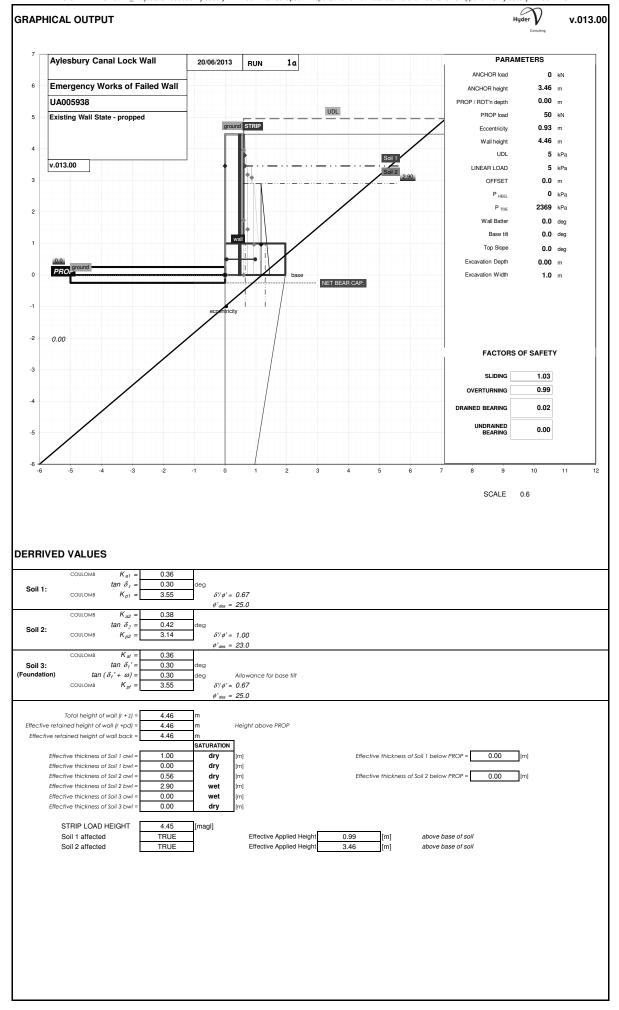


07120027	TIONS							Hyder	v.013.0
				PROP	PROP				
Per m run IORIZONTAL	(Disturb)	Force [kN]		Lever arm [m]	<b>Moment</b> [kN.m]	Comment			
1	Sr <sub>1</sub>	1.8	UDL (Surcharge) 1.80	3.96	7.14				1
	Sr <sub>2</sub>	6.6	6.61 STRIP LOAD	1.73	11.43			_	~
	S <sub>L1</sub> S <sub>L2</sub>	0.0 0.0	0.00 0.00	3.95 1.73	0.00 0.00				$\bowtie$ –
			SOIL 1 (active)						
S1a S1b	Soil 1 (awl) Soil 1 (bwl)	<b>3.1</b> tri <b>0.0</b> sq	3.07 0.00	3.79 3.46	11.64 0.00				
S1c	Soil 1 (bwl)	<b>0.0</b> tri	0.00 WATER (Behind Wall)	3.46	0.00			_	
U	water	0.0	0.00	0.00	0.00	Water head above	ground level	_	
S2a2	Soil 2 (awl)	<b>38.9</b> tri	SOIL 2 (active) 38.86	1.15	44.82				
S2a1	Soil 2 (awl)	<b>22.5</b> sq	22.46	1.73	38.86				
S2b S2c	Soil 2 (bwl) Soil 2 (bwl)	<b>0.0</b> sq <b>0.0</b> tri	0.00 0.00	0.00 0.00	0.00 0.00	M <sub>h</sub> = 113.89			
			SOIL 2 (passive)		•	•		_	
<b>1</b> Pp <sub>min</sub>	Sr <sub>3</sub> 119.0	<b>0.0</b> sq	0.00	0.00	0.00	Surcharge			$\Rightarrow_{D}$
Рр <sub>тах</sub> <b>U1</b>	119.0	<b>0.0</b> sq	0.00	0.00	0.00	Water pressure wit	hin nassive zone		
U2		0.0 tri	0.00	0.00	0.00	Water pressure wit	hin passive zone		
Fp1 Fp2		<b>0.0</b> sq <b>0.0</b> tri	0.00 0.00	0.00 0.00	0.00 0.00	Passive reaction (b Passive reaction (b			
			SOIL 3 (passive) INFRONT	0.00	0.00				
Pp <sub>min</sub> Pp <sub>max</sub>	0.0					Max depth of pass	ve soil [m]	0.00	
Fpf3a	Soil 3 (awl)	0.0 tri	0.00	0.00	0.00	Passive F	Resistance	Ignored - F	PROPPED
Fpf3b Fpf3c	Soil 3 (bwl) Soil 3 (bwl)	<b>0.0</b> sq <b>0.0</b> tri	0.00 0.00	0.00 0.00	0.00 0.00			J	
U	water	<b>0.0</b> tri	0.00	0.00	0.00	P <sub>RES</sub> =			
P <sub>p</sub> Total pass	ive reistance		PROP FORCE			P <sub>p</sub> (Passive) or P <sub>f</sub> (Prop	60.00	kN/m run	
P <sub>f</sub>	PROP	-60.0	ANCHOR FORCE	0.00	0.00	Force)			
$A_{fh}$	ANCHOR	0.0	0.00	3.46	0.00				
	Rh =	12.8	Rh <sub>(net)</sub> = 72.80	M <sub>h</sub> =	113.89				
			г	PROP	PROP				
Per m run		Force	<u>L</u>	Lever arm	Moment				
/ERTICAL - (I	Restore)	[kN]	LOADS	[m]	[kN.m]				_
Ww <sub>1</sub>	wall stem	0.0	0.00	0.00	0.00	Wall (triangle)		I	
Ww <sub>2</sub> Wb <sub>1</sub>	wall stem wall base	43.0 39.6	43.03 39.60	0.30 0.75	12.91 29.70	Wall (rectangle) Base (rectangle)		Σ	\$7 L
Wb₂ Wp	wall downstand parapet	0.0 0.0	0.00 0.00	1.00 0.25	0.00 0.00	Base (traingle)	-1		
Ws 1 dry	Soil 1	15.3	15.30	1.05	16.07	Parapet (rectangle Soil 1 dry weight o			
Ws <sub>1 wet</sub> Ws <sub>2 dry</sub>	Soil 1 Soil 2	0.0 52.9	0.00 52.94	1.05 1.05	0.00 55.58	Soil 1 wet weight o Soil 2 dry weight o			
Ws 2 wet	Soil 2	0.0	0.00	1.05	0.00	Soil 2 wet weight o			
Wsr	surcharge								
		4.5	4.50 SOIL 1 (active)	1.05	4.73	M <sub>w</sub> = 114.26		_	
S1a	Soil 1 (awl)	<b>4.5</b> <b>0.0</b> tri	SOIL 1 (active) 0.00	0.60	0.00	M <sub>w</sub> = 114.26		_	
S1a S1b S1c		4.5	SOIL 1 (active)		•	M <sub>w</sub> = 114.26		_	
S1b S1c	Soil 1 (awl) Soil 1 (bwl) Soil 1 (bwl)	4.5 0.0 tri 0.0 sq 0.0 tri	SOIL 1 (active)  0.00 0.00 0.00 SOIL 2 (active)	0.60 0.60 0.60	0.00 0.00 0.00	M <sub>w</sub> = 114.26		-	
S1b S1c S2a2 S2a1	Soil 1 (awl) Soil 1 (bwl) Soil 1 (bwl) Soil 2 (awl) Soil 2 (awl)	0.0 tri 0.0 sq 0.0 tri 0.0 tri 0.0 sq	SOIL 1 (active)  0.00 0.00 0.00 SOIL 2 (active) 0.00 0.00	0.60 0.60 0.60 0.60	0.00 0.00 0.00 0.00	M <sub>w</sub> = 114.26		-	
\$1b \$1c \$2a2 \$2a1 \$2b	Soil 1 (awl) Soil 1 (bwl) Soil 1 (bwl) Soil 2 (awl) Soil 2 (awl) Soil 2 (bwl)	0.0 tri 0.0 sq 0.0 tri 0.0 tri 0.0 tri 0.0 sq 0.0 sq	SOIL 1 (active) 0.00 0.00 0.00 SOIL 2 (active) 0.00 0.00 0.00	0.60 0.60 0.60 0.60 0.60 0.60	0.00 0.00 0.00 0.00 0.00 0.00	M <sub>w</sub> = 114.26		-	
\$1b \$1c \$2a2 \$2a1 \$2b \$2c	Soil 1 (awl) Soil 1 (bwl) Soil 1 (bwl) Soil 2 (awl) Soil 2 (awl) Soil 2 (bwl)	4.5 0.0 tri 0.0 sq 0.0 tri 0.0 sq 0.0 tri 0.0 sq 0.0 sq 0.0 sq 0.0 sq	SOIL 1 (active) 0.00 0.00 0.00 SOIL 2 (active) 0.00 0.00 0.00 0.00 ANCHOR FORCE	0.60 0.60 0.60 0.60 0.60 0.60 0.60	0.00 0.00 0.00 0.00 0.00 0.00 0.00			-	
\$1b \$1c \$2a2 \$2a1 \$2b	Soil 1 (awl) Soil 1 (bwl) Soil 1 (bwl) Soil 2 (awl) Soil 2 (awl) Soil 2 (bwl)	0.0 tri 0.0 sq 0.0 tri 0.0 tri 0.0 tri 0.0 sq 0.0 sq	SOIL 1 (active)  0.00 0.00 0.00 SOIL 2 (active) 0.00 0.00 0.00 ANCHOR FORCE 0.00	0.60 0.60 0.60 0.60 0.60 0.60	0.00 0.00 0.00 0.00 0.00 0.00	$M_{w} = 114.26$ Vert component o $M_{v(net)} = 0.00$	f ANCHOR force	e (about Prop)	
\$1b \$1c \$2a2 \$2a1 \$2b \$2c	Soil 1 (awl) Soil 1 (bwl) Soil 1 (bwl) Soil 2 (awl) Soil 2 (awl) Soil 2 (bwl) Soil 2 (bwl) ANCHOR	4.5 0.0 tri 0.0 sq 0.0 tri 0.0 sq 0.0 tri 0.0 sq 0.0 sq 0.0 sq	SOIL 1 (active)  0.00 0.00 0.00 SOIL 2 (active) 0.00 0.00 0.00 0.00 ANCHOR FORCE 0.00	0.60 0.60 0.60 0.60 0.60 0.60 0.60 0.00	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	$\begin{array}{c} \text{Vert component o} \\ \text{M}_{v(net)} = 0.00 \end{array}$	f ANCHOR force	e (about Prop)	
\$1b \$1c \$2a2 \$2a1 \$2b \$2c	Soil 1 (awl) Soil 1 (bwl) Soil 1 (bwl) Soil 2 (awl) Soil 2 (awl) Soil 2 (bwl) Soil 2 (bwl) ANCHOR	4.5 0.0 tri 0.0 sq 0.0 tri 0.0 sq 0.0 tri 0.0 sq 0.0 sq 0.0 sq	SOIL 1 (active)  0.00 0.00 0.00 SOIL 2 (active) 0.00 0.00 0.00 ANCHOR FORCE 0.00	0.60 0.60 0.60 0.60 0.60 0.60 0.60	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	Vert component o	f ANCHOR force	– – e (about Prop)	
\$1b \$1c \$2a2 \$2a1 \$2b \$2c	Soil 1 (awl) Soil 1 (bwl) Soil 1 (bwl) Soil 2 (awl) Soil 2 (awl) Soil 2 (bwl) Soil 2 (bwl) ANCHOR	4.5 0.0 tri 0.0 sq 0.0 tri 0.0 sq 0.0 tri 0.0 sq 0.0 sq 0.0 sq	SOIL 1 (active)  0.00 0.00 0.00 SOIL 2 (active) 0.00 0.00 0.00 ANCHOR FORCE 0.00	0.60 0.60 0.60 0.60 0.60 0.60 0.60 0.00	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	$\begin{array}{c} \text{Vert component o} \\ \text{M}_{v(net)} = 0.00 \end{array}$	I ANCHOR force	e (about Prop)	
\$1b \$1c \$2a2 \$2a1 \$2b \$2c \$A_{fv}	Soil 1 (awl) Soil 1 (bwl) Soil 1 (bwl) Soil 2 (awl) Soil 2 (awl) Soil 2 (bwl) Soil 2 (bwl) Soil 2 (bwl) ANCHOR Rv =	4.5 0.0 tri 0.0 sq 0.0 tri 0.0 sq 0.0 tri 0.0 sq 0.0 sq 0.0 sq	SOIL 1 (active) 0.00 0.00 0.00 SOIL 2 (active) 0.00 0.00 0.00 0.00 ANCHOR FORCE 0.00 RV <sub>(net)</sub> = 155.37	0.60 0.60 0.60 0.60 0.60 0.60 0.60 0.00	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	Vert component o  M <sub>v(net)</sub> = 0.00  /-Mh)	f ANCHOR force	e (about Prop)	
\$1b \$1c \$2a2 \$2a1 \$2b \$2c \$A_{Iv} \$V = Weight of	Soil 1 (awl) Soil 1 (bwl) Soil 1 (bwl) Soil 2 (awl) Soil 2 (awl) Soil 2 (bwl) Soil 2 (bwl) ANCHOR Rv =	4.5 0.0 tri 0.0 sq 0.0 tri 0.0 sq 0.0 tri 0.0 sq 0.0 sq 0.0 sq	SOIL 1 (active)  0.00 0.00 0.00 SOIL 2 (active) 0.00 0.00 0.00 ANCHOR FORCE 0.00	0.60 0.60 0.60 0.60 0.60 0.60 0.60 0.00	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	$\begin{array}{c} \text{Vert component o} \\ \text{M}_{v(net)} = 0.00 \end{array}$		e (about Prop)	
S1b S1c  S2a2 S2a1 S2b S2c  A <sub>fv</sub> V = Weight of  v = Vertical fix  a' = Effective	Soil 1 (awl) Soil 1 (bwl) Soil 1 (bwl) Soil 2 (awl) Soil 2 (awl) Soil 2 (bwl) Soil 2 (bwl) ANCHOR Rv =	4.5 0.0 tri 0.0 sq 0.0 tri 0.0 sq 0.0 tri 0.0 sq 0.0 sq 0.0 sq	SOIL 1 (active) 0.00 0.00 0.00 SOIL 2 (active) 0.00 0.00 0.00 ANCHOR FORCE 0.00 Rv <sub>(net)</sub> = 155.37 0.00 2.0	0.60 0.60 0.60 0.60 0.60 0.60 0.60 0.00	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	Vert component of $M_{v(net)} = 0.00$ 1.50			
S1b S1c  S2a2 S2a1 S2b S2c  A <sub>fv</sub> V = Weight of the Vertical fixed Effective = Base width	Soil 1 (awl) Soil 1 (bwl) Soil 1 (bwl) Soil 2 (awl) Soil 2 (awl) Soil 2 (bwl) Soil 2 (bwl) ANCHOR Rv =	4.5  0.0 tri 0.0 sq 0.0 tri  0.0 sq 0.0 sq 0.0 sq 0.0 sq 0.1 sq 0.1 sq 0.2 sq 0.3 sq 0.3 sq 0.4 sq 0.5 sq 0.5 sq 0.6 sq 0.7 sq 0.8 sq 0.9 sq 0	SOIL 1 (active) 0.00 0.00 0.00 SOIL 2 (active) 0.00 0.00 0.00 0.00 ANCHOR FORCE 0.00 Rv <sub>(net)</sub> = 155.37	0.60 0.60 0.60 0.60 0.60 0.60 0.60 0.00	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	Vert component of $M_{v(net)} = 0.00$ 1.50		e (about Prop)	
S1b S1c  S2a2 S2a1 S2b S2c  A <sub>fv</sub> V = Weight of the Vertical fixed Effective 1 = Base width	Soil 1 (awl) Soil 1 (bwl) Soil 1 (bwl) Soil 2 (awl) Soil 2 (awl) Soil 2 (bwl) Soil 2 (bwl) Soil 2 (bwl) WANCHOR Rv =	4.5  0.0 tri 0.0 sq 0.0 tri  0.0 sq 0.0 sq 0.0 sq 0.0 sq 0.1 sq 0.1 sq 0.2 sq 0.3 sq 0.3 sq 0.4 sq 0.5 sq 0.5 sq 0.6 sq 0.7 sq 0.8 sq 0.9 sq 0	SOIL 1 (active) 0.00 0.00 0.00 0.00 SOIL 2 (active) 0.00 0.00 0.00 ANCHOR FORCE 0.00 RV <sub>(nat)</sub> = 155.37 155.37 0.00 2.0 1.50	0.60 0.60 0.60 0.60 0.60 0.60 0.60 0.00	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	Vert component of $M_{v(net)} = 0.00$ 1.50		e (about Prop)	
S1b S1c  S2a2 S2a1 S2b S2c  A <sub>fv</sub> V = Weight of every extract of every ex	Soil 1 (awl) Soil 1 (bwl) Soil 1 (bwl) Soil 2 (awl) Soil 2 (awl) Soil 2 (bwl) Soil 2 (bwl) Soil 2 (bwl) WANCHOR Rv =	4.5  0.0 tri 0.0 sq 0.0 tri  0.0 sq 0.0 sq 0.0 sq 0.0 sq 0.1 sq 0.1 sq 0.2 sq 0.3 sq 0.3 sq 0.4 sq 0.5 sq 0.5 sq 0.6 sq 0.7 sq 0.8 sq 0.9 sq 0	SOIL 1 (active) 0.00 0.00 0.00 0.00 SOIL 2 (active) 0.00 0.00 0.00 ANCHOR FORCE 0.00 RV <sub>(nat)</sub> = 155.37 155.37 0.00 2.0 1.50	0.60 0.60 0.60 0.60 0.60 0.60 0.60 0.00	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	Vert component of $M_{v(net)} = 0.00$ 1.50		e (about Prop)	
S1b S1c  S2a2 S2a1 S2b S2c  A <sub>fv</sub> V = Weight of the Vertical fixed Effective 1 = Base width	Soil 1 (awl) Soil 1 (bwl) Soil 1 (bwl) Soil 2 (awl) Soil 2 (awl) Soil 2 (bwl) Soil 2 (bwl) Soil 2 (bwl) WANCHOR Rv =	4.5  0.0 tri 0.0 sq 0.0 tri  0.0 sq 0.0 sq 0.0 sq 0.0 sq 0.1 sq 0.1 sq 0.2 sq 0.3 sq 0.3 sq 0.4 sq 0.5 sq 0.5 sq 0.6 sq 0.7 sq 0.8 sq 0.9 sq 0	SOIL 1 (active) 0.00 0.00 0.00 0.00 SOIL 2 (active) 0.00 0.00 0.00 ANCHOR FORCE 0.00 RV <sub>(nat)</sub> = 155.37 155.37 0.00 2.0 1.50	0.60 0.60 0.60 0.60 0.60 0.60 0.60 0.00	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	Vert component of $M_{v(net)} = 0.00$ 1.50		e (about Prop)	
S1b S1c  S2a2 S2a1 S2b S2c  A <sub>fv</sub> V = Weight of the Vertical fixed Effective 1 = Base width	Soil 1 (awl) Soil 1 (bwl) Soil 1 (bwl) Soil 2 (awl) Soil 2 (awl) Soil 2 (bwl) Soil 2 (bwl) Soil 2 (bwl) WANCHOR Rv =	4.5  0.0 tri 0.0 sq 0.0 tri  0.0 sq 0.0 sq 0.0 sq 0.0 sq 0.1 sq 0.1 sq 0.2 sq 0.3 sq 0.3 sq 0.4 sq 0.5 sq 0.5 sq 0.6 sq 0.7 sq 0.8 sq 0.9 sq 0	SOIL 1 (active) 0.00 0.00 0.00 0.00 SOIL 2 (active) 0.00 0.00 0.00 ANCHOR FORCE 0.00 RV <sub>(nat)</sub> = 155.37 155.37 0.00 2.0 1.50	0.60 0.60 0.60 0.60 0.60 0.60 0.60 0.00	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	Vert component of $M_{v(net)} = 0.00$ 1.50		e (about Prop)	
S1b S1c  S2a2 S2a1 S2b S2c  A <sub>fv</sub> V = Weight of every extract of every ex	Soil 1 (awl) Soil 1 (bwl) Soil 1 (bwl) Soil 2 (awl) Soil 2 (awl) Soil 2 (bwl) Soil 2 (bwl) Soil 2 (bwl) WANCHOR Rv =	4.5  0.0 tri 0.0 sq 0.0 tri  0.0 sq 0.0 sq 0.0 sq 0.0 sq 0.1 sq 0.1 sq 0.2 sq 0.3 sq 0.3 sq 0.4 sq 0.5 sq 0.5 sq 0.6 sq 0.7 sq 0.8 sq 0.9 sq 0	SOIL 1 (active) 0.00 0.00 0.00 0.00 SOIL 2 (active) 0.00 0.00 0.00 ANCHOR FORCE 0.00 RV <sub>(nat)</sub> = 155.37 155.37 0.00 2.0 1.50	0.60 0.60 0.60 0.60 0.60 0.60 0.60 0.00	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	Vert component of $M_{v(net)} = 0.00$ 1.50			
S1b S1c  S2a2 S2a1 S2b S2c  A <sub>fv</sub> V = Weight of every extract of every ex	Soil 1 (awl) Soil 1 (bwl) Soil 1 (bwl) Soil 2 (awl) Soil 2 (awl) Soil 2 (bwl) Soil 2 (bwl) Soil 2 (bwl) WANCHOR Rv =	4.5  0.0 tri 0.0 sq 0.0 tri  0.0 sq 0.0 sq 0.0 sq 0.0 sq 0.1 sq 0.1 sq 0.2 sq 0.3 sq 0.3 sq 0.4 sq 0.5 sq 0.5 sq 0.6 sq 0.7 sq 0.8 sq 0.9 sq 0	SOIL 1 (active) 0.00 0.00 0.00 0.00 SOIL 2 (active) 0.00 0.00 0.00 ANCHOR FORCE 0.00 RV <sub>(nat)</sub> = 155.37 155.37 0.00 2.0 1.50	0.60 0.60 0.60 0.60 0.60 0.60 0.60 0.00	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	Vert component of $M_{v(net)} = 0.00$ 1.50			
S1b S1c  S2a2 S2a1 S2b S2c  A <sub>fv</sub> V = Weight of v = Vertical fd '' = Effective = Base width	Soil 1 (awl) Soil 1 (bwl) Soil 1 (bwl) Soil 2 (awl) Soil 2 (awl) Soil 2 (bwl) ANCHOR Rv =	4.5  0.0 tri 0.0 sq 0.0 tri  0.0 sq 0.0 sq 0.0 sq 0.0 sq 0.1 sq 0.1 sq 0.2 sq 0.3 sq 0.3 sq 0.4 sq 0.5 sq 0.5 sq 0.6 sq 0.7 sq 0.8 sq 0.9 sq 0	SOIL 1 (active) 0.00 0.00 0.00 0.00 SOIL 2 (active) 0.00 0.00 0.00 ANCHOR FORCE 0.00 RV <sub>(nat)</sub> = 155.37 155.37 0.00 2.0 1.50	0.60 0.60 0.60 0.60 0.60 0.60 0.60 0.00	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	Vert component of $M_{v(net)} = 0.00$ 1.50		e (about Prop)	

STABILITY RESULTS			Hyder	v.013.00
Lever arm of base	e resultant (from toe) M(net)/Rv =		Middle 3rd (distances from to 0.50 to	e in m) 1.00
Eccentricity of re		UTSIDE MIDDLE THIRD !	<b>*</b> ++-	
Maximum and minimum bearing pressures (P	P = (Rv / B)•(1 {+/-} 6e / I	В)	e	
P <sub>max</sub> = 3156 kN/m <sup>2</sup> EXCEEDS BEARING CAPACITY	P <sub>min</sub> = 0	kN/m²	q <sub>net</sub> Net Bearing Capacity  BEARING FAILURE	48.31 kPa
FoS AGAINST SLIDING F = {	$(W + P_v) \cdot tan(\delta + \omega) + (c_a' \cdot B) + P_{RES} \} / P_h$	1.50 OK	Minimum FoS:	1.0
FoS AGAINST OVERTURNING	$F = M_w / (M_h - M_{v(net)})$	1.00 OK	Minimum FoS:	1.0
FOS AGAINST BEARING FAILURE	P <sub>MAX</sub> Max Bearing Pressure <b>q</b> * <sub>ult</sub> Drained Ultimate Bear. Cap. FOS	3156.10 48.31 0.02 CHECK	Minimum FoS:	1.0
	<b>q</b> <sub>ult</sub> Undrained Ultimate Bear. Cap. FOS	0.00 0.00 CHECK	<u>""</u>	
COMMENTS: Reference (BS800	22 Earth Retaining Structures dated 1994)			

\HC-UKR-BM-FS-10\BM_Projects\UA005938 Aylesbury	Arm Lock Wall Collapse\F-Reports\Review of Po	ential Failure Mechanisms\[Appendix C A	ylesbury BA 001 TP3.xlsm] Gravity Wall De	ign		J GAT
Aylesbury Canal Lock \					Hyd	$\sim$
Emergency Works of F	ailed Wall				1190	Consulting
JA005938	Run No:	1a				
Existing Wall State - propp	ed		Author:	CF	Date:	20/06/201
			Checked By:		Date:	
			Approved By:		Date:	
Section based on Trial Hole	3. Maximum Assumed Wo	ater Level				
					=	

NALYSIS	- INPUT [	DATA								Hyder V v.013
Ī	USE PARTIA	L FACTOR (Y / N)	S OF SAFETY ?	N						
	ALLOW FO	R VERTICA	L SOIL FORCE	N		Partial Factors	of Safety		Factored	
Soil 1:	Above water	(Y / N) Ys1	Unit wt fill	17.0	[kN/m³]		1.00	<b>Y</b> s1	17.0	%
	Below water	γ' <sub>s1</sub>	Submerged wt	7.2	[kN/m³]	Sγ <sub>1 fill</sub>		γ's1 (sub)	7.2	[kN/m³]
	Above water Below water	γ <sub>s2</sub> γ′ <sub>s2</sub>	Unit wt fill Submerged wt	17.0 7.2	[kN/m <sup>3</sup> ] [kN/m <sup>3</sup> ]	Sγ <sub>2 fill</sub>	1.00	γ <sub>s2</sub> γ' <sub>s2 (sub)</sub>	17.0 7.2	[kN/m³]
	Above water	γ <sub>s2</sub>	Unit wt fill	19.0	[kN/m³]	Sy <sub>3f fill</sub>	1.00	<b>7</b> s2 (sub)	19.0	[kN/m³]
Wall:	Below water WALL	γ' <sub>s2</sub>	Submerged wt Unit wt	9.2 22.0	[kN/m³]		1.00	γ's3f (sub)	9.2	[K14/111 ]
wan.	PARAPET	γw γ <sub>p</sub>	Unit wt	22.0	[kN/m³] [kN/m³]	Sγ <sub>masonry</sub>	1.00	l		
	BASE	γ <sub>ь</sub>	Unit wt	22.0	[kN/m³]	Sγ concrete	1.00			
Water: Soil 1:		γ <sub>u</sub> φ <sub>1</sub> ' <sub>peak</sub>	Unit wt water Fill	9.81 25.0	[kN/m³] [deg]	Sφ fill [M]	1.50	φ <sub>1</sub> 'des	25.0	
		VI peak C <sub>1</sub>		0.0	[kN/m³]	Oφ ∰ [ivi]	1.50	♥1 des	20.0	
Soil 2:		Φ2'peak	Fill	23.0	[deg]			<b>∳2</b> 'des	23.0	[deg]
Soil 3 <sub>f</sub> :		¢ 'peak		25.0	[kN/m <sup>3</sup> ] [deg]	S¢ formation	1.50	• des	25.0	
		Ca'	Formation	2.0	[kN/m³]					
Loads:		C <sub>u</sub>	UDL	0.0 5	[kN/m³] [kN/m²]	l s .	1.00	1		
_5005.		SL	Linear Load	5	[kN/m <sup>2</sup> ]	S <sub>surcharge</sub> MUST BE GREATE		] -		
ſ	APPLY LOA (Y/N		N	0.0	[kN/m²]					
L	(1/10		s <sub>L</sub> offset	0.0	[m from back of wall]			•		
			s <sub>L</sub> width oad shed angle	0.0 35	[m]	s <sub>L</sub> ' effective width	0.02	[m]		
Г	APPLY BASE		N	0.0	[deg] [kN/m run]	Qs - Shear componen	t of reultant lan	d (permana)	aring capacity a=1:	culation
	(Y/N	)		0.0	[VIA/IIIIA]	as should componen	. 5 50114111 100	_ (po. mion) - be	g capacity Cak	
			inst overturning	1.0	Global min.				ALL FRICTION RAT	<u>os</u>
R	Required Facto	r of Safet	y against sliding	1.0	Global min.			δ's₁/φ: 8's /Δ:		
Required	Factor of Saf	ety agains	at bearing failure	1.0	Global min			გვ./∳: გვ./∳:		
	г			DIMENSIONS						
			Soil thickness S <sub>1</sub>	1.00	Thickness of Soil 1 [m] (from top of wall)		ELEVATIONS			AFFECTED BY WATER
		s o		1.00		Top elevation	4.46	[m]		No
		ı	Soil thickness		71/11/11/11/11	Bottom elevation  Top elevation	3.46 3.46	[]		
arning! S <sub>2</sub> IS	NEGATIVE	L S	S <sub>2</sub>	3.46	Thickness of Soil 2 [m]	Bottom elevation	0.00	[m]		Yes
		-	Soil thickness	0.00	Thickness of Soil 3 <sub>f</sub>	Top elevation	0.00	[m]		Yes
	}		S <sub>3 foundation</sub>		below gl / overdig [m]  Water height behind [m]	Bottom elevation	0.00	<u> </u>		
		W A	BEHIND WALL	2.90	(above ground level)					
		T		2.90						
		E R	IN FRONT	-1.15	Water height in front [m] (above ground level)					
T00 H				-1.15						
IGNORE WAT	TER INFRONT C (Y / N)	F WALL	Υ	0.00	Effective height of water in (above ground level)	front of wall				
			Ph	0.00	Parapet height [m]	APPLY PARAP	ET LOAD	N	1	
			P <sub>w</sub>	0.50	Parapet width [m]	(Y/N)			-	
			z	0.00	Toe depth [m] (below ground level)					
			z GLC	0.00						
		_	r	4.46	Retained height [m] (top of wall to gl)	FAC	TORED PROPE	RTIES		
		D I	r GLC	4.46		γ <sub>des</sub> Wall	22.0	[kN/m <sup>3</sup> ]		
		М	W <sub>1</sub>	0.00	Equiv. face width [m]	γ <sub>des</sub> Base	22.0	11.51731		
		E N	W <sub>2</sub>	0.60	Top of wall width [m]	Patter 0°	0.0	[kN/m³] [deg]		
		S	В	1.95	Base width [m]					/
		Ó	L h	1.0	Wall length [m] Heel projection [m]					/
		N S	t	0.00	Toe projection [m]			•		/
		-	t GLC d	0.00 1.00	Min base thickness [m]	Surcharge (Sr <sub>des</sub> ) δ <sub>1</sub> ' <sub>des</sub> fill-wall	5.0 16.50	[kN/m²] [deg]		
			d'	1.00	Max base thickness [m]	δ <sub>1</sub> des fill-wall δ <sub>2</sub> des fill-wall	23.00	[deg]	EXISTING V	GL
			β <sub>back</sub>	0.0	Back slope angle [deg]	δ' <sub>des</sub> formation	16.50	[deg]	NEW GL	GLC
			β <sub>front</sub> α	90	Front slope angle [deg]  Back wall angle [deg]				₹	<del></del>
			ω ω	0.0	Base Tilt [deg]	Max base depth	0.00	[m bgl]		
GROUND LEVI	EL CHANGE (IN (Y/N)	FRONT)	EXISTING GL	-0.60 0.00	[m] LOWERED					
ALLOW FOR		N	٥.	0.00	Overdig = 0.5m or 10% or r,					
LLOW FOR	CTLIDIG :	14	O <sub>d</sub>		which ever is less.					
			DEPTH pd	0.00	[m] - (below EXISTING groun					1.00
		P R	-	0.00	[m] - (below proposed NEV	v ground level)				1.03
		0	FORCE Pf effective pd	<b>50</b> 0.00	[kN/m run] [m]	PROP Depth (Rota	tion ground t		oS - OVERTURNING	0.99
		Р	•					j	FoS - BEARING FAILURE	0.02
	<u> </u>		effective Pf	50	[kN/m run]	No Passive Resista	ince utilised		(Drained)	
		A N C	HEIGHT ah	3.46	[m] - (above EXISTING grou				FoS - BEARING FAILURE	0.00
		С Н О		3.46	[m] - (above proposed NEV	W ground level)			(Undrained)	2.00
	L	R	FORCE Af	0	[kN/m run]	Horizontal thrust a	ANCHOR le	vel / m run		
Jse Coulomb	method or	C	OULOMB					Ka	Кр	
put own Ear	th Pressure						Soil 1	0.44	2.60	
Coefficient	s Ka & Kp						Soil 2 Soil 3f	0.44 0.41	2.60 2.85	
								U.T I	۵.00	
								BS 8002 Ann		



<b>☆</b> one	nin passive zone nin passive zone	Water head above ground leve  Mh = 138.53  Surcharge	PROP  Moment  [kN.m]  7.14  11.43  0.00  0.00  11.64  0.00  0.00  39.88  3.14  11.56  42.59  11.16	PROP Lever arm [m] 3.96 1.73 3.95 1.73 3.79 3.46 3.46 0.97 3.09	UDL (Surcharge)	Force [kN] 1.8 6.6	AL - (Disturb)	Per m run ORIZONT
<b>☆</b> one	nin passive zone nin passive zone	Water head above ground leve  M <sub>h</sub> = 138.53	[kN.m] 7.14 11.43 0.00 0.00 11.64 0.00 0.00 39.88 3.14 11.56 42.59	[m] 3.96 1.73 3.95 1.73 3.79 3.46 3.46 0.97	1.80 6.61 STRIP LOAD 0.00 0.00 SOIL 1 (active) 3.07 0.00 0.00	[kN]	AL - (Disturb)	
<b>☆</b> one	nin passive zone nin passive zone	M <sub>h</sub> = 138.53	11.43 0.00 0.00 11.64 0.00 0.00 39.88 3.14 11.56 42.59	1.73 3.95 1.73 3.79 3.46 3.46 0.97	1.80 6.61 STRIP LOAD 0.00 0.00 SOIL 1 (active) 3.07 0.00 0.00		Sr <sub>1</sub>	
<b>☆</b> Jone	nin passive zone nin passive zone	M <sub>h</sub> = 138.53	11.43 0.00 0.00 11.64 0.00 0.00 39.88 3.14 11.56 42.59	1.73 3.95 1.73 3.79 3.46 3.46 0.97	6.61 STRIP LOAD 0.00 0.00 SOIL 1 (active) 3.07 0.00 0.00		0.1	
<b>☆</b> Jone	nin passive zone nin passive zone	M <sub>h</sub> = 138.53	0.00 11.64 0.00 0.00 39.88 3.14 11.56 42.59	3.95 1.73 3.79 3.46 3.46 0.97	0.00 0.00 SOIL 1 (active) 3.07 0.00 0.00		Sr <sub>2</sub>	1
<b>☆</b> Jone	nin passive zone nin passive zone	M <sub>h</sub> = 138.53	0.00 11.64 0.00 0.00 39.88 3.14 11.56 42.59	1.73 3.79 3.46 3.46 0.97	0.00 SOIL 1 (active) 3.07 0.00 0.00			
<b>☆</b> Jone	nin passive zone nin passive zone	M <sub>h</sub> = 138.53	11.64 0.00 0.00 39.88 3.14 11.56 42.59	3.79 3.46 3.46 0.97	SOIL 1 (active) 3.07 0.00 0.00	0.0	S <sub>L1</sub>	
<b>☆</b> Jone	nin passive zone nin passive zone	M <sub>h</sub> = 138.53	0.00 0.00 39.88 3.14 11.56 42.59	3.46 3.46 0.97 3.09	3.07 0.00 0.00	0.0	S <sub>L2</sub>	
<b>☆</b> Jone	nin passive zone nin passive zone	M <sub>h</sub> = 138.53	39.88 3.14 11.56 42.59	3.46 0.97 3.09	0.00	<b>3.1</b> tri	Soil 1 (awl)	S1a
<b>☆</b> Jone	nin passive zone nin passive zone	M <sub>h</sub> = 138.53	39.88 3.14 11.56 42.59	0.97 3.09		<b>0.0</b> sq	Soil 1 (bwl)	S1b
<b>☆</b> Jone	nin passive zone nin passive zone	M <sub>h</sub> = 138.53	3.14 11.56 42.59	3.09	WATER (Bening Wall)	<b>0.0</b> tri	Soil 1 (bwl)	S1c
<b>☆</b> Jone	nin passive zone nin passive zone	M <sub>h</sub> = 138.53	3.14 11.56 42.59	3.09	41.25	41.3	water	U
one	nin passive zone	•	11.56 42.59		SOIL 2 (active)	41.5	Water	
one	nin passive zone	•	42.59		1.02	1.0 tri	Soil 2 (awl)	S2a2
one	nin passive zone	•		3.18	3.64	<b>3.6</b> sq	Soil 2 (awl)	S2a1
one	nin passive zone	•	11.10	1.45	29.37	29.4 sq	Soil 2 (bwl)	S2b
one	nin passive zone	Surcharge		0.97	SOIL 2 (passive)	11.5 tri	Soil 2 (bwl)	S2c
one	nin passive zone		0.00	0.00	0.00	<b>0.0</b> sq	Sr <sub>3</sub>	1
one	nin passive zone						74.4	Pp min
	nin passive zone						74.4	Pp <sub>max</sub>
OHG.		Water pressure within passive zo	0.00 0.00	0.00 0.00	0.00 0.00	<b>0.0</b> sq <b>0.0</b> tri		U1 U2
	elow PROPI	Water pressure within passive zo Passive reaction (below PROP)	0.00	0.00	0.00	0.0 tri 0.0 sq		U2 Fp1
		Passive reaction (below PROP)	0.00	0.00	0.00	<b>0.0</b> tri		Fp2
·					SOIL 3 (passive) INFRONT			
0.00	ve soil [m]	Max depth of passive soil [m]					0.0	Pp min
			0.00	0.00	0.00	0.0 +-1	0.0 Soil 3 (2001)	Pp <sub>max</sub>
e Ignored - PROPPE	esistance l	Passive Resistanc	0.00 0.00	0.00 0.00	0.00 0.00	<b>0.0</b> tri <b>0.0</b> sq	Soil 3 (awl) Soil 3 (bwl)	Fpf3a Fpf3b
			0.00	0.00	0.00	0.0 sq 0.0 tri	Soil 3 (bwl)	Fpf3c
$\neg$		P <sub>RES</sub> =	0.00	0.00	0.00	0.0 tri	water	U
kN/m run	50.00	P <sub>p</sub> (Passive) 50.00			0.00		ssive reistance	p Total pa
KI VIII TOIT	00.00	or P <sub>f</sub> (Prop	0.00	0.00	PROP FORCE	50.0	DDOD.	
		rorcej	0.00	0.00	ANCHOR FORCE	-50.0	PROP	Pf
			0.00	3.46	0.00	0.0	ANCHOR	$A_{fh}$
			138.53	M <sub>h</sub> =	Rh <sub>(net)</sub> = 98.30	48.3	Rh =	
		Wall (triangle)			LOADS			
$\sim$		Wall (rectangle)	13.70	0.30	45.67	45.7	wall stem	Ww <sub>2</sub>
~~~		Base (rectangle)	41.83	0.98	42.90	42.9	wall base	Wb <sub>1</sub>
$\vee$		Base (traingle)						
		Soil 1 wet weight on top of heal	0.00	1.28	0.00	0.0	Soil 1	Ws 1 wet
		Soil 2 dry weight on top of heal	16.39	1.28	12.85	12.9	Soil 2	Ws 2 dry
J.	1 top of heal	Soil 2 wet weight on top of heal	35.89	1.28	28.15	28.1	Soil 2	Ws 2 wet
_		M <sub>w</sub> = 137.07	8.61	1.28		6.8	surcharge	Wsr
			0.00	0.60		0.0 tri	Soil 1 (awl)	S1a
			0.00	0.60	0.00	0.0 sq	Soil 1 (bwl)	S1b
			0.00	0.60	0.00	<b>0.0</b> tri	Soil 1 (bwl)	S1c
				· · · · · · · · · · · · · · · · · · ·				-
				0.00	SOIL 2 (active)			S2a2
			0.00	0.60 0.60	0.00	0.0 tri 0.0 sa	Soil 2 (awl) Soil 2 (awl)	
			0.00 0.00 0.00	0.60 0.60 0.60		0.0 tri 0.0 sq 0.0 sq	Soil 2 (awl) Soil 2 (awl) Soil 2 (bwl)	S2a1 S2b
_			0.00	0.60	0.00 0.00 0.00 0.00	<b>0.0</b> sq	Soil 2 (awl)	S2a1
			0.00 0.00 0.00	0.60 0.60 0.60	0.00 0.00 0.00 0.00 ANCHOR FORCE	<b>0.0</b> sq <b>0.0</b> sq <b>0.0</b> tri	Soil 2 (awl) Soil 2 (bwl) Soil 2 (bwl)	S2a1 S2b S2c
rce (about Prop)	ANCHOR force	Vert component of ANCHOR for	0.00 0.00 0.00	0.60 0.60 0.60 0.00	0.00 0.00 0.00 0.00 ANCHOR FORCE 0.00	0.0 sq 0.0 sq 0.0 tri	Soil 2 (awl) Soil 2 (bwl) Soil 2 (bwl) ANCHOR	S2a1 S2b
rce (about Prop)	ANCHOR force	Vert component of ANCHOR for	0.00 0.00 0.00	0.60 0.60 0.60	0.00 0.00 0.00 0.00 ANCHOR FORCE	<b>0.0</b> sq <b>0.0</b> sq <b>0.0</b> tri	Soil 2 (awl) Soil 2 (bwl) Soil 2 (bwl)	S2a1 S2b S2c
rce (about Prop)	ANCHOR force		0.00 0.00 0.00 0.00 145.67	0.60 0.60 0.60 0.00	0.00 0.00 0.00 0.00 ANCHOR FORCE 0.00	0.0 sq 0.0 sq 0.0 tri	Soil 2 (awl) Soil 2 (bwl) Soil 2 (bwl) ANCHOR	S2a1 S2b S2c
rce (about Prop)	ANCHOR force	u <sub>v(net)</sub> = 0.00	0.00 0.00 0.00 0.00 145.67	0.60 0.60 0.60 0.00 M <sub>v</sub> =	0.00 0.00 0.00 0.00 ANCHOR FORCE 0.00 Rv <sub>(net)</sub> = 159.27	0.0 sq 0.0 sq 0.0 tri	Soil 2 (awl) Soil 2 (bwl) Soil 2 (bwl) Soil 2 (bwl)  ANCHOR  RV =	S2a1 S2b S2c S2c
rce (about Prop)		u <sub>v(net)</sub> = 0.00  th)	0.00 0.00 0.00 0.00 145.67	0.60 0.60 0.60 0.00 M <sub>v</sub> =	0.00 0.00 0.00 0.00 ANCHOR FORCE 0.00	0.0 sq 0.0 sq 0.0 tri	Soil 2 (awl) Soil 2 (bwl) Soil 2 (bwl) Soil 2 (bwl)  ANCHOR  Rv =	S2a1 S2b S2c
rce (about Prop)		u <sub>v(net)</sub> = 0.00  th)	0.00 0.00 0.00 0.00 145.67 7.14 /A	0.60 0.60 0.60 0.00 M <sub>v</sub> =	0.00 0.00 0.00 0.00 ANCHOR FORCE 0.00 Rv <sub>(net)</sub> = 159.27	0.0 sq 0.0 sq 0.0 tri	Soil 2 (awl) Soil 2 (bwl) Soil 2 (bwl) ANCHOR Rv =	S2a1 S2b S2c  A <sub>fv</sub>
rce (about Prop)		u <sub>v(net)</sub> = 0.00  th)	0.00 0.00 0.00 0.00 145.67 7.14 /A	0.60 0.60 0.60 0.00 M <sub>v</sub> =	0.00 0.00 0.00 0.00 ANCHOR FORCE 0.00 Rv <sub>(net)</sub> = 159.27	0.0 sq 0.0 sq 0.0 tri 0.0 159.3	Soil 2 (awl) Soil 2 (bwl) Soil 2 (bwl) ANCHOR Rv =	S2a1 S2b S2c  A <sub>fv</sub> = Weight '= Vertical '= Effectiv = Base wice
ı	n top of hea n top of hea n top of hea	Base (rectangle) Base (traingle) Parapet (rectangle) Soil 1 dry weight on top of hea Soil 1 wet weight on top of hea Soil 2 dry weight on top of hea	PROP Moment [kN.m]  0.00 13.70 41.83 0.00 0.00 29.26 0.00 16.39	M <sub>h</sub> =  PROP Lever arm [m]  0.00 0.30 0.98 1.30 0.25 1.28 1.28 1.28	Rh <sub>(net)</sub> = 98.30	Force [kN]  0.0 45.7 42.9 0.0 23.0 0.0 12.9	Rh =  - (Restore)  wall stem wall stem wall base wall downstand parapet Soil 1 Soil 2	Ww <sub>1</sub> Ww <sub>2</sub> Wb <sub>1</sub> Wb <sub>2</sub> Wp Ws <sub>1 dry</sub> Ws <sub>1 wet</sub>

//HC-0KH-BWI-F3-10/BWI_	Projects/UA005938 Aylesbury Arm Lock Wall Collapse/F-H	reports/neview or For	ential i allule	Mechanisms Appendix C Aylesbu	IV BA 001 1F3
STABILITY RESULTS				l Hyd	v.013.00
Lever ar	rm of base resultant (from toe) M(net)/Rv =	0.04 DUTSIDE MIDDLE TH	]m	Middle 3rd (distances	from toe in m) 1.30
Eccentri	icity of resultant (e) e =		]m	+	
Maximum and minimum bearing pres	ssures (P) $P = (Rv/B) \cdot (1 \{+/-\} 6e/B)$	B)		e i	
P <sub>max</sub> = 2369 EXCEEDS BEARING CAPACITY	kN/m <sup>2</sup>	kN/m <sup>2</sup>		q <sub>net</sub> Net Bearing Capacity  BEARING FAILURE	50.75 kPa
FoS AGAINST SLIDING	$F = \{ (W + P_v) \cdot tan(\delta + \omega) + (c_a' \cdot B) + P_{RES} \} / P_h$	1.03	] ок	Minimum FoS:	1.0
Fos against overturning	$F = M_w / (M_h - M_{v(net)})$		CHECK !!!	Minimum FoS:	1.0
FoS AGAINST BEARING FAILURE	P <sub>MAX</sub> Max Bearing Pressure q¹ <sub>ult</sub> Drained Ultimate Bear. Cap. FOS	2369.00 50.75 0.02	CHECK !!!	Minimum FoS:	1.0
	<b>q</b> <sub>ult</sub> Undrained Ultimate Bear. Cap. FOS	0.00 0.00	CHECK !!!	-	
COMMENTS: Reference	ce (BS8002 Earth Retaining Structures dated 1994)				

Appendix E Ground Engineering Article October 2013

## Weather impact on landslides highlighted

Wet weather in 2012 resulted in a dramatic increase in the number of landslides occurring outside the normal "season" according to new research by the British Geological Society (BGS).

The higher incident rate has resulted in the BGS using Twitter, as well as traditional media and public contact, to improve response time and coverage of landslide monitoring, which has enabled a landslide forecast to be incorporated into the Daily Hazard Assessment reports issued by the Natural Hazards Partnership (NHP).

The BGS research presented at the British Science Festival in Newcastle this week also shows that the increased landslide rate that occurred in 2012 is continuing into this year.

According to the research, there was a five-fold increase in the number of landslides recorded by the BGS Landslide Response Team in the period between June 2012 and June 2013. "In addition, there has been an unprecedented increase in the number of landslides outside of the generally accepted 'Landslide Season' of October to March, especially during the summer months," said the report.

The report links the increase to the "exceptional amount of rainfall over the last 12 months, especially last summer which was the second wettest in the UK (and the wettest English summer) since records began in 1910".